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(54) Title: SELF-LIGATING ORTHODONTIC BRACKETS

(57) Abstract: The present invention employs a self-ligating orthodontic bracket comprising a body having a pair of laterally spaced gingival tie wings and a pair of laterally spaced occlusal tie wings, the gingival and occlusal tie wings projecting from a labial surface of the body: an arch wire slot extending mesially-distally across the body and between the gingival and occlusal tie wings to accommodate an arch wire: a free-sliding, controlled-locking, or pivoting clip wherein the clip allows placement and removal of the arch wire when in the open position and prevents the displacement of the arch wire from the bracket member when in the closed position.

Self-Ligating Orthodontic Brackets

Related Applications

[0001] This patent application claims the benefit of and priority to U.S. Provisional Patent Application Ser. No. 61/711,381, filed on October 9, 2012 and U.S. Provisional Patent Application Ser. No. 61/768,317, filed on February 22, 2013, which are herein incorporated by reference for all purposes.

Field of Invention

[0002] The present invention is directed to the field of orthodontics, and specifically to the field of orthodontic bracket assemblies.

Summary of the Invention

[0003] The present invention provides improved self-ligating orthodontic brackets. In one aspect, the present invention provides a self-ligating orthodontic bracket comprising: a body having a pair of laterally spaced gingival tie wings and a pair of laterally spaced occlusal tie wings, the gingival and occlusal tie wings projecting from a labial surface of the body; an archwire slot extending mesially-distally across the body and between the gingival and occlusal tie wings to accommodate an arch wire; a free-sliding, controlled-locking or pivoting clip wherein the clip allows placement and removal of the arch wire when in the open position and prevents the displacement of the arch wire from the bracket member when in the closed position.

Brief Description of the Drawings

[0004] FIGS. 1A-1F are various views of a first embodiment of the present invention.

[0005] FIGS. 2A-2C are various views of a second embodiment of the present invention.

[0006] FIGS. 3A-3C are various views of a third embodiment of the present invention.

[0007] FIGS. 4A-4D are various views of a fourth embodiment of the present invention.

[0008] FIGS. 5A-5E are various views of a fifth embodiment of the present invention.

[0009] FIGS. 6A-6D are various views of a sixth embodiment of the present invention.

[0010] FIGS. 7A-7C are various views of a seventh embodiment of the present invention.

[0011] FIGS. 8A-8E are various views of a eighth embodiment of the present invention.

[0012] FIGS. 9A-9H are various views of a ninth embodiment of the present invention.

[0013] FIGS. 10A-10D are various views of a tenth embodiment of the present invention.

[0014] FIGS. 11A-11C are various views of a eleventh embodiment of the present invention.

[0015] FIGS. 12A-12C are various views of a twelfth embodiment of the present invention.

[0016] FIGS. 13A-13C are various views of a thirteenth embodiment of the present invention.

[0017] FIGS. 14A-14C are various views of a fourteenth embodiment of the present invention.

[0018] FIGS. 15A-15C are various views of a fifteenth embodiment of the present invention.

[0019] FIGS. 16A-16C are various views of a sixteenth embodiment of the present invention.

[0020] FIGS. 17A-17N are various views of a seventeenth embodiment of the present invention.

[0021] FIGS. 18A-18D are various views of a eighteenth embodiment of the present invention.

[0022] FIGS. 19A-19F are various views of a nineteenth embodiment of the present invention.

[0023] FIGS. 20A-20B are various views of a twentieth embodiment of the present invention.

[0024] FIGS. 21A-21C are various views of a twenty-first embodiment of the present invention.

[0025] FIGS. 22A-22B are various views of a twenty-second embodiment of the present invention.

[0026] FIGS. 23A-23B are various views of a twenty-third embodiment of the present invention.

[0027] FIGS. 24A-24C are various views of a twenty-fourth embodiment of the present invention.

[0028] FIGS. 25A-25C are various views of a twenty-fifth embodiment of the present invention.

[0029] FIGS. 26A-26C are various views of a twenty-sixth embodiment of the present invention.

[0030] FIGS. 27A-27C are various views of a twenty-seventh embodiment of the present invention.

[0031] FIGS. 28A-28C are various views of a twenty-eighth embodiment of the present invention.

[0032] FIGS. 29A-29C are various views of a twenty-ninth embodiment of the present invention.

[0033] FIGS. 30A-30C are various views of a thirtieth embodiment of the present invention.

[0034] FIGS. 31A-31C are various views of a thirty-first embodiment of the present invention.

Description of Invention

[0035] It is appreciated that the present invention provides for several embodiments of a self-ligating orthodontic bracket assembly that includes a bracket and a locking clip(s). The bracket has a closed position in which the clip inhibits access to an archwire slot and an open position in which the clip allows access to the archwire slot.

[0036] Generally, the illustrated bracket includes a body and a base. The body may include the archwire slot (two receiving areas positioned mesially and distally of the bracket body), a first tie

wing (e.g., gingival tie wing(s)), a second tie wing (e.g., occlusal tie wing(s)), and an interwing region extending gingivally-occlusally across the body and may be generally defined by at least one of the lateral spacing or a bridge portion of the gingival tie wings and the lateral spacing or a bridge portion of the occlusal tie wings. The base connects the bracket to a tooth and may include an attachment portion that defines a pattern, which receives an adhesive and is shaped to affix to the tooth. In one specific embodiment, the lingual side of the attachment portion affixes to the labial side of the tooth. In the construction, the base may be attached to the body with welds. In other constructions, the base may be attached in other ways or formed as a single piece with the body.

[0037] Referring now to FIGS. 1A to 1F, a self-ligating orthodontic bracket is shown and is generally indicated to by reference numeral 1010. FIG. 1A is a perspective view of a self-ligating dental bracket in a closed position in accordance with the present invention with a lateral spacing between the gingival tie wings and a labial portion (e.g., hood portion) extending from the respective mesial and distal gingival tie wings to form the receiving areas. The labial portions extending outside the mesial and distal sides of the body for receiving a tab portion (e.g., a prong) of the clip. The labial free end of the clip (e.g., gingival tip portion) includes the tab portions of the clip, which may be contoured to match the contour of the receiving area beneath the hood portions of the gingival tie wings.

[0038] More particularly, the orthodontic bracket 1000 includes a body 1012 and a lingual mounting base 1014 attached to the body. The mounting base 1014 has a lingual surface to be attached to a tooth. Generally, the body 1012 defines a square, rectangle, or otherwise shaped member. However, it is appreciated that the body 1012 may be defined by various other shaped configurations such as a rhombus-shaped, a circular-shaped, an oval-shaped, or otherwise shaped member.

[0039] A pair of laterally spaced gingival tie wings 1016 and a pair of laterally spaced occlusal tie wings 1018 extend from the labial surface of the body 1012. The gingival tie wings 1016 and the occlusal tie wings 1018 generally curve lingually. An interwing region 1024 extends gingivally-occlusally across the body 1012 and may be generally defined by the lateral spacing of the gingival tie wings 1016 and/or the lateral spacing of the occlusal tie wing 1018. The interwing region 1024 may be an opened (e.g., unobstructed) passageway or may be a closed (partially or completely obstructed) passageway FIGS. 1A-1F, or otherwise. An archwire slot 1020 extends mesially-distally across the body 1012 and between the gingival and occlusal tie

wings 1016 and 1018. The archwire slot 1020 opens labially to receive an archwire (not shown). The archwire slot 1020 may be interrupted in the interwing region 24 of the body.

[0040] The bracket 1010 may further include a locking mechanism that includes a locking clip 1026 for maintaining the archwire in the archwire slot 1020 while in the closed position. This locking clip 1026 is structured in a substantially U-shaped cross-sectional configuration, and one side thereof is formed as a lingual free end 1028 (a portion located on the lingual side) located on the base side and extending along the base (through an opening formed between the body 1012 and the base 1014), while the other side thereof is formed as a labial free end 1030 having substantially the same width as the length of the arch wire slot 1020 and extending on the upper side of the slot. The lingual free end 1028 and the labial free end 1030 may be interconnected by a curved portion 1032.

[0041] The locking clip 1026 may be formed of an elastic member in which a notched portion 1034 is provided substantially in the center of a tip edge portion of the labial free end 1030 (a portion located on the labial side). The notch portion 1034 may be defined by left and right (e.g., mesial and distal) tab portions 1031 of the counter base portion 1028, which is the T or Y-shape head portion in the substantially T or Y-shaped configuration of the locking clip 1026.

[0042] Further, since the notched portion 1034 of the locking clip may correspondingly be provided for the width of the bracket body (e.g., mesial/distal free/open edge portions) so as to be fitted to it, the shift and twisting of the tab portions of the locking clip 1026 in the longitudinal direction of the slot can be effectively suppressed. Namely, with respect to the shift and twisting of the tip portion of the locking clip 1026 in the longitudinal direction of the body, such shift can be suppressed by a receiving area provided about a mesially side and/or a distally side of the bracket body 1012.

[0043] The receiving area may be defined by a receiving member 1036 extending from the outer free/open edge of the bracket body 1012. Preferably, the outer free/open edge of the bracket body is generally coplanar with the mesial/distal free ends of the archwire slot 1020, though not required. In one specific example as shown in FIGS 1A-1F, the receiving member 1036 may include a labial hood portions 1038 extending mesially/distally from the outer free/open edge of the gingival tie wing 1016 of the bracket body 1012. The labial hood portion may be provided for stopping a tip of the locking clip 1026 (e.g., tabs 1031) at a slot closed position at a free/open edge portion of the bracket body. More particularly, a mesial labial hood portion 1039 may extending mesially from the mesial free/open edge portion of the bracket body (e.g., mesially extending from the mesial-gingival tie wing) and a distal labial hood portion 1038b

may extend distally from a distal free/open edge portion of the bracket body (e.g., distally extending from the distal-gingival tie wings). Desirably, the labial hood portions 1039 and 1038b prevent the arch wire from unintentionally being removed from the archwire slot 1020 by limiting labial movement of the locking clip 1026 while in the closed position.

[0044] The locking clip 1026 may further include an engaging end portion 1040, which can be formed by a notched portion, a recessed portion, a projection, or the like. The engaging end portion may be formed at a rear end portion of the lingual free end 1028 in the locking clip 1026. The engaging end portion 1040 may be configured to aid in moving the locking clip 1026 from the closed position to an open position through contact by a tool or otherwise. By way of example, a tool may contact the engaging end portion so that the lingual free end 1028 moves occlusally threrby moving the labial free end 1030 occlusially away from the hood portions 1039 and 1038b to an open stop groove 1042 about the labial surface of the occlusal tie wings 1018 so that the locking clip 1026 may be maintained in the open position.

[0045] When included, the open stop groove 1042 may be provided in the interwing region 1024 connecting the occlussal tie wings therebetween. Furthermore, the open stop groove 1042 may include a mesial-distal protrusion 1044, which does what? The open stop groove 1042 may further include a mesial-distal depression 1046 having mesial and distal edge walls 1048. The depression 1046 having substantially the same width as the curved portion 1032 of the locking clip 1026 so that the edge walls 1048 can minimize the mesial-distal shift of the locking clip 1026 resulting from an unexpected force being applied on the bracket. Optionally, the interior walls 1050 of the occlusal tie wings may also minimize the mesial-distal shift of the locking clip 1026 resulting from an unexpected force being applied on the bracket in addition to or in place of the depression 1046 (desirably a locking clip having a curved portion with a width corresponding to the width of the interwing region between the occlusal tie wings).

[0046] FIGS. 2A-2C are various views of an alternate embodiment of a self-ligating bracket shown in FIG. 1A. As such the present invention may provide a self-ligating bracket 1010a having a bracket body 1012a, a base 1014, a locking clip 1026 and a bridge portion 1052a in the gingival interwing region 1024a so as to connect the interior mesial side of gingival-distal tie wing with the interior distal side of the gingival-mesial tie wing. Optionally, the bridge portion 1052a may include a depression 1054a having an opening 1056a to allow for access of a dental tool to aid in the opening and/or closing of the bracket 1010a.

[0047] FIGS. 3A-3E are various views of another alternate embodiment of the self-ligating bracket shown in FIG. 2A in which the present invention may include a self-ligating bracket

1010b having a bracket body 1012b, a base 1014, a locking clip 1026b and a receiving member 1036b. The receiving member may further include at least one lingual ledge 1058b. Lingual ledges 1058b may be provided as separate artifacts that mesially and distally extend from the respective sides of the body 1012b in a location lingually spaced from the hood portions 1038b. Lingual ledges 1058b may be configured to minimize and/or substantially prevent lingual movement of the locking clip 1026b. In this specific example, the hood portions 1038b have been reduced/thinned (gingivally-occlussally) and the gingival tip of the tab portions of the clip may be bent slightly labially for enhanced interactivity. Furthermore, the curved portion 1032b of the locking clip 1026b may include a throughhole 1060b, which corresponds with a depression 1046b of the open-stop groove 1042b to allow for access of a dental tool to aid in the opening and/or closing of the bracket 1010b.

[0048] Bracket 1010b may further include an alternate locking mechanism having a modified lingual free end of the locking clip being received by the lingual opening of the bracket. More particularly, the locking clip 1026b may include a lingual free end 1028b having a plurality of spaced apart deformable fingers 1062b for engagement with a lingual opening 1064b formed at an occlusal portion of the body. The deformable fingers 1062b having outwardly extending mesial/distal flange portions 1066b at a gingival free end. The lingual opening 1064b extending into a cavity 1068b having a larger width than the width of the lingual opening 1064b to prevent the deformable fingers from passing through the lingual opening (while in a non-stressed state) and separating from the clip. Desirably the deformable fingers 1062b are deformed towards one another such that the width between the outer edges of the flange portion is less than the lingual opening 1064b so that the lingual free end 1028b of the locking clip 1026b may be inserted through the lingual opening 1064b and into the lingual cavity 1068b for securement therein. Once the lingual free end of the locking clip is received into the lingual cavity, the deformable fingers substantially return to their non-stressed state/position. Optionally, once received in the lingual cavity, the deformable fingers may remain in a partially stressed state due to active engagement of the outer edges 1070b of the flange portions with the respective mesial and distal side walls 1072b of the lingual cavity to aid in suppressing movement (e.g., twisting, mesial-distal movement, and/or otherwise).

[0049] FIGS. 4A-4D are various views of another alternate embodiment of the self-ligating bracket shown in FIGS. 3A-3E in which the receiving member 1036c may further include end walls 1074c interconnecting the labial hoods 1038c and the lingual ledges 1058c to define a perimeter around a throughhole 1076c in the receiving areas to cover and protect the mesial

and distal tab portions 1031c of the locking clip 1026c while in the closed position. As in FIGS. 3A-3E, the gingival tie wings 1016c have been reduced/thinned (gingivally-occlusally) and the gingival tip of the tab portions 1031c may be bent slightly labially for enhanced interactivity. Furthermore, the width of the notched portion 1034c at the tab portions 1031c may be correspondingly provided to fit the width of the bracket body 1012c to suppress shifting and/or twisting of the locking clip 1026c while in the closed position.

[0050] FIGS. 5A-5F are various views of another alternate embodiment of the self-ligating bracket shown in FIGS. 3A-3E in which the receiving member 1036d may further include a separate artifact as mesial-distal extension 1078d to the gingival tie wings 1016d. The mesial-distal extensions 1078d being configured to interconnect the labial hood portions 1038d with the respective lingual ledges 1058d in the shape of a "c-cup" to retain the tab portions 1031d of the locking clip 1026d while in the closed position.

[0051] FIG. 5E is a cross-sectional view of the self-ligating dental bracket in FIG 5A, which further illustrates a depression/chamfer 1046d in the open stop groove 1042d of the body 1012d between the occlusal tie wings 1018d to guide a standard dental instrument to facilitate the opening of the locking clip 1026d.

[0052] FIGS. 6A-6C are various views of another alternate embodiment of the self-ligating bracket shown in FIGS. 5A-5E in which an alternate locking mechanism may be provided. The alternate locking mechanism may include ratchet portions 1080e about the respective side walls 1072e (e.g., mesial and distal side walls) of the lingual cavity 1068e to substantially maintain each flange portion 1066e of the lingual free end 1028e of the locking clip 1026c in a generally predetermined position 1082e and/or area of the lingual cavity 1068e while in the closed position. The ratchet portions 1080e may further include tapered occlusal end portions 1084e to facilitate movement of the lingual free end 1028e to the predetermined (gingival) area 1082e of the lingual cavity.

[0053] FIG. 6B is a cross-sectional view of an alternate embodiment of the body and clip of a self-ligating dental bracket shown in FIG. 5E in which the clip slides gingivally toward the open position before the lingual free end of the clip slightly pivots labially at the near-open position.

[0054] FIG. 6C is a bottom view of the body and clip in FIG. 6A in which the lingual free end of the locking clip locks securely in the closed position. When the clip slides gingivally toward the open position, the lingual free end of the clip will be guided by the tapered opening in the lingual portion of the body.

[0055] FIG. 6E is a perspective view of the locking clip 1026e may further include a least one grooves 1086e extending (e.g., labially-lingually) about the curved portion 1032e. In one specific example, the locking clip 1026e includes a pair of labially-lingually extending grooves 1086e, though not required. The grooves 1086e may provide additional reinforcement to the locking clip 1026e to suppress shifting and/or twisting of the locking clip 1026e while in the closed position. .IS THIS TRUE?

[0056] FIGS. 7A-7C are various views of another alternate embodiment of the self-ligating bracket shown in which the receiving member 1036f may include full hood portions 1038f similar to the alternate embodiment shown in FIG. 1A (e.g., not having a reduced in thickness) while further including lingual ledges 1058f. In this specific embodiment, the gingival tip portions 1033f of the tab portions 1031f may remain generally flat.

[0057] FIGS. 8A-8E are various views of another alternate embodiment of the self-ligating bracket shown in FIGS. 4A-4D in which the receiving member 1036g may further include full hood portions 1038g extending from the respective gingival tie wings 1016g thereby providing an increased labial surface 1088g about the gingival tie wings 1016g. In doing so, the hook portions 1019g of the gingival tie wings 1018g may extend lingually, at least partially covering the gingival side of the throughhole 1076gl.

[0058] FIGS. 9A-9H are various views of another embodiment of the self-ligating bracket of the present invention in which the bracket 1010h includes a modified locking clip 1026h and a modified receiving member 1036h. In this specific embodiment, the receiving member 1036h may be centrally located about the bracket body 1012h and may include a continuous retaining (e.g., resting) channel 1090h to allow a positive seat for retaining the locking clip 1026h. Desirably, the retaining channel 1090h extends generally in a parallel manner to the archwire slot 1020h between the respective mesial and distal sides of the bracket body 1012h. In this specific embodiment, the width of the locking clip 1026h at the labial free end 1030h may be been reduced to generally the same mesial-distal width of the bracket body 1012h. Furthermore, the labial free end 1030a of the locking clip 1026h may include a single tab portion 1031h (e.g., generally free of a notch), which generally corresponds with the retaining channel 1090h. The retaining channel may be further defined by a generally c-shaped profile to not only provide a positive seat (and limit lingual movement of the labial free end 1030h), but may also provide a hood portion 1038h to limit labial movement of the labial free end 1030h while in the closed position. Optionally, the height (e.g., labial-lingual height) of the retaining channel 1090h may be sufficiently sized (e.g., less than or equal to the thickness of the archwire) so that

archwire entrapment therein may be substantially prevented while the free end portion 1030h of the locking clip 1026h is in the closed position.

[0059] FIG. 9F is a gingival view of the self-ligating dental bracket 1010h shown in FIG. 9A that incorporates a lingual opening 1064h (e.g., throughhole), which is a continuous channel extending between the gingival tie wings 1016h and the occlusal tie wings 1018h towards the lingual portion of the body to facilitate the cleaning of entrapped calculus / tartar.

[0060] FIG. 9G is a bottom view of the body 1012h and locking clip 1026h of a self-ligating dental bracket shown in FIG. 9A while in a closed position with the base removed. In this specific embodiment, the lingual opening 1064h extends completely through the lingual portion of the body 1012h (as discussed above) while the area of the lingual cavity 1068h has been reduced.

[0061] FIGS. 10A-10B, 10C-10D, 11A-11C, 12A-12C, 13A-13C, 14A-14C, 15A-15C, and 16A-16C are various views of alternate locking mechanisms of the self-ligating dental brackets of the present invention.

[0062] FIGS. 10A-10D are various views of an alternate embodiment of the self-ligating dental bracket shown in FIGS. 9G-9H in which the lingual cavity 1068m has.

[0063] FIGS. 10A-10B provide self-ligating bracket 1010i, which may include a modified locking arrangement having a locking clip 1026i and a lingual cavity 1068i having a centrally located stabilizing member with locking grooves/ratchets to facilitate and securely lock the lingual free end of the locking clip in both the opened and closed positions. In this specific embodiment, the locking clip 1026i includes a Y-shaped/U-shaped lingual free end 1028i having deformable fingers 1062i. The deformable fingers 1062i may include inwardly extending flange portions 1066i that are configured to actively engage open position grooves 1094i (to aid in maintaining the bracket in the open position) or closed position grooves 1096i (to aid in maintaining the bracket in the closed position) of a stabilizing member 1098i. The stabilizing member 1098i may be located generally in a central region (e.g., generally parallel to the interwing region 1024i) of the lingual cavity 1068i, though not required. In this specific embodiment, the stabilizing member 1098i extends from the gingival side of the lingual opening 1064 to an intermediate position within the lingual cavity 1068i so that each deformable finger 1062i extends along at least one side of the stabilizing member 1098i.

[0064] In use, the deformable fingers compress towards one another to reduce the overall width of the lingual free end portion 1028i for insertion into through the lingual opening. Once the lingual free end portion extends through the lingual opening 1064i, the deformable fingers return

to a non-stressed position, which includes a width generally smaller than the width of engagement ribs of the stabilizing member 1098i. Insertion of the locking clip 1026h continues into the lingual cavity 1068i, where the flange portions 1066i are deflected outwards upon contacting a first pair of engagement ribs 1100i until the flange portions 1066i are received in the pair of open position grooves 1094i and will remain while the bracket is in the open position. To achieve the closed position, the locking clip 1026i is further inserted (gingivally) into the lingual cavity 1068i, where the flange portions 1066i are again deflected outward upon contacting a second pair of engagement ribs 1102i until the flange portions 1066i are received into the pair of closed position grooves 1096i so that the bracket 1010i is substantially maintained in the closed position. To return the bracket to the open position, the locking clip 1026i is moved occlusally towards the second pair of engagement rings until the flange portions 1066i are received into the open position grooves 1094i. Active engagement of the deformable fingers 1062i (e.g., flange portions 1066i) and the stabilizing member 1098i (closed position grooves) aid in suppressing movement (e.g., twisting, mesial-distal movement, and/or otherwise) of the locking clip 1026i while in the closed position.

[0065] The self-ligating dental bracket 1010i may incorporate a lingual opening 1064i (e.g., throughhole), which may include two channels 1064i'extending from the gingival tie wings 1016i to a single channel 1064i" at the occlusal tie wings 1018i towards at a lingual portion of the body to facilitate the cleaning of entrapped calculus / tartar.

[0066] FIGS. 10C-10D provide self-ligating bracket 1010j, which may include a modified locking arrangement having a locking clip 1026j and a lingual cavity 1068j having a mesially and distally located locking grooves/ratchets to facilitate and securely lock the lingual free end of the locking clip in both the opened and closed positions. In this specific embodiment, the locking clip 1026j includes a Y-shaped/U-shaped lingual free end 1028j having deformable fingers 1062j. The deformable fingers 1062i may include outwardly extending flange portions 1066j that are configured to actively engage open position grooves 1094j (to aid in maintaining the bracket in the open position) or closed position grooves 1096j (to aid in maintaining the bracket in the closed position) of the mesial and distal side walls 1072j of the lingual cavity 1068j.

[0067] In use, the deformable fingers compress inwards towards one another to reduce the overall width of the lingual free end portion 1028j for insertion through the lingual opening. Once the lingual free end portion extends past a first pair of engagement ribs 1100j, the deformable fingers attempt to return to a non-stress position while the flange portions 1066j are received in the pair of open position grooves 1094j and will remain while the bracket is in the

open position. To achieve the closed position, the locking clip 1026j is further inserted (gingivally) into the lingual cavity 1068j, where the flange portions 1066j are again deflected inward upon contacting a second pair of engagement ribs 1102j until the flange portions 1066j are received into the pair of closed position grooves 1096j so that the bracket 1010j is substantially maintained in the closed position. To return the bracket to the open position, the locking clip 1026j is moved occlusally towards the second pair of engagement ribs 1102j until the flange portions 1066j are received into the open position grooves 1094i. Active engagement (e.g., flange portions in compression (stressed position) so that an outward force on the sidewalls 1072j is provided) on the deformable fingers 1062j (e.g., flange portions 1066j) and the stabilizing member 1098j (closed position grooves) aid in suppressing movement (e.g., twisting, mesial-distal movement, and/or otherwise) of the locking clip 1026j while in the closed position.

[0068] FIGS. 11A-11B are various views of another alternate embodiment of the self-ligating bracket shown in FIG. 3E in which the lingual cavity 1068k further includes a stabilizing member 1098k extending from a gingival side wall 1073k in generally a central location. In this specific embodiment, the width of the stabilizing member 1098k and the width of the spacing between the deformable fingers 1062k may be configured to correspond (e.g., fit and/or active engage) with one another to aid in suppressing movement (e.g., twisting, mesial-distal movement, and/or otherwise) of the locking clip 1026k while in the closed position.

[0069] As shown in FIGS 11A-11B, the lingual cavity 1068k may further include a chamfered portion (e.g., recess) 1099k to guide the lingual free end portion 1028k of the locking clip 1026k and aid in expanding the locking clip 1026 during the transition from the open position to the closed position. Furthermore, the chamfered portion 1099k may be configured to provide clearance for the curved portion 1032k of the locking clip 1026k while in the closed position.

[0070] FIGS. 12A-12C are various views of another alternate embodiment of the self-ligating bracket shown in FIG. 3E in which the lingual cavity 1068l may further include a rib 1104l and a wedge portion 1106l to actively engage a locking clip 1026k having a bridge portion 1108l. The bridge portion 1108l interconnecting the deformable fingers 1062l at a gingival portion of the lingual free end 1028l of the locking clip 1026l. The rib portion 1104l being spacedly positioned from the gingival side wall 1073l and configured to engage the bridge portion 1108l having a corresponding mesial-distal groove 1111l for a positive lock to substantially maintain the locking clip in the closed position. The wedge portion being occlussally positioned within the cavity at a central location and configured to substantially prevent the locking clip 1026l from being

removed from the lingual cavity 1068l. In this specific embodiment, the positive lock of the bridge portion with the rib and/or the fit of the wedge 1106l within the corresponding spacing between the deformable fingers 1062l are configured to aid in suppressing movement (e.g., twisting, mesial-distal movement, and/or otherwise) of the locking clip 1026l while in the closed position. Furthermore, the width of the neck portion 1029l may correspond (e.g., fit to) the mesial distal width of the lingual cavity 1068l (and the lingual opening 1064l) to further aid in suppressing movement (e.g., twisting, mesial-distal movement, and/or otherwise) of the locking clip 1026l while in the closed position.

[0071] FIGS. 13A-13C are various views of another alternate embodiment of the self-ligating bracket shown in FIG. 11A in which the lingual cavity 1068m may further include a plurality of mesially-distally spaced apart stabilizing members 1098m extending from a gingival side wall 1073m in generally a centralized location with the lingual cavity 1068m. In this specific embodiment, the locking clip 1026m may further include a stabilizing finger 1110m extending from the lingual free end 1028m and intermediate of the deformable fingers 1062m. The width of the stabilizing finger 1110m and the width of the spacing between the stabilizing members 1098m are configured to correspond (e.g., fit and/or actively engage) with one another to aid in suppressing movement (e.g., twisting, mesial-distal movement, and/or otherwise) of the locking clip 1026m while in the closed position. Optionally, the mesial-distal width of the lingual free end 1028m (e.g., generally taken across the flange portions 1066m) is configured to be wider (in a non-stressed state) than the mesial-distal width of the lingual cavity 1068m so that upon insertion within the lingual cavity 1068m the flange portions 1066m may exert an outward force (e.g., in a stressed state) on the respective mesial and distal side walls 1072m to aid in suppressing movement (e.g., twisting, mesial-distal movement, and/or otherwise) of the locking clip 1026m while in the closed position.

[0072] FIGS. 14A-14C are various views of another alternate embodiment of the self-ligating bracket shown in FIG. 11A in which the lingual cavity 1068m may further include a plurality of mesially-distally spaced apart stabilizing members 1098m extending from a gingival side wall 1073m in generally a centralized location with the lingual cavity 1068m. In this specific embodiment, the locking clip 1026m may further include a stabilizing finger 1110m extending from the lingual free end 1028m and intermediate of the deformable fingers 1062m. The width of the stabilizing finger 1110m and the width of the spacing between the stabilizing members 1098m are configured to correspond (e.g., fit and/or actively engage) with one another to aid in suppressing movement (e.g., twisting, mesial-distal movement, and/or otherwise) of the locking

clip 1026m while in the closed position. Optionally, the mesial-distal width of the lingual free end 1028m (e.g., generally taken across the flange portions 1066m) is configured to be wider (in a non-stressed state) than the mesial-distal width of the lingual cavity 1068m so that upon insertion within the lingual cavity 1068m the flange portions 1066m may exert an outward force (e.g., in a stressed state) on the respective mesial and distal side walls 1072m to aid in suppressing movement (e.g., twisting, mesial-distal movement, and/or otherwise) of the locking clip 1026m while in the closed position.

[0073] FIGS. 14A-14C are various views of another alternate embodiment of the self-ligating bracket shown in FIG. 13A in which the lingual cavity 1068n further includes a single stabilizing member 1098n extending from a gingival side wall 1073n in generally a central location. In this specific embodiment, the mesial-distal width of the lingual free end 1028n (e.g., generally taken across the flange portions 1066n) may be configured to be wider (in a non-stressed state) than the mesial-distal width of the lingual cavity 1068m (e.g., from mesial side wall to distal side wall) so that upon insertion within the lingual cavity 1068n the flange portions 1066n may exert an outward force (e.g., in a stressed state) on the respective mesial and distal side walls 1072n to aid in suppressing movement (e.g., twisting, mesial-distal movement, and/or otherwise) of the locking clip 1026n while in the closed position. Furthermore, the locking mechanism may further include a wider stabilizing member 1098n of the lingual cavity 1068n, an increased lingual free end portion 1028n mesial-distal width to lingual cavity 1068 mesial-distal width ratio, or both so that an additional force may be provided by an intermediate portion 1112n of the deformable fingers 1062n on the stabilizing member 1098n to further aid in suppressing movement (e.g., twisting, mesial-distal movement, and/or otherwise) of the locking clip 1026n while in the closed position.

[0074] FIGS. 15A-15C are various views of another alternate embodiment of the self-ligating bracket shown in FIG. 3E in which the lingual free end 1028o of the locking clip 1026o may further include a neck portion 1029o and intermediate grooves 1114o to aid in the deformation of the deformable fingers 1062. In this specific embodiment, the mesial-distal width of the lingual free end portion 1028o (e.g., generally taken across the flange portions 1066o) may be configured to be wider (in a non-stressed state) than the mesial-distal width of the lingual cavity 1068o (e.g., from mesial side wall to distal side wall) so that upon insertion within the lingual cavity 1068o the flange portions 1066o may exert an outward force (e.g., in a stressed state) on the respective mesial and distal side walls 1072o to aid in suppressing movement (e.g., twisting, mesial-distal movement, and/or otherwise) of the locking clip 1026o while in the closed position.

Furthermore, the neck portion 1029o may extend into the lingual cavity (while in the closed position) and may be sized corresponding to the width of the lingual opening 1064o to aid in guiding the locking clip 1026o during transition between the open and closed positions.

[0075] FIGS. 16A-16C are various views of another alternate embodiment of the self-ligating bracket shown in FIG. 3E in which wider mesial and distal side walls 1072p may be provided so as to be generally flush mesial and distal edges 1116p of the lingual opening 1064p (occlusal side of body) thereby resulting in a reduced lingual cavity 1068p. Furthermore, the locking clip 1026p may further include a U-shaped lingual free end 1028p having deformable fingers 1062p with inward facing flange portions 1066p forming a gingival opening 1118p therebetween. The flange portions 1066p may include opposing edges 1120p having angled, curved, and/or otherwise portions to aid in securing the locking clip 1026p to the bracket body 1012p. More particularly, during installation of the locking clip 1026p the lingual free end 1028p is inserted gingivally into the occlusal side of the lingual opening 1064p where the opposing edges 1120p of the flange portions 1066p are brought into contact with an occlusal protrusion 1122p of the lingual cavity 1068p. The deformable fingers 1062p may be deformed outward thereby increasing the width of the gingival opening 1118p to allow for passage of the occlusal protrusion 1122p through the gingival opening 1118p. In doing so, the lingual free end 1028p is allowed to be further inserted into the lingual cavity for securement of the locking clip to the body 1012p. The gingival opening 1118p may be configured so that the gingival side of the gingival opening 1118p allows for passage of the occlusal protrusion 1122p during installment of the locking clip while the occlusal side of the gingival opening substantially preventing passage of the occlusal protrusion 1122p so that the locking clip may remain secured to the body 1012p. Desirably, the neck portion 1029p may extend into the lingual cavity (while in the closed position) and may be sized corresponding to the width of the lingual opening 1064p to aid in guiding the locking clip 1026p during transition between the open and closed positions. Desirably, the width of the neck portion 1029p (e.g., from distal edge of distal deformable finger to the mesial edge of the mesial deformable finger) may correspond (e.g., fit to) the mesial distal width of the lingual cavity 1068p (and the lingual opening 1064p) to further aid in guiding the locking clip between the open and closed positions and/or suppressing movement (e.g., twisting, mesial-distal movement, and/or otherwise) of the locking clip 1026p while in the closed position.

[0076] In yet another embodiment of the present invention, a self-ligating orthodontic bracket is shown in FIGS. 17A-17I, and is generally indicated to by reference numeral 610. As can be

seen, the orthodontic bracket 610 includes a body 612, a lingual mounting base 614 attached to the body, and a locking mechanism having a locking clip 626 and a retaining member 627. The body 612 may include a pair of laterally spaced gingival tie wings 616 and a pair of laterally spaced occlusal tie wings 618 extending from the labial surface of the body 612. The gingival tie wings 616 and the occlusal tie wings 618 generally curve lingually. An archwire slot 620 extends mesio-distally across the body 612 and between the gingival and occlusal tie wings 616 and 618. The archwire slot 620 opens labially to receive an archwire 622.

[0077] A first bridge portion 660 and a second bridge portion 661 are provided in an interwing region 624, with the first bridge portion 660 spanning between the gingival tie wings 616 and the second bridge portion 661 spanning between the occlusal tie wings 618. It is appreciated that the first and second bridge portions 660 and 661 extend from labial surface of the archwire slot (and defining portions thereof) up to the labial surfaces of the respective tie wings 616 and 618.

[0078] The retaining member 627 may includes a first pair of stops 644 and a second pair of stops 646 on the gingival tie wings 616 to inhibit inadvertent movement of the locking clip 626 from a closed position (e.g., an active first closed position in stops 644 or a second closed position in stops 646) to an open position and optionally to maintain the locking clip 626 open when it is pivoted to the open position. Each stop defining a first opening, at least one guide portion, and at least one flange. The first pair of stops 644 extend generally outward from the respective gingival tie wings 616 and include a first opening 664, a first guide portion 674, and a first flange 668 for engagement with the locking clip 626 to maintain the first closed position (e.g., active bracket for active first closed position). Similarly, the second pair of stops 646 extend generally outward from the respective gingival tie wings 616 and include a second opening 666, a guide portion 675, and a second flange 669 for engagement with the locking clip 626 to maintain the second closed position (e.g., passive bracket for passive second closed position). It is appreciated that the first and second pairs of stops 644 and 646 may positioned so that one stop of each pair of stops 644 and 646 is gingivally-occlusally juxtaposed to the respective other stop of each pair of stops 644 and 646. Desirably, the pairs of stops on each gingival tie may define a generally W-shaped configuration. It is further appreciated that the pairs of stops may be located elsewhere, for example along the respective internal surface of the gingival tie wings 616 about the interwing region 624.

[0079] The locking clip 626 is pivotally mounted on the occlusal tie wings 618 and is moveable between two closed positions (FIGS. 34-37) where access to the archwire slot 620 is inhibited and an open position (FIG. 31-33) where access to the archwire slot 620 is permitted. It is

appreciated that the locking clip 626 is in the form of spring element having a generally Y-shaped configuration. More particularly, the locking clip 626 may include a head portion 628, with a pair of opposing side arms 650 and 652, which define an opening 629 therebetween. It is appreciated that the head portion 628 and/or the side arms 650 and 652 are configured to extend across the archwire slot 620.

[0080] The arms 650 and 652 may include free ends (e.g., extending generally mesial and distal, though not required) that are in-turned to define oppositely directed spaced apart hook ends 672. The (gingival) hook ends 672 may be received in the respective first openings 664 or the respective second openings 666, which are formed in the gingival tie wings 616.

[0081] The locking clip 626 may also include a connecting the head 628 and a base portion 692 having opposed free ends (e.g., extending generally mesial and distal, though not required) that are out-turned to define oppositely directed spaced apart tail ends 632 and 634 respectively. Each of the tail ends 632 and 634 is received in a respective bore 636 and 638 formed in one of the occlusal tie wings 618. The bores 636 and 638 may extend (e.g., mesial-distally) completely through the respective tie wings 618 or partially therethrough.

[0082] To close the orthodontic bracket 610 in the first closed position, the locking clip 626 is pivoted about the tails 632 and 634 towards the first pair of stops 644 (e.g., gingival first pair of stops) of the locking mechanism 627 about the gingival tie wings 616. The hook ends 672 (e.g., 672a and 672b) make contact with and are gingivally guided along the respective labial surface of the first guide portions 674. The hook ends 672 are continually guided along the labial surfaces of the first guide portions 674 until the hook ends 672 extend beyond the flanges 668 of the first pair of stops 644. This allows the locking clip 626 to snap back towards its non-stressed state so that the hooks 672 engage the respective flanges 668 thereby maintaining the locking clip 626 in the first closed position. In doing so, the locking clip 626 is deflected lingually so that contact between the locking clip, the archwire, and the archwire slot may be substantially or completely maintained while in the first closed position (FIGS. 36A, 36B, and 37).

[0083] More particularly, the reaction force applied to the labial surface of the first guide portions 674 by the hook ends 672 causes the locking clip 676 to deflect (e.g., gingivally-lingually) into a stressed-state. When the hook ends 672 are pivoted beyond the respective first stops 644 and generally lingually into the first openings 664, the locking clip 626 snaps back towards the first flanges 668 in an attempt to return to its non-stressed state. In doing so, the first flanges 668 of the first pair of stops 644 prevent removal of the respective hook ends 672 from the first opening 664 during its first closed position. The first flanges 668 inhibit the locking

clip 626 while in this stressed condition from moving back towards the open position. In this way, the archwire slot 620 remains closed thereby actively securing the archwire 622a in the archwire slot.

[0084] To close the orthodontic bracket 610 in the second closed position, the locking clip 626 is pivoted about the tails 632 and 634 towards the second pair of stops 646 of the locking mechanism 627 about the gingival tie wings 616. The hook ends 672 make contact with and are gingivally guided along the respective labial surface of the second guide portions 675. The hook ends 672 are continually guided along the labial surfaces of the second guide portions 675 until the hook ends 672 extend beyond (e.g., gingivally-lingually) the first flanges 669 of the second pair of stops 646. This allows the locking clip 626 to snap back towards its non-stressed state so that the hook ends 672 engage the respective second flanges 669 thereby maintaining the locking clip 626 in the second closed position. In doing so, the locking clip 626 may be slightly deflected lingually so that minimal or no contact between the locking clip 626 and the archwire may be maintained while in the second closed position (FIGS. 34A, 34B, and 35).

[0085] More particularly, the reaction force applied to the labial surface of the second guide portions 675 by the hook ends 672 causes the locking clip 676 to deflect (e.g., gingivally-lingually) into a stressed-state. When the hook ends 672 are pivoted beyond the respective second stops 646 and generally lingually into the second openings 666, the locking clip 626 snaps back towards the second flanges 669 in an attempt to return to its non-stressed state. In doing so, the second flanges 669 prevent removal of the respective hook ends 672 from the second openings 666 during its second closed position. As such, the second flanges 669 inhibit the locking clip 626 while in this stressed condition from moving back towards the open position. In this way, the archwire slot 620 remains closed thereby passively securing the archwire 622b in the archwire slot.

[0086] To release the archwire, the locking clip 626 are pushed gingivally-lingually to disengage the hook ends 672 from the respective first or second pairs of stops 644 and 646. In one specific example to release the archwire from the first closed position, the hooks ends 672 are first moved gingivally-lingually (typically along the labial surface of a third guide portion 676) beyond the first flanges 668. In another specific example to release the archwire from the second closed position, the hooks ends 672 are first moved gingivally-lingually (typically along the labial surface of a first guide portion 674) beyond the second flanges 669. Thereafter, the locking clip 626 may be removed from either of the respective first and second pairs of stops

644 and 646 so that the locking clip 626 (in its non-stressed state) is free to pivot about the tails 632 and 634

[0087] In one specific example, it is contemplated that as the locking clip 626 is moved (e.g., directed or pushed gingivally) along the first guide 674, the locking clip 626 disengages from the second pair of stops 646. Once the locking clip 626 is moved beyond the first pair of stops 644, the hook ends 672 bias lingually-occlusally into the first opening 664 thereby transitioning the locking clip from the second closed position to the first closed position.

[0088] Optionally, the bracket 610 may further include a groove 680 for receiving an optional ligature. When included, the groove 680 may be positioned between the along the exterior of the tie wings 616. It is appreciated that the groove 680 may be configured to aid in releasing the locking clip 626 from the second closed position and/or the first closed position by providing access to the arms of the locking clip 626. For example, while the locking clip 626 is being moved (e.g., directed or pushed gingivally) from the first closed position along the third guide 676, the hook ends 672 will be directed lingually and under the lingual free ends of the tie wings into the groove 680 such that the spring-tension of the locking clip will automatically move (e.g., labially direct) the locking clip 626 through the groove 680 to the open position.

[0089] FIGS. 17J-17L are various views of another alternate embodiment of the self-ligating bracket shown in FIGS. 17A-17I in which the occlusal portion of the locking clip 626a includes a pair of lingually curved arms 696a for pivotal engagement with the bores 636a and 638a. The arms 696a being spaced apart to define a generally Y-shaped occlusal portion of the locking clip 626a.

[0090] Self-ligating brackets having a ratchet design may include a single ratchet or a plurality of ratchets that may be attached to the tie wing (e.g. gingival tie wing or wings) of the bracket body. The ratchets may be an integral part of gingival tie-wings (outside or inside), or may be attached permanently to Tie-wings by appropriate manufacturing method, or can be attached to any other (appropriate) location on the body. The ratchet design may have multiple slots to lock the top legs of clip (at a labial portion of the archwire clip and preferably at a labial free end of the clip) when closed.

[0091] It is believed that this engagement design may be configured such that the clip may be opened and/or closed simply pushing the clip with a finger and/or otherwise (e.g., tool). Advantageously, this ratchet based engagement mechanism may be configured such that the need for instrument to open or close the clip may be eliminated as compared to the prior art.

[0092] FIGS. 18A-18D are various views of an alternative embodiment of the self-ligating bracket shown in FIG 17A in which a modified "ratchet" based engagement mechanism may be provided having a locking clip 626b and a retaining member 627b. The body 612b may include a pair of laterally spaced gingival tie wings 616b and a pair of laterally spaced occlusal tie wings 618b extending the body 612b. The gingival tie wings 616b generally curve lingually thereby forming a portion of the retaining member 627b.

[0093] The retaining member 627b may include a pair of opposing stops 644b on the gingival tie wings 616b to inhibit inadvertent movement of the locking clip 626b from a closed position to an open position and optionally to maintain the locking clip 626b open when it is pivoted to the open position. The stops 644b may be an integral extension of the respective gingival tie wings 616b curving lingually therefrom to form opening 664bs, guide portions 674b, and flanges 668b for engagement with the locking clip 626b to maintain a closed position. Desirably, the stops 644b on each gingival tie wing may define a generally hook-shaped configuration, though not required.

[0094] The locking clip 626b may include a base portion 692b having opposing base arms 693b being pivotally mounted on the occlusal tie wings 618b. The spaced apart base arms 693b may further include oppositely directed tail ends 632b and 634b respectively. Each of the tail ends 632b and 634b is received in a respective bore 636b and 638b formed in one of the occlusal tie wings 618b. In this specific embodiment, the base arms 693b are generally flat.

[0095] It is appreciated that the locking clip 626b may be in the form of spring element having a generally T-shaped configuration. More particularly, the locking clip 626b may include a head portion 628b and an intermediate portion 649b that generally covers the arch wire slot 620b while in the closed position. The head portion 628b and the intermediate portion 649b may include a pair of side arms 650b and 652b, respectively, which extend mesially and distally from the head portion 628b and intermediate portion 649b to define recesses 651b therebetween. The arms 650b may be received in the respective openings 664, which are formed in the gingival tie wings 616 to secure the locking clip 626b in the closed position.

[0096] Optionally, the bracket 610b may further include grooves 680b for receiving an optional ligature. When included, the groove 680b may be positioned along the exterior of the gingival tie wings 616b. It is appreciated that the groove 680b may be configured to aid in releasing the locking clip 626b (e.g., arms 650b) from the closed position by providing access to the arms 650b of the locking clip 626b. For example, while the locking clip 626b is being moved (e.g., directed or pushed gingivally) from the closed position along the guide 674b, the arms 650b will

be directed lingually and under the lingual free ends of the tie wings into the groove 680b such that the spring-tension of the locking clip will automatically move (e.g., labially direct) the locking clip 626b through the groove 680 to the open position.

[0097] FIGS. 19A-19E are various views of another alternate embodiment of the self-ligating bracket shown in FIGS. 18A-18D in which the retaining members 627c have been reduced extend inwardly from a portion of the gingival tie wings 616c. In doing so, hook portions of the gingival tie wings 616c may available for receiving optional ligature(s).

[0098] The interactivity between the locking clip 626c and archwire 622c in the final active stage may be critical from a clinical perspective. It is believed that variation in the clip design may allow for the interactivity between the clip and archwire. Generally, the interactivity may be defined as clip having some room to move (e.g., "floating" and/or moveable while in the closed position). For example as shown in FIG. 19D, a zoomed in view of a "ratcheting" member is provided, which alone or in combination with an opposing ratcheting member may be configured to achieve this type of interactivity. More particularly, as shown if FIG. 19D, a clearance may be achieved while the labial free end of the clip engages the locking ratcheting slot after the clip is in the closed position.

[0099] The middle of clip (e.g., the section of the clip that generally may be in contact with archwire) may be sufficiently flexible to generally maintain a predetermined interactivity. Both geometry change (i.e. less material) and/or softer material of the clip may be optimized to achieve the predetermined interactivity between the middle section of clip and the arch wire (FIG 19C).

[00100] Once the clip is in the final locked position, tensional (spring) force may be generated in the clip. As a result, it is appreciated that when the clip is pushed down (e.g., lingually) further from the final locked position, the tension will pull the tip of the clip (e.g., T-shaped or otherwise shaped post at the labial free end of the clip) so that the clip may be released from the slot (e.g., ginigival ratcheting slot(s)) to the open position.

[00101] FIGS. 20A-20B are various views of another alternate embodiment of the self-ligating bracket shown in FIGS. 19A-19E in which the base portion 692d of the locking clip 626d may include curved base arms 693d.

[00102] FIGS. 21A-21C are various views of another alternate embodiment of the self-ligating bracket shown in FIGS. 19A-19E in which the tail ends 632e and 634e may be provided as generally rectangular members extending from the base arms 693e. In doing so, the

respective bores 636e and 638e have been modified rectangular openings to correspond with the rectangular tail ends 632e and 634e.

[00103] FIGS. 22A-22C are various views of another alternate embodiment of the self-ligating bracket shown in FIGS. 19A-19E in which the bores 636f and 638f have been configured as a figure 8-shape so that the locking clip 626f can slide-rotate between an open position (e.g., a lingual-occlusal side 636f' and 638' of the respective bore 636f, 638f) and a closed position (e.g., a labial-gingival side 636f" and 638f" of the respective bore 636f, 638f).

[00104] FIGS. 23A-23B are various views of another alternate embodiment of the self-ligating bracket shown in FIGS. 19A-19E in which the bores 636g and 638g have been configured as a figure 8-shape so that the locking clip 626g can slide-rotate between an open position (e.g., a labial-occlusal side 636g' and 638g' of the respective bore 636g, 638g) and a closed position (e.g., a lingual-gingival side 636g" and 638g" of the respective bore 636g, 638g).

[00105] Unlike the free rotating hinged clip design that only rotates about a fulcrum as discussed herein, this additional embodiment may include both rotational and sliding motion separately or preferably at the same time. It is believed that the sliding-up motion during the clip closing, FIGS. 23D-23E, less stress may be generated in the clip so that permanent deformation may be prevented.

[00106] FIGS. 24A-24B are various views of another alternate embodiment of the self-ligating bracket shown in FIGS. 19A-19E in which a second pair of retaining (lingual) openings 666h may be further provided. In this specific embodiment., the retaining member 627h may include a first pair of stops 644h and a second pair of stops 646h on the gingival tie wings 616h to inhibit inadvertent movement of the locking clip 626h from a closed position (e.g., an active first closed position in stops 644h or a second closed position in stops 646h) to an open position and optionally to maintain the locking clip 626h open when it is pivoted to the open position. Each stop defining a first opening, at least one guide portion, and at least one flange. The first pair of stops 644h extend generally outward from the respective gingival tie wings 616 and include a first opening 664h, a first guide portion 674h, and a first flange 668h for engagement with the locking clip 626h to maintain the first closed position (e.g., active bracket for active first closed position). Similarly, the second pair of stops 646h extend generally outward from the respective gingival tie wings 616 and include a second opening 666h, a guide portion 675h, and a second flange 669 for engagement with the locking clip 626h to maintain the second closed position (e.g., passive bracket for passive second closed position). It is appreciated that the first

and second pairs of stops 644h and 646h may positioned so that one stop of each pair of stops 644h and 646h is gingivally-occlusally juxtaposed to the respective other stop of each pair of stops 644h and 646h. Desirably, the pairs of stops on each gingival tie may define a generally W-shaped configuration.

[00107] As shown in FIGS. 22 and 24, the present invention may include another embodiment of a self-ligating bracket having a clip sliding/pivoting mechanism that may be configured to reduce the tension in the clip and/or prevent any resulting permanent deformation of clip so as to generally maintain the functionality of the clip.

[00108] The present invention may further provide another embodiment of the self-ligating bracket as shown in FIGS. 25A-25H. Generally, the self-ligating bracket may include a body molded with a base and a C-Shape clip. The clip has two bent ends that slide over the archwire slot in both gingival and occlusal directions and depending on the mode of closing (gingival or occlusal), the system will behave active or passive during the course of treatment. More particularly, this bracket concept has three components (see in the above picture): Body, Clip and Base. The clip may be shaped like a C and it is capable of closing in both gingival and occlusal mode. With a rectangular/square arch wire sits in the slot of body, this clip can express both the Passive and the Active engagement with the same ach wire depending on which end of clip covers the slot of arch wire. The uniqueness of this concept is the ability to change from a Passive stage to an Active stage (or vice-versa) without changing the wire. However, it is anticipated that the circular wire will tend to remain passive stage in both gingival and occlusal closing modes. The clip has a C-side shape (see the following picture) and has two bent ends. The two ends of clip have two different clip-spans (see the red arrows in the following picture). In the Orthodontic treatment stages, the bracket has the passive stage (no contact between the arch wire and the clip) and the active stage (Interference contact between the arch wire and the clip). See the following pictures for the details. In the Passive stage (FIG. 25G) when the bigger end (e.g., gingival end) of the clip covers the arch wire, there is no contact between the clip and the arch wire. When the clip is in the open position, it doesn't cover the arch wire, FIG. 25H. In the Active stage (FIG. 25I) when the smaller end of the clip covers the arch wire, there is interference contact between the clip and the arch wire. Desirably, dual stage brackets may be designed to have the interactivity between the clip and the arch wire for both Passive stage and Active stage.

[00109] FIG. 25J shows the interactivity between the arch wire and the occlusal end of clip in the Passive stage. The same design principal can be used on the gingival end of clip in

the Active stage for the interactivity between the arch wire and the gingival end of clip. Desirably, during the Passive stage, there is no physical contact between the arch wire and the clip. However, in some crowded occlusal cases, the arch wire will start to contact with the clip. Because the clearance above the clip in the retainer channel (area between the occlusal free end of the clip and the lingual surface of the retainer wall (e.g., hood), the interactivity between the clip and the arch wire will be achieved.

[00110] In this specific embodiment, the self-ligating bracket of the present invention in which the bracket 1010q includes a modified locking clip 1026q and a modified receiving members 1036q. The receiving members 1036q may include a first receiving member 1036q', which may be mesially and distally located about the gingival tie wings 1016q of the bracket body 1012q and may include a non-continuous retaining (e.g., resting) channel 1090q which includes a mesial and distal portions 1091q to allow a positive seat for the respective tab portions 1031q of the locking clip 1026q. Desirably, the mesial and distal portions 1027q of the retaining channel 1090q extends generally in a parallel manner to the archwire slot 1020q. In this specific embodiment, the width of the locking clip 1026q at the labial free end 1030q may be generally the same mesial-distal width of the bracket body 1012q. Furthermore, the labial free end 1030q of the locking clip 1026q may include a notch portion 1034q disposed between the tab portions 1031q. The retaining channel may be further defined by a generally c-shaped profile to not only provide a positive seat (and limit lingual movement of the labial free end 1030q), but may also provide a hood portion 1038h to limit labial movement of the labial free end 1030h while in the closed position. Optionally, the height (e.g., labial-lingual height) of the retaining channel 1090q may be sufficiently sized (e.g., less than or equal to the thickness of the archwire) so that archwire entrapment therein may be substantially prevented while the free end portion 1030q of the locking clip 1026q is in the closed position.

[00111] The receiving member 1036q may further include a second receiving member 1036q", which may be centrally located about the interwing region 1024q between the occlusal tie wings 1018q. The interwing region 1024q may include an open stop groove 1042 having protrusions 1044q to aid in movement of the clip from an open position to a closed position. Desirably the width of the labial-occlusal free end 1122q corresponds to the width of the interwing region 1024q for receiving the labial-occlusal free end 1122q.

[00112] In this embodiment the bracket 1010q may be configured for two closed positions (an active closed position and a passive closed position) and an open position. In the active closed position (FIG. 25G), the locking clip 1026q is occlusally displaced such that the labial-

gingival free end 1030q is actively engaging the archwire 1022q locking clip 1026. In the passive closed position (FIG 25H), the locking clip 1026q is gingivally displaced such that the labial-occlusal free end 1122q closes off (e.g., covers) the archwire slot 1020 while substantially free of contact with the archwire. Advantageously, the locking clip 1026q may be further displaced gingivally as shown in FIG. 25I to accommodate smaller archwires in a passive closed position. In the open position (FIG. 25F), the locking clip 1026q is generally positioned so that a spacing 1124q between the labial-gingival free end 1030q and the labial-occlusal free end 1122q is orientated generally parallel to the archwire slot 1020 so as to allow for removal of the archwire 1022, located therein.

[00113] FIGS. 26A-26H are various views of another embodiment of a self-ligating bracket of the present invention, which may include a body 1012r (e.g., Rhomboid body design) molded with a base 1014r and at least one clip 1026r (e.g., a plurality of clips). More particularly, the clips 1026r (e.g., metal clips) and body gear racks 1126r can be formed through a micro-machining process. The clip 1026r and body 1012r may be designed as a mating gear rack mechanism or otherwise along the labial-lingual direction allowing the clip to lock at different positions for different wire sizes. The adjustable clips 1026r include racks 1128r, which correspond and/or mate with the respective body gear racks 1126r for ratcheting/adjusting of the clips 1026r. The adjustable clips 1026r can also allow for the adjustment between a passive, active, and interactive engagement on the arch wire (e.g., Passive engagement refers to when the clip does not contact the arch wire while Active engagement may refer to when the clip is applying a force directly on the arch wire). Interactive engagement may occur when the clip engages with the arch wire but does not apply a force or substantially no force on the arch wire. When a plurality of clips are included, the two clips are desirably independent of each other so it is possible to have engagement on the arch wire on one side alone.

[00114] The clip-wire interactions may be adjusted in various ways. For example, the clip-wire interaction may be adjusted by one or more of the following, but not limited to: Active Engagement on the arch wire on the mesial and distal sides of the bracket body; Passive Engagement on the arch wire on the mesial and distal sides of the bracket body; Interactive Engagement on the arch wire on the mesial and distal sides of the bracket body; Active Engagement on the arch wire on the mesial side and Passive Engagement on the distal side of the bracket body; Active Engagement on the arch wire on the distal side and Passive Engagement on the mesial side of the bracket body; Interactive Engagement on the arch wire on the mesial side and Passive Engagement on the distal side of the bracket body; Interactive

Engagement on the arch wire on the distal side and Passive Engagement on the mesial side of the bracket body; Active Engagement on the arch wire on the mesial side and Interactive Engagement on the distal side of the bracket body; Active Engagement on the arch wire on the distal side and Interactive Engagement on the mesial side of the bracket body; and any combination thereof.

[00115] The clips 1026r may be opened using a scalar or other common dental instrument by applying a force at the edge of the gear rack 1128r (e.g., ratcheting system) on the clip and pulling the clip in the labial direction. The orientation of the gear rack 1128r allows the clips to be closed by pushing towards the lingual direction. As shown in FIGS. 26G-26H, a rounded knob 1130r on the clip on the opposite side of the gear rack allows the clip to slide easily in the labial direction to a stop 1132r that is built in the body of the bracket. When the round knob 1130r reaches the stop 1132r on the body, the gear rack 1128r on the clip is disengaged from the mating gear rack 1126r on the body and the clip can then pivot so that it is no longer block the arch wire slot 1020r and an arch wire 1022r can be removed or inserted (FIG. 26I). A post 1134r (e.g., hook) may be attached to each clip for elastics ligation. The elastics that can be ligated can be used for aesthetic purposes allowing different color ligatures to be attached with affecting the performance of the bracket. Elastics can also be attached to help with leveling and aligning and tooth extrusion.

[00116] FIGS. 27A-27G are various views of another alternate embodiment of the self-ligating bracket shown in FIGS. 24A-24B in which a first and second pair of retaining members are provided on the occlusal side of the gingival tie wings. Generally, the self-ligating bracket may include a body 612i molded with a base 614i and a sliding locking clip 626i. More particularly, the bracket body may include two retainer channels (e.g., openings) 664i, 666i that may be used to allow the clip 626i to utilize two treatment stages (Passive and Active) with the same arch wire. This bracket concept may also be designed to have three different directions, gingival, occlusal, lingual, to open, close and change treatment stage (Active vs. Passive), respectively.

[00117] The bracket may include three components such as a body, base and clip. For illustration purposes, a rectangular/square arch wire sits in the slot of body. Please note that the slot is capable of accommodating round wires as well. As shown in the figures, the labial free end 692i of the clip may designed to have a "post" (e.g., a T-shaped free end) like feature that when closed first sits in a passive clip retaining channel (e.g., longitudinally positioned spaced apart labial openings). At this position (FIG. 27F) there may be substantially or

completely no contact between the clip and the arch wire, which is the passive stage of orthodontic treatment.

[00118] Typically, as treatment progresses, the clip may needs to be changed from the passive stage (no contact between the clip and the arch wire, FIG. 27F) to the active stage (Interference contact between the clip and the arch wire, FIG. 27G) where the post feature sits in the active clip retaining channel (e.g., longitudinally spaced apart lingual openings being generally positioned below the passive retaining channels). The mechanism to change the clip (FIG 27I) from the Passive stage to the Active stage may be to simply apply a force and push down on the labial free end portion of the clip (shown in the arrow in FIG. 27D), to the active clip resting channel. As shown in FIG. 27F, the labial free end portion of the clip may be position in a mesial-distal resting groove 1042 while in the open position. The number of clip retaining channels may be reduced or increased if needed, and the channel positions (with respect to bottom of the archwire slot) can be altered if necessary too.

[00119] In this specific embodiment, the retaining member 627 may includes a first pair of stops 644i and a second pair of stops 646i on the occlusal side of the gingival tie wings 616i to inhibit inadvertent movement of the locking clip 626i from a closed position (e.g., an active first closed position in stops 644 or a second closed position in stops 646i) to an open position and optionally to maintain the locking clip 626i open when it is pivoted to the open position. Each stop defining a first opening, at least one guide portion, and at least one flange. The first pair of stops 644i extend generally outward from the respective gingival tie wings 616i and include a first opening 664i, a first guide portion 674i, and a first flange 668i for engagement with the locking clip 626i to maintain the first closed position (e.g., active bracket for active first closed position). Similarly, the second pair of stops 646i extend generally outward from the respective gingival tie wings 616 and include a second opening 666, a guide portion 675i, and a second flange 669i for engagement with the locking clip 626i to maintain the second closed position (e.g., passive bracket for passive second closed position). It is appreciated that the first and second pairs of stops 644i and 646i may positioned so that one stop of each pair of stops 644i and 646i is gingivally-occlusally juxtaposed to the respective other stop of each pair of stops 644i and 646i. Desirably, the pairs of stops on each gingival tie may define a generally W-shaped configuration.

[00120] The locking clip 626i slides on the occlusal tie wings 618i and is moveable between two closed positions (FIGS. 27D-27E) where access to the archwire slot 620i is inhibited and an open position (FIG. 27F) where access to the archwire slot 620i is permitted. It

is appreciated that the locking clip 626i is in the form of spring element having a generally U-shaped head configuration. More particularly, the locking clip 626 may include a head portion 628i, with a pair of opposing side arms 650i and 652i, which define an opening T-Shape configuration. It is appreciated that the head portion 628i and/or the side arms 650i and 652i are configured to extend across the archwire slot 620i.

[00121] The arms 650i and 652i may include free ends extending generally mesially and distally outward, though not required. The arms 650i and 652i may be received in the respective first openings 664i or the respective second openings 666i, which are formed in occlusal side of the gingival tie wings 616i.

[00122] To close the orthodontic bracket 610i in the first closed position (Active closed position), the locking clip 626 is slide gingivally towards the first pair of stops 644i (e.g., lingual first pair of stops) of the locking mechanism 627i about the gingival tie wings 616i. The arms 650i and 652i make contact with and are gingivally guided along the respective labial surface of the first guide portions 674i. The arms 650i and 652i are continually guided along the labial surfaces of the first guide portions 674i until the hook ends 672i extend beyond the flanges 668i of the first pair of stops 644i. This allows the locking clip 626i to snap back towards its non-stressed state so that the arms 650i and 652i engage the respective flanges 668i thereby maintaining the locking clip 626i in the first closed position. In doing so, the locking clip 626i is deflected lingually so that contact between the locking clip, the archwire, and the archwire slot may be substantially or completely maintained while in the first closed position (FIGS. 27E).

[00123] To close the orthodontic bracket 610i in the second closed position, the locking clip 626 is slid towards the second pair of stops 646i of the locking mechanism 627i about the occlusal side of the gingival tie wings 616i. The arms 650i and 652i make contact with and are gingivally guided along the respective labial surface of the second guide portions 675i. The arms 650i and 652i are continually guided along the labial surfaces of the second guide portions 675i until the hook ends 672i extend beyond (e.g., gingivally-lingually) the first flanges 669i of the second pair of stops 646i. This allows the locking clip 626i to snap back towards its non-stressed state so that the hook ends 672i engage the respective second flanges 669i thereby maintaining the locking clip 626i in the second closed position. In doing so, the locking clip 626i may be slightly deflected lingually so that minimal or no contact between the locking clip 626i and the archwire may be maintained while in the second closed position (FIGS. 27D).

[00124] As discussed above with reference to FIGS. 27A-27G, different slot locations may provide different clip status. For example, a labially positioned slot(s) and/or opening(s)

may provide for a Passive stage closed position (e.g., FIG. 27D - generally no contact between arch wire and clip) or a lingually positioned slot(s) may provide for an Active stage closed position (e.g., FIG. 27E - contact and interference between archwire and clip). It is appreciated that the ratchet(s) and/or slot(s) may be positioned such that an expressive stage closed position may result where minimal contact occurs between arch wire and clip.

[00125] Referring now to FIGS. 28A-28B, a self-ligating orthodontic bracket is shown and is generally indicated to by reference numeral 10. As can be seen, orthodontic bracket 10 includes a body 12 and a lingual mounting base 14 attached to the body. The mounting base 14 has a lingual surface to be attached to a tooth. The body 12 may include a side wall 15 extending between the base 14 and a labial surface 19 to define a generally curved-shaped perimeter. Desirably, the perimeter of the body 12 defines a circular, oval, or otherwise shaped member. However, it is appreciated that the body 12 may be defined by various other shaped configurations such as a square-shaped, a rectangular-shaped a rhomboid-shaped, or otherwise shaped member. When provided, it is believed that the curved-shaped (e.g., oval-shaped) body 12 may reduce dental calculus or otherwise buildup about the perimeter of the body 12 and/or allow for easier removal thereof.

[00126] A pair of laterally spaced gingival tie wings 16 and a pair of laterally spaced occlusal tie wings 18 extend from the labial surface 19 of the body 12. The gingival tie wings 16 and the occlusal tie wings 18 generally curve lingually. An interwing region 24 extends gingivally-occlusally across the body 12 and may be generally defined by the lateral spacing of the gingival tie wings 16 and the lateral spacing of the occlusal tie wing 18. The interwing region 24 may be an opened (e.g., unobstructed) passageway or may be a closed (partially or completely obstructed) passageway, or otherwise. An archwire slot 20 extends mesially-distally across the body 12 and between the gingival and occlusal tie wings 16 and 18. The archwire slot 20 opens labially to receive an archwire 22. The archwire slot 20 is interrupted in the interwing region 24 of the body.

[00127] It is appreciated that the body 12 may also include an interior slot for receiving an optional auxiliary wire. Desirably, the body 12 may include at least one interior vertical slot 25 that extends occlusally-gingivally (e.g., generally parallel to the interwing region 24) through the body 12, though not required.

[00128] The bracket 10 may further include a locking mechanism that includes a locking clip 26 and a retaining member 27 for maintaining the locking clip 26 in the closed position. In one embodiment, the retaining member 27 may include stops 44 and 46 on the gingival tie

wings 16 to inhibit inadvertent movement of the locking clip 26 from a closed position to an open position and to maintain the locking clip 26 open when it is pivoted to the open position. The stops 44 and 46 extend generally towards one another from the respective gingival tie wings 16 so as to define a reduced opening 48 in the interwing area 24. Desirably, the stops 44 and 46 may form a circular (e.g., semi-circular) shape extending from the respective mesial and distal surfaces of the gingival tie wings 16 in the interwing are 24. However, it is appreciated that the stops 44 and 46 may form other shapes that include curved, arcuate, angled, flat, or otherwise portions.

[00129] The locking clip 26 is pivotally mounted on the occlusal tie wings 18 and is moveable between a closed position where access to the archwire slot 20 is inhibited by stops 44 and 46 and an open position where access to the archwire slot 20 is permitted. It is appreciated that the locking clip 26 is in the form of spring element having a generally cruciform outline. In one embodiment, the locking clip 26 may include a gingival head 28, which curves lingually to define a forwardly (e.g., gingivally) projecting hook 72. The head 28 may include interconnected opposing side portions 30, which define a width (e.g., mesial-distally) that is typically larger than width of the reduced opening 48.

[00130] The locking clip 26 may also include a pair of oppositely directed arms 50 and 52 (e.g., mesially and distally extending arm portions) which extend generally along and across the archwire slot 20. It is appreciated, that the arms 50 and 52 may at least partially or substantially extend in a parallel manner with the archwire slot 20. Each arm 50 and 52 may form a generally U-shaped configuration having a gingival portion extending to an occlusal portion with an end portion 58, therebetween to define an opening 60 therebetween. It is appreciated that the end portion 58 can extend as wide as necessary in both the mesial and distal direction to achieve optimum rotational control of the archwire.

[00131] When included, the gingival and occlusal portions of the arms 50 and 52 may be configured to desirably achieve direct translation of forces from the locking clip 26 to the archwire 22 along a Facial Axis FA (e.g., generally perpendicularly to the archwire slot 20). As can be seen in FIG. 28D, both gingival and occlusal portions (e.g. corners 86 and 87) of the archwire 22 may be engaged by the arms 50 and 52 (e.g., gingival and occlusal portions of the arms 50 and 52) in the closed position so as to directly translate the forces from the archwire 22 to the FA point on the tooth so as to optimize treatment time of the patient.

[00132] The locking clip 26 may also include opposed free ends (e.g., extending generally mesial and distal, though not required) that are out-turned to define oppositely

directed spaced apart tail ends 32 and 34 respectively. Each of the tail ends 32 and 34 is received in a respective bore 36 and 38 formed in one of the occlusal tie wings 18. The bores 36 and 38 may extend (e.g., mesial-distally) completely through the respective tie wings 18 or partially therethrough. The tail ends 32 and 34 may include a flange portion 40 and 42 extending (e.g., radially) from the clip 26. The flange portion 40 and 42 may be configured to act as a stop for the tail ends 32 and 34 when inserted in the respective bores 36 and 38. Desirably, the flange portions 40 and 42 may prevent the tail ends 32 and 34 from extending beyond a predetermined depth into and/or beyond the bores 36 and 38.

[00133] It is further contemplated that the locking clip 26 may be in a compressed state such that the tail ends 32 and 34 exert a generally continual outward force on the respective tie wings 16 (mesially for mesially-gingival tie wing 16 and distally for the distally-gingival tie wing 16) thereby maintaining the tail ends 32 and 34 within the respective bores 36 and 38. In doing so, the tails 32 and 34 are generally free to rotate within the respective bores 36 and 38 to permit pivotal movement of the locking clip 26 between the opened and closed positions.

[00134] In another embodiment, the stops 44 and 46 may form multiple stop portions (e.g., semi-circular portions) (not shown), each set of stop portions extending from the respective inner surface of the gingival ties wings 16 (e.g., into the interwing region 24). For example, the multiple stop portions may include a pair of labially-lingually spaced apart stops along the inner surface of each of the gingival tie wings 16. When included, the pairs of opposing pairs of stops may be configured to allow the locking clip 26 movable between an open position and two different closed positions. More particularly, a first pair of opposing labial stops may include a labial-mesial stop and a labial-distal stop while the second pair of opposing lingual stops may include a lingual-mesial stop and a lingual-distal stop, with the first pair of opposing labial stops being labially spaced from the second pair of opposing lingual stops. In the first closed position, the hook 72 may be positioned below the second pair of opposing lingual sops and the labial surface 19 of the body 12 in the gingival interwing area 24 to define an active first closed position. In the second closed position, the hook 72 may be positioned below between the first pair of opposing labial stops and the second pair of opposing lingual stops in the gingival interwing area to define a second closed position. .

[00135] The locking clip 26 is generally configured to withstand typical forces incurred by the bracket while substantially maintaining the locking clip 26 in the closed position. Typical forces may include, but are not limited to forces resulting from the movement of the archwire, the clip, and/or the bracket relative to one another or otherwise such as movement caused by

brushing your teeth and/or eating food. However, it is appreciated that the clip 26 may also be configured to allow deformation thereof resulting from a sufficient amount of force, which is generally greater than the typical forces described above. For example, as the dentist urges the head 28 against the stops 44 and 46 with a sufficient amount of force, the opposing side portions 30 deform towards one another so as to reduce the width of the head 28 thereby allowing the head 28 to pass through the reduce opening 48 while moving the locking clip between the open position and the closed position. After passing through the reduced opening 48, the head 28 generally returns to its typical non-deformed shape (e.g., non-stressed state).

[00136] The stops 44 and 46 contact a labial surface of the locking clip 26 about the hook portion 72 when the locking clip 26 is in a closed position to inhibit the locking clip from accidentally opening during application in the patient's mouth.

[00137] As can be seen in FIG. 28A, the stops 44 and 46 retain the locking clip 26 against the archwire 22 and inhibit relative movement between the archwire 22 and the body 12 of the orthodontic bracket 10. To release the archwire 22, the locking clip 26 is pivoted about the tails 32 and 34 while applying a sufficient amount of force against the stops 44 and 46. As a sufficient amount of force is being applied to the head 28 during engagement of the stops 44 and 46, the width of the head 28 is reduced thereby allowing it to pass through the reduced opening 48.

[00138] In another embodiment as shown in FIGS. 28C-28D, a self-ligating orthodontic bracket 110 is provided. The bracket 110 may comprise a locking mechanism including the locking clip 126 and an alternate retaining member 127. In this embodiment, the retaining member 127 is in the form of a first member 121 and a second member 123 with a reduced opening 148 therebetween. The first and second members 121, 123 may extend labially from the labial surface 119 of the body 112 in an occlusally-gingivally relationship relative to one another about the gingival interwing area 124.

[00139] At least one stop similar to that of the previous embodiment may be provided on one of the first and second members 121, 123 to inhibit inadvertent movement of the locking clip 126 from a closed position to an open position and to maintain the locking clip 126 open when the locking clip 126 is pivoted to the open condition. The stop may be included in various shapes and/or configurations such that they provide a reduced opening 148 between the first and second members 121, 123. In one specific example, the second member 123 (e.g., occlusally positioned relative to the first member 121) may include a stop 144 that extends from a gingival surface of the second member 123 at a free end 128. The stop 144 may be generally

similar in shape to the stop 44 as discussed above including curved portions to help guide the head 128 of the clip 126 between open and closed positions. The first member 121 (gingivally positioned relative to the second member 123) may include a stop 146 that extends from occlusal surface of the first member 121 at a free end 130. The stop 146 may be generally shaped as a ramp portion that gradually increases thickness (e.g., taper) as it extends towards a flat portion at the free end 130 to help guide hook portion 172 of the head 28 of the clip 126 between open and closed positions. The stops 144 and 146 generally oppose one another to form the reduced opening 148 therebetween. Desirably, in a non-stressed state, the reduced opening 148 may be dimensioned (occlusally-gingivally) with a maximum spacing that is less than the thickness of the head 128 to substantially prevent movement of the clip 126 between the open position and the closed position. It is appreciated that non-stressed state herein may be defined as (in non-stressed state such as in the open or closed positions of the bracket 110 shown in FIGS. 6 and 7).

[00140] It is appreciated that at least one or both of the first and second members 121, 123 may be configured to deform away from the other to allow movement of the clip 126 between open and closed positions. Deformation of the first member 121 and/or the second members 123 may occur upon contact by the clip 126 (e.g., head 128) with a sufficient force (e.g., by the dentist). For example, as the dentist urges the head 128 against the stops 144 and 146 with a sufficient amount of force, at least one (e.g., or both) of the first and second members 121, 123 deform towards the another so as to increase the spacing of the reduced opening 148 between the stops 144, 146 thereby allowing the hook portion 172 of the head 128 to pass through the widened reduced opening 148 while moving the locking clip 126 between the open position and the closed position. After passing through the reduced opening 148, the first member 121 and the second member 123 generally return to their typical non-deformed shape (e.g., non-stressed state) while returning the reduced opening 148 to it maximum spacing thereby maintaining the clip 28 in the open or closed positions. It is further appreciated that the hook portion 172 (or other portion(s) of the head 128) may deflect, deform, and/or compress to pass thorough the reduced opening 148, though not required.

[00141] More particularly, to close the orthodontic bracket 110, the locking clip 126 is pivoted about the tails 132 and 134. As the locking clip is pivoted, the head 128 of the clip 126 is pushed into the gingival portion of the interwing region 124 against the stops 144, 146. The reaction force applied to the stops 144, 146 by the head 128 of the locking clip 126 causes the at least one of the first and second members 121, 123 to move occlusally-gingivally in a

direction away from one another. When the locking clip 126 is pivoted beyond the stops 144 and 146, the first member 121 and/or the second member 123 snaps back into its non-stressed state (e.g., generally upright and/or perpendicular from the labial surface 119) and the head 126 is biased towards the labial surface 119 to its closed position below the stops 144 and 146. The stops 144 and 146 in this condition inhibit the locking clip 126 from moving back towards the open position. In this way, the archwire slot 120 remains closed securing the archwire 122 in the archwire slot.

[00142] Referring now to FIG. 28E, yet another embodiment of a self-ligating orthodontic bracket 210 is shown. The bracket 210 may comprise a body 212, a base 214, and a locking mechanism including the locking clip 226 and a retaining member 227. The body 212 may include gingival tie wings 216 and occlusal tie wings 218 with a mesially-distally extending archwire slot 220 therebetween. In this specific example, the body 212 has a rectangular-shaped body and includes a first bridge portion 260 in the interwing region 224, which spans between the gingival tie wings 216. The first bridge portion 260 extends from labial surface of the archwire slot 220 to the labial surface the gingival tie wings. The body 212 may also include a second bridge portion 261 in the interwing region 224, which spans between the occlusal tie wings 218. It is appreciated that the second bridge portion 261 extends partially from the labial surface of the archwire slot 220 to allow for rotation of the locking clip 226. The body 212 may also include an interior slot for receiving an optional auxiliary wire, though not required. In one specific embodiment, the body 212 may include an interior vertical slot 225 that extends occlusally-gingivally (e.g., generally transverse to the archwire slot 220) through the body 212.

[00143] The locking clip 226 may be in the form of a generally U-Shaped spring element having out-turned free mesial and distal ends defining laterally spaced tails 232 and 234. Each of the tails is pivotally received within a respective bore 236 and 238 formed in the respective one of the occlusal tie wings 218.

[00144] The retaining member 227 is provided in the first bridge portion 260 and may include sets of opposing stops 244 and 246 similar to that of the first embodiment, which may be provided on the bridge 260 to maintain the locking clip 226 within recesses 262 in the closed position.

[00145] More particularly, to close the orthodontic bracket 210, the locking clip 226 is pivoted about the tails 232 and 234. As the locking clip 226 is pivoted, the clip arms 250 and 252 of the head portion 228 are pushed into the bridge portion 260 against the respective pairs of opposing stops 244 and 246. The reaction force applied to the sets of opposing stops 244

and 246 by the clip arms 250 and 252 causes the clips arms 250 and 252 and/or the opposing stops 244 and 246 to deform thereby allowing the clip arms 250 and 252 to pass through reduced openings 248 between the open and closed positions. When the clip head 228 is pivoted beyond the sets of opposing stops 244 and 246, the clip arms 250 and 252, the opposing stops 244 and 246, or a combination of both snap back into their non-stressed state and the head 226 is biased towards the labial surface 219 about the recesses 262 to its closed position below the respective sets of opposing stops 244 and 246. The sets of opposing stops 244 and 246 in this condition (e.g., non-stressed state) inhibit the locking clip 226 from moving back towards the open position. In this way, the archwire slot 220 remains closed thereby securing the archwire (not shown) in the archwire slot 220.

[00146] Referring now to FIGS. 28F-28G, another embodiment of a self-ligating orthodontic bracket is shown and is generally indicated to by reference numeral 310. In this embodiment, the bracket 310 may comprise an oval body 312, a base 314, and a locking mechanism including a locking clip 326 and a retaining member 327. The body 312 may include gingival tie wings 316 and occlusal tie wings 318 with a mesially-distally extending archwire slot 320 therebetween. A first bridge portion 360 and a second bridge portion 361 may be in the interwing region 324, with the first bridge portion 360 spanning between the gingival tie wings 316 and the second bridge portion 361 spanning between the occlusal tie wings 318. It is appreciated that the first bridge portion 360 and/or the second bridge portion 361 may extend partially or entirely from the labial surface of the archwire slot to labial surface of the respective tie wings 316 and 318. In one specific example, the first and second bridge portions 360 and 362 extend from labial surface of the archwire slot up to the labial surfaces of the respective tie wings 316 and 318.

[00147] The body 312 may also include an interior slot for receiving an optional auxiliary wire, though not required. For example, the body 312 may include an interior vertical slot 325 that extends occlusally-gingivally (e.g., generally transverse to the archwire slot 320) through the body 312.

[00148] The locking clip 326 may be in the form of a generally U-Shaped spring element having a mesially-distally extending gingival head portion 328, a pair of oppositely directed arm portions 350 and 352, and in-turned free mesial and distal ends defining laterally spaced tails 332 and 334 extending respectively from arms 350 and 352 and free ends 358, therebetween. Each of the tails 332 and 334 is pivotally received within a respective bore 336 and 338 formed in the respective one of the occlusal tie wings 318. More particularly, the tails 332 and 334 are

received within the respective bore 336 and 338 along the outer surface of the respective occlusal tie wing (e.g., the mesial side of the mesial-occlusal tie wing and the distal side of the distal-occlusal tie-wing 318). In this specific embodiment, the locking clip 326 may include a biasing member 370, which extends lingually from the head portion 328 to define a forwardly projecting labial hook 372 and a lingual guide portion 374.

[00149] The retaining member 327 may be provided in the first bridge portion 360 and desirably includes a first opening 364 in the labial face of the first bridge portion 360 and a second opening 366 in the gingival face of the first bridge portion 360. Desirably, the first opening 364 and the second opening 366 define a throughhole 362 therebetween for receiving the biasing member 370 to maintain the locking clip 326 in the closed position.

[00150] The second opening 366 on the gingival surface of the bridge portion 360 includes a lingual flange 368, which engages the labial hook 372 when the locking clip 326 is in the closed position. The engagement between the flange 368 and the labial hook 372 maintains the locking clip in the closed position while retaining the locking clip 326 against the archwire thereby inhibiting relative movement between the archwire and the body 312 of the orthodontic bracket 310. To close the orthodontic bracket 310, the locking clip 326 is pivoted about the tails 332 and 334 towards the first bridge portion 360. As the lingual guide 374 contacts the gingival edge 376 of the first opening 364, the biasing member deflects (e.g., biases) occlusally thereby allowing the lingual guide 374 into the throughhole 362.

[00151] Desirably, the lingual guide 374 is provided at the free end of the biasing member 370 and includes a portion that is configured to direct the biasing member 370 into the first opening 360 and into the throughhole 362. It is appreciated that the guide portion may be curved, arcuate, angled, flat, or otherwise shaped to aid in directing the biasing member 370 into the closed position.

[00152] The reaction force applied to the gingival edge 376 of the first opening 364 by the lingual guide 374 causes the biasing member 370 to deflect (e.g., occlusally) thereby allowing the labial hook 372 to pass through the first opening 364 and into the throughhole 362 between the open and closed positions. When the hook portion 372 is pivoted lingually beyond the flange 368 in the throughhole 362, the biasing member 370 snaps back towards its non-stressed state and the lingual hook 372 engages the flange 368 of the throughhole 362 to its closed position. The biasing member 370 in this condition (e.g., non-stressed state) inhibits the locking clip 326 from moving back towards the open position. In this way, the archwire slot 320 remains closed thereby securing the archwire in the archwire slot.

[00153] At least one labial face of the gingival tie wings 316 and the bridge portion 360 may include a groove 380 having a shape complementary for receiving a portion of the locking clip 326 (e.g., head portion 328) while in the closed position. It is contemplated that the groove 380 may be configured with an angled or curved portion to aid in guiding the lingual guide 374 of the biasing member 370 into the first opening 364. Desirably, the labial faces of the gingival tie wings 316 (along the archwire slot) and the bridge portion 360 extending therebetween include the groove 380 having a generally semi-circular cross-section.

[00154] To release the archwire, the lingual guide 374 is moved (e.g., pushed) generally occlusally through the second opening 366 and into the throughhole 362 so that the hook portion 372 moves occlusally beyond the flange 368 thereby disengaging the hook 374 from the flange 368. Thereafter, the biasing member 370 may be removed from the retaining member 327 through the first opening 364 and the locking clip 326 is free to pivot about the tails 332 and 334.

[00155] Referring now to FIGS. 28H-28I, another embodiment of a self-ligating orthodontic bracket is shown and is generally indicated to by reference numeral 410. In this embodiment, the bracket 410 may comprise a rectangular body 412, a base 414, and a locking mechanism including a locking clip 426 and a retaining member 427. The body 412 may include gingival tie wings 416 and occlusal tie wings 418 with a mesially-distally extending archwire slot 420 therebetween. A first bridge portion 460 and a second bridge portion 461 is provided in the interwing region 424, with the first bridge portion 460 spanning between the gingival tie wings 416 and the second bridge portion 461 spanning between the occlusal tie wings 418. More particularly, the first bridge portion 460 extends from labial surface of the archwire slot up to the labial surface of the gingival tie wings 416 while the second bridge portion 461 extends only partially to the labial surface of the occlusal tie wings 418.

[00156] The body 412 may further include an interior vertical slot 425 that extends occlusally-gingivally (e.g., generally transverse to the archwire slot 420) through the body 412.

[00157] The locking clip 426 may be in the form of a generally U-Shaped spring element having a mesially-distally extending gingival head portion 428, a pair of oppositely directed arm ends 458 and in-turned free mesial and distal ends defining laterally spaced tails 432 and 434 extending respectively from arms 450 and 452. Each of the tails is pivotally received within a respective bore 436 and 438 formed in the respective one of the occlusal tie wings 418. More particularly, the tails 432 and 434 are received within the respective bore 436 and 438 along the outer surface of the respective occlusal tie wing (e.g., the mesial side of the mesial-occlusal tie

wing 418 and the distal side of the distal-occlusal tie-wing 418). In this embodiment, the locking clip 426 may include a pair of spacedly disposed biasing members 470a and 470b, which extend lingually from the head portion 428 to define respective mesially and distally projecting labial hooks 472a and 472b and respective lingual guide portions 474a and 474b.

[00158] The retaining member 427 is provided about the gingival tie wings 416. More particularly, each gingival tie wing 416 outwardly extends from the gingival surface of the body 412 to define a flange 468 which engages the respective labial hooks 472a and 472b when the locking clip 426 is in the closed position. The engagement between the flanges 468 and the labial hook 472a, 472b maintains the locking clip 426 in the closed position thereby retaining the locking clip 426 against the archwire so as to inhibit relative movement between the archwire and the body 412 of the orthodontic bracket 410.

[00159] To close the orthodontic bracket 410, the locking clip 426 is pivoted about the tails 432 and 434 towards the locking mechanism 427 about the gingival tie wings 416. The lingual guides 474a and 474b contact the labial surfaces of the respective gingival tie wings 416 so that the curved free ends 482 of the lingual guides 474a and 474b are guided inward along the respective inner surfaces of the gingival tie wings 416. In doing so, the biasing members 470a, 470b are deflected towards one another so that they can be positioned into the interwing region 424 between the gingival tie wings 416 as the locking clip 426 is pivoted towards the closed position. The lingual guides 474a and 474b continue to be guided along the inner surfaces of the gingival tie wings 416 until the labial hooks 472a and 472b are positioned below the flanges 468 of the locking mechanisms 427a and 427b. This allows the biasing members 470a and 470b to snap back into their non-stressed state so that the labial hooks 472a and 472b engage the flanges 468 thereby maintaining the locking clip 426 in the closed position. .

[00160] More particularly, the reaction force applied to the labial and inner surfaces of the gingival tie wings 416 by the lingual guides 474a and 474b cause the biasing members 470a and 470b to deflect (e.g., mesially or distally inward) thereby allowing the labial hooks 472a and 472b to pass into the reduced opening 448 of the interwing region 424 between the open and closed positions. When the lingual guides 474a and 474b are pivoted lingually beyond the flanges 468, the biasing members 470a and 470b snap back towards their non-stressed state and the lingual hooks 472a and 472b engage the flanges 468 of the retaining members 427a and 427b to its closed position. The biasing members 470a and 470b in this condition inhibit the locking clip 426 from moving back towards the open position. In this way, the archwire slot 420 remains closed thereby securing the archwire in the archwire slot.

[00161] To release the archwire, the biasing members 470a and 470b (e.g., the lingual guide portions 474a and 474b) are pushed generally towards one another (e.g., mesially-distally) to disengage each labial hook 472a and 472b from the respective flange 468. Thereafter, the biasing members 470a and 470b may be removed (e.g., labially) from flanges 468 of the retaining member 427 so that the locking clip 426 is free to pivot about the tails 432 and 434.

[00162] In this specific embodiment, the head 428 of the locking clip 426 extend gingivally beyond the first bridge portion 460. The labial surface of the gingival tie wings 416 may include a groove 480 having a shape complementary for receiving a portion of the locking clip 426 (e.g., head portion 428) while in the closed position. It is contemplated that the groove 480 may be configured with an angled or curved portion to aid in maintaining the locking clip 426 in the closed position. Desirably, the labial faces of the gingival tie wings 316 include the groove 480 having a generally semi-circular cross-section, which may be complementary to the locking clip 426.

[00163] Referring now to FIGS. 28J-28K, another embodiment of a self-ligating orthodontic bracket is shown and is generally indicated to by reference numeral 510. The bracket 510 may comprise a body 512, a base 514, and a locking mechanism including a locking clip 526 and a retaining member 527. The body 512 may include gingival tie wings 516 and occlusal tie wings 518 with a mesially-distally extending archwire slot 520 therebetween. A first bridge portion 560 and a second bridge portion 561 is provided in the interwing region 524, with the first bridge portion 560 spanning between the gingival tie wings 516 and the second bridge portion 561 spanning between the occlusal tie wings 518. It is appreciated that the first and second bridge portions 560 and 561 may extend from labial surface of the archwire slot up to the labial surfaces of the respective tie wings 516 and 518 thereby defining a portion of the gingival and occlusal walls of the archwire slot between the respective gingival and occlusal tie-wings.

[00164] In this embodiment, the locking clip 526 is in the form of spring element having a generally cruciform outline. The locking clip 526 may include a gingival head 528 having a lingually-gingivally projecting hook 572 and a curved lingual guides 574. The head 528 may be interconnected with a pair of oppositely directed arms 550 and 552 (e.g., mesially and distally extending arm portions) which extend across the archwire slot 520 to arm free ends 558. It is appreciated, that the arms 550 and 552 may at least partially or substantially extend in a parallel manner with the archwire slot 520. Each arm 550 and 552 may form a generally U-shaped

configuration having a gingival portion extending to an occlusal portion with the arm free end 558 therebetween. .

[00165] The locking clip 526 may also include opposed free ends (e.g., extending generally mesial and distal, though not required) that are out-turned to define oppositely directed spaced apart tail ends 532 and 534 respectively. Each of the tail ends 532 and 534 is received in a respective bore 536 and 538 formed in one of the occlusal tie wings 518 at an occlusal opening 596 in a lingual portion of the body 512.

[00166] The retaining member 527 includes a mesially-distally directed labial member 590 that extends between the gingival tie wings 516 in a generally parallel relationship to the first bridge portion 560 to define a first opening 564. The labial member 590 includes a lingual flange 568 that engages the hook 572 when the locking clip 426 is in the closed position. The engagement between the flange 568 and the hook 572 maintains the locking clip 526 in the closed position so that the locking clip 526 is retained against the archwire thereby inhibiting relative movement between the archwire and the body 512 of the orthodontic bracket 510.

[00167] To close the orthodontic bracket 510, the locking clip 526 is pivoted about the tails 532 and 534 towards the locking mechanism 527 (e.g., labial member 590) about the gingival tie wings 516. The lingual guide 574 contacts the labial-occlusal surfaces of the labial member 590 so that the hook 572 is guided occlusally along the occlusal inner surface of the labial member 590. In doing so, the head 528 is deflected occlusally towards the first bridge portion 560 so that the head 528 can be positioned into the first opening 564 between the gingival tie wings 516 as the locking clip 526 is pivoted towards the closed position. The lingual guide 574 is continually guided along the occlusal inner surface of the labial member 590 until the free end 584 of the hook 572 is positioned below the flange 468 of the labial member 590. This allows the biasing member 570 to snap back towards its non-stressed state so that the hook 572 engage the flange 568 thereby maintaining the locking clip 526 in the closed position.

[00168] More particularly, the reaction force applied to the occlusal-inner surface of the labial member 590 by the lingual guide 574 causes the head 528 to deflect (e.g., occlusally) thereby allowing the hook 572 to pass into the first opening 564 between the open and closed positions. When the lingual guide 574 is pivoted (lingually-gingivally) beyond the flange 568, the locking clip 526 snaps back towards its non-stressed state so that the hook 572 to engage the flanges 468 thereby preventing removal of the hook 572 from the flange 568 and the first opening 564 during its closed position. The head 528 in this condition inhibits the locking clip

526 from moving back towards the open position. In this way, the archwire slot 520 remains closed thereby securing the archwire in the archwire slot.

[00169] To release the archwire, the head 528 (e.g., the hook 572) is pushed lingually and occlusally to disengage the hook 572 from the labial member 590. Thereafter, the biasing members 570 may be removed from labial member 590 and the first opening 564 so that the locking clip 526 is free to pivot about the tails 532 and 534.

[00170] Optionally, the locking clip 26 may further include a cover portion 90 as shown in FIG. 29A. The cover portion 90 defines a generally oval shape and may include a labial surface 92 that extends generally the length and width of the archwire slot when included. The cover portion 90 may also include an attachment member 94 for connecting to the locking clip 26. It is appreciated that the attachment member 94 is positioned about the lingual surface 96 of the cover portion 90 and has a size and shape complementary to the clip opening 60. When included, the attachment member 94 engages the clip opening 60 of the locking clip 26 so that it is removable affixed thereto. While in the closed position, it is appreciated that the cover portion 90 substantially or entirely cover the archwire slot having the archwire therein so as to provide a more aesthetic look to the bracket. Furthermore, it is appreciated that the cover portion 90 may aid in preventing food and/or plague buildup in the bracket 10. As shown in the drawing the cover portion 90 may be a separate component of the locking clip 26, however it is appreciated that the cover portion 90 and the locking clip 26 may be an integral piece.

[00171] Optionally, the locking clip 326 may further include a cover portion 390a as shown in FIG. 29B. The cover portion 390a may define a generally flat and/or curved portion having an oval and/or rectangular shape and may include a labial surface 392a that extends generally the length and width of the archwire slot when included. The cover portion 390a may also include a plurality of attachment members 394a (e.g., deformable attachment members) for connecting to the locking clip 326. It is appreciated that the attachment members 394a may be positioned about the lingual surface 396a of the cover portion 390a at the respective corners thereof and may have a size and shape complementary to the thickness of the locking clip 326. When included, the attachment members 394a engage multiple portions of the locking clip 326 so that the cover portion 390a is removable affixed thereto. While in the closed position, it is appreciated that the cover portion 390a may substantially or entirely cover the archwire slot having the archwire therein so as to provide a more aesthetic look to the bracket. Furthermore, it is appreciated that the cover portion 390a may aid in preventing food and/or plague buildup in the bracket 310. As shown in the drawings, the cover portion 390a may be a separate

component of the locking clip 326; however it is appreciated that the cover portion 390a and the locking clip 326 may be an integral piece.

[00172] Optionally, the locking clip 326b may further include a cover portion 390b as shown in FIG. 29C. The cover portion 390b may define a generally oval and/or rectangular shape and may include a labial surface 392b that extends generally the length and width of the archwire slot when included. The cover portion 390b may also include a first attachment member 394b and a second attachment member 395b (e.g., deformable attachment members) for connecting to the locking clip 326b. It is appreciated that the attachment member 394b may be positioned about the gingival free end 398b of the cover portion 390b and may include a tubular shape having a mesial-distal opening 399b along its entire length for receive the locking clip 326b. The attachment member 394b has a size and shape complementary to the thickness of the locking clip 326b. In this embodiment, the biasing member 370 (having a guide portion 374b and a hook portion 372b for engaging the retaining member) has been removed from the clip 326 so that the cover portion 390b further includes a biasing member 370b for engaging the flange 368 in the closed position. When included, the attachment members 394b (being deformable) snaps over the gingival portion of the locking clip 326b (the attachment member being generally tubular with a longitudinal opening for receiving a portion of the locking clip) so that the cover portion 390b is removable affixed thereto. While in the closed position, it is appreciated that the cover portion 390b may substantially or entirely cover the archwire slot having the archwire therein so as to provide a more aesthetic look to the bracket. Furthermore, it is appreciated that the cover portion 390b may aid in preventing food and/or plague buildup in the bracket 310. As shown in the drawings, the cover portion 390b may be a separate component of the locking clip 326b; however it is appreciated that the cover portion 390b and the locking clip 326b may be an integral piece.

[00173] FIGS. 30A-30D are various views of another alternate embodiment of the self-ligating bracket shown in FIG. 28E in which the bracket 210a may comprise a body 212a, a base 214a, and a locking mechanism including the locking clip 226a and a retaining member 227a. The body 212a may include gingival tie wings 216a and occlusal tie wings 218a with a mesially-distally extending archwire slot 220a therebetween. In this specific example, the body 212a has a rectangular-shaped body and includes a first bridge portion 260a in the interwing region 224a, which spans between the gingival tie wings 216a. The first bridge portion 260a extends from labial surface of the archwire slot 220a to the labial surface the gingival tie wings. The body 212a may also include a second bridge portion 261a in the interwing region 224a,

which spans between the occlusal tie wings 218a. It is appreciated that the second bridge portion 261a extends partially from the labial surface of the archwire slot 220a to allow for rotation of the locking clip 226a.

[00174] The locking clip 226a may be in the form of a generally cross-shaped spring element having out-turned free mesial and distal ends defining laterally spaced tails 232a and 234a. Each of the tails is pivotally received within a respective bore 236a and 238a formed in the respective one of the occlusal tie wings 218a.

[00175] The retaining member 227a is provided in the first bridge portion 260a and may include sets of opposing stops 244a and 246a. More particularly, to close the orthodontic bracket 210a, the locking clip 226a may be pivoted about the tails 232a and 234a. As the locking clip 226a is pivoted, the clip arms 250a and 252a of the head portion 228a are pushed into the bridge portion 260a against the respective pairs of opposing stops 244a and 246a. The reaction force applied to the sets of opposing stops 244a and 246a by the clip arms 250a and 252a causes the clips arms 250a and 252a and/or the opposing stops 244a and 246a to deform thereby allowing the clip arms 250a and 252a to pass through reduced openings 248 between the open and closed positions. When the clip head 228a is pivoted beyond the sets of opposing stops 244a and 246a, the clip arms 250a and 252a, the opposing stops 244a and 246a, or a combination of both snap back into their non-stressed state and the head 226a is biased towards the labial surface 219a about the recesses 262a to its closed position below the respective sets of opposing stops 244a and 246a. The sets of opposing stops 244a and 246a in this condition (e.g., non-stressed state) inhibit the locking clip 226a from moving back towards the open position. In this way, the archwire slot 220a remains closed thereby securing the archwire (not shown) in the archwire slot 220a. Furthermore, the archwire slot may include a generally non-flat mesially-distally extending portion (e.g., a curved portion such as a concave portion or a convex portion and/or an angled portion). For example, a labially positioned bracket may include an archwire slot having a lingually directed base surface thereby forming a generally convexed portion of the archwire slot or a lingually positioned bracket may include an archwire slot having a labially directed base surface thereby forming a generally concaved portion of the archwire slot, though not required. More particularly, the archwire slot may include a lingually directed portion that also extends along the mesially-distally direction to define at least one non-flat portion of the archwire slot. Desirably, a curved and/or angled archwire 720a with a curved and/or angled labial surface 721a may provide for a more aesthetic looking bracket having a low profile.

[00176] Referring now to FIGS. 30E-30L, additional embodiments of a self-ligating orthodontic bracket are shown and are generally indicated to by reference numeral 710 (710a, 710b, 710c, and 710d). The orthodontic brackets 710a and 710b being generally similar to the embodiment of FIGS. 28A-28B, while the orthodontic brackets 710c and 710d being generally similar to the embodiment of FIGS. 28H-28I. However, these embodiments are not limiting and it is appreciated that any of the brackets described herein or otherwise may include an archwire slot having a generally non-flat mesially-distally extending portion (e.g., a curved portion such as a concave portion or a convex portion and/or an angled portion). For example, a labially positioned bracket may include an archwire slot having a lingually directed base surface thereby forming a generally convexed portion of the archwire slot or a lingually positioned bracket may include an archwire slot having a labially directed base surface thereby forming a generally concaved portion of the archwire slot, though not required.

[00177] More particularly, the archwire slot may include a lingually directed portion that also extends along the mesially-distally direction to define at least one non-flat portion of the archwire slot. Desirably, a curved and/or angled archwire 720 with a curved and/or angled labial surface 721 may provide for a more aesthetic looking bracket having a low profile with vertical slot 725 (FIGS. 30E-30F and 30I-30J or a very low profile without the vertical slot 725 (FIGS 30G-30H and 30K-30L). It is appreciated that the archwire slot may extend mesially-distally in a generally parallel manner relative to the lingual surface of the base, the labial surface of the base, the labial surface of the tooth, or otherwise, though not required.

[00178] A portion of the archwire slot may be lingually directed towards the base 714 relative to at least one labially directed portion of the archwire slot. More particularly, the at least one labially directed portion may include an apex portion 796 that is labially offset or displaced relative to at least one other mesially-distally located portion of the archwire slot (e.g., mesial and distal ends 794 of the arch wire slot 720). It is appreciated that the archwire slot may include a constant curve radius or taper along its mesial-distal length; however, a variable curve radius or variable taper is also contemplated. Desirably, the apex portion 796 may be provided in a central portion of the arch wire slot (e.g., interwing region 724). Preferably, the apex portion 796 is provided midway of the archwire slot, such that the arch wire slot is symmetrical as shown in the cross-sections of FIGS. 30F, 30H, 30J, and 30L. However, it is appreciated that the apex portion 796 may be provided at various locations along the archwire slot from the mesial end to the distal end or may be provided at one of the mesial and distal ends 794. Furthermore, it is also appreciated that the archwire slot may include a generally flat

portion in the interwing region while having lingually directed end portions that may be angled and/or curved relative to the central (e.g., midway) flat portion.

[00179] As mentioned above, the base surface of the archwire slot may also include a concaved portion. When included, a portion of the archwire slot base surface may be labially directed away from the base of the bracket relative to another portion of the archwire slot base surface. This may be accomplished along a curvature or in an angled manner. Furthermore, as discussed above, any curved and/or angled portion of the archwire slot base surface may be positioned along one or more portions along the base of the archwire slot (e.g., at an edge portion, at the opposing edge portion, at a central portion, or in between or elsewhere along the base surface of the arch wire slot.

[00180] FIGS. 31A-31D are various views of an alternate embodiment of the self-ligating dental bracket shown in FIGS. 9A-9G in which the lingual free end 1028s pivotally engages a lingual opening 1064s formed in the lingual portion of the open stop groove 1042s. In this specific embodiment, the locking clip 1026s may include a generally J-shaped configuration and include deformable fingers 1062s having flange portions 1066. Once received in the lingual cavity, the deformable fingers may remain in a partially stressed state due to active engagement of the outer edges 1070s of the flange portions with the respective interior mesial and distal side walls 1136s of the occlusal tie wings 1018s to aid in suppressing movement (e.g., twisting, mesial-distal movement, and/or otherwise) of the locking clip 1026s while in the closed position. Additionally, this active engagement further allows for rotation of the locking and/or securement of the locking clip to the bracket body.

[00181] It is appreciated that the locking clips described herein may be formed of a superelastic member such as a nickel-titanium alloy, even if the locking member has been deformed relatively greatly, there is no large variation of the load, and the arch wire can be pressed down moderately under the superelasticity. Additionally, favorable operating efficiency in the treatment operation can be maintained. For example, wires ranging from a narrow round wire to a full-sized square wire can be pressed into the slot with a virtually equivalent load, and three-dimensional control becomes possible starting from an early period of treatment with an optimum force in the living body. In addition to the restoring force of the wire, the correcting force is also produced by the force with which the locking member presses down the arch wire, and treatment of higher dimensionality becomes possible.

[00182] In one specific example, the locking clip may be formed of an alloy comprising 35-55 (e.g., 40-50) wt% Co, 10-30 (e.g., 15-25) wt% Ni, 10-30 (e.g., 15-25) wt% Cr, 0.5-15 (e.g.,

1-10) wt% Fe, 0.01-15 (e.g., 0.1-10) wt% W, 0.01-15 (e.g., 0.1-10) wt% Mo, and/or 0.01-10 (e.g., 0.1-5) wt% Ti.

[00183] It is appreciated that the present invention may include one or more of the following features: the base may include an 80 gauge micro-mesh pad for optimal bonding/de-bonding; the body may be in the form of a rhomboid, square, or oval-shaped body design; the locking clip may be metal, plastic or a composite; the locking clip may be in the form of a wire configuration; the locking clip may be formed by utilizing wire-bending or similar manufacturing processes; the locking clip may exhibit optimum balance between force applied to secure the arch wire in the slot to motivate tooth movement and maintaining flexibility of the wire properties in the locking clip to apply rotational control of the arch wire; the edges of the locking clip may maintain enough elasticity to be assembled or disassembled by the user by either an inner or outer hinge design; the locking clip may be inserted or removed by simply squeezing the lower bars (e.g., with tweezers) to allow compression and expansion of the locking clip; the locking clip may open and/or close by rotation on the hinged-axis; the locking clip may be locked into position by any of the following methods 1) push-lock design that locks the locking clip into place by utilizing the elasticity of locking clip around side bevels in the body of bracket, 2) push-lock design that locks the locking clip into place by utilizing the elasticity of locking clip around a top bevel in the body of bracket that exhibits a downward force on the locking clip, 3) push-lock design that locks the locking clip into place by utilizing the cavity in the body of the bracket that holds the locking clip into place, 4) snap-fit design with a centrally located locking mechanism that compresses when pushed into the slot of the body before expanding into locked position in the open cavity of the body and 5) snap-fit design with two laterally located locking mechanisms that compresses when pushed into the bevels before expanding into locked position when the mechanism clears the bevel; optimum rotational control of the arch wire as the locking clip can be extended as far mesially or distally as necessary without affecting the mechanism of the locking clip/body assembly; the locking clip spans over the entire width (e.g., of the archwire slot) of the bracket base while engaging the wire, thus providing maximum torque possible; low friction in system as there will be two points of contact between the locking clip and arch wire (gingival and occlusal corners at mesial and distal ends of the archwire) as opposed to continuous line of contact along only gingival portions or occlusal portions of the archwire; the archwire slot may be designed with at least one bump (e.g., a plurality of bumps) and/or at least one groove (e.g., a plurality of grooves) in the bottom and/or side walls to minimize the contact area between the archwire and archwire slot, (to optionally express the built-in torque at any

wire size); the locking clip may be designed with at least one bump (e.g., a plurality of bumps) and/or at least one groove (e.g., a plurality of grooves) to reduce the contact area between the archwire and archwire slot, (to optionally express the built-in torque at any wire size); the locking clip may be interchangeable with any type of body regardless of material (metal, ceramic, plastic, etc.) to keep the in-out dimensions of the system consistent; the open/close mechanism in this application may be a freely rotating hinge; upon removal of the locking clip, the self-ligating bracket may be utilized as a conventional (twin) bracket; the tie wings may be used for ligation; the tie wings may be flared out to provide maximum torque; direct translation of forces occur from the locking clip to the archwire, to a force point on the bracket and to a Facial Axis (FA) point on tooth; the locking clip may engage the archwire at both the gingival and occlusal corners and translate directly to the FA point on the tooth to optimize treatment time of the patient; the locking clip may be over-molded or insert-molded with plastic for aesthetic purposes; the material used for forming the locking clip and/or bracket may be plastic, which may be of any color as indicated by the patient; low friction characteristics of system may still be maintained since there may be no or substantially no contact between the molded plastic and arch wire; the base and the body may be coated with aesthetic material, antibiofilm material or both (for example, silver nanoparticles, PEG); the body of bracket may be interchangeable with either a rhomboid, square, or oval shaped body; the base may be contoured to marginal ridge for increased accuracy in placement and aesthetics (applicable to molar and bicuspids); the body may be over-molded with a soft plastic material (desirably in central and lateral brackets) to reduce chipping of upper incisal edge; a cap and/or cover portion formed of a soft plastic material may be attached to the bracket to reduce/eliminate chipping of upper incisal edge, the cap and/or cover portion may be removed after first phase of treatment; and any combination thereof.

[00184] It will be further appreciated that functions or structures of a plurality of components or steps may be combined into a single component or step, or the functions or structures of one-step or component may be split among plural steps or components. The present invention contemplates all of these combinations. Dimensions and geometries of the various structures depicted herein are not intended to be restrictive of the invention, and other dimensions or geometries are possible. References to directions are intended to clarify the description and do not in any way limit the scope of the invention. In other embodiments, the reference directions may be other than are shown, disclosed, or arranged differently. Also, it is to be understood that the phraseology and terminology used herein is for the purpose of

description and should not be regarded as limiting. In addition, while a feature of the present invention may have been described in the context of only one of the illustrated embodiments, such feature may be combined with one or more other features of other embodiments, for any given application. It will also be appreciated from the above that the fabrication of the unique structures herein and the operation thereof also constitute methods in accordance with the present invention. The present invention also encompasses intermediate and end products resulting from the practice of the methods herein. The use of "comprising" or "including" also contemplates embodiments that "consist essentially of" or "consist of" the recited feature.

[00185] The explanations and illustrations presented herein are intended to acquaint others skilled in the art with the invention, its principles, and its practical application. Those skilled in the art may adapt and apply the invention in its numerous forms, as may be best suited to the requirements of a particular use. Accordingly, the specific embodiments of the present invention as set forth are not intended as being exhaustive or limiting of the invention. The scope of the invention should, therefore, be determined not with reference to the above description, but should instead be determined with reference to the appended claims, along with the full scope of equivalents to which such claims are entitled. The disclosures of all articles and references, including patent applications and publications, are incorporated by reference for all purposes.

CLAIMS

1. A self-ligating orthodontic bracket comprising:

a body having a pair of laterally spaced gingival tie wings and a pair of laterally spaced occlusal tie wings, the gingival and occlusal tie wings projecting from a labial surface of the body;

an arch wire slot extending mesially-distally across the body and between the gingival and occlusal tie wings to accommodate an arch wire

a free-sliding, controlled-locking, or pivoting clip wherein the clip allows placement and removal of the arch wire when in the open position and prevents the displacement of the arch wire from the bracket member when in the closed position.

2. The orthodontic bracket according to claim 1, wherein a first pair of grooves extends in opposite directions from another at a distance from the lingual surface of the body to define a locking recess, the locking recess having a width greater than the reduced opening;

wherein a second pair of grooves extends in opposite directions from another at a distance from the lingual surface of the body to define a locking recess that is occlusal with respect to the first pair of grooves, the locking recess having a width greater than the reduced opening;

wherein the lingual portion of locking clip in a stressed-state is deformed to allow passage of the engagement portion occlusally from the first set of grooves through the reduced opening and into the locking recess of the second pair of grooves to the open position;

wherein the lingual portion of the locking clip while in the locking recess returns towards a non-stressed state such that the engagement portion is prevented from passing through the reduced opening thereby maintain the locking clip in the open position;

wherein the lingual portion of locking clip in a stressed-state is deformed to allow passage of the engagement portion gingivally from the second set of grooves through the reduced opening and into the locking recess of the first pair of grooves to the closed position, and

wherein the lingual portion of the locking clip while in the locking recess returns towards a non-stressed state such that the engagement portion is prevented from passing through the reduced opening thereby maintain the locking clip in the closed position.

3. The orthodontic bracket according to claim 1, wherein a first pair of grooves extends in opposite directions from another at a distance from the lingual surface of the body to define a locking recess, the locking recess having a width greater than the reduced opening;

wherein a tapered opening extends occlusally from the first pair of grooves from the lingual surface of the body to guide the movement of the lingual portion of the locking clip;

wherein the lingual portion of the locking clip in a stressed-state is deformed to allow passage of the engagement portion gingivally through the reduced opening;

wherein the lingual portion of the locking clip gradually returns towards a non-stressed state such that the lingual free end of the clip pivots slightly labially as it approaches the occlusal wall of the body, thereby maintaining the locking clip in the open position;

wherein the lingual portion of locking clip in a stressed-state is deformed to allow passage of the engagement portion gingivally from the open position through the reduced opening and into the locking recess of the first pair of grooves to the closed position, and

wherein the lingual portion of the locking clip while in the locking recess returns towards a non-stressed state such that the engagement portion is prevented from passing through the reduced opening thereby maintain the locking clip in the closed position.

4. The orthodontic bracket according to claim 1, wherein the lingual free end of the clip pivots with respect to the axis generated by the bottom face of the arch wire slot when the facial portion of the clip rotates gingivally or occlusally.

5. The orthodontic bracket according to claim 1, wherein the facial surface of the clip contains a hole to allow standard dental instruments to mate for opening the clip in the occlusal direction;

wherein the facial surface of the clip contains ribs protruding from the facial surface of the clip to allow both visual placement of the bracket by aligning with the long axis of the tooth and enhanced clip durability; and

wherein in the body contains an entry slot to guide standard dental instruments on a plane parallel to the groove on the clip.

6. The orthodontic bracket according according to claim 1, wherein the mesial and distal portions of the labial free end of the clip prongs extend beyond the body and arch-wire slot;

wherein a ledge has been added as a separate artifact as mesial and distal extensions from the body to provide a positive seat for the labial free end of the clip in the closed position;

wherein the extended mesial-distal ledges from the body have a cover that protects the mesial and distal edges of the labial free end of the clip in the closed position;

wherein the extended mesial-distal ledges from the body have enclosed pockets that protects the mesial, distal, and gingival edges of the labial free end of the clip in the closed position;

wherein the extended mesial-distal ledges from the body have open pockets in the form of a "C-cup" that protects the gingival edges of the labial free end of the clip in the closed position.

7. The orthodontic bracket according to claim 1,

wherein a continuous channel extends in the gingival-occlusal direction through the lingual portion of the body to facilitate the cleaning of entrapped calculus / tartar.

wherein the depth of the continuous channel that travels mesial-distally in the clip resting closed position has been reduced such that the smallest possible arch wire does not get entrapped during treatment.

8. A self-ligating orthodontic bracket comprising:

a body having a pair of laterally spaced gingival tie wings and a pair of laterally spaced occlusal tie wings, the gingival and occlusal tie wings projecting from a labial surface of the body;

an arch wire slot extending mesially-distally across the body and between the gingival and occlusal tie wings to accommodate an arch wire;

a free-sliding, controlled-locking, clip wherein the clip allows placement and removal of the arch wire when in the open position and prevents the displacement of the arch wire from the bracket member when in the closed position.

9. An Orthodontic bracket according to Claim 8, wherein a first pair of slots extending mesially-distally across the body and inside of the gingival tie wings;

wherein a second pair of slots extending mesially-distally across the body, inside of the gingival tie wings, lingually parallel to the first pair of slot;

wherein the locking clip is in the furthest occlusal position and in a stressed-state, the arch wire slot is not covered by the labial portion of locking clip. This position is called the open position.

wherein the locking clip moves gingivally from the open position and the labial portion of locking clip sits in the first pair of slots, there is no contact between the labial portion of locking clip and the labial side of arch wire. This position is called the closed Passive stage.

wherein the labial portion of locking clip was moved from the first pair of slots to the second pair of slots so that there is interference contact between the labial portion of locking clip and the labial side of arch wire thereby locating the clip in a closed active stage position.

10. An Orthodontic bracket according to Claim 8, wherein a few of slots extending mesially-distally across the gingival tie-wings. The slots can be extended across the gingival tie-wings partially or completely;

wherein a few of locking slots protruding mesially between the gingival tie-wings or distally from the gingival tie-wings;

wherein a free rotating, and flexible clip has two gingival potions that will be locked into different locking slots on the body, which create different closed stages (Passive, and Active);

wherein the inside clearance of locking slot can designed in such way that the gingival portion of clip has clearance in all closed positions to create the interactivity between the clip and the arch wire;

wherein the flexible clip has two occlusal potions that insert mesially-distally between the occlusal tie-wings, the occlusal portions (hinge, a better word) can be round shape or non-round shape such as rectangular;

wherein the middle potion of clip can be designed such way that there is a clearance between the clip and the arch wire to create the interactivity between them.

wherein between the occlusal tie-wings of the body, two slots where the two occlusion portions (hinges) of flexible clip were inserted; the hinges can be round shape or non-round shape such as rectangular. These two slots have extended length gingival-occlusal so that the clip can be strictly rotating or the combination between rotating and sliding.

11. An Orthodontic bracket according to Claim 8, wherein a pair of slots extending mesially-distally across the body and inside of the gingival tie wings;

wherein a locking clip has two labial ends – the gingival labial end and the occlusal labial end, the profile of clip looks like a "C" from mesially-distally;

wherein a locking clip has different distances between two labial ends to the gingival portion of the locking clip;

wherein a locking clip moves the furthest gingival position, the occlusal labial end covers the labial opening of arch wire slot. There is no contact between the occlusal labial end of locking clip and the labial side of arch wire. The occlusal labial portion of locking clip is in a stress-free state and this position of bracket is called the Passive stage.

wherein a locking clip moves the furthest occlusal position, the gingival labial end covers the labial opening of arch wire slot. There is interference contact between the gingival labial end of locking clip and the labial side of arch wire. The gingival labial portion of locking clip is in a stressed-state and this position of bracket is called the Active stage.

wherein a locking clip moves to a middle position between the furthest gingival position and the furthest occlusal position, neither of labial ends of locking clip covers the labial opening of arch wire slot. This position of bracket is called the open position.

12. A self-ligating orthodontic bracket comprising:

a body having a pair of laterally spaced gingival tie wings and a pair of laterally spaced occlusal tie wings, the gingival and occlusal tie wings projecting from a labial surface of the body;

an arch wire slot extending mesially-distally across the body and between the gingival and occlusal tie wings to accommodate an archwire;

a locking mechanism on the mesial and distal ends of the bracket body designed as a gear rack; and

a locking clip with a mating gear rack of the locking mechanism to keep the clip closed.

13. A self-ligating orthodontic bracket according to claim 12, in which two independently operated clips on the mesial and distal edges of the bracket body can allow different expressions on the arch wire on each edge, in any combination.

14. A self-ligating orthodontic bracket clip according to claim 12, wherein each clip is adjustable to provide a passive arch wire engagement, an active arch wire engagement, or interactive arch wire engagement.

15. A self-ligating orthodontic bracket clip according to claim 12, wherein a post is attached to the clip, which can be angled anywhere between 0 degrees to 90 degrees.

16. A self-ligating orthodontic bracket clip according to claim 12, wherein the body includes a gingivally-occlusally extending vertical slot.

17. A self-ligating orthodontic bracket clip according to claim 12, wherein a rounded stop on the opposite end of the gear rack allows a pivot motion to open the clip and prevents the clip from disengaging from the body.

18. An Orthodontic bracket according to comprising

a base adapted to engage the tooth surface;

a bracket body extending in a substantially perpendicular direction from said base, said bracket body having an arch wire slot which extends in a mesiodistal direction;

a locking clip for opening or closing said arch wire slot;

wherein said locking member having a notched portion being provided substantially in a center of said labial free end between two opposing tab portions;

wherein said bracket has a receiving area formed about a mesially and a distally side of the bracket body, the receiving area being defined by an receiving member of the gingival tie wings.

19. The orthodontic bracket according to claim 18, wherein the retaining member is selected from the group consisting of:

a. a labial hood;

b. a lingual ledge;

c. an end wall extending between a labial hood and a lingual ledge, and opposingly spaced from the body thereby enclosing at least a portion of the receiving area;

d. a c-shaped member; and

e. combinations thereof.

20. An Orthodontic bracket according to comprising

a base adapted to engage the tooth surface;

a bracket body extending in a substantially perpendicular direction from said base, said bracket body having an arch wire slot which extends in a mesiodistal direction;

a locking clip for opening or closing said arch wire slot; and a locking mecanisn form in a lingual cavitiy of the body, the lingual cavity being configured to receive deformable fingers of the locking clip through an opening, the deformable fingers having boss portions that define a width in a non-stressed state being larger than a width of a lingual opening of the lingual cavity;

wherein said locking clip having a notched portion being provided substantially in a center of said labial free end between two opposing tab portions;

wherein said bracket has a receiving area formed within a mesial-distal retaining channel of the bracket body.

21. The orthodontic bracket according to claim 19,

wherein the locking clip includes first and second arms having a hook portion;

wherein the retaining member includes a first pair of stops and a second pair of stops, each stop of the first pair of stops having a first opening, a first guide portion and a first flange portion, and each stop of the second pair of stops having a second opening, a second guide portion and a second flange portion;

wherein the locking clip is deformable such that as the hook portions are guided towards the first openings or the second openings, the locking clip deforms into a stressed-state thereby enabling the hook portions to be received into the first openings or the second openings; and

wherein the hook portions are guided along the first guide portions or the second guide portions until the hook portions extend beyond the first pair of stops or the second pair of stops thereby allowing the locking clip to return towards a non-stressed-state so that the hook portions engage the flange portions of the first pair of stops or the second pair of stops to maintain the locking clip in a first closed position or a second closed position.

22. A self-ligating orthodontic bracket comprising:

a body having a pair of laterally spaced gingival tie wings and a pair of laterally spaced occlusal tie wings, the gingival and occlusal tie wings projecting from a labial surface of the body;

an archwire slot extending mesially-distally across the body and between the gingival and occlusal tie wings to accommodate an archwire

a locking mechanism having a locking clip and a retention member, the locking clip movable between an open position and a closed position and having a engagement portion for engaging the retention member;

wherein the locking clip allows placement and removal of the archwire when in the open position and prevents the displacement of the archwire from the bracket member when in the closed position.

23. The orthodontic bracket according to claim 22, wherein the retaining member includes at least one pair of opposing spaced apart stops defining a reduced opening therebetween, the reduced opening having a width that is smaller than the engagement portion of the locking clip.

24. The orthodontic bracket according to claim 22,

wherein a first pair of stops extend towards one another from the respective gingival tie wings and at a distance from the labial surface of the body to define a locking recess, the locking recess having a width greater than the reduced opening;

wherein the width of the locking recess is defined by a distance between the gingival tie wings;

wherein the locking clip in a stressed-state is deformed to allow passage of the engagement portion lingually through the reduced opening and into the locking recess to the closed position, and

wherein the locking clip while in the locking recess returns towards a non-stressed state such that the engagement portion is prevented from passing through the reduced opening thereby maintain the locking clip in the closed position.

25. The orthodontic bracket according to claim 22,

wherein the retaining member includes a first member and a second member that extend labially from the labial surface of the body in an occlusally-gingivally relationship relative to one another about the gingival interwing area;

wherein the pair of stops extend towards one another from the respective first and second members and at a distance from the labial surface of the body to define a locking recess, the locking recess having a width greater than the reduced opening;

wherein the width of the locking recess is defined by a distance between the first member and a second member;

wherein the locking clip in a stressed-state is deformed to allow passage of the engagement portion lingually through the reduced opening and into the locking recess to the closed position; and

wherein the locking clip while in the locking recess returns towards a non-stressed state such that the engagement portion is prevented from passing through the reduced opening thereby maintain the locking clip in the closed position.

26. The orthodontic bracket according to claim 22,

wherein the engagement portion of the locking clip includes a first arm portion and a second arm portion;

wherein a first pair of stops and a second pair of stops are provided along a first bridge portion in the interwing region between the gingival tie wings, each pair of stops extending at a distance from a labial surface of the bridge portion to define a locking recess, the locking recess having a width greater than the reduced opening;

wherein the locking clip in a stressed-state deforms the engagement portion such that passage of the first arm portion lingually through the reduced opening of the first pair of stops and into a first locking recess is allowed and passage of the second arm portion lingually through the reduced opening of the second pair of stops and into a second locking recess is allowed; and

wherein the first and second arm portions while in the respective first and second locking recesses return towards a non-stressed state such that the engagement portion is prevented from passing through the reduced openings thereby maintaining the locking clip in the closed position.

27. The orthodontic bracket according to claim 22, wherein the engagement portion of the locking clip includes at least one biasing member having a hook portion and a guide portion.

28. The orthodontic bracket according to claim 22,

wherein the retaining member includes a first opening and a second opening about a first bridge portion in the interwing region between the gingival tie wings, the first and second openings defining a through therebetween;

wherein the guide portion upon contact with a wall of the first opening causes the biasing member to deflect thereby enabling the at least one biasing member through the first opening and into the throughhole; and

wherein the at least one biasing member is guided along the throughhole until the hook portion extends beyond a flange portion within the throughhole thereby allowing the at least one biasing member to return towards a non-stressed-state so that the hook portion engages the flange portion to maintain the locking clip in the closed position.

29. The orthodontic bracket according to claim 22, wherein the locking clip is a tubular or cylindrical member having a generally U-shaped configuration such that the at least one biasing member is lingually directed from a head portion of the locking clip.

30. The orthodontic bracket according to claim 22, wherein

wherein the at least one biasing member includes a first biasing member and a second biasing member, each having a hook portion and a guide portion;

wherein the guide portions upon contact with a wall of the gingival tie wings in the interwing region, cause the first and second biasing members to deflect towards one another thereby enabling the first and second biasing members passage into a reduced opening between the gingival tie wings; and

wherein the first and second biasing members are guided along the respective wall of the gingival tie wings until the hook portions extend beyond a respective flange portion of the gingival tie wings thereby allowing the first and second biasing members to return towards a non-stressed-state so that the hook portions engage the flange portions to maintain the locking clip in the closed position.

31. The orthodontic bracket according to claim 22, wherein at least one of the gingival tie wings includes a labial surface having groove for receiving a portion of the locking clip in the closed position.

32. The orthodontic bracket according to claim 22, wherein the gingival tie wings and the first bridge portion extending therebetween include a labial surface having groove for receiving a portion of the locking clip in the closed position.

33. The orthodontic bracket according to claim 22, wherein the gingival tie wings include a labial surface having a groove for receiving the head portion of the locking clip in the closed position, the head portion being extended occlusally beyond the first bridge portion of the body.

34. The orthodontic bracket according to claim 22,

wherein the retaining member includes a labial member having a flange portion, the labial member extending between the gingival tie wings to define a first opening between a first bridge portion and the labial member and a second opening between the labial member and the labial surface of the body, the first and second openings defining a throughhole therebetween;

wherein the guide portion upon contact with a wall of the labial member causes the head portion to deflect thereby enabling the hook portion into the first opening and into the throughhole; and

wherein the hook portion is guided into the throughhole until the hook portion extends beyond the flange portion of the labial member thereby allowing the locking clip to return towards a non-stressed-state so that the hook portion engages the flange portion to maintain the locking clip in the closed position.

35. The orthodontic bracket according to claim 22,

wherein the locking clip includes first and second arms having a hook portion;

wherein the retaining member includes a first pair of stops and a second pair of stops, each stop of the first pair of stops having a first opening, a first guide portion and a first flange portion, and each stop of the second pair of stops having a second opening, a second guide portion and a second flange portion;

wherein the locking clip is deformable such that as the hook portions are guided towards the first openings or the second openings, the locking clip deforms into a stressed-state thereby enabling the hook portions to be received into the first openings or the second openings; and

wherein the hook portions are guided along the first guide portions or the second guide portions until the hook portions extend beyond the first pair of stops or the second pair of stops thereby allowing the locking clip to return towards a non-stressed-state so that the hook portions engage the flange portions of the first pair of stops or the second pair of stops to maintain the locking clip in a first closed position or a second closed position.

36. The orthodontic bracket according to claim 22, wherein the first pair of stops is gingivally positioned relative to the second pair of stops.

37. The orthodontic bracket according to claim 22, wherein each of the first and second pairs of stops include a mesial stop and a distal stop, the mesial stops being provided about the mesial-gingival tie wing and the distal stops being provided about the distal-gingival tie wing.

38. The orthodontic bracket according to claim 22, wherein the mesial stops and the distal stops define a generally W-shaped configuration about the respective gingival tie wing.

39. The orthodontic bracket according to claim 22, wherein the first and second pairs of stops are provided along the gingival tie wings, the first pair of stops being gingivally located relative to the second pair of stops.

40. The orthodontic bracket according to claim 22, wherein the first and second pairs of stops are provided along the gingival tie wings, the first pair of stops being gingivally located relative to the second pair of stops.

41. The orthodontic bracket according to claim 22, wherein the gingival tie wings include at least one labial surface, the first guiding portions being provided on first labial surfaces of the gingival tie wings and the second guiding portions being provided on second labial surfaces of the gingival tie wings, the first guiding portions being gingivally located relative to the second guiding portions.

42. The orthodontic bracket according to claim 22, wherein the gingival tie wings include at least one lingual surface, the first flange portions being provided on first lingual surfaces of the gingival tie wings and the second flange portions being provided on second lingual surfaces of the gingival tie wings, the first flange portions being gingivally located relative to the second flange portions.

43. The orthodontic bracket according to claim 22, wherein locking clip has a generally U-shaped or a cruciform profile.

44. The orthodontic bracket according to claim 22, wherein locking clip in the closed position engages both gingival and occlusal corners of the archwire.

45. The orthodontic bracket according to claim 22, wherein mesial and distal portions of the locking clip in the closed position engage both gingival and occlusal portions of the archwire.

46. The orthodontic bracket according to claim 22, wherein locking clip is pivotally mounted to the body.

47. The orthodontic bracket according to claim 22, wherein the locking clip includes opposed free ends having tail ends, each tail end being received in a respective bore formed in one of the occlusal tie wings to permit pivotal movement of the locking clip between open and closed positions.

48. The orthodontic bracket according to claim 22, wherein each tail end includes a flange portion that is configured to act as a stop for the tail ends when inserted in the respective bores such that the flange portions prevent the tail ends from extending beyond a predetermined depth into and/or beyond the bores.

49. The orthodontic bracket according to claim 22, wherein the body includes a gingivally-occlusally extending vertical slot.

50. The orthodontic bracket according to claim 22, wherein the body is oval or elliptically shaped.

51. The orthodontic bracket according to claim 22, wherein the archwire slot includes a first portion mesially-distally positioned from a second portion, the first portion being lingually offset relative to the second portion.

52. The orthodontic bracket according to claim 22, wherein the archwire slot defines a lingually directed, mesially-distally extending curved portion or profile.

53. The orthodontic bracket according to claim 22, wherein the archwire slot defines a lingually directed, mesially-distally extending angled portion or profile

54. The orthodontic bracket according to claim 22, wherein the archwire slot includes at least one bump or at least one groove in the bottom and/or side walls to minimize the contact area between the archwire and archwire slot, the locking clip includes at least one bump or at least one groove to reduce the contact area between the archwire and archwire slot, or a combination of both.

55. The orthodontic bracket according to claim 22, wherein the locking clip further includes a cover portion.

56. The orthodontic bracket according to claim 22, wherein the cover portion is removably affixed to the locking clip.

57. The orthodontic bracket according to claim 22, wherein cover portion includes at least one attachment member for being removably secured to the locking clip.

58. The orthodontic bracket according to claim 22, wherein the at least one attachment member includes a shape and size that is complementary to a portion of an opening in the locking clip for removable securement thereto.

59. The orthodontic bracket according to claim 22, wherein the at least one attachment member includes a plurality of attachment members that have a shape and size that is complementary to portions of the locking clip for removable securement thereto.

60. The orthodontic bracket according to claim 22, wherein the at least one attachment includes a biasing tubular portion with a longitudinally opening that is configured to deform sufficiently to receive a cylindrical or semi-cylindrical portion of the locking clip for removable securement thereto.

61. The orthodontic bracket according to claim 22, wherein the cover portion extends mesially-distally the length of the arch wire slot.

62. The orthodontic bracket according to claim 22, wherein the first closed position is an active closed position and the second closed position is a passive closed position.

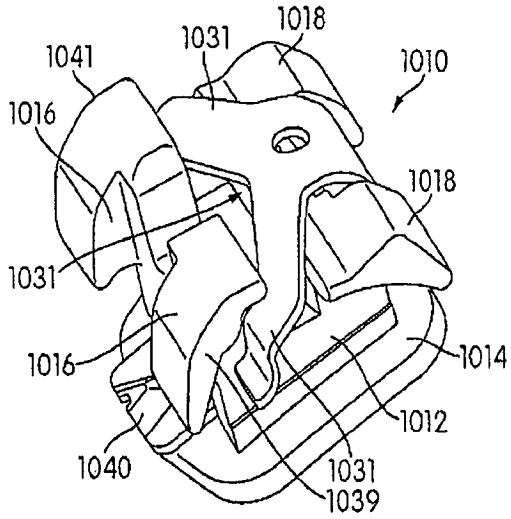

FIG. 1A

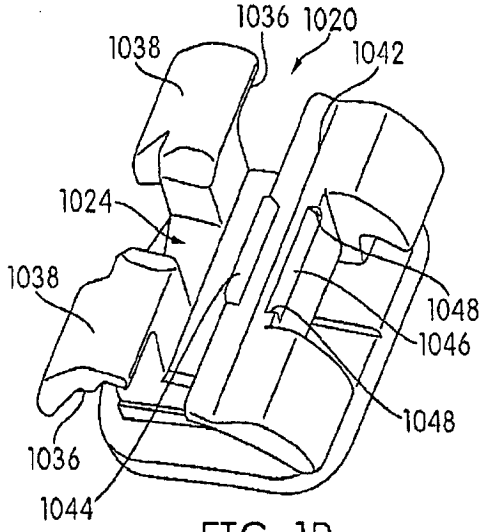

FIG. 1B

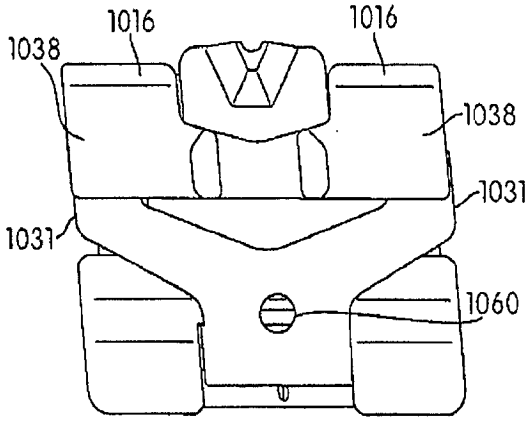

FIG. 1C

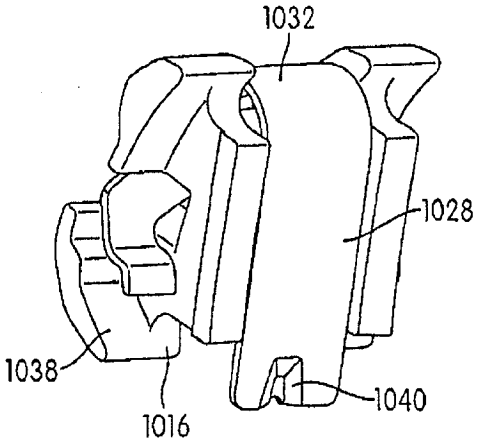

FIG. 1D

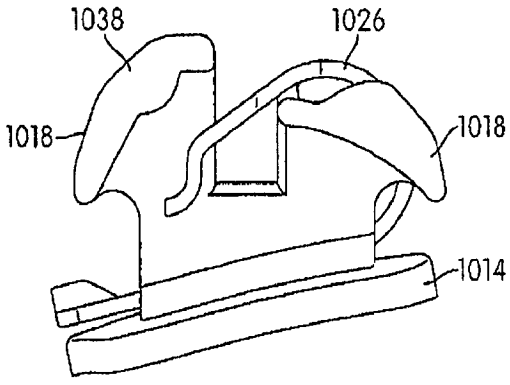

FIG. 1E

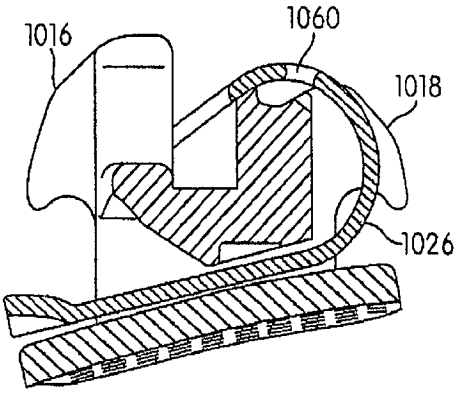

FIG. 1F

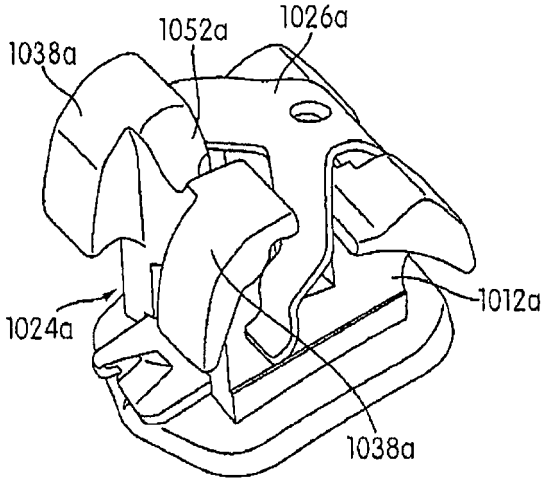

FIG. 2A

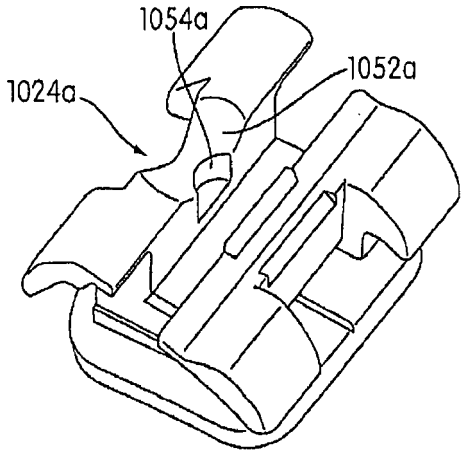

FIG. 2B

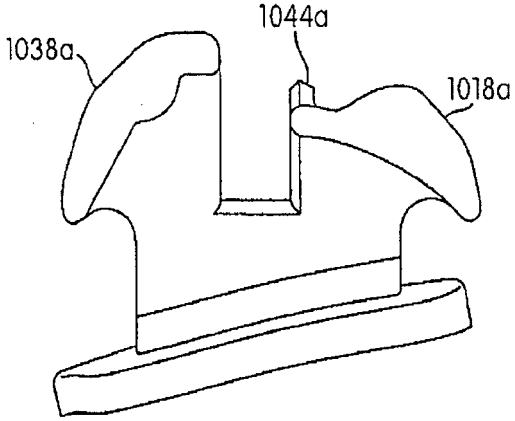

FIG. 2C

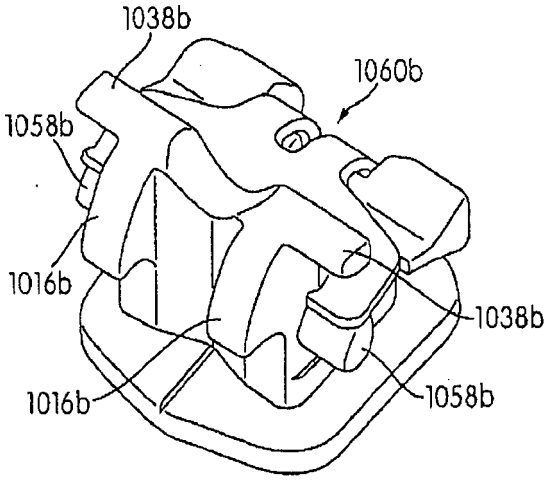

FIG. 3A

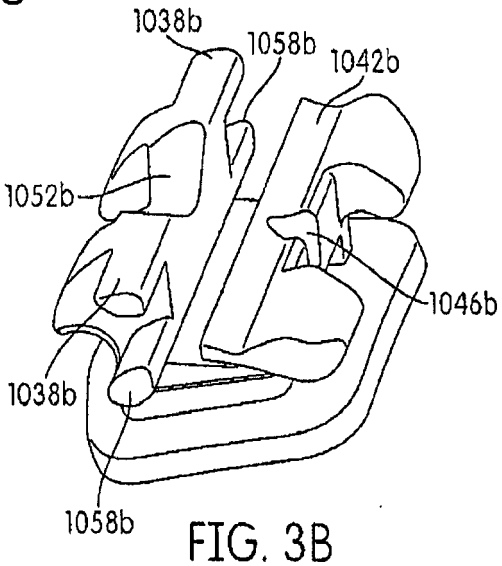

FIG. 3B

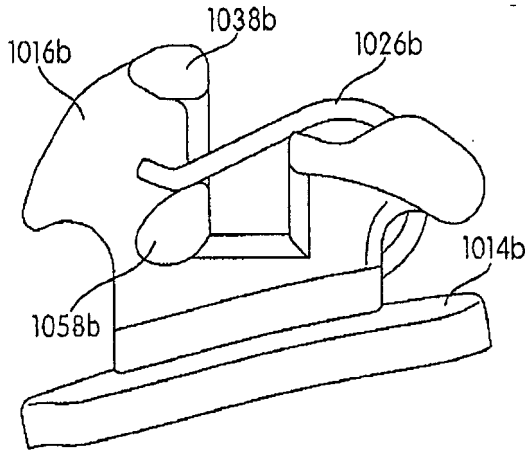

FIG. 3C

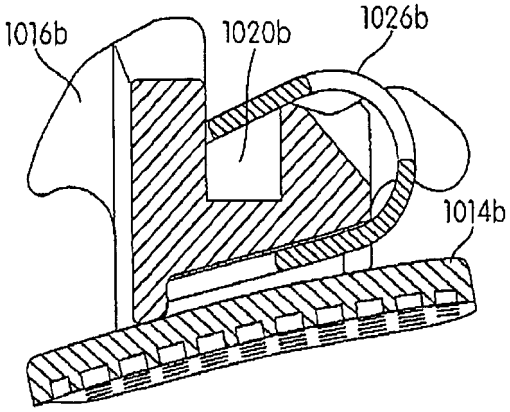

FIG. 3D

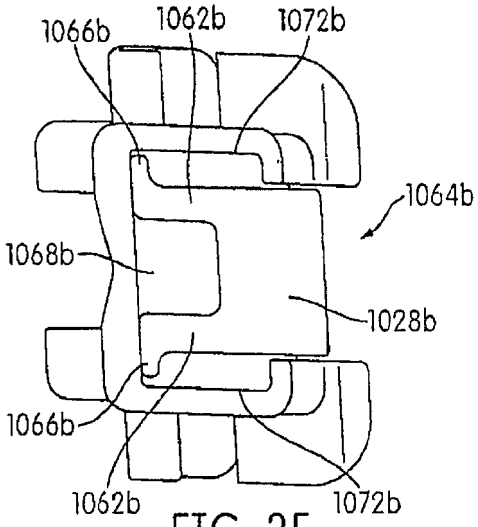

FIG. 3E

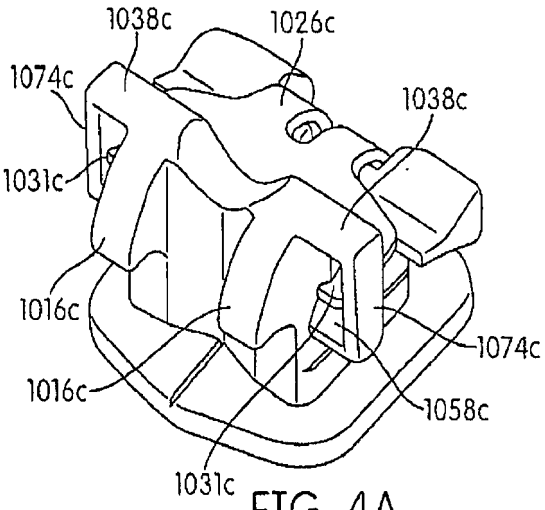

FIG. 4A

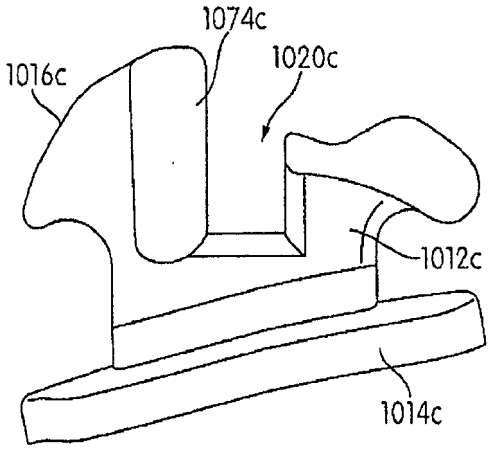

FIG. 4B

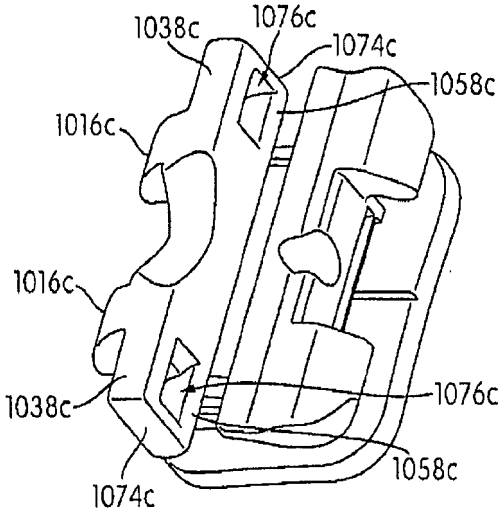

FIG. 4C

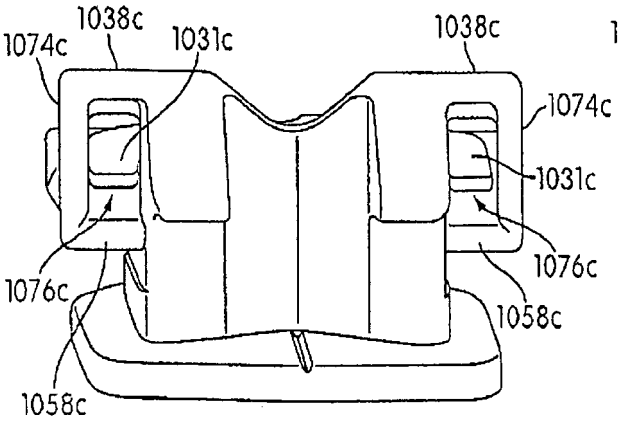

FIG. 4D

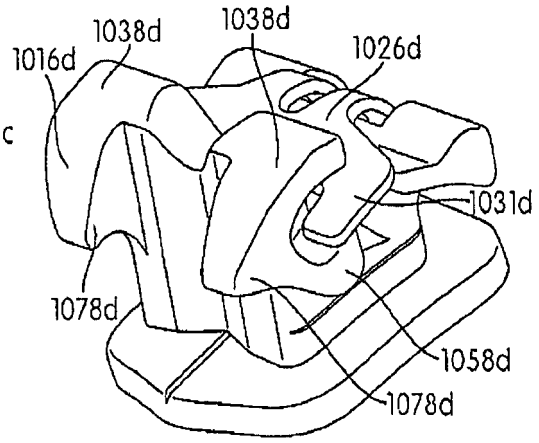

FIG. 5A

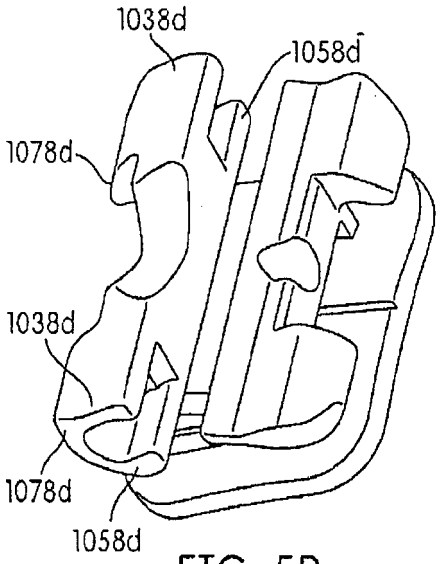

FIG. 5B

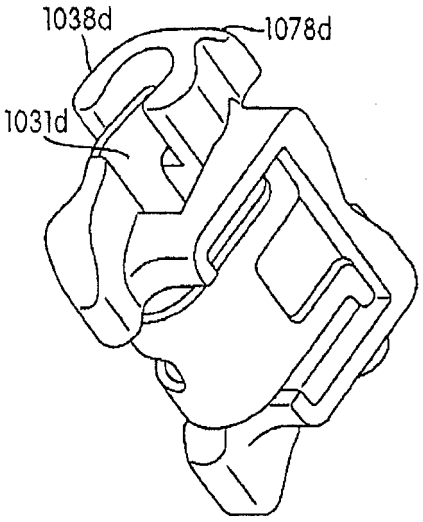

FIG. 5C

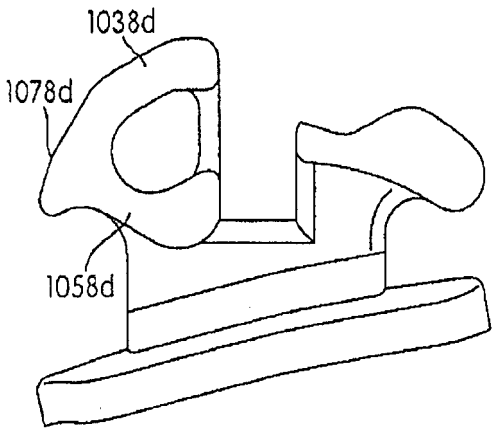

FIG. 5D

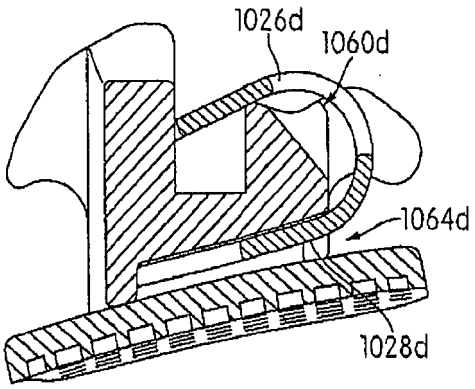

FIG. 5E

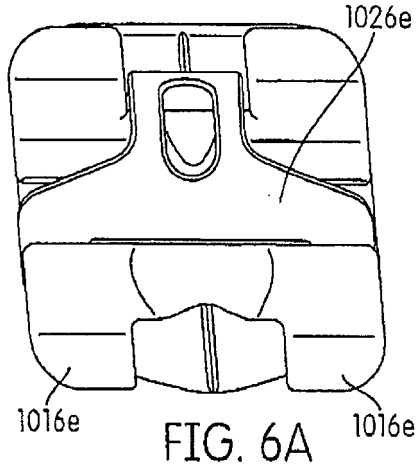

FIG. 6A

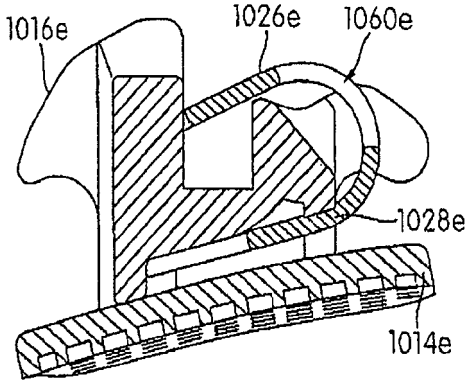

FIG. 6B

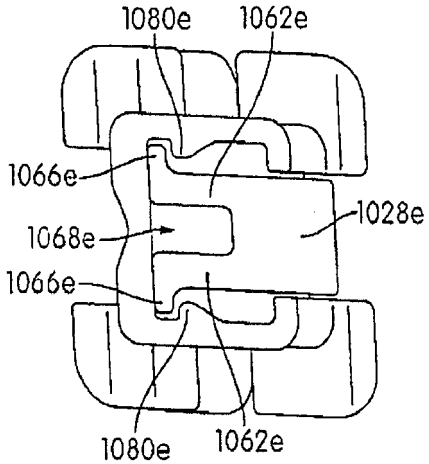

FIG. 6C

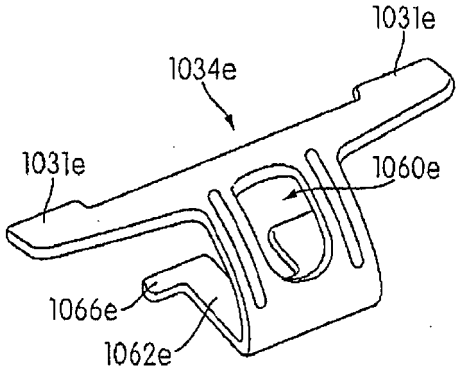

FIG. 6D

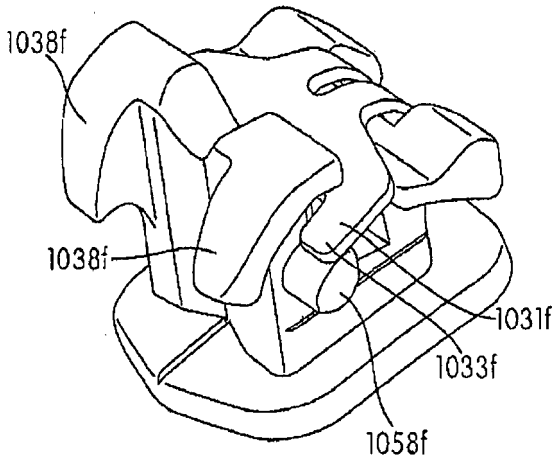

FIG. 7A

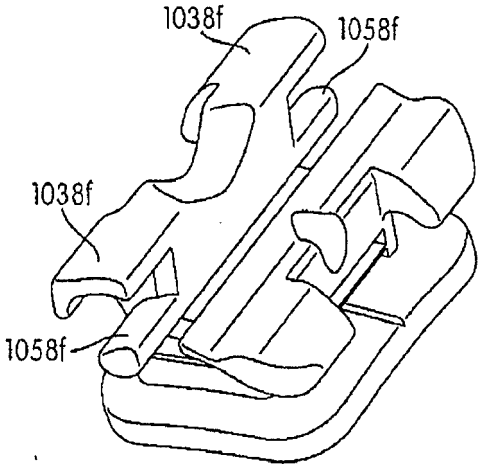

FIG. 7B

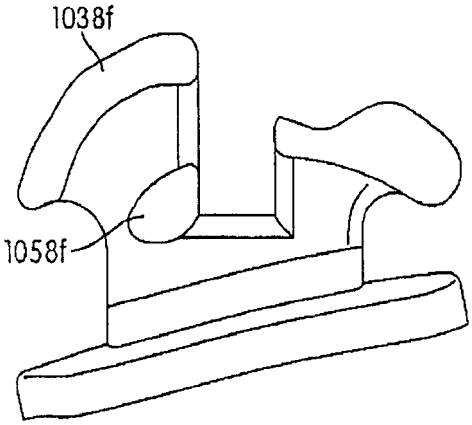

FIG. 7C

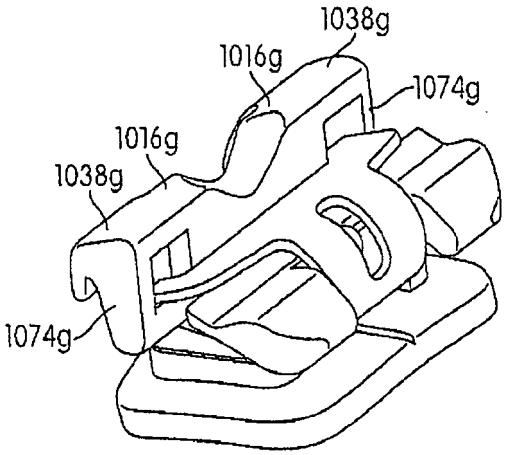

FIG. 8A

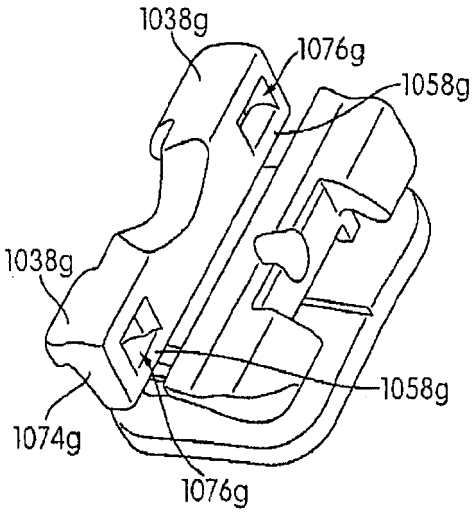

FIG. 8B

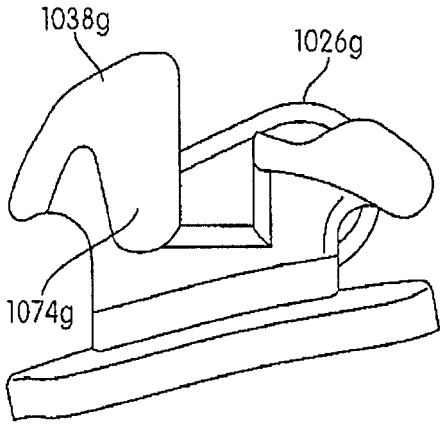

FIG. 8C

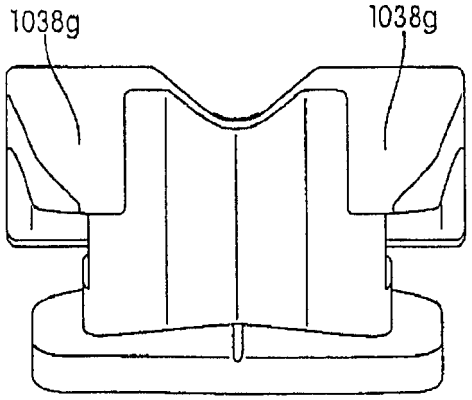

FIG. 8D

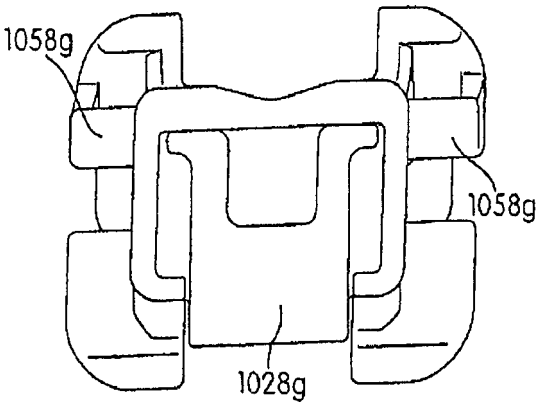

FIG. 8E

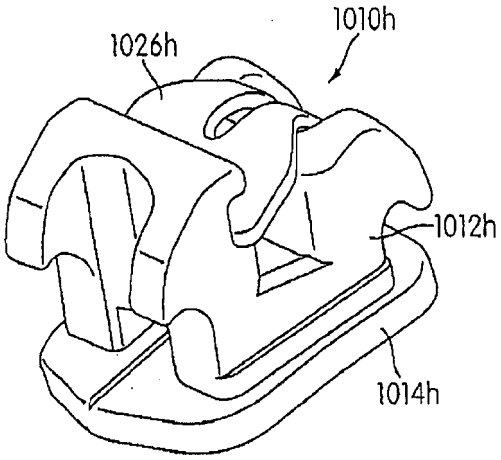

FIG. 9A

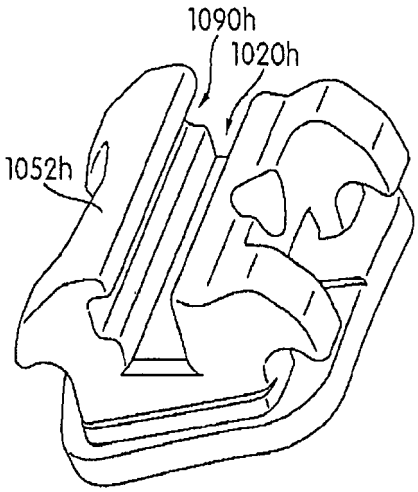

FIG. 9B

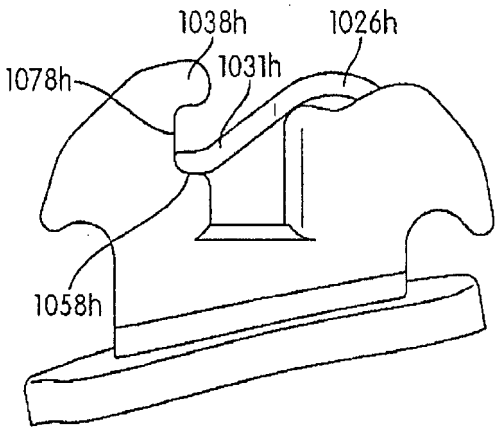

FIG. 9C

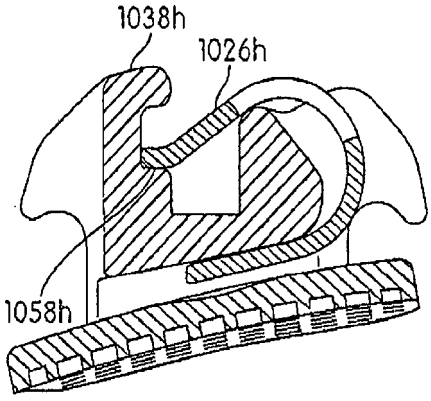

FIG. 9D

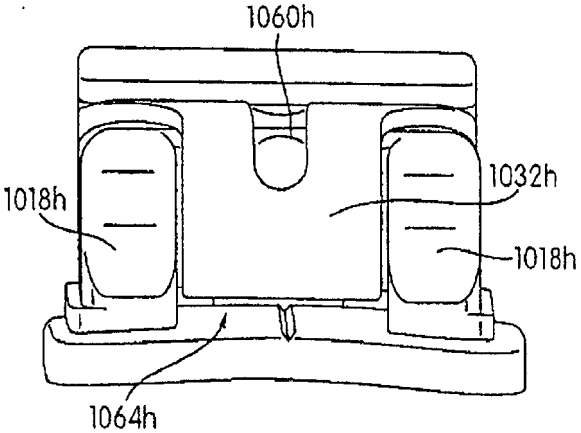

FIG. 9E

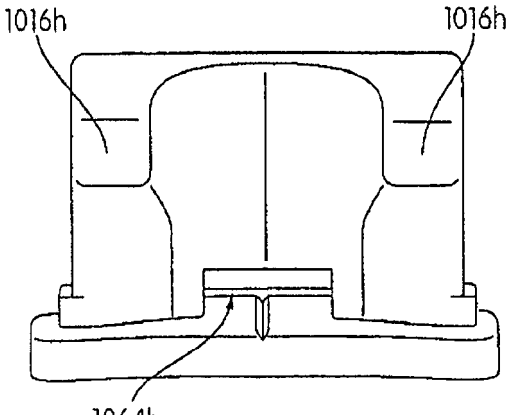

FIG. 9F

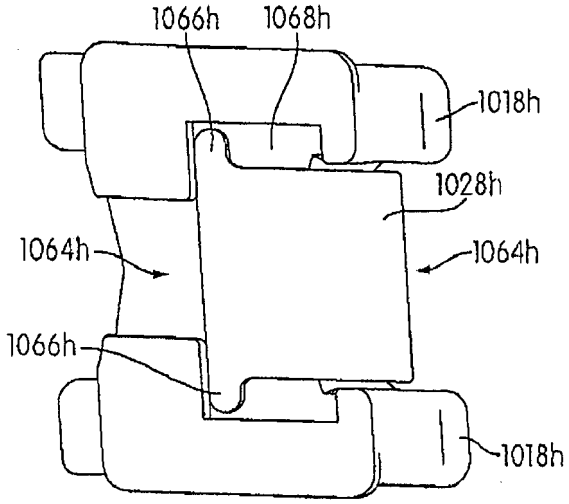

FIG. 9G

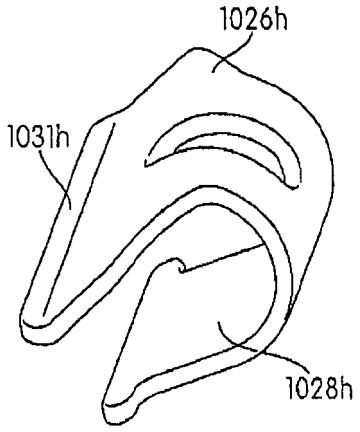

FIG. 9H

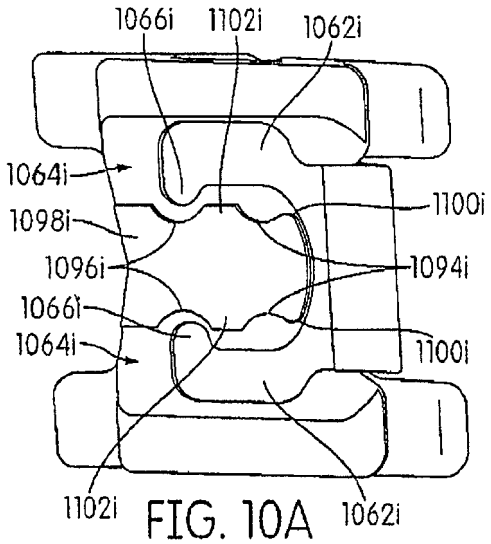

FIG. 10A

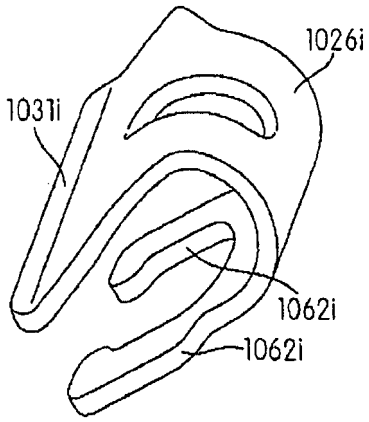

FIG. 10B

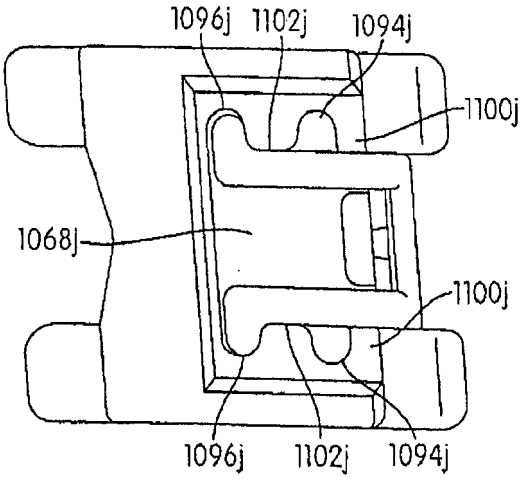

FIG. 10C

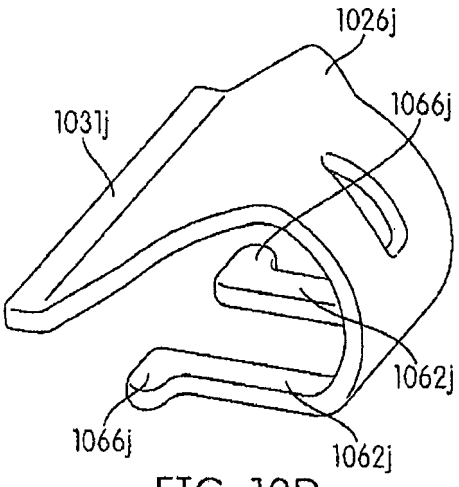

FIG. 10D

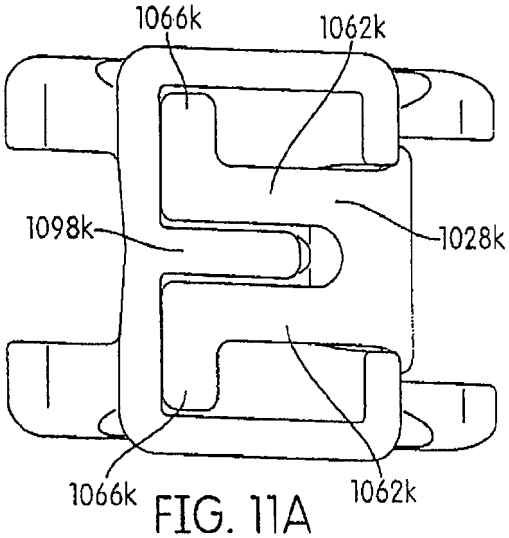

FIG. 11A

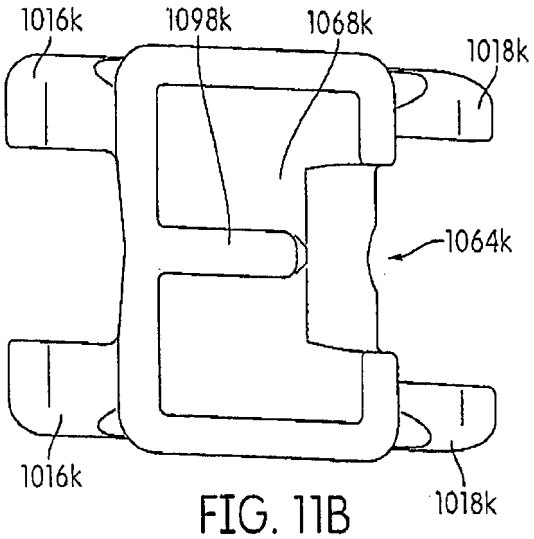

FIG. 11B

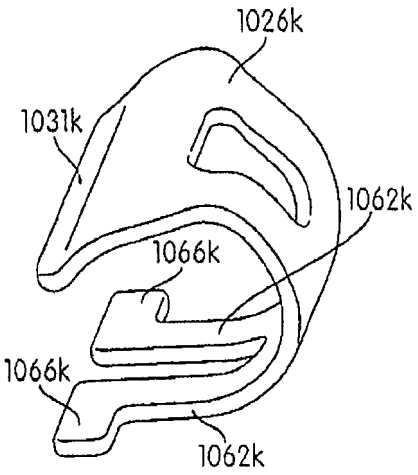

FIG. 11C

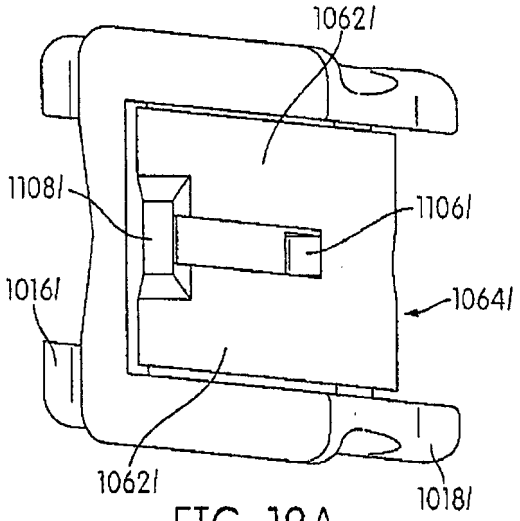

FIG. 12A

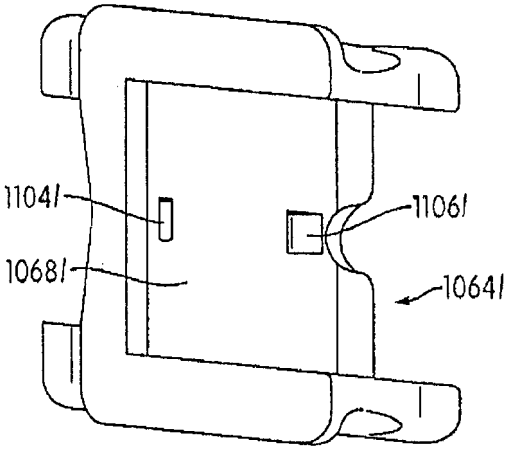

FIG. 12B

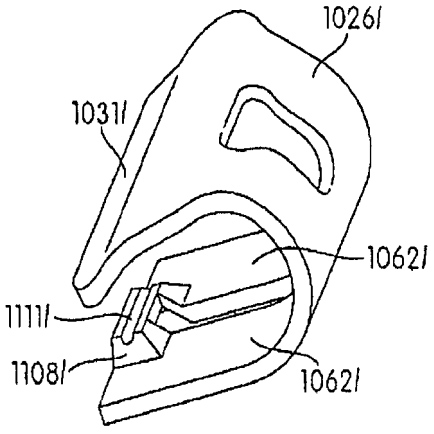

FIG. 12C

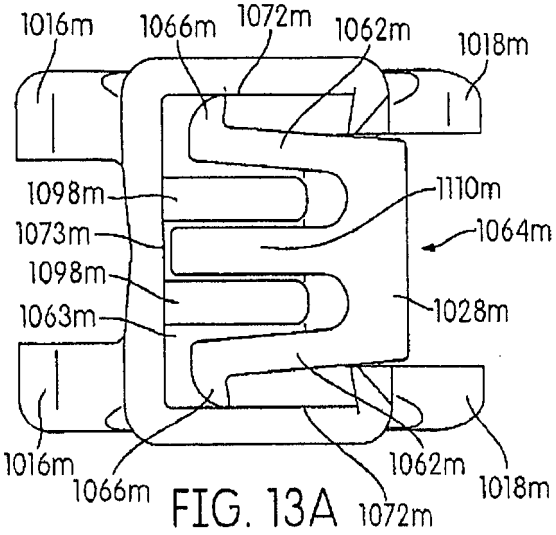

FIG. 13A

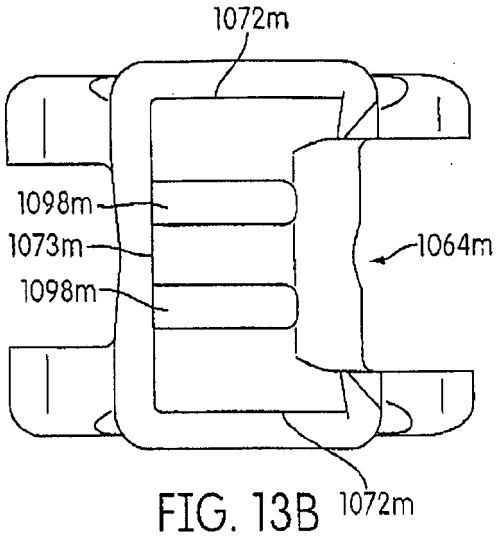

FIG. 13B

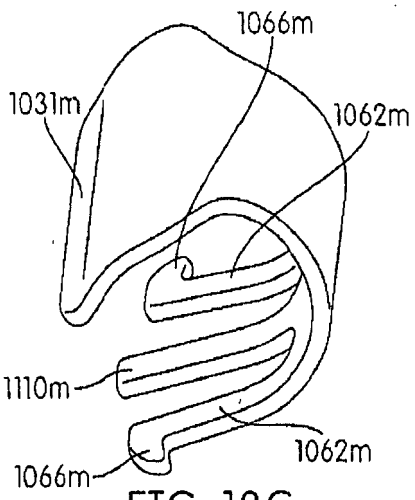

FIG. 13C

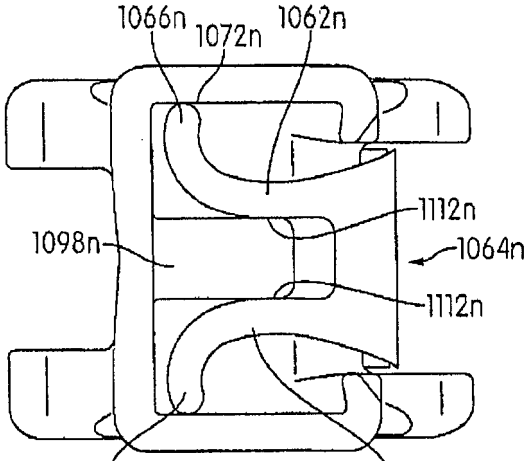

FIG. 14A

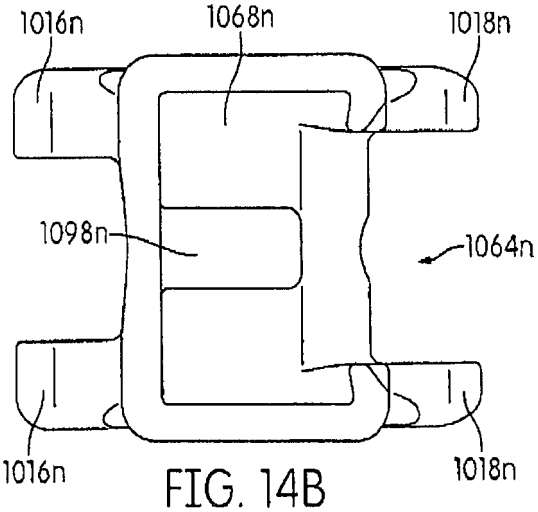

FIG. 14B

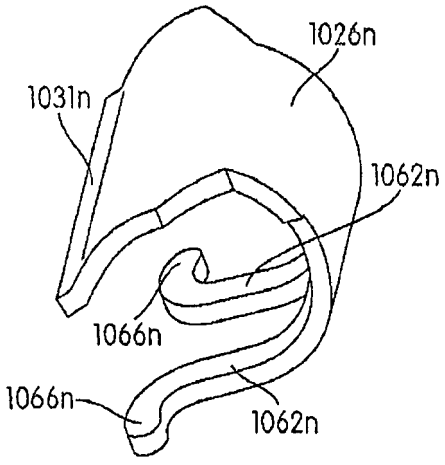

FIG. 14C

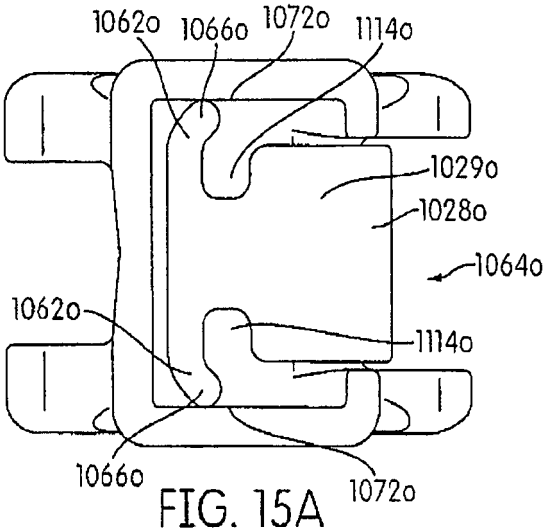

FIG. 15A

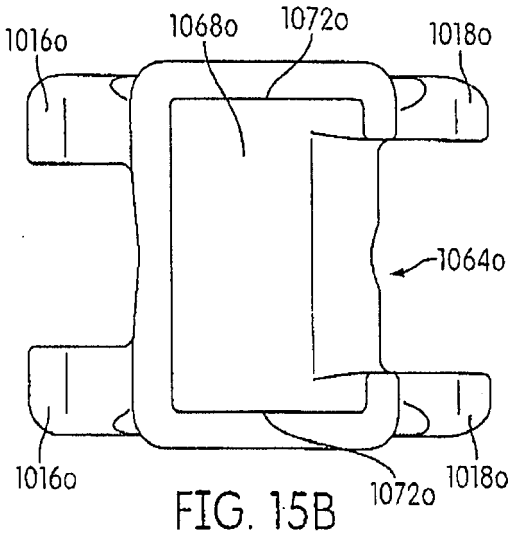

FIG. 15B

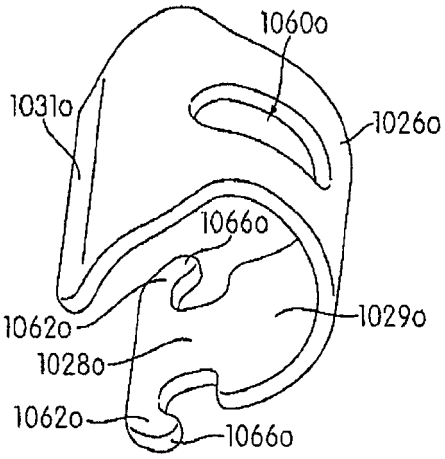

FIG. 15C

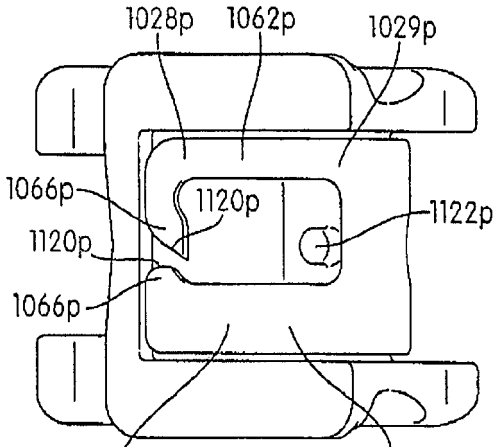

FIG. 16A

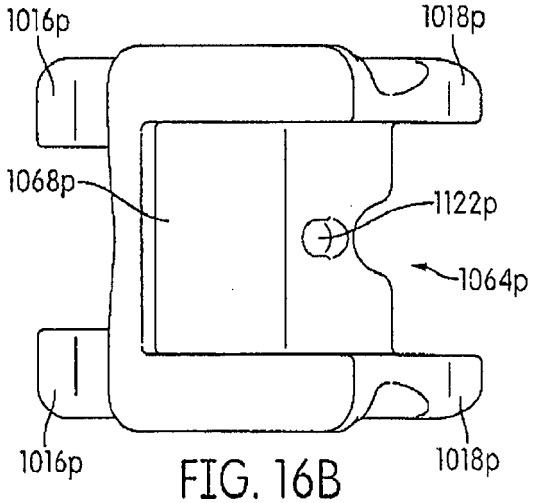

FIG. 16B

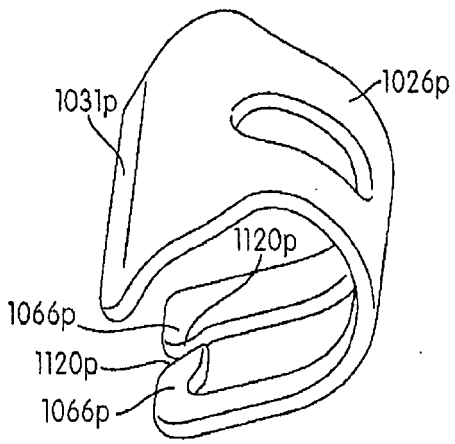

FIG. 16C

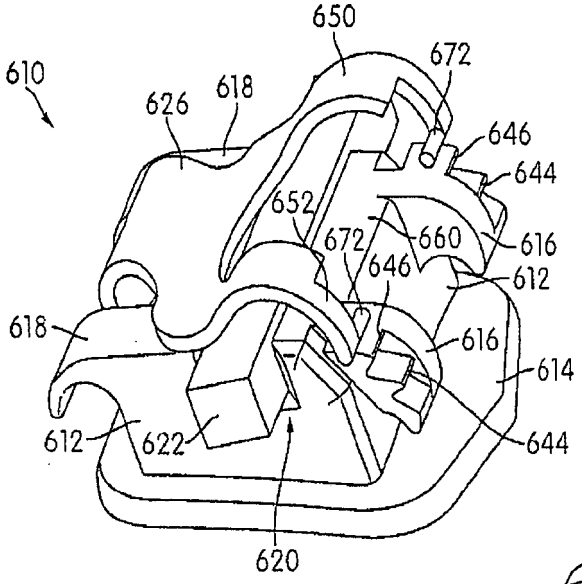

FIG. 17A

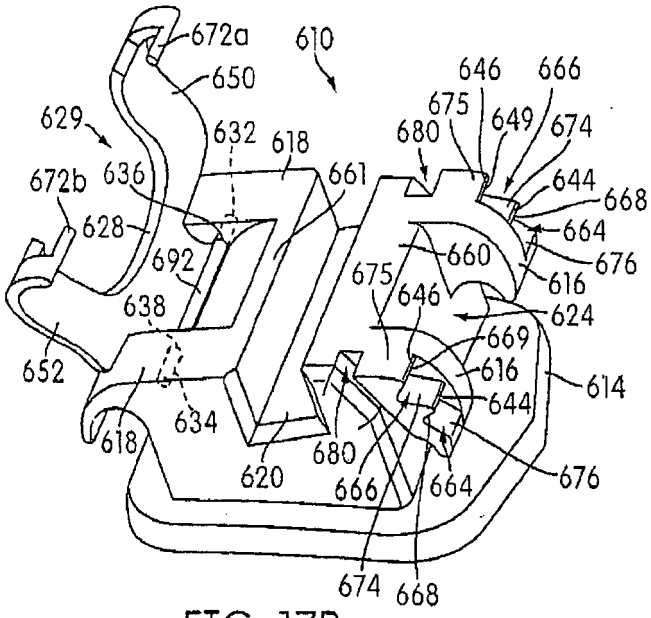

FIG. 17B

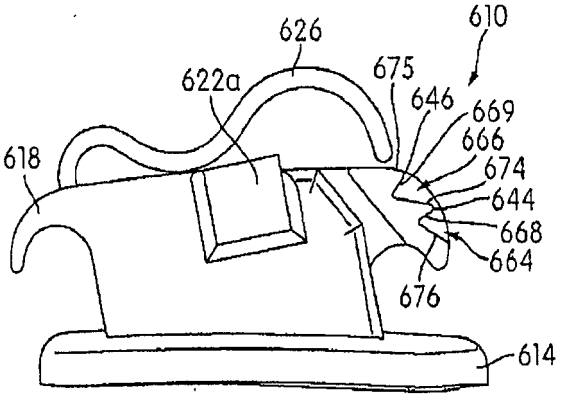

FIG. 17C

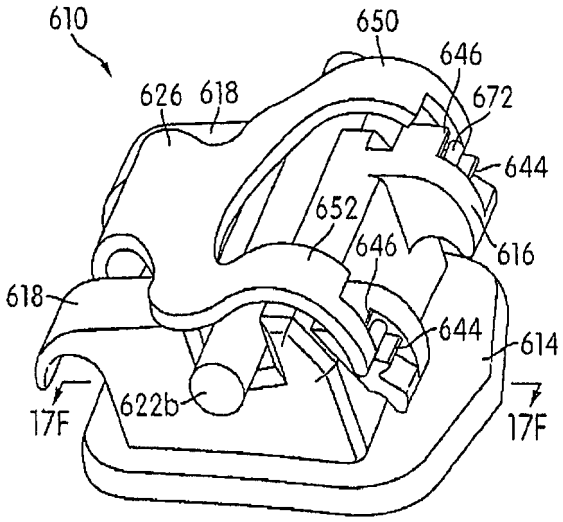

FIG. 17D

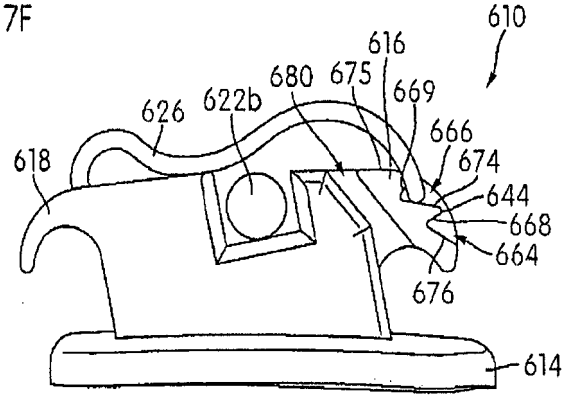

FIG. 17E

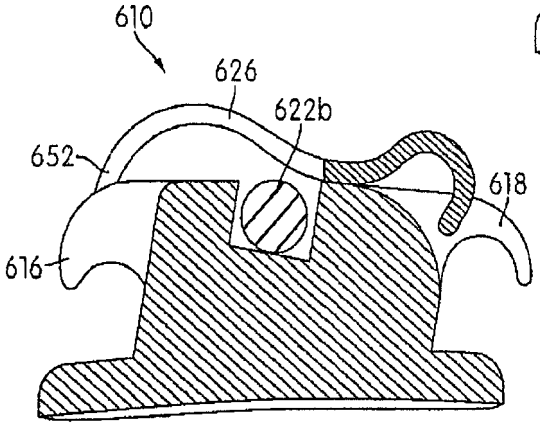

FIG. 17F

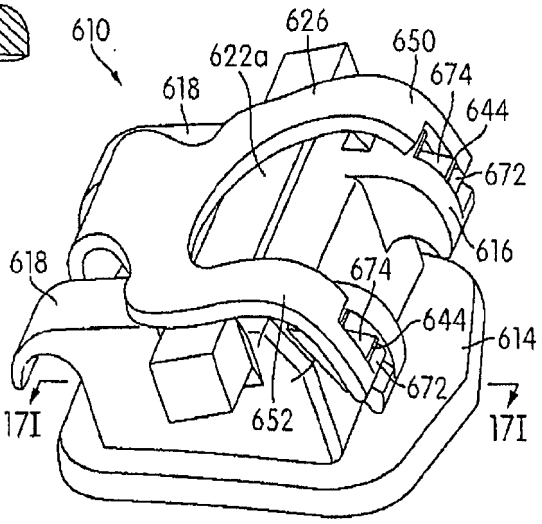

FIG. 17G

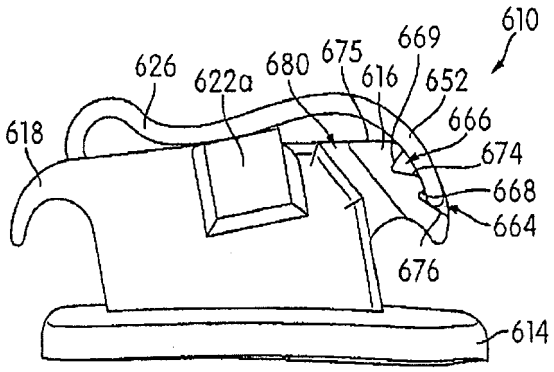

FIG. 17H

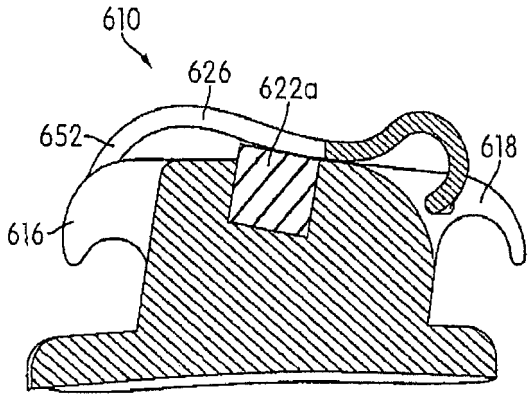

FIG. 17I

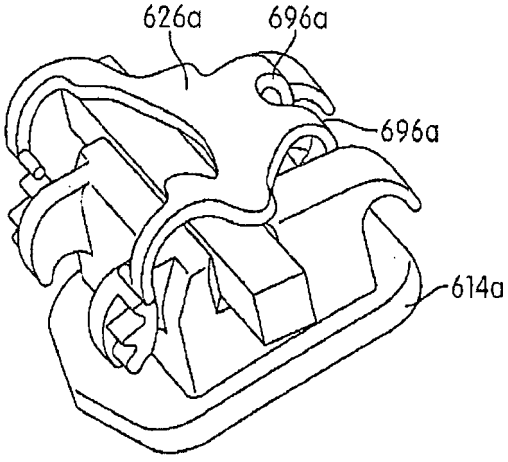

FIG. 17J

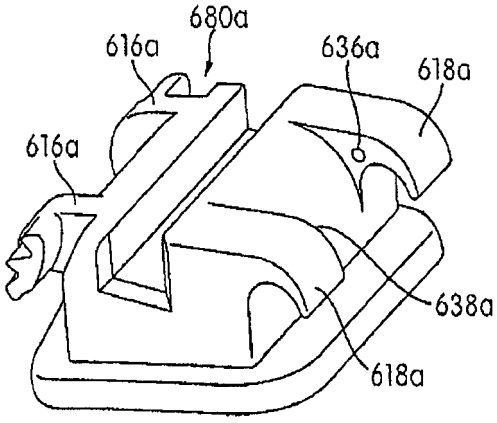

FIG. 17K

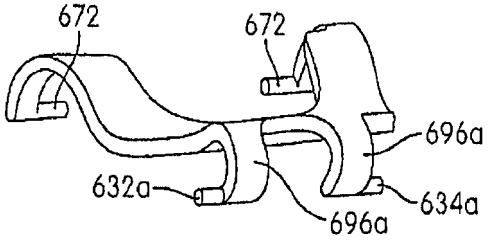

FIG. 17L

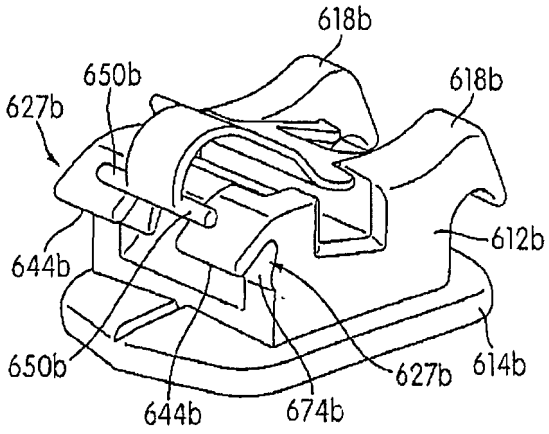

FIG. 18A

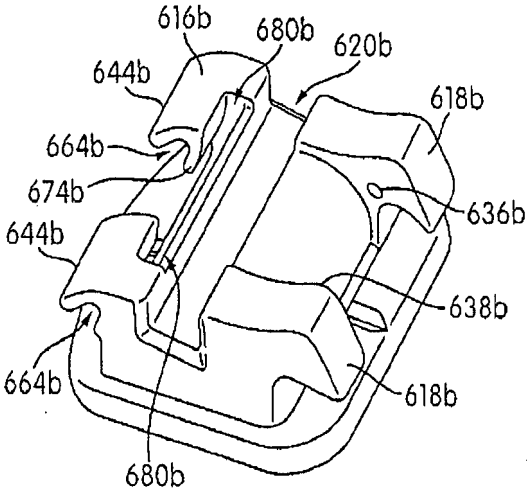

FIG. 18B

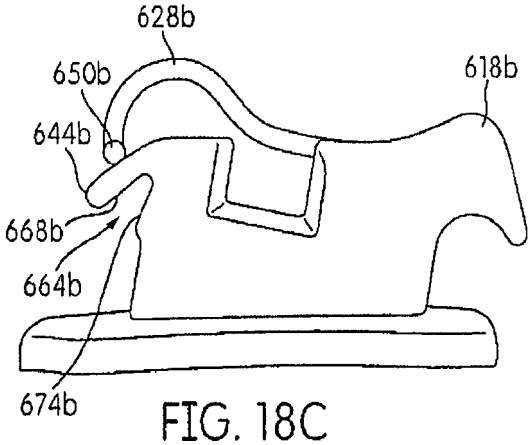

FIG. 18C

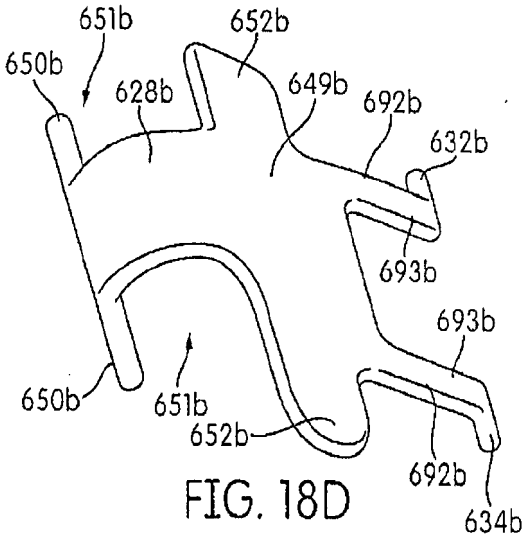

FIG. 18D

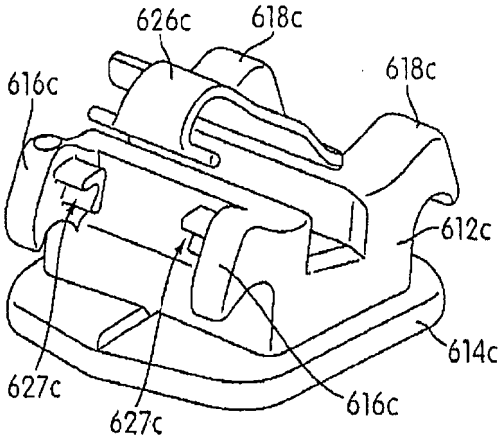

FIG. 19A

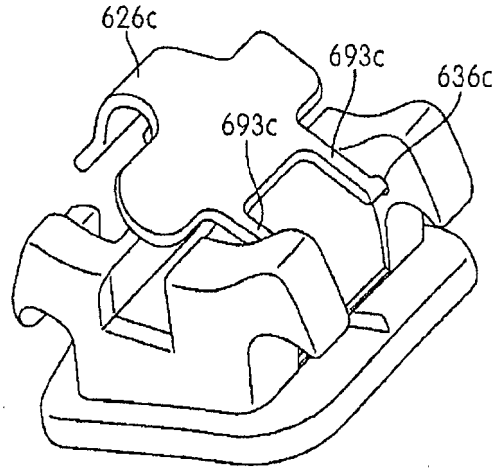

FIG. 19B

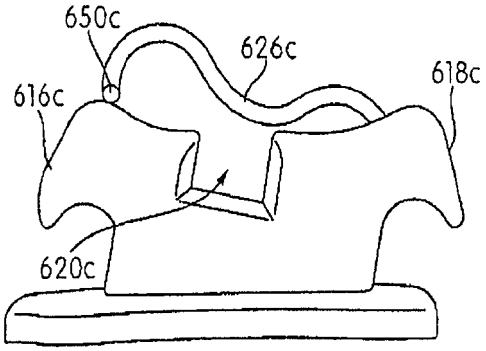

FIG. 19C

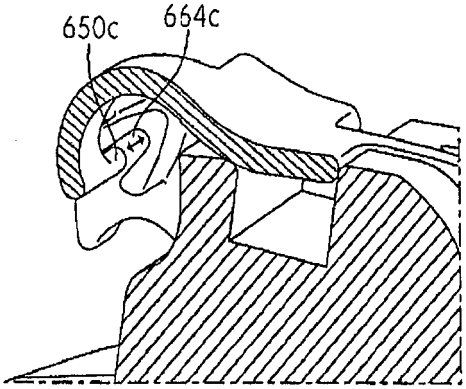

FIG. 19D

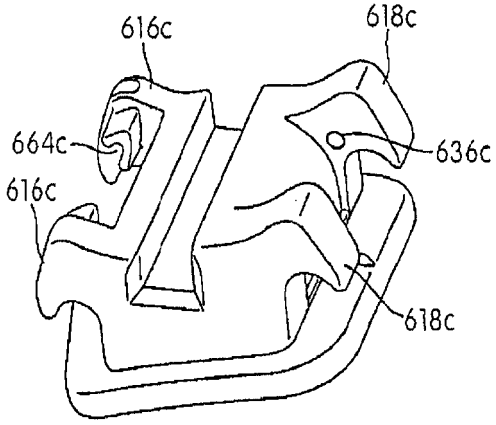

FIG. 19E

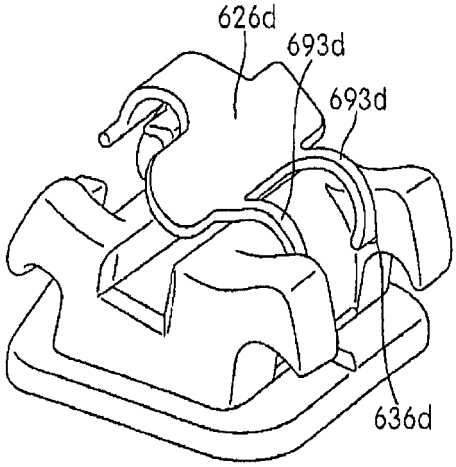

FIG. 20A

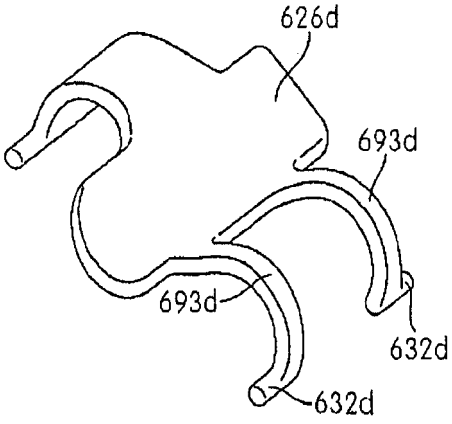

FIG. 20B

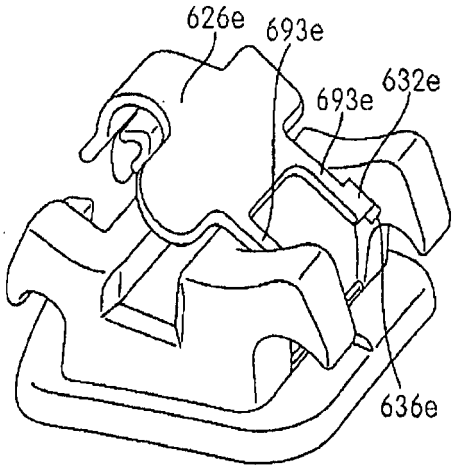

FIG. 21A

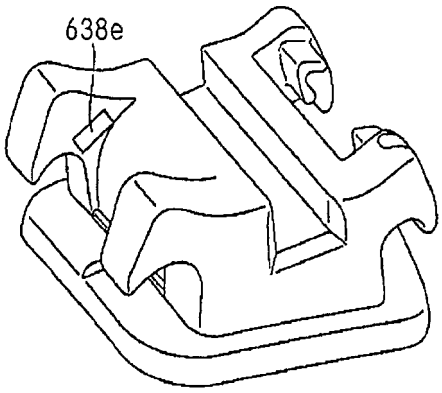

FIG. 21B

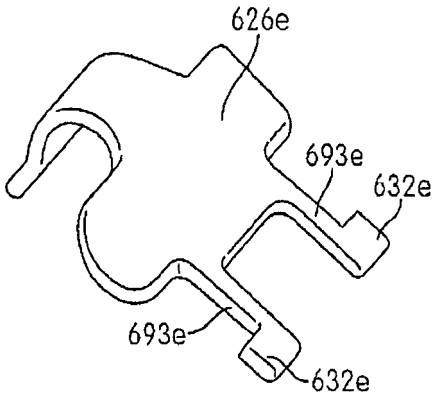

FIG. 21C

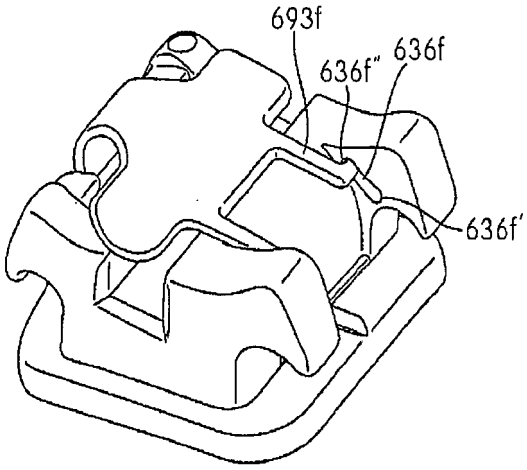

FIG. 22A

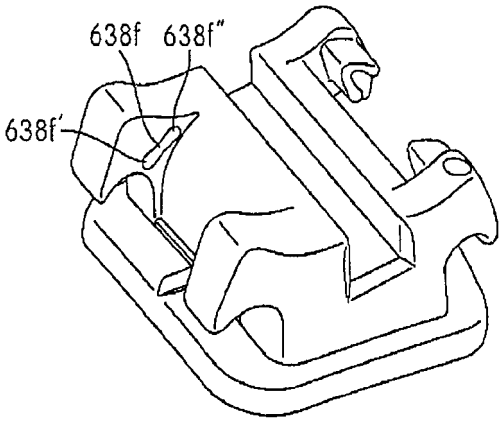

FIG. 22B

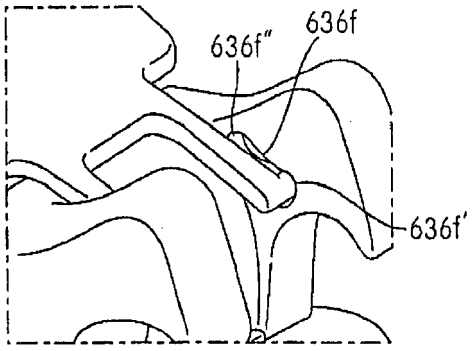

FIG. 22C

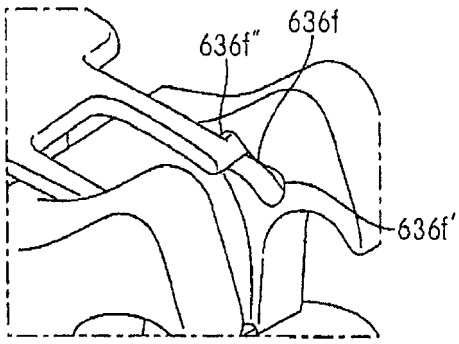

FIG. 22D

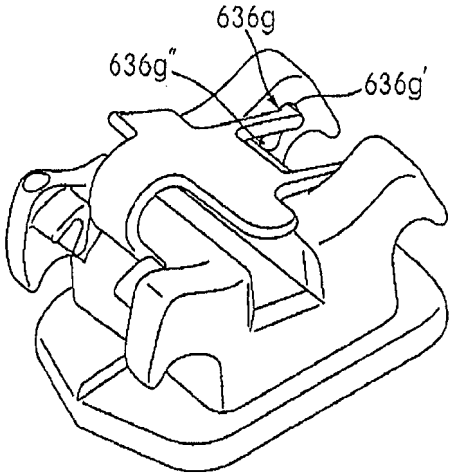

FIG. 23A

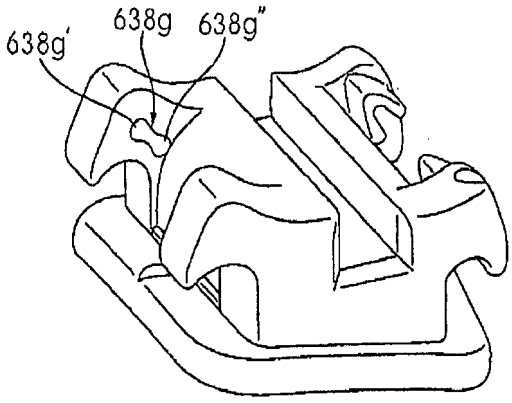

FIG. 23B

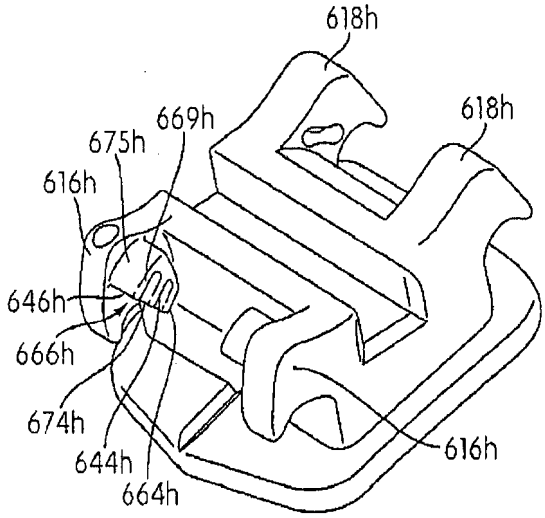

FIG. 24A

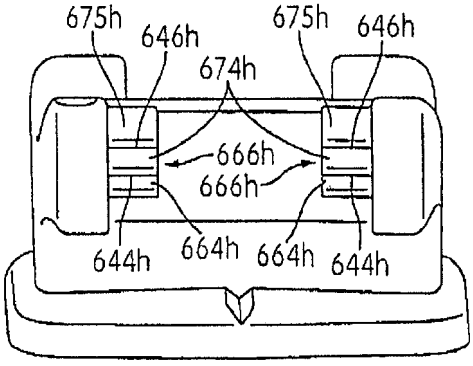

FIG. 24B

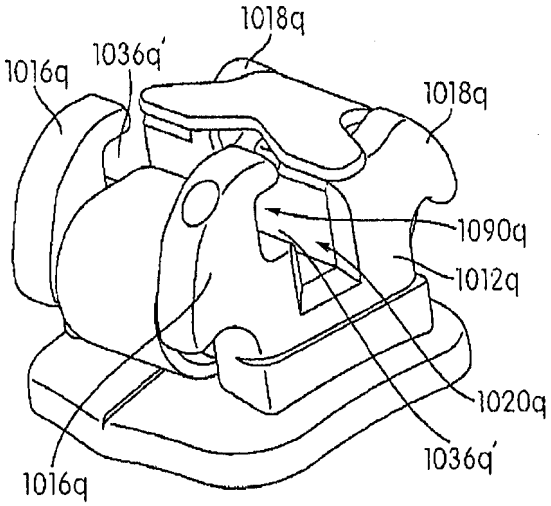

FIG. 25A

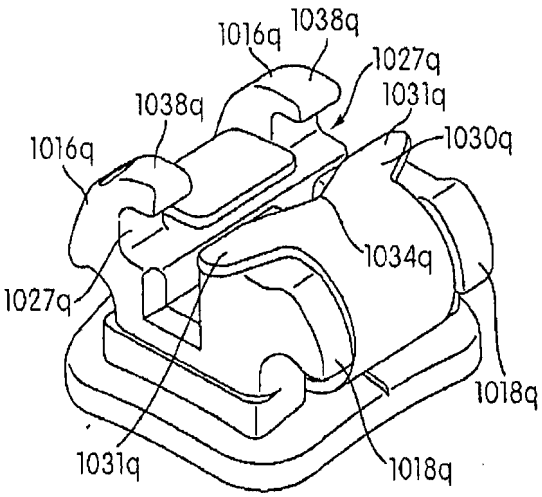

FIG. 25B

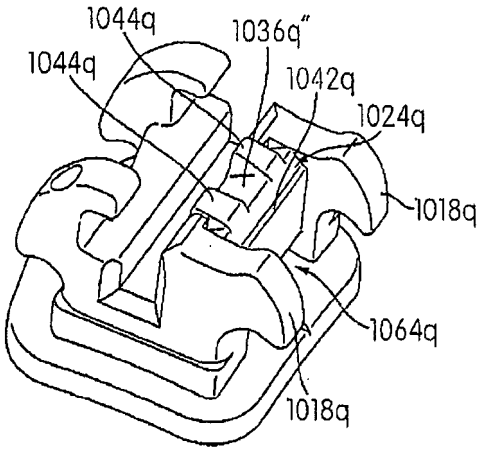

FIG. 25C

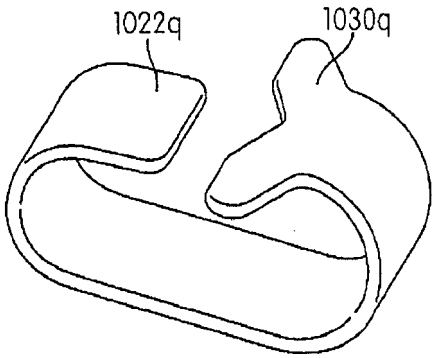

FIG. 25D

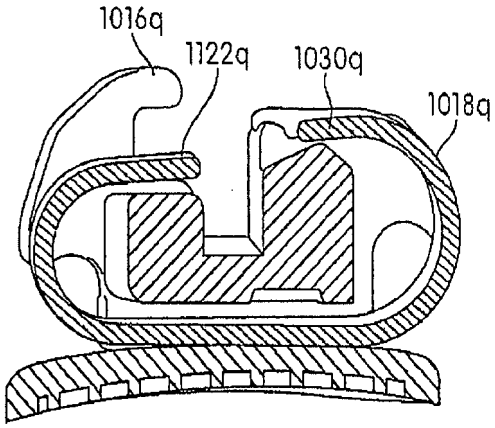

FIG. 25E

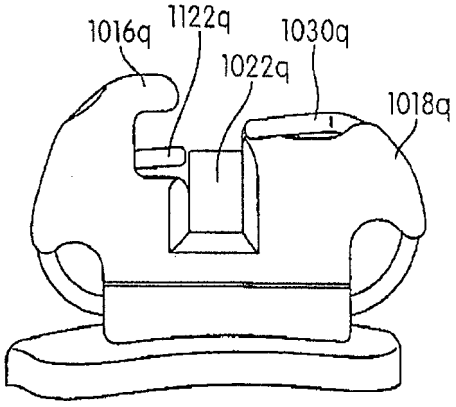

FIG. 25F

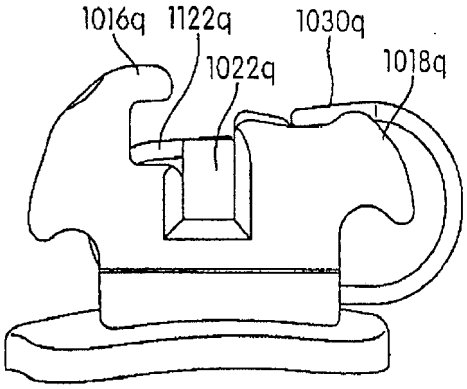

FIG. 25G

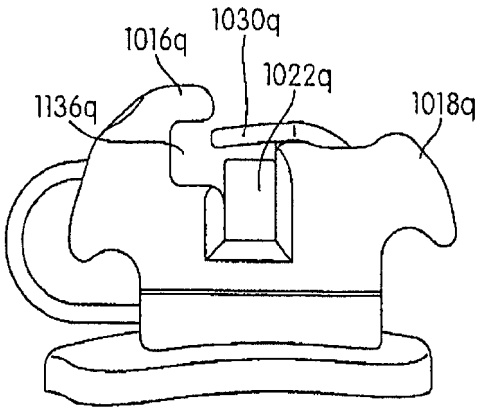

FIG. 25H

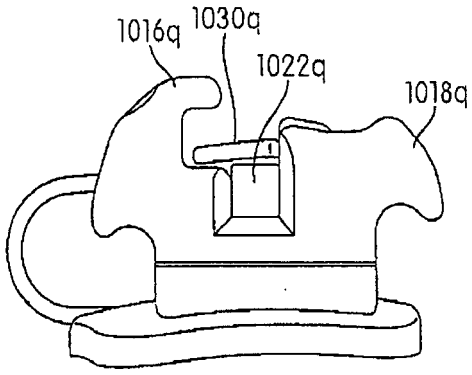

FIG. 25I

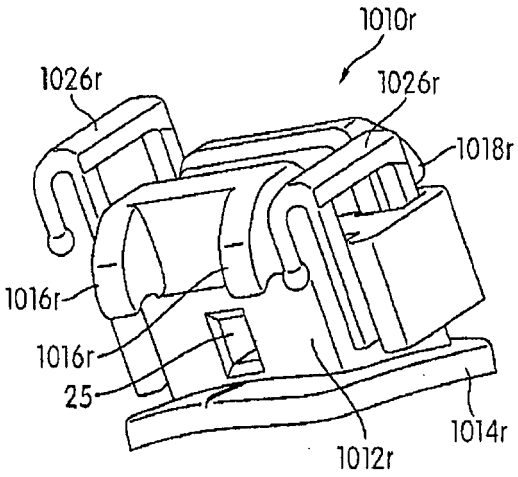

FIG. 26A

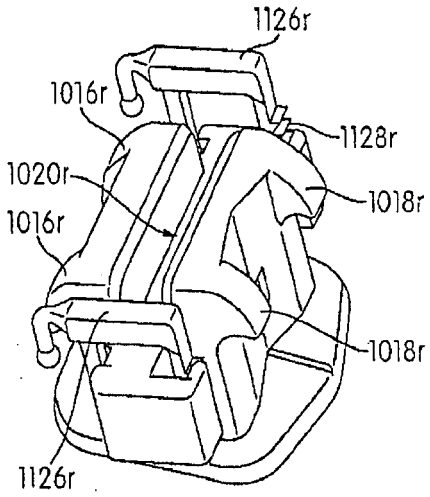

FIG. 26B

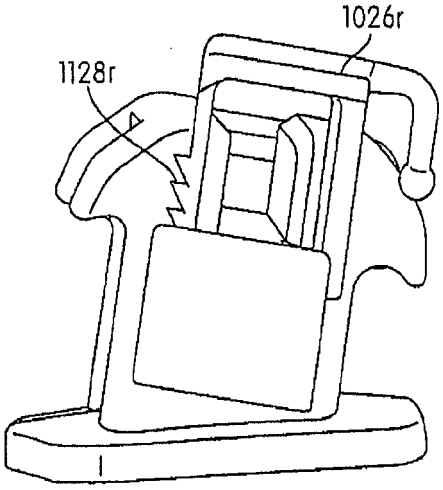

FIG. 26C

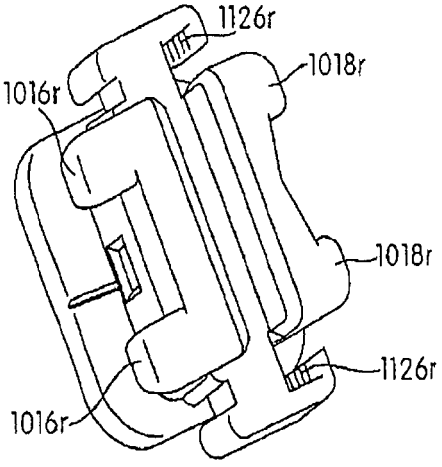

FIG. 26D

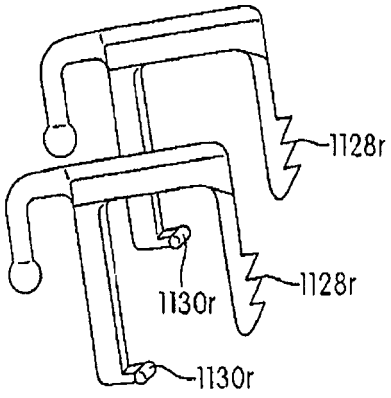

FIG. 26E

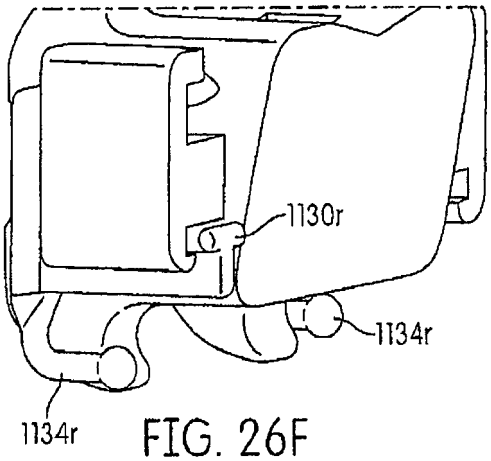

FIG. 26F

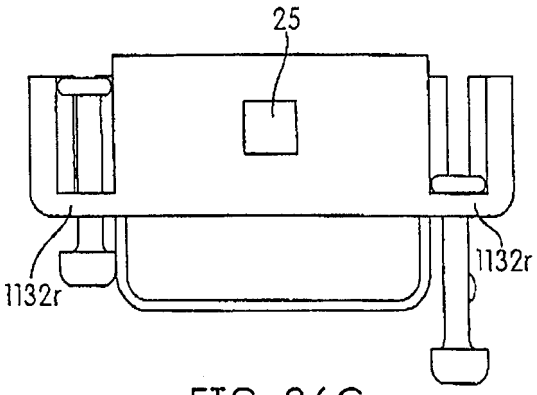

FIG. 26G

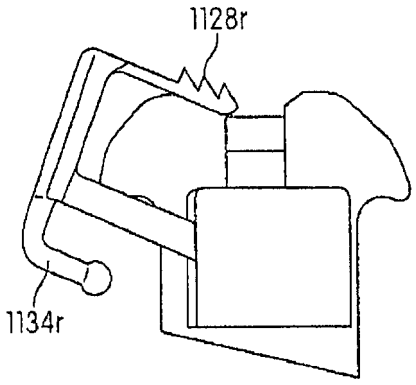

FIG. 26H

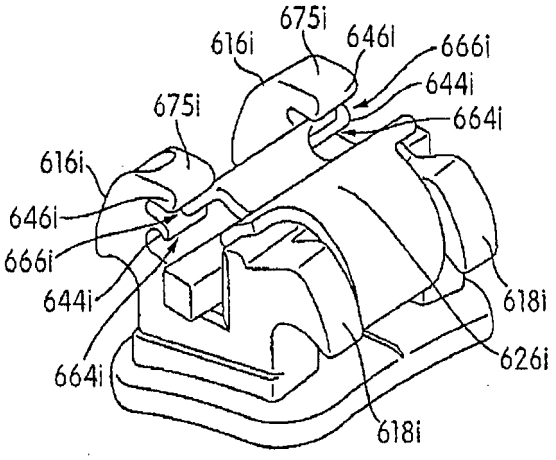

FIG. 27A

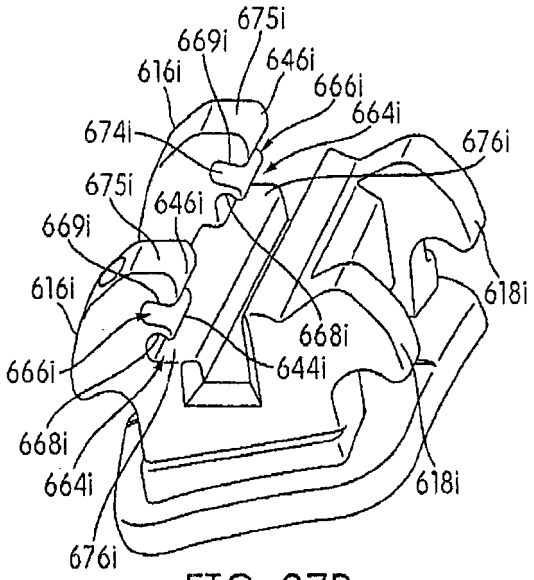

FIG. 27B

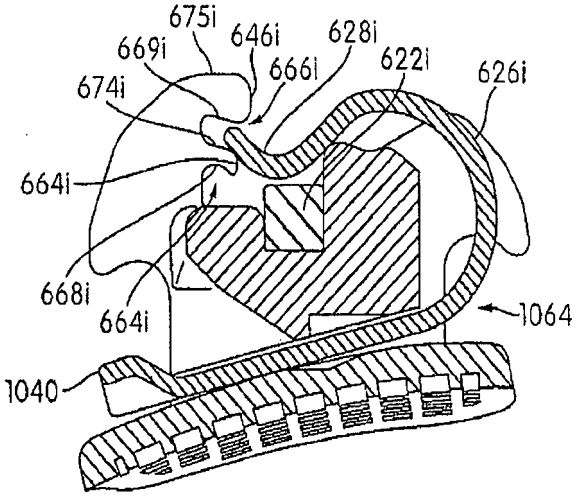

FIG. 27C

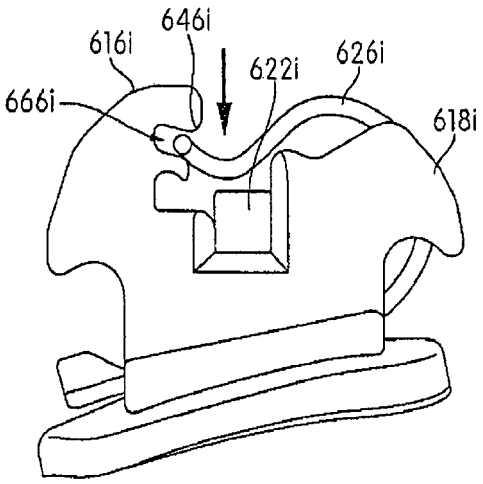

FIG. 27D

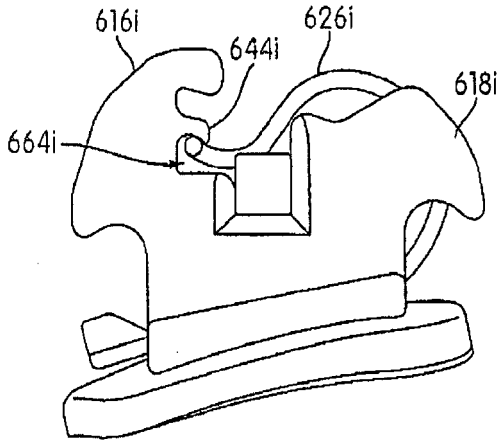

FIG. 27E

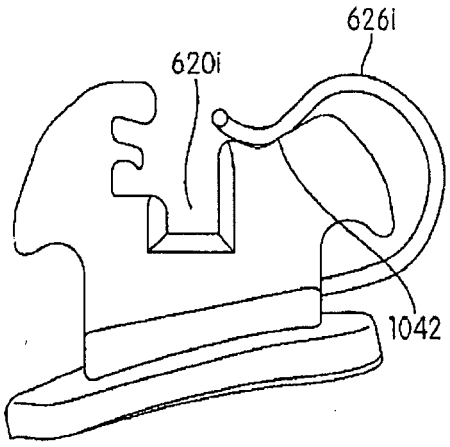

FIG. 27F

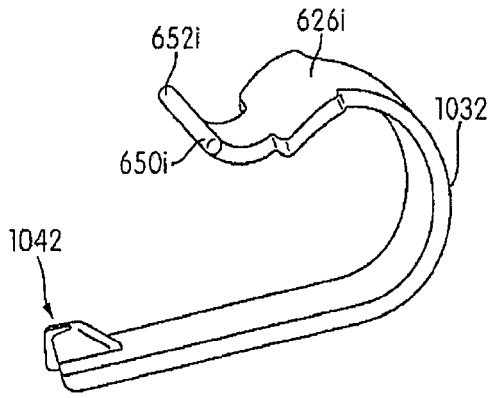

FIG. 27G

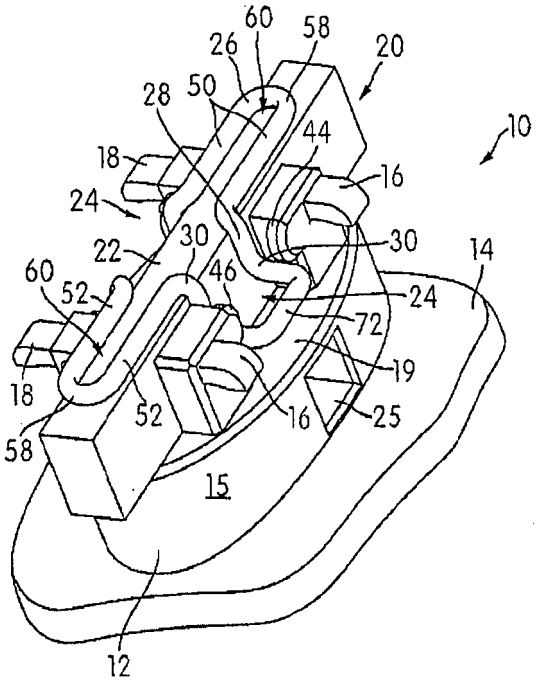

FIG. 28A

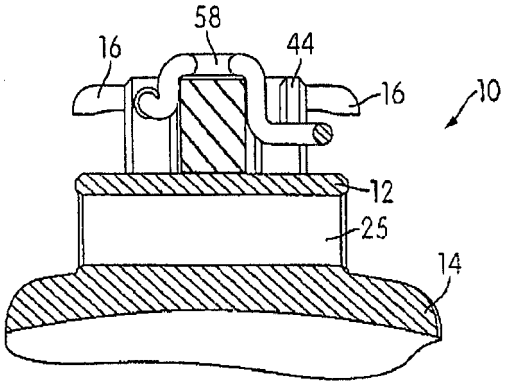

FIG. 28B

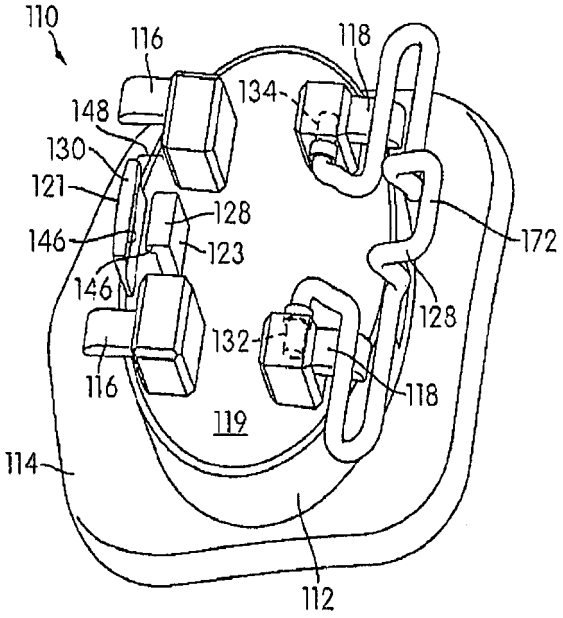

FIG. 28C

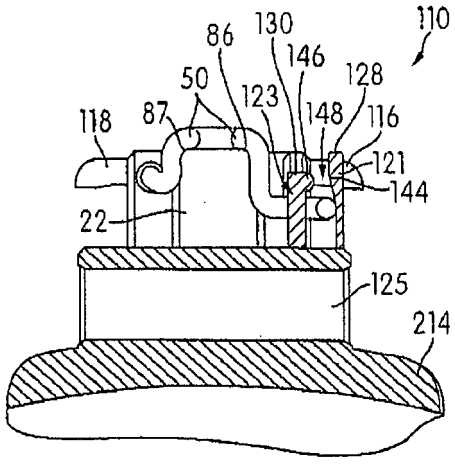

FIG. 28D

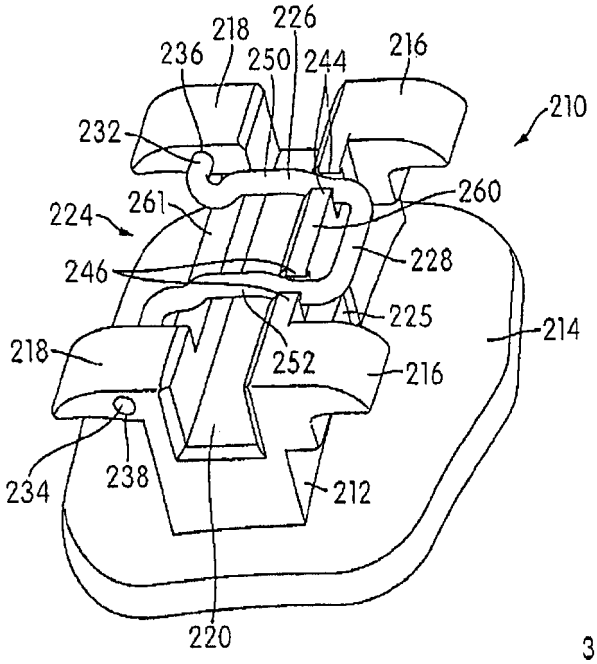

FIG. 28E

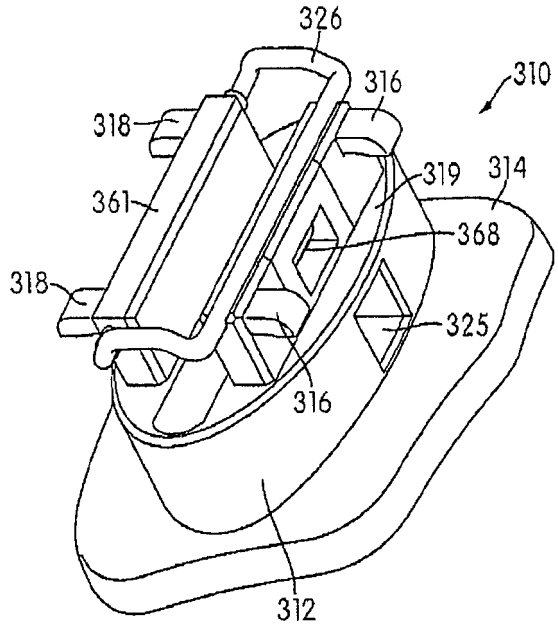

FIG. 28F

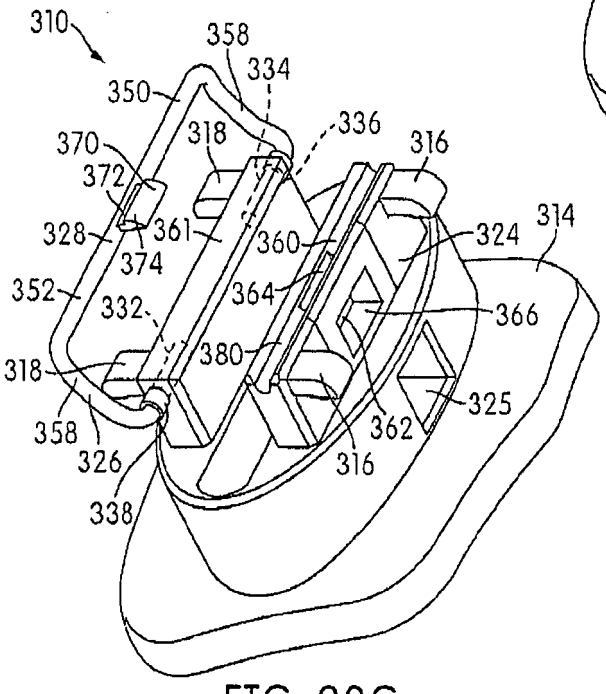

FIG. 28G

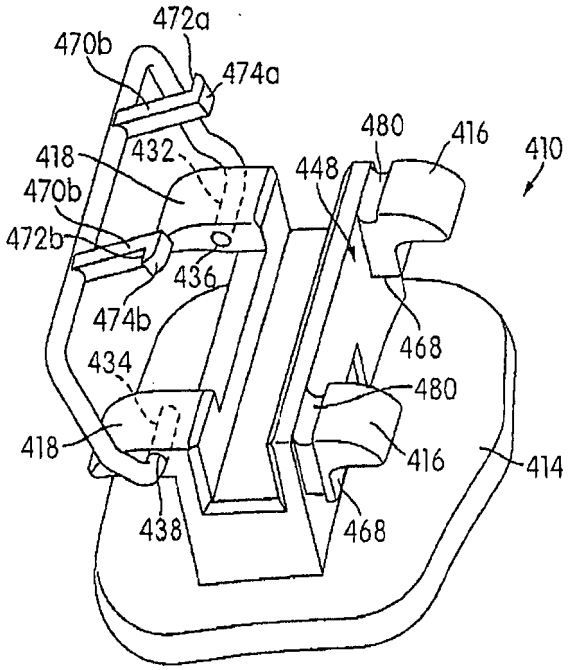

FIG. 28H

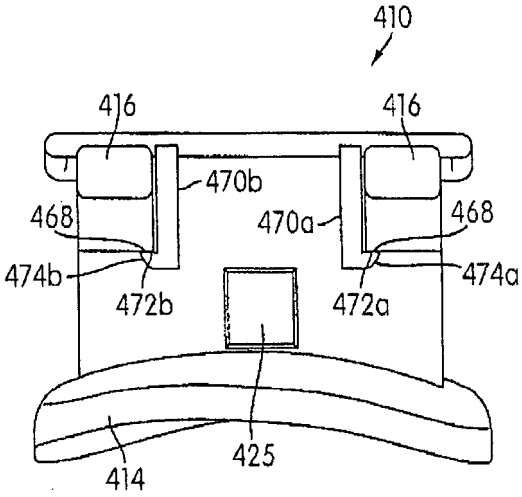

FIG. 28I

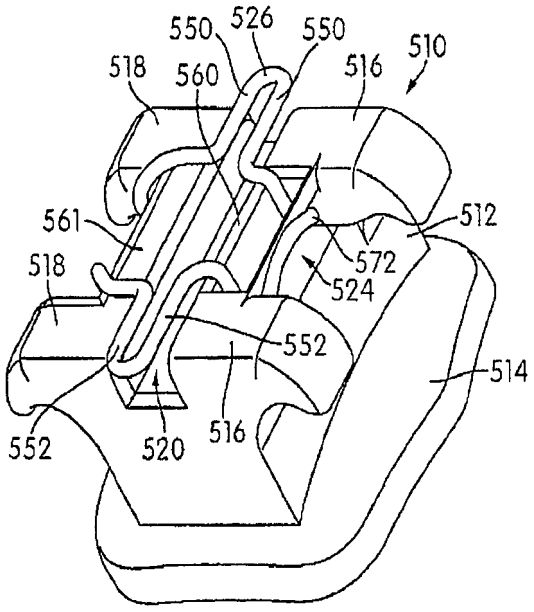

FIG. 28J

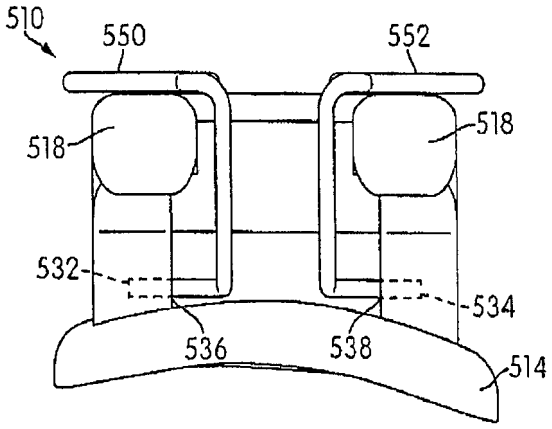

FIG. 28K

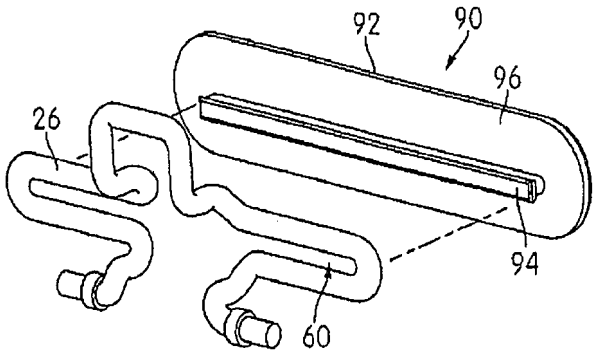

FIG. 29A

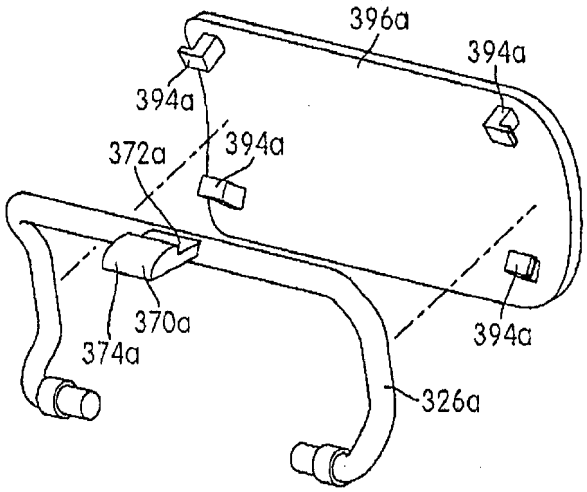

FIG. 29B

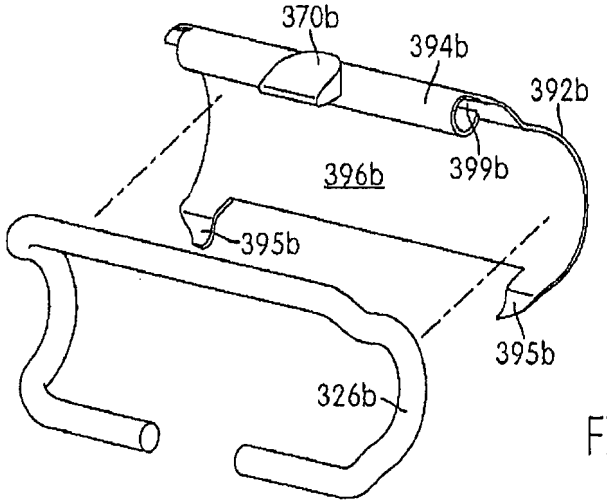

FIG. 29C

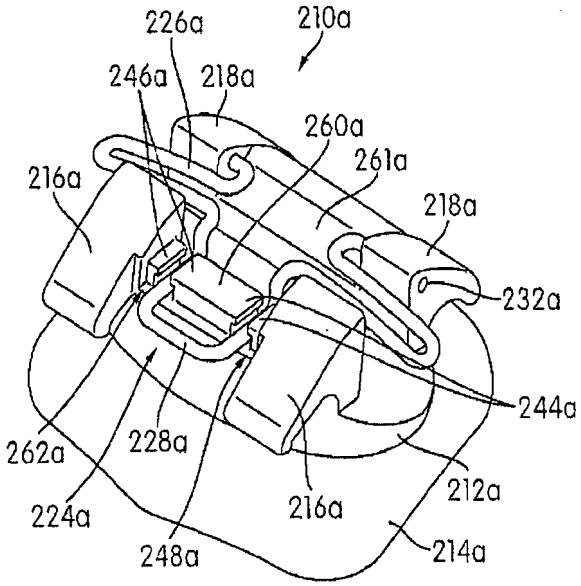

FIG. 30A

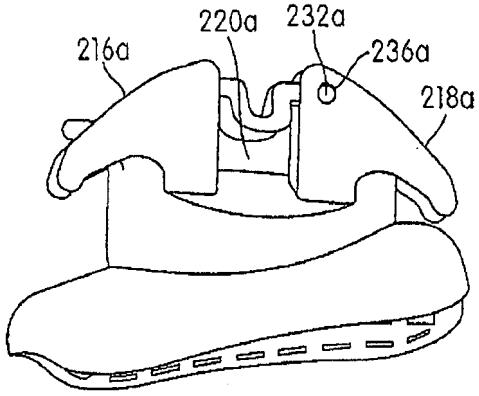

FIG. 30B

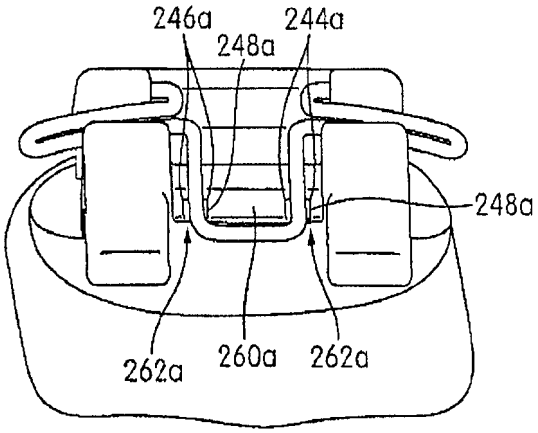

FIG. 30C

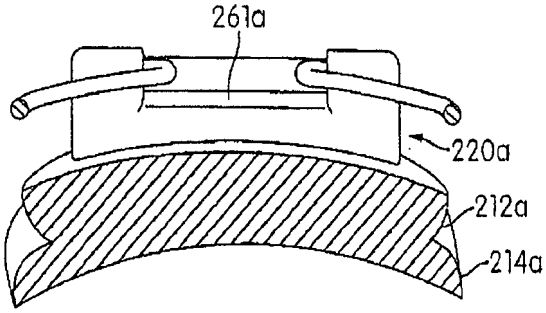

FIG. 30D

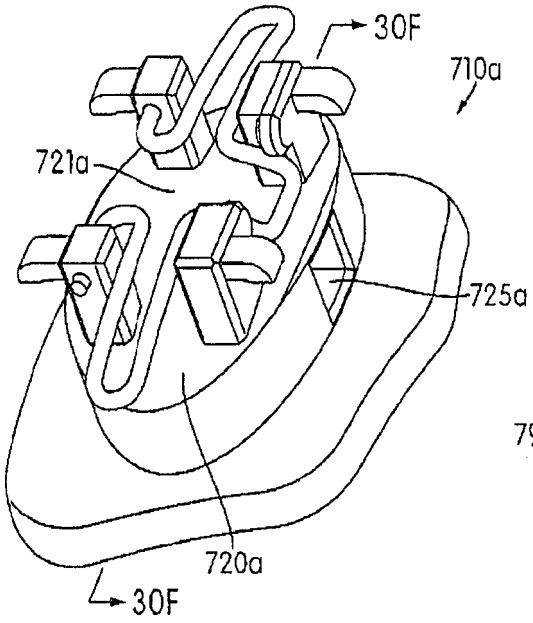

FIG. 30E

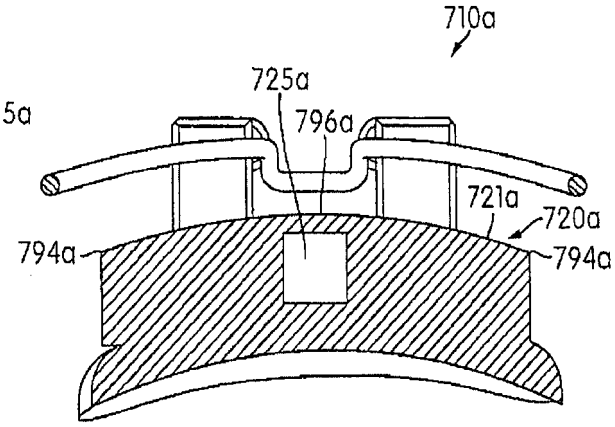

FIG. 30F

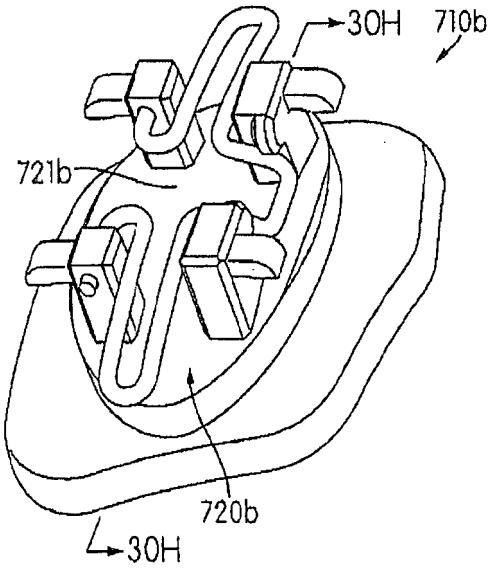

FIG. 30G

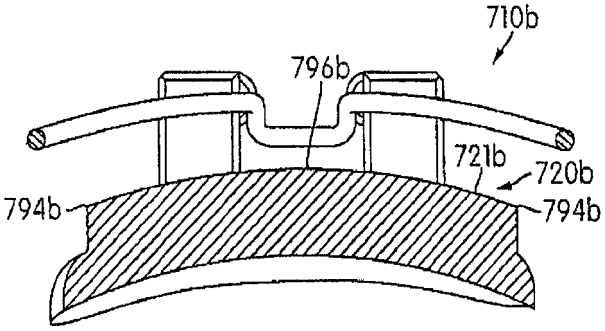

FIG. 30H

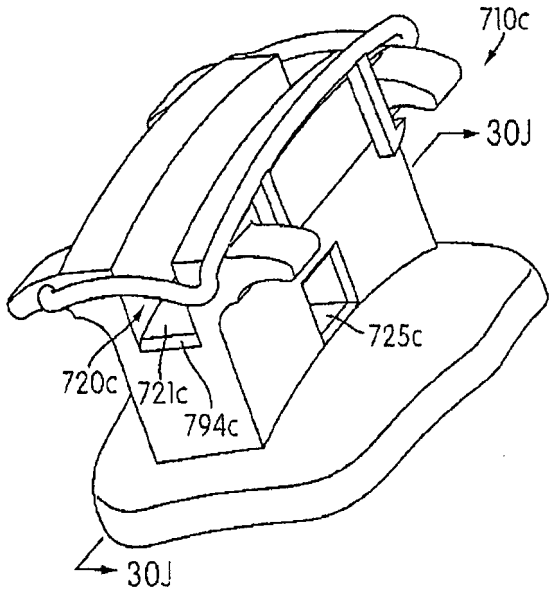

FIG. 30I

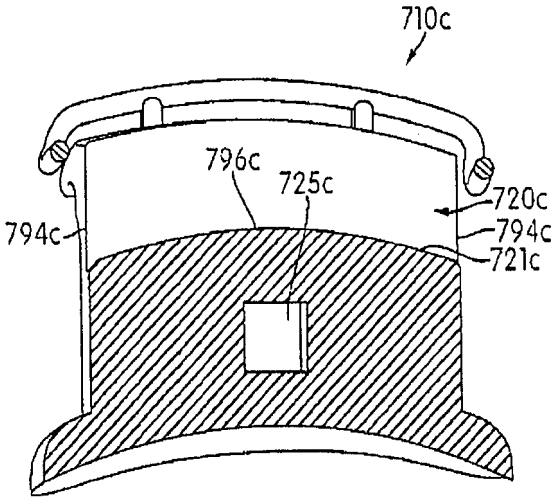

FIG. 30J

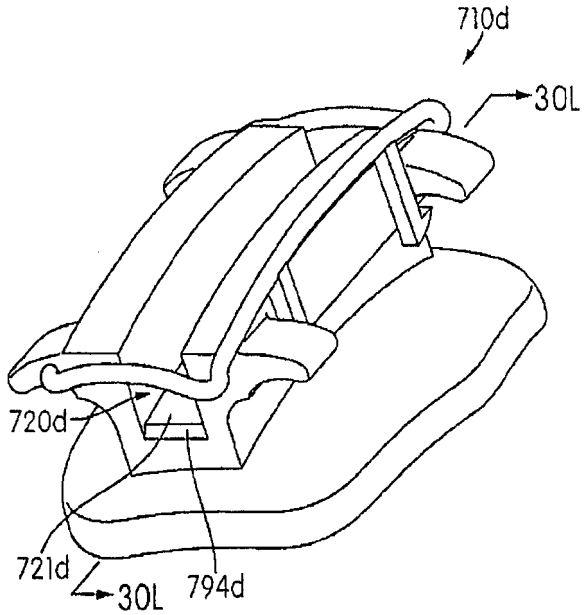

FIG. 30K

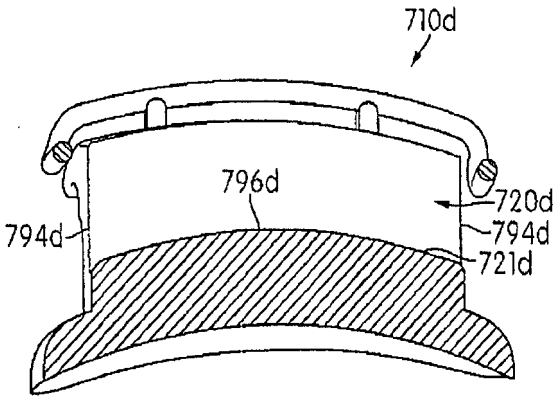

FIG. 30L

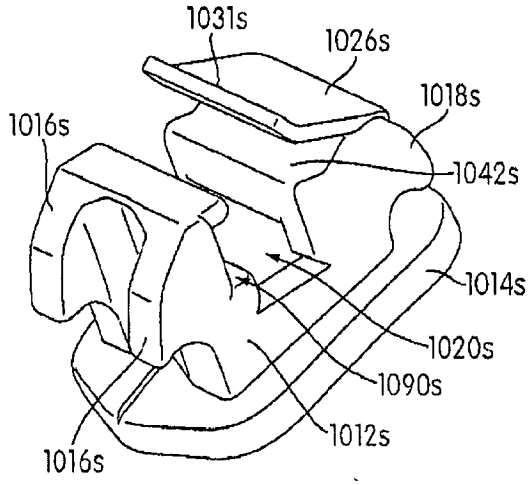

FIG. 31A

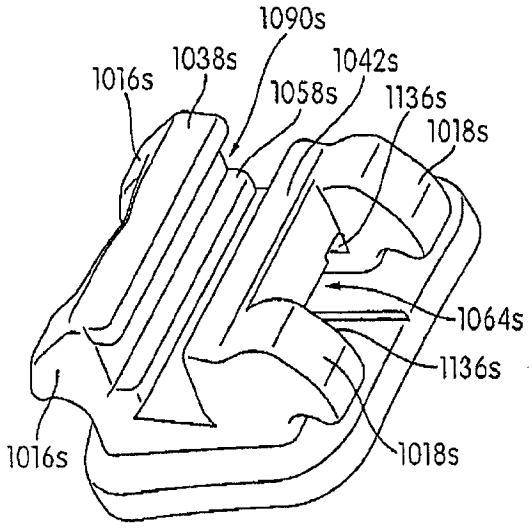

FIG. 31B

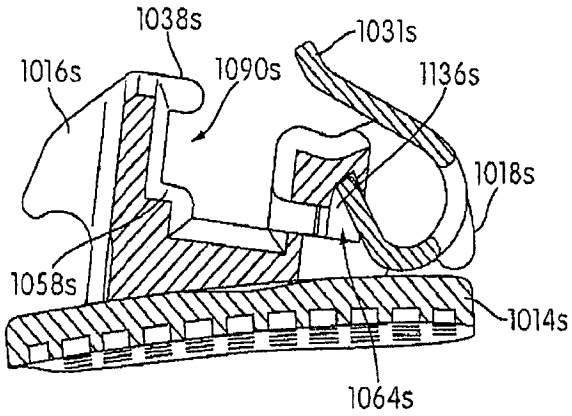

FIG. 31C

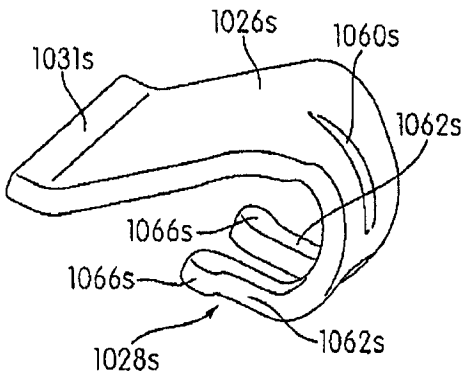

FIG. 31D

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A61C 7/28 (2006.01)

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61/768,317 22 February 2013 (22.02.2013) US

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(72) Inventors; and
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(74) Agents: **ZDURNE, David** et al.; Dentsply International INC., 570 West College Avenue, York, PA 17401-3880 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

(88) Date of publication of the international search report:
25 September 2014

(54) Title: SELF-LIGATING ORTHODONTIC BRACKETS

(57) Abstract: The present invention employs a self-ligating orthodontic bracket comprising a body having a pair of laterally spaced gingival tie wings and a pair of laterally spaced occlusal tie wings, the gingival and occlusal tie wings projecting from a labial surface of the body: an arch wire slot extending mesially-distally across the body and between the gingival and occlusal tie wings to accommodate an arch wire: a free-sliding, controlled-locking, or pivoting clip wherein the clip allows placement and removal of the arch wire when in the open position and prevents the displacement of the arch wire from the bracket member when in the closed position.

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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2013/064184

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61C7/14 A61C7/28 A61C7/12
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2012/052459 A1 (BINGMIN HUANG [CN] ET AL) 1 March 2012 (2012-03-01) paragraphs [0037] - [0047] figures 1-14	1,4-9, 11,18,19
X A	US 2012/135364 A1 (TUNEBERG LEE [US] ET AL) 31 May 2012 (2012-05-31) paragraphs [0017] - [0019] figures 1-7	1,4-8, 18,19 9,11
X Y A	US 2006/228662 A1 (LOKAR ROBERT R [US] ET AL) 12 October 2006 (2006-10-12) paragraphs [0064] - [0078] figures 1-16	1,5,7,8 2 3,6,20, 21

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28 July 2014	04/08/2014

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Pisseloup, Arnaud

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International application No
PCT/US2013/064184

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	EP 2 425 798 A2 (ORMCO CORP [US]) 7 March 2012 (2012-03-07) paragraphs [0060] - [0170] figures 1-30	1,3,5,7, 8,20,21 2,6
Y	WO 2012/036096 A1 (TOMY INC [JP]; ORIKASA MASAAKI; KATAYOSE SHINGO; ENDO KOSEI) 22 March 2012 (2012-03-22) paragraphs [0019] - [0064] figures 1-12	6
X A	US 6 071 119 A (CHRISTOFF JAMES D [US] ET AL) 6 June 2000 (2000-06-06) column 6, line 34 - column 17, line 39 figures 1-22	1,4,7, 10,22, 31, 43-45, 49-55,61 23-30, 32-42, 46-48, 56-60,62
X A	EP 1 810 639 A1 (WINKELSTROETER DENTAURUM [DE]) 25 July 2007 (2007-07-25) paragraphs [0039] - [0052] figures 1-5	1,4,7, 22-25 10,26-62
X A	US 5 908 293 A (VOUDOURIS JOHN C [CA]) 1 June 1999 (1999-06-01) column 5, line 65 - column 11, line 37 figures 1-12	1,4,7, 22-24, 27,31, 44-54 10,25, 26, 28-30, 32-43, 55-62
X A	US 2008/241782 A1 (ABELS NORBERT [DE] ET AL) 2 October 2008 (2008-10-02) paragraphs [0033] - [0066] figures 1-8	1,4,7, 22,27,31 10, 23-26, 28-30, 32-62
X A	US 5 269 681 A (DEGNAN EDWARD V [US]) 14 December 1993 (1993-12-14) column 3, line 62 - column 13, line 25 figures 1-12	1,4,7, 22,44-46 10, 23-43, 47-62
X A	US 4 149 314 A (NONNENMANN MICHAEL J) 17 April 1979 (1979-04-17) column 2, line 36 - column 4, line 5 figures 1-10	1,4,7,22 10,23-62

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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2013/064184

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 287 789 A2 (TOMY INC [JP]) 5 March 2003 (2003-03-05)	1,4,7,22
A	paragraphs [0029] - [0111] figures 1-14	10,23-62

X	US 4 209 906 A (FUJITA KINYA [JP]) 1 July 1980 (1980-07-01)	12,16,17
A	column 2, line 52 - column 5, line 32 figures 1-22	13-15

X	WO 2010/000883 A1 (EUROORTODONCIA S L [ES]; CERVERA SABATER ALBERTO [ES]; HERRERO ZABALET) 7 January 2010 (2010-01-07)	12
A	page 11, line 11 - page 12, line 30 figures 1-9	13-17

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A	CN 102 462 555 A (GUOBIN ZHANG) 23 May 2012 (2012-05-23) paragraphs [0004], [0014] figures 1-7	54

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/064184

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: 22-62(partially)
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 9, 11, 18, 19(completely); 1, 5-8(partially)

A self-ligating orthodontic bracket comprising:
a body having a pair of laterally spaced gingival tie wings and a pair of laterally spaced occlusal tie wings, the gingival and occlusal tie wings projecting from a labial surface of the body;
an arch wire slot extending mesially-distally across the body and between the gingival and occlusal tie wings to accommodate an arch wire
a free-sliding clip wherein the clip allows placement and removal of the arch wire when in the open position and prevents the displacement of the arch wire from the bracket member when in the closed position.
A self-ligating orthodontic bracket comprising:
a body having a pair of laterally spaced gingival tie wings and a pair of laterally spaced occlusal tie wings, the gingival and occlusal tie wings projecting from a labial surface of the body;
an arch wire slot extending mesially-distally across the body and between the gingival and occlusal tie wings to accommodate an archwire;
a locking mechanism on the mesial and distal ends of the bracket body designed as a gear rack; and
a locking clip with a mating gear rack of the locking mechanism to keep the clip closed.

1.1. claims: 18, 19

A self-ligating orthodontic bracket comprising:
a body having a pair of laterally spaced gingival tie wings and a pair of laterally spaced occlusal tie wings, the gingival and occlusal tie wings projecting from a labial surface of the body;
an arch wire slot extending mesially-distally across the body and between the gingival and occlusal tie wings to accommodate an archwire;
a locking mechanism on the mesial and distal ends of the bracket body designed as a gear rack; and
a locking clip with a mating gear rack of the locking mechanism to keep the clip closed.

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2. claims: 2, 3, 20, 21(completely); 1, 5-8(partially)

A self-ligating orthodontic bracket comprising:
a body having a pair of laterally spaced gingival tie wings and a pair of laterally spaced occlusal tie wings, the gingival and occlusal tie wings projecting from a labial surface of the body;
an arch wire slot extending mesially-distally across the body and between the gingival and occlusal tie wings to

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

accommodate an arch wire
a controlled-locking clip wherein the clip allows placement and removal of the arch wire when in the open position and prevents the displacement of the arch wire from the bracket member when in the closed position.

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3. claims: 4, 10, 22-62(completely); 1, 7(partially)

A self-ligating orthodontic bracket comprising:
a body having a pair of laterally spaced gingival tie wings and a pair of laterally spaced occlusal tie wings, the gingival and occlusal tie wings projecting from a labial surface of the body;
an arch wire slot extending mesially-distally across the body and between the gingival and occlusal tie wings to accommodate an arch wire
a pivoting clip wherein the clip allows placement and removal of the arch wire when in the open position and prevents the displacement of the arch wire from the bracket member when in the closed position.

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4. claims: 12-17

A self-ligating orthodontic bracket comprising:
a body having a pair of laterally spaced gingival tie wings and a pair of laterally spaced occlusal tie wings, the gingival and occlusal tie wings projecting from a labial surface of the body;
an arch wire slot extending mesially-distally across the body and between the gingival and occlusal tie wings to accommodate an archwire;
a locking mechanism on the mesial and distal ends of the bracket body designed as a gear rack; and
a locking clip with a mating gear rack of the locking mechanism to keep the clip closed.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 22-62(partially)

The wording of independent claim 22 as it stands does not exclude that the retention member is a part of the body retaining the clip, therefore, its subject-matter is so broad that it is anticipated by most documents of IPC class A61C7/28.

In addition, the wording of claim 22 also covers embodiments in which the retention member is a separate element, only coupled to the bracket in the closed position. Therefore, claim 22 does not meet the requirements of article 6 PCT because its subject-matter hence covers embodiments that are not fully supported by the description.

Following a cumbersome analysis of claims 22 to 62, from the non-exhaustive list of examples cited below, it appears that the subject-matter of those claims are related to embodiments corresponding to figures 17 to 24, and 28 to 30, which encompass a pivoting self-ligating bracket.

List of examples:

- "biasing member" in claim 27 is only mentioned in paragraphs 148 to 175 of the description, which refer to the pivoting embodiments of figure 28.
- "locking clip has a generally U-shaped or cruciform profile" in claim 43 is only mentioned in paragraph 129 of the description, which refers to the pivoting embodiments of figure 28.
- "locking clip is pivotably mounted" in claim 46 is only mentioned in paragraph 129 of the description, which refers to the pivoting embodiments of figure 28.
- "tail ends" in claim 47 is mentioned in paragraphs 94, 102, 132 and 133, which refer to different pivoting embodiments respectively illustrated in figures 18, 21 and 28.
- "vertical slot" in claim 49 is mentioned in paragraphs 127, 142 and 147, which refer to the pivoting embodiments illustrated in figures 17 and 28.
- "oval body shape" in claim 50 is only mentioned in paragraph 125, which refers to the pivoting embodiment illustrated in figure 28.
- "cover portion" and "attachment member" in claims 55 and 58 is mentioned in paragraphs 170 to 172, which refer to the pivoting embodiment illustrated in figure 29.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

out during examination before the EPO (see EPO Guidelines C-IV, 7.2), should the problems which led to the Article 17(2) declaration be overcome.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2013/064184

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权利要求书8页 说明书28页 附图35页

(54)发明名称

自绑扎正畸托架

(57)摘要

本发明使用一种自绑扎正畸托架，其包括：主体，所述主体具有一对横向间隔牙龈系翼和一对横向间隔牙合系翼，所述牙龈和牙合系翼从所述主体的唇表面突出；弓丝槽，所述弓丝槽近中地-远侧地横越所述主体并且在所述牙龈和牙合系翼之间延伸以容纳弓丝；自由滑动、受控锁定或枢转夹子，其中所述夹子在处于打开位置时允许所述弓丝的放置和移除并且在处于闭合位置时防止所述弓丝从所述托架构件的移位。

CN 105407832 A

1. 一种自绑扎正畸托架，其包括：

主体，所述主体具有一对横向间隔牙龈系翼和一对横向间隔牙合系翼，所述牙龈和牙合系翼从所述主体的唇表面突出；

弓丝槽，所述弓丝槽近中地-远侧地横越所述主体并且在所述牙龈和牙合系翼之间延伸以容纳弓丝；

自由滑动、受控锁定或枢转夹子，其中所述夹子在处于打开位置时允许所述弓丝的放置和移除并且在处于闭合位置时防止所述弓丝从所述托架构件的移位。

2. 根据权利要求 1 所述的正畸托架，其中第一对凹槽在彼此相反的方向上在离所述主体的舌表面一定距离处延伸以限定锁定凹陷，所述锁定凹陷具有大于减小开口的宽度；

其中第二对凹槽在彼此相反的方向上在离所述主体的舌表面一定距离处延伸以限定锁定凹陷，其相对于所述第一对凹槽向牙合，所述锁定凹陷具有大于减小开口的宽度；

其中处于应力状态的所述锁定夹子的舌部分变形以允许接合部分从所述第一组凹槽向牙合穿过减小开口并且进入所述第二对凹槽的锁定凹陷到达打开位置；

其中所述锁定夹子的舌部分在处于锁定凹陷中时朝着非应力状态返回使得防止接合部分穿过减小开口，由此将所述锁定夹子保持在打开位置；

其中处于应力状态的所述锁定夹子的舌部分变形以允许接合部分从所述第二组凹槽向牙龈穿过减小开口并且进入所述第一对凹槽的锁定凹陷到达闭合位置，并且

其中所述锁定夹子的舌部分在处于锁定凹陷中时朝着非应力状态返回使得防止接合部分穿过减小开口，由此将所述锁定夹子保持在闭合位置。

3. 根据权利要求 1 所述的正畸托架，其中第一对凹槽在彼此相反的方向上在离所述主体的舌表面一定距离处延伸以限定锁定凹陷，所述锁定凹陷具有大于减小开口的宽度；

其中锥形开口从所述第一对凹槽从所述主体的舌表面向牙合延伸以引导所述锁定夹子的舌部分的运动；

其中处于应力状态的所述锁定夹子的舌部分变形以允许接合部分向牙龈穿过减小开口；

其中所述锁定夹子的舌部分朝着非应力状态逐渐返回使得所述夹子的舌自由端在它接近所述主体的牙合壁时稍稍向唇枢转，由此将所述锁定夹子保持在打开位置；

其中处于应力状态的所述锁定夹子的舌部分变形以允许接合部分从打开位置向牙龈穿过减小开口并且进入所述第一对凹陷的锁定凹陷到达闭合位置，并且

其中所述锁定夹子的舌部分在处于锁定凹陷中时朝着非应力状态返回使得防止接合部分穿过减小开口，由此将所述锁定夹子保持在闭合位置。

4. 根据权利要求 1 所述的正畸托架，其中当所述夹子的面部分向牙龈或向牙合旋转时所述夹子的舌自由端相对于由所述弓丝槽的底面生成的轴线枢转。

5. 根据权利要求 1 所述的正畸托架，其中所述夹子的面部表面包含孔以允许标准牙科器械配合以便在牙合方向上打开所述夹子；

其中所述夹子的面部表面包含从所述夹子的面部表面突出的肋以允许通过与牙齿的长轴对准来虚拟放置所述托架并且增强夹子耐用性；并且

其中在所述主体中包含入口槽以在平行于所述夹子上的凹槽的平面上引导标准牙科器械。

6. 根据权利要求 1 所述的正畸托架，其中所述夹子尖头的唇自由端的近中和远侧部分延伸超出所述主体和弓丝槽；

其中凸台作为独立工件被加入以作为从所述主体的近中和远侧延伸部，从而为处于闭合位置的所述夹子的唇自由端提供形状配合容座；

其中从所述主体延伸的近中 - 远侧凸台具有盖，所述盖保护处于闭合位置的所述夹子的唇自由端的近中和远侧边缘；

其中从所述主体延伸的近中 - 远侧凸台具有封闭凹穴，所述封闭凹穴保护处于闭合位置的所述夹子的唇自由端的近中、远侧和牙龈边缘；

其中从所述主体延伸的近中 - 远侧凸台具有呈“C 杯”的形式的敞开凹穴，所述敞开凹穴保护处于闭合位置的所述夹子的唇自由端的牙龈边缘。

7. 根据权利要求 1 所述的正畸托架，

其中连续通道在牙龈 - 牙合方向上延伸通过所述主体的舌部分以便于清洁俘获的牙石 / 牙垢；

其中在靠置闭合位置的所述夹子中近中地 - 远侧地延伸的所述连续通道的深度减小使得在治疗期间最小的可能弓丝不会被俘获。

8. 一种自绑扎正畸托架，其包括：

主体，所述主体具有一对横向间隔牙龈系翼和一对横向间隔牙合系翼，所述牙龈和牙合系翼从所述主体的唇表面突出；

弓丝槽，所述弓丝槽近中地 - 远侧地横越所述主体并且在所述牙龈和牙合系翼之间延伸以容纳弓丝；

自由滑动、受控锁定夹子，其中所述夹子在处于打开位置时允许所述弓丝的放置和移除并且在处于闭合位置时防止所述弓丝从所述托架构件的移位。

9. 根据权利要求 8 所述的正畸托架，其中第一对槽近中地 - 远侧地横越所述主体并且在所述牙龈系翼的内部延伸；

其中第二对槽近中地 - 远侧地横越所述主体、在所述牙龈系翼的内部、向舌平行于所述第一对槽延伸；

其中所述锁定夹子处于最远牙合位置并且处于应力状态，所述弓丝槽不由所述锁定夹子的唇部分覆盖，该位置被称为打开位置；

其中所述锁定夹子从打开位置向牙龈移动并且所述锁定夹子的唇部分就座在所述第一对槽中，在所述锁定夹子的唇部分和所述弓丝的唇侧之间没有接触，该位置被称为闭合被动阶段，

其中所述锁定夹子的唇部分从所述第一对槽移动到所述第二对槽使得在所述锁定夹子的唇部分和所述弓丝的唇侧之间有干涉接触，由此将所述夹子定位在闭合主动阶段位置。

10. 根据权利要求 8 所述的正畸托架，其中几个槽近中地 - 远侧地横越所述牙龈系翼延伸，所述槽能部分地或完全地横越所述牙龈系翼延伸；

其中几个锁定槽在所述牙龈系翼之间近中地或从所述牙龈系翼远侧地突出；

其中自由旋转和挠性夹子具有两个牙龈部分，所述牙龈部分将锁定到所述主体上的不同锁定槽中，其产生不同的闭合阶段（被动和主动）；

其中所述锁定槽的内部间隙能以这样的方式设计成使得所述夹子的牙龈部分在所有闭合位置具有间隙以产生所述夹子和所述弓丝之间的互动性；

其中所述挠性夹子具有近中地－远侧地插入所述牙合系翼之间的两个牙合部分，所述牙合部分（铰链，更恰当地说）能为圆形或非圆形，如矩形；

其中所述夹子的中间部分能以这样的方式设计成使得在所述夹子和所述弓丝之间有间隙以产生它们之间的互动性；

其中在所述主体的所述牙合系翼之间有两个槽，所述挠性夹子的两个牙合部分（铰链）插入其中；所述铰链能为圆形或非圆形，如矩形，这两个槽具有延长长度牙龈－牙合使得所述夹子能严格地旋转或旋转和滑动之间的组合。

11. 根据权利要求8所述的正畸托架，其中一对槽近中地－远侧地横越所述主体并且在所述牙龈系翼的内部延伸；

其中锁定夹子具有两个唇端－牙龈唇端和牙合唇端，所述夹子的轮廓从近中－远侧看上去像“C”；

其中锁定夹子具有两个唇端到所述锁定夹子的牙龈部分之间的不同距离；

其中锁定夹子移动最远牙龈位置，牙合唇端覆盖所述弓丝槽的唇开口，在所述锁定夹子的牙合唇端和所述弓丝的唇侧之间没有接触，所述锁定夹子的牙合唇部分处于无应力状态并且托架的该位置被称为被动阶段；

其中锁定夹子移动最远牙合位置，牙龈唇端覆盖所述弓丝槽的唇开口，在所述锁定夹子的牙龈唇端和所述弓丝的唇侧之间有干涉接触，所述锁定夹子的牙龈唇部分处于应力状态并且托架的该位置被称为主动阶段；

其中锁定夹子移动到最远牙龈位置和最远牙合位置之间的中间位置，所述锁定夹子的唇端都不覆盖所述弓丝槽的唇开口，托架的该位置被称为打开位置。

12. 一种自绑扎正畸托架，其包括：

主体，所述主体具有一对横向间隔牙龈系翼和一对横向间隔牙合系翼，所述牙龈和牙合系翼从所述主体的唇表面突出；

弓丝槽，所述弓丝槽近中地－远侧地横越所述主体并且在所述牙龈和牙合系翼之间延伸以容纳弓丝；

在所述托架主体的近中和远侧端部上的锁定机构，其设计为齿条；以及

锁定夹子，其具有所述锁定机构的配合齿条以保持所述夹子闭合。

13. 根据权利要求12所述的自绑扎正畸托架，其中在所述托架主体的近中和远侧边缘上的两个独立操作夹子能以任何组合允许每个边缘上的弓丝的不同表现。

14. 根据权利要求12所述的自绑扎正畸托架，其中每个夹子可调节以提供被动弓丝接合、主动弓丝接合或互动弓丝接合。

15. 根据权利要求12所述的自绑扎正畸托架，其中柱附连到所述夹子，其能以0度到90度之间的任何角度成角。

16. 根据权利要求12所述的自绑扎正畸托架，其中所述主体包括向牙龈－向牙合延伸的竖直槽。

17. 根据权利要求12所述的自绑扎正畸托架，其中在所述齿条的相对端部上的圆形止挡允许枢转运动以打开所述夹子和防止所述夹子从所述主体脱离。

18. 一种正畸托架，其包括：

适合于接合牙齿表面的基座；

在大致垂直方向上从所述基座延伸的托架主体，所述托架主体具有在近中远侧方向上延伸的弓丝槽；

用于打开或闭合所述弓丝槽的锁定夹子；

其中所述锁定构件具有开槽部分，所述开槽部分大致设在两个相对凸耳部分之间的所述唇自由端的中心；

其中所述托架具有围绕所述托架主体的近中侧和远侧形成的接收区域，所述接收区域由牙龈系翼的接收构件限定。

19. 根据权利要求 18 所述的正畸托架，其中所述保持构件从以下组成的群组选择：

a. 唇罩；

b. 舌台；

c. 端壁，所述端壁在唇罩和舌台之间延伸，并且从所述主体相对地间隔，由此封闭所述接收区域的至少一部分；

d. c 形构件；以及

e. 它们的组合。

20. 一种正畸托架，其包括：

适合于接合牙齿表面的基座；

在大致垂直方向上从所述基座延伸的托架主体，所述托架主体具有在近中远侧方向上延伸的弓丝槽；

用于打开或闭合所述弓丝槽的锁定夹子；以及形成于所述主体的舌腔中的锁定机构，所述舌腔配置成通过开口接收所述锁定夹子的可变形指状件，所述可变形指状件具有凸起部分，所述凸起部分在非应力状态下限定的宽度大于所述舌腔的舌开口的宽度；

其中所述锁定构件具有开槽部分，所述开槽部分大致设在两个相对凸耳部分之间的所述唇自由端的中心；

其中所述托架具有形成于所述托架主体的近中 - 远侧保持通道内的接收区域。

21. 根据权利要求 19 所述的正畸托架，

其中所述锁定夹子包括具有钩部分的第一和第二臂；

其中所述保持构件包括第一对止挡和第二对止挡，所述第一对止挡的每个止挡具有第一开口、第一引导部分和第一凸缘部分，并且所述第二对止挡的每个止挡具有第二开口、第二引导部分和第二凸缘部分；

其中所述锁定夹子可变形使得当所述钩部分朝着所述第一开口或所述第二开口被引导时，所述锁定夹子变形到应力状态，由此使所述钩部分能够接收到所述第一开口中或所述第二开口中；并且

其中所述钩部分沿着所述第一引导部分或所述第二引导部分被引导直到所述钩部分延伸超出所述第一对止挡或所述第二对止挡，由此允许所述锁定夹子朝着非应力状态返回，使得所述钩部分接合所述第一对止挡或所述第二对止挡的凸缘部分以将所述锁定夹子保持在第一闭合位置或第二闭合位置。

22. 一种自绑扎正畸托架，其包括：

主体，所述主体具有一对横向间隔牙龈系翼和一对横向间隔牙合系翼，所述牙龈和牙合系翼从所述主体的唇表面突出；

弓丝槽，所述弓丝槽近中地－远侧地横越所述主体并且在所述牙龈和牙合系翼之间延伸以容纳弓丝；

具有锁定夹子和保持构件的锁定机构，所述锁定夹子在打开位置和闭合位置之间可移动并且具有用于接合所述保持构件的接合部分；

其中所述锁定夹子在打开位置时允许所述弓丝的放置和移除并且在闭合位置时防止所述弓丝从所述托架构件的移位。

23. 根据权利要求 22 所述的正畸托架，其中所述保持构件包括在其间限定减小开口的至少一对相对间隔开的止挡，所述减小开口具有小于所述锁定夹子的所述接合部分的宽度。

24. 根据权利要求 22 所述的正畸托架，

其中第一对止挡朝着彼此从相应的牙龈系翼并且在离所述主体的唇表面一定距离处延伸以限定锁定凹陷，所述锁定凹陷具有大于所述减小开口的宽度；

其中所述锁定凹陷的宽度由所述牙龈系翼之间的距离限定；

其中处于应力状态的所述锁定夹子变形以允许所述接合部分向舌穿过所述减小开口并且进入所述锁定凹陷到达闭合位置，并且

其中所述锁定夹子在处于所述锁定凹陷中时朝着非应力状态返回使得防止所述接合部分穿过所述减小开口，由此将所述锁定夹子保持在闭合位置。

25. 根据权利要求 22 所述的正畸托架，

其中所述保持构件包括相对于彼此以向牙合－向牙龈关系围绕牙龈翼间区域从所述主体的唇表面向舌延伸的第一构件和第二构件；

其中所述一对止挡朝着彼此从相应的第一和第二构件并且在离所述主体的唇表面一定距离处延伸以限定锁定凹陷，所述锁定凹陷具有大于所述减小开口的宽度；

其中所述锁定凹陷的宽度由所述第一构件和所述第二构件之间的距离限定；

其中处于应力状态的所述锁定夹子变形以允许所述接合部分向舌穿过所述减小开口并且进入所述锁定凹陷到达闭合位置；并且

其中所述锁定夹子在处于所述锁定凹陷中时朝着非应力状态返回使得防止所述接合部分穿过所述减小开口，由此将所述锁定夹子保持在闭合位置。

26. 根据权利要求 22 所述的正畸托架，

其中所述锁定夹子的接合部分包括第一臂部分和第二臂部分；

其中第一对止挡和第二对止挡沿着所述牙龈系翼之间的翼间区域中的第一桥部分被提供，每对止挡在离所述桥部分的唇表面一定距离处延伸以限定锁定凹陷，所述锁定凹陷具有大于所述减小开口的宽度；

其中处于应力状态的所述锁定夹子变形所述接合部分使得允许所述第一臂部分向舌穿过所述第一对止挡的减小开口并且进入第一锁定凹陷，并且允许所述第二臂部分向舌穿过所述第二对止挡的减小开口并且进入第二锁定凹陷；并且

其中所述第一和第二臂在处于相应的第一和第二锁定凹陷中时朝着非应力状态返回使得防止所述接合部分穿过所述减小开口，由此将所述锁定夹子保持在闭合位置。

27. 根据权利要求 22 所述的正畸托架，其中所述锁定夹子的所述接合部分包括具有钩部分和引导部分的至少一个偏压构件。

28. 根据权利要求 22 所述的正畸托架，

其中所述保持构件包括围绕所述牙龈系翼之间的翼间区域中的第一桥部分的第一开口和第二开口，所述第一和第二开口限定其间的通孔；

其中所述引导部分在与所述第一开口的壁接触时导致所述偏压构件偏转，由此使所述至少一个偏压构件通过所述第一开口并且进入所述通孔；并且

其中所述至少一个偏压构件沿着所述通孔被引导直到所述钩部分延伸超出所述通孔内的凸缘部分，由此允许所述至少一个偏压构件朝着非应力状态返回使得所述钩部分接合所述凸缘部分以将所述锁定夹子保持在闭合位置。

29. 根据权利要求 22 所述的正畸托架，其中所述锁定夹子是具有大体 U 形配置的管状或圆柱形构件，使得所述至少一个偏压构件从所述锁定夹子的头部分向舌定向。

30. 根据权利要求 22 所述的正畸托架，其中

其中所述至少一个偏压构件包括第一偏压构件和第二偏压构件，每个具有钩部分和引导部分；

其中所述引导部分在与翼间区域中的所述牙龈系翼的壁接触时，导致所述第一和第二偏压构件朝着彼此偏转，由此使所述第一和第二偏压构件能够进入所述牙龈系翼之间的减小开口中；并且

其中所述第一和第二偏压构件沿着所述牙龈系翼的相应的壁被引导直到所述钩部分延伸超出所述牙龈系翼的相应的凸缘部分，由此允许所述第一和第二偏压构件朝着非应力状态返回使得所述钩部分接合所述凸缘部分以将所述锁定夹子保持在闭合位置。

31. 根据权利要求 22 所述的正畸托架，其中所述牙龈系翼中的至少一个包括唇表面，所述唇表面具有凹槽以便接收处于闭合位置的所述锁定夹子的一部分。

32. 根据权利要求 22 所述的正畸托架，其中所述牙龈系翼和在其间延伸的所述第一桥部分包括唇表面，所述唇表面具有凹槽以便接收处于闭合位置的所述锁定夹子的一部分。

33. 根据权利要求 22 所述的正畸托架，其中所述牙龈系翼包括唇表面，所述唇表面具有凹槽以便接收处于闭合位置的所述锁定夹子的头部分，所述头部分向牙合延伸超出所述主体的所述第一桥部分。

34. 根据权利要求 22 所述的正畸托架，

其中所述保持构件包括具有凸缘部分的唇构件，所述唇构件在所述牙龈系翼之间延伸以限定所述第一桥部分和所述唇构件之间的第一开口以及所述唇构件和所述主体的唇表面之间的第二开口，所述第一和第二开口限定其间的通孔；

其中所述引导部分在与所述唇构件的壁接触时导致所述头部分偏转，由此使所述钩部分能够进入所述第一开口中和所述通孔中；并且

其中所述钩部分被引导到所述通孔中直到所述钩部分延伸超出所述唇构件的凸缘部分，由此允许所述锁定夹子朝着非应力状态返回使得所述钩部分接合所述凸缘部分以将所述锁定夹子保持在闭合位置。

35. 根据权利要求 22 所述的正畸托架，

其中所述锁定夹子包括具有钩部分的第一和第二臂；

其中所述保持构件包括第一对止挡和第二对止挡，所述第一对止挡的每个止挡具有第一开口、第一引导部分和第一凸缘部分，并且所述第二对止挡的每个止挡具有第二开口、第二引导部分和第二凸缘部分；

其中所述锁定夹子可变形使得当所述钩部分朝着所述第一开口或所述第二开口被引导时，所述锁定夹子变形到应力状态，由此使所述钩部分能够接收到所述第一开口中或所述第二开口中；并且

其中所述钩部分沿着所述第一引导部分或所述第二引导部分被引导直到所述钩部分延伸超出所述第一对止挡或所述第二对止挡，由此允许所述锁定夹子朝着非应力状态返回，使得所述钩部分接合所述第一对止挡或所述第二对止挡的凸缘部分以将所述锁定夹子保持在第一闭合位置或第二闭合位置。

36. 根据权利要求 22 所述的正畸托架，其中所述第一对止挡相对于所述第二对止挡向牙龈定位。

37. 根据权利要求 22 所述的正畸托架，其中所述第一和第二对止挡的每一个包括近中止挡和远侧止挡，所述近中止挡围绕近中 - 牙龈系翼被提供并且所述远侧止挡围绕远侧 - 牙龈系翼被提供。

38. 根据权利要求 22 所述的正畸托架，其中近中止挡和远侧止挡限定围绕相应的牙龈系翼的大体 W 形配置。

39. 根据权利要求 22 所述的正畸托架，其中所述第一和第二对止挡沿着所述牙龈系翼被提供，所述第一对止挡相对于所述第二对止挡向牙龈定位。

40. 根据权利要求 22 所述的正畸托架，其中所述第一和第二对止挡沿着所述牙龈系翼被提供，所述第一对止挡相对于所述第二对止挡向牙龈定位。

41. 根据权利要求 22 所述的正畸托架，其中所述牙龈系翼包括至少一个唇表面，第一引导部分设在所述牙龈系翼的第一唇表面上并且第二引导部分设在所述牙龈系翼的第二唇表面上，所述第一引导部分相对于所述第二引导部分向牙龈定位。

42. 根据权利要求 22 所述的正畸托架，其中所述牙龈系翼包括至少一个舌表面，第一凸缘部分设在所述牙龈系翼的第一舌表面上并且第二凸缘部分设在所述牙龈系翼的第二舌表面上，所述第一凸缘部分相对于所述第二凸缘部分向牙龈定位。

43. 根据权利要求 22 所述的正畸托架，其中所述锁定夹子具有大体 U 形或十字形轮廓。

44. 根据权利要求 22 所述的正畸托架，其中处于闭合位置的所述锁定夹子接合所述弓丝的牙龈和牙合角部。

45. 根据权利要求 22 所述的正畸托架，其中处于闭合位置的所述锁定夹子的近中和远侧部分接合所述弓丝的牙龈和牙合部分。

46. 根据权利要求 22 所述的正畸托架，其中所述锁定夹子枢转地安装到所述主体。

47. 根据权利要求 22 所述的正畸托架，其中所述锁定夹子包括具有尾端的相对自由端，每个尾端接收在形成于所述牙合系翼中的一个中的相应的腔孔中以允许在打开和闭合位置之间的所述锁定夹子的枢转运动。

48. 根据权利要求 22 所述的正畸托架，其中每个尾端包括凸缘部分，当插入相应的腔孔中时所述凸缘部分配置成用作所述尾端的止挡使得所述凸缘部分防止所述尾端延伸超出进入和 / 或超出所述腔孔的预定深度。

49. 根据权利要求 22 所述的正畸托架，其中所述主体包括向牙龈 - 向牙合延伸的竖直槽。

50. 根据权利要求 22 所述的正畸托架，其中所述主体为卵形或椭圆形。

51. 根据权利要求 22 所述的正畸托架，其中所述弓丝槽包括从第二部分近中地 - 远侧地定位的第一部分，所述第一部分相对于所述第二部分向舌偏移。

52. 根据权利要求 22 所述的正畸托架，其中所述弓丝槽限定向舌定向的、近中地 - 远侧地延伸的弯曲部分或轮廓。

53. 根据权利要求 22 所述的正畸托架，其中所述弓丝槽限定向舌定向的、近中地 - 远侧地延伸的成角部分或轮廓。

54. 根据权利要求 22 所述的正畸托架，其中所述弓丝槽包括在底部和 / 或侧壁中的至少一个隆起或至少一个凹槽以最小化所述弓丝和所述弓丝槽之间的接触面积，所述锁定夹子包括至少一个隆起或至少一个凹槽以减小所述弓丝和所述弓丝槽之间的接触面积，或两者的组合。

55. 根据权利要求 22 所述的正畸托架，其中所述锁定夹子还包括盖部分。

56. 根据权利要求 22 所述的正畸托架，其中盖部分可移除地附着到所述锁定夹子。

57. 根据权利要求 22 所述的正畸托架，其中盖部分包括至少一个附连构件以便可移除地固定到所述锁定夹子。

58. 根据权利要求 22 所述的正畸托架，其中至少一个附连构件包括与所述锁定夹子中的开口的一部分互补的形状和尺寸以便可移除地固定到所述部分。

59. 根据权利要求 22 所述的正畸托架，其中至少一个附连构件包括多个附连构件，其具有与所述锁定夹子的部分互补的形状和尺寸以便可移除地固定到所述部分。

60. 根据权利要求 22 所述的正畸托架，其中至少一个附连构件包括具有纵向开口的偏压管状部分，所述纵向开口配置成充分地变形以接收所述锁定夹子的圆柱形或半圆柱形部分以便可移除地固定到所述部分。

61. 根据权利要求 22 所述的正畸托架，其中盖部分在所述弓丝槽的长度上近中地 - 远侧地延伸。

62. 根据权利要求 22 所述的正畸托架，其中第一闭合位置是主动闭合位置并且第二闭合位置是被动闭合位置。

自绑扎正畸托架

[0001] 相关申请

[0002] 本专利申请要求于2012年10月9日提交的、序列号为61/711,381的美国临时专利申请和于2013年2月22日提交的、序列号为61/768,317的美国临时专利申请的权益和优先权，上述专利申请为了所有目的通过引用合并于本文中。

技术领域

[0003] 本发明涉及正畸的领域，并且具体地涉及正畸托架组件的领域。

发明内容

[0004] 本发明提供改进的自绑扎正畸托架。在一方面，本发明提供一种自绑扎正畸托架，其包括：主体，所述主体具有一对横向间隔牙龈系翼和一对横向间隔牙合系翼，所述牙龈和牙合系翼从所述主体的唇表面突出；弓丝槽，所述弓丝槽近中地-远侧地横越所述主体并且在所述牙龈和牙合系翼之间延伸以容纳弓丝；自由滑动、受控锁定或枢转夹子，其中所述夹子在处于打开位置时允许所述弓丝的放置和移除并且在处于闭合位置时防止所述弓丝从所述托架构件的移位。

附图说明

[0005] 图1A-1F是本发明的第一实施例的各种视图。

[0006] 图2A-2C是本发明的第二实施例的各种视图。

[0007] 图3A-3C是本发明的第三实施例的各种视图。

[0008] 图4A-4D是本发明的第四实施例的各种视图。

[0009] 图5A-5E是本发明的第五实施例的各种视图。

[0010] 图6A-6D是本发明的第六实施例的各种视图。

[0011] 图7A-7C是本发明的第七实施例的各种视图。

[0012] 图8A-8E是本发明的第八实施例的各种视图。

[0013] 图9A-9H是本发明的第九实施例的各种视图。

[0014] 图10A-10D是本发明的第十实施例的各种视图。

[0015] 图11A-11C是本发明的第十一实施例的各种视图。

[0016] 图12A-12C是本发明的第十二实施例的各种视图。

[0017] 图13A-13C是本发明的第十三实施例的各种视图。

[0018] 图14A-14C是本发明的第十四实施例的各种视图。

[0019] 图15A-15C是本发明的第十五实施例的各种视图。

[0020] 图16A-16C是本发明的第十六实施例的各种视图。

[0021] 图17A-17N是本发明的第十七实施例的各种视图。

[0022] 图18A-18D是本发明的第十八实施例的各种视图。

[0023] 图19A-19F是本发明的第十九实施例的各种视图。

[0024] 图 20A-20B 是本发明的第二十实施例的各种视图。

[0025] 图 21A-21C 是本发明的第二十一实施例的各种视图。

[0026] 图 22A-22B 是本发明的第二十二实施例的各种视图。

[0027] 图 23A-23B 是本发明的第二十三实施例的各种视图。

[0028] 图 24A-24C 是本发明的第二十四实施例的各种视图。

[0029] 图 25A-25C 是本发明的第二十五实施例的各种视图。

[0030] 图 26A-26C 是本发明的第二十六实施例的各种视图。

[0031] 图 27A-27C 是本发明的第二十七实施例的各种视图。

[0032] 图 28A-28C 是本发明的第二十八实施例的各种视图。

[0033] 图 29A-29C 是本发明的第二十九实施例的各种视图。

[0034] 图 30A-30C 是本发明的第三十实施例的各种视图。

[0035] 图 31A-31C 是本发明的第三十一实施例的各种视图。

具体实施方式

[0036] 可以领会本发明提供包括托架和（一个或多个）锁定夹子的自绑扎正畸托架组件的若干实施例。托架具有夹子禁止接近弓丝槽的闭合位置和夹子允许接近弓丝槽的打开位置。

[0037] 一般而言，示例的托架包括主体和基座。主体可以包括弓丝槽（从托架主体近中地和远侧地定位的两个接收区域）、第一系翼（例如，（一个或多个）牙龈系翼）、第二系翼（例如，（一个或多个）牙合系翼）和翼间区域，所述翼间区域横越主体向牙龈－向牙合延伸并且可以大体上由牙龈系翼的横向间隔或桥部分和牙合系翼的横向间隔或桥部分中的至少一个限定。基座将托架连接到牙齿并且可以包括限定图案的附连部分，所述图案接收粘合剂并且成形为附着到牙齿。在一个具体实施例中，附连部分的舌侧附着到牙齿的唇侧。在构造中，基座可以用焊缝附连到主体。在其它构造中，基座可以以其它方式被附连或者与主体形成为单件。

[0038] 现在参考图 1A 至 1F，自绑扎正畸托架被显示并且大体上由附图标记 1010 指示。图 1A 是根据本发明的处于闭合位置的自绑扎牙科托架的透视图，具有牙龈系翼之间的横向间隔和从相应的近中和远侧牙龈系翼延伸以形成接收区域的唇部分（例如，罩部分）。唇部分在主体的近中侧和远侧的外部延伸以便接收夹子的凸耳部分（例如，尖头）。夹子的唇自由端（例如，牙龈尖端部分）包括夹子的凸耳部分，其可以构型成匹配在牙龈系翼的罩部分之下的接收区域的轮廓。

[0039] 更特别地，正畸托架 1000 包括主体 1012 和附连到主体的舌安装基座 1014。安装基座 1014 具有待附连到牙齿的舌表面。一般而言，主体 1012 限定方形、矩形或另外形状的构件。然而，可以领会主体 1012 可以由各种其它形状的配置限定，如菱形、圆形、卵形或另外形状的构件。

[0040] 一对横向间隔牙龈系翼 1016 和一对横向间隔牙合系翼 1018 从主体 1012 的唇表面延伸。牙龈系翼 1016 和牙合系翼 1018 大体上向舌弯曲。翼间区域 1024 横越主体 1012 向牙龈－向牙合延伸并且可以大体上由牙龈系翼 1016 的横向间隔和／或牙合系翼 1018 的横向间隔限定。翼间区域 1024 可以是敞开（例如，无阻塞）通道或者可以是闭合（部分

或完全阻塞）通道，图 1A-1F，或以另外方式。弓丝槽 1020 近中地 - 远侧地横越主体 1012 并且在牙龈和牙合系翼 1016 和 1018 之间延伸。弓丝槽 1020 向唇敞开以接收弓丝（未显示）。弓丝槽 1020 可以在主体的翼间区域 24 中被中断。

[0041] 托架 1010 还可以包括锁定机构，所述锁定机构包括当处于闭合位置时用于将弓丝保持在弓丝槽 1020 中的锁定夹子 1026。该锁定夹子 1026 以大致 U 形横截面配置被构造，并且其一侧形成为位于基侧并且沿着基座延伸（通过形成于主体 1012 和基座 1014 之间的开口）的舌自由端 1028（位于舌侧的一部分），而其另一侧形成为具有与弓丝槽 1020 的长度大致相同的宽度并且在槽的上侧延伸的唇自由端 1030。舌自由端 1028 和唇自由端 1030 可以由弯曲部分 1032 互连。

[0042] 锁定夹子 1026 可以由弹性构件形成，其中开槽部分 1034 大致设在唇自由端 1030 的尖端边缘部分（位于唇侧的一部分）的中心。开槽部分 1034 可以由反基部 1028 的左和右（例如，近中和远侧）凸耳部分 1031 限定，所述反基部是锁定夹子 1026 的大致 T 或 Y 形配置的 T 或 Y 形头部分。

[0043] 此外，由于锁定夹子的开槽部分 1034 可以针对托架主体（例如，近中 / 远侧自由 / 敞开边缘部分）的宽度相应地被提供从而与其配合，因此锁定夹子 1026 的凸耳部分在槽的纵向方向上的移位和扭转可以主动地被抑制。即，关于锁定夹子 1026 的尖端部分在主体的纵向方向上的移位和扭转，这样的移位可以由围绕托架主体 1012 的近中侧和 / 或远侧提供的接收区域抑制。

[0044] 接收区域可以由从托架主体 1012 的外自由 / 敞开边缘延伸的接收构件 1036 限定。优选地，托架主体的外自由 / 敞开边缘大体上与弓丝槽 1020 的近中 / 远侧自由端共面，但是不需要。在一个具体例子中，如图 1A-1F 中所示，接收构件 1036 可以包括从托架主体 1012 的牙龈系翼 1016 的外自由 / 敞开边缘近中地 / 远侧地延伸的唇罩部分 1038。唇罩部分可以被提供用于将锁定夹子 1026 的尖端（例如，凸耳 1031）停止在托架主体的自由 / 敞开边缘部分处的槽闭合位置。更特别地，近中唇罩部分 1039 可以从托架主体的近中自由 / 敞开边缘部分近中地延伸（例如，从近中牙龈系翼近中地延伸）并且远侧唇罩部分 1038b 可以从托架主体的远侧自由 / 敞开边缘部分远侧地延伸（例如，从远侧牙龈系翼远侧地延伸）。期望地，当处于闭合位置时通过限制锁定夹子 1026 的向唇运动，唇罩部分 1039 和 1038b 防止弓丝从弓丝槽 1020 意外地移除。

[0045] 锁定夹子 1026 还可以包括可以由开槽部分、凹陷部分、突起等形成的接合端部分 1040。接合端部分可以形成于锁定夹子 1026 中的舌自由端 1028 的后端部分处。接合端部分 1040 可以配置成通过由工具接触或以另外方式帮助将锁定夹子 1026 从闭合位置移动到打开位置。作为例子，工具可以接触接合端部分使得舌自由端 1028 向牙合移动，由此向牙合移动唇自由端 1030 远离罩部分 1039 和 1038b 到达围绕牙合系翼 1018 的唇表面的敞开停止凹槽 1042，使得锁定夹子 1026 可以保持在打开位置。

[0046] 当包括时，敞开停止凹槽 1042 可以设在连接其间的牙合系翼的翼间区域 1024 中。此外，敞开停止凹槽 1042 可以包括近中 - 远侧突起 1044（其做什么？）。敞开停止凹槽 1042 还可以包括具有近中和远侧边缘壁 1048 的近中 - 远侧凹陷 1046。凹陷 1046 具有与锁定夹子 1026 的弯曲部分 1032 大致相同的宽度使得边缘壁 1048 可以最小化由预料不到的力施加到托架产生的锁定夹子 1026 的近中 - 远侧移位。可选地，作为凹陷 1046 的附加或替代，

牙合系翼的内壁 1050 也可以最小化由预料不到的力施加到托架产生的锁定夹子 1026 的近中 - 远侧移位（期望地，锁定夹子具有弯曲部分，所述弯曲部分具有的宽度对应于牙合系翼之间的翼间区域的宽度）。

[0047] 图 2A-2C 是图 1A 中所示的自绑扎托架的替代实施例的各种视图。因而本发明可以提供自绑扎托架 1010a，其具有托架主体 1012a、基座 1014、锁定夹子 1026 和桥部分 1052a，所述桥部分在牙龈翼间区域 1024a 中从而连接牙龈远侧系翼的内近中侧和牙龈近中系翼的内远侧。可选地，桥部分 1052a 可以包括具有开口 1056a 的凹陷 1054a 以允许牙科工具的接近从而帮助打开和 / 或闭合托架 1010a。

[0048] 图 3A-3E 是图 2A 中所示的自绑扎托架的另一替代实施例的各种视图，其中本发明可以包括自绑扎托架 1010b，其包括托架主体 1012b、基座 1014、锁定夹子 1026b 和接收构件 1036b。接收构件还可以包括至少一个舌台 1058b。舌台 1058b 可以作为独立工件被提供，其在从罩部分 1038b 向舌间隔的位置从主体 1012b 的相应侧近中地和远侧地延伸。舌台 1058b 可以配置成最小化和 / 或大致防止锁定夹子 1026b 的向舌运动。在该具体例子中，罩部分 1038b 已减小 / 薄化（向牙龈 - 向牙合）并且夹子的凸耳部分的牙龈尖端可以稍稍向唇弯曲以便增强互动性。此外，锁定夹子 1026b 的弯曲部分 1032b 可以包括通孔 1060b，其对应于敞开停止凹槽 1042b 的凹陷 1046，以允许牙科工具接近从而帮助打开和 / 或闭合托架 1010b。

[0049] 托架 1010b 还可以包括替代锁定机构，所述替代锁定机构具有由托架的舌开口接收的锁定夹子的经修改的舌自由端。更特别地，锁定夹子 1026b 可以包括舌自由端 1028b，所述舌自由端具有多个间隔开的可变形指状件 1062b 以便与形成于主体的牙合部分处的舌开口 1064b 接合。可变形指状件 1062b 具有在牙龈自由端处的向外延伸近中 / 远侧凸缘部分 1066b。舌开口 1064b 延伸到腔 1068b 中，所述腔具有的宽度大于舌开口 1064b 的宽度以防止可变形指状件穿过舌开口（当处于非应力状态时）并且从夹子分离。期望地可变形指状件 1062b 朝着彼此变形使得凸缘部分的外缘之间的宽度小于舌开口 1064b 使得锁定夹子 1026b 的舌自由端 1028b 可以通过舌开口 1064b 插入舌腔 1068b 中以便固定在其中。一旦锁定夹子的舌自由端接收到舌腔中，可变形指状件大致返回它们的非应力状态 / 位置。可选地，一旦接收在舌腔中，由于凸缘部分的外缘 1070b 与舌腔的相应近中和远侧侧壁 1072b 主动接合以帮助抑制运动（例如，扭转、近中 - 远侧运动和 / 或另外的运动），可变形指状件可以保持在部分应力状态。

[0050] 图 4A-4D 是图 3A-3E 中所示的自绑扎托架的另一替代实施例，其中接收构件 1036c 还可以包括端壁 1074c，所述端壁互连唇罩 1038c 和舌台 1058c 以限定围绕接收区域中的通孔 1076c 的周边从而覆盖和保护处于闭合位置时的锁定夹子 1026c 的近中和远侧凸耳部分 1031c。与图 3A-3E 中一样，牙龈系翼 1016c 已减小 / 薄化（向牙龈 - 向牙合）并且凸耳部分 1031c 的牙龈尖端可以稍稍向唇弯曲以便增强互动性。此外，凸耳部分 1031c 处的开槽部分 1034c 的宽度可以相应地被提供以配合托架主体 1012c 的宽度从而抑制处于闭合位置时的锁定夹子 1026c 的锁定夹子 1026c 的移位和 / 或扭转。

[0051] 图 5A-5F 是图 3A-3E 中所示的自绑扎托架的另一替代实施例，其中接收构件 1036d 还可以包括作为到牙龈系翼 1016d 的近中 - 远侧延伸部 1078d 的独立工件。近中 - 远侧延伸部 1078d 配置成以“c 杯”的形状互连唇罩部分 1038d 和相应舌台 1058d 以保持处于闭合

位置时的锁定夹子 1026d 的凸耳部分 1031d。

[0052] 图 5E 是图 5A 中的自绑扎牙科托架的横截面图，其进一步示出引导标准牙科器械以便于打开锁定夹子 1026d 的牙合系翼 1018d 之间的主体 1012d 的敞开停止凹槽 1042d 中的凹陷 / 倒角 1046d。

[0053] 图 6A-6C 是图 5A-5E 中所示的自绑扎托架的另一替代实施例的各种视图，其中可以提供替代的锁定机构，替代的锁定机构可以包括围绕舌腔 1068e 的相应侧壁 1072e（例如，近中和远侧侧壁）的棘齿部分 1080e 从而当处于闭合位置时将锁定夹子 1026c 的舌自由端 1028e 的每个凸缘部分 1066e 大致保持在舌腔 1068e 的大体预定位置 1082e 和 / 或区域。棘齿部分 1080e 还可以包括锥形牙合端部分 1084e 以便于舌自由端 1028e 移动到舌腔的预定（牙龈）区域 1082e。

[0054] 图 6B 是图 5E 中所示的自绑扎牙科托架的主体和夹子的替代实施例的横截面图，其中在夹子的舌自由端在近打开位置向唇稍稍枢转之前夹子朝着打开位置向牙龈滑动。

[0055] 图 6C 是图 6A 中的主体和夹子的仰视图，其中锁定夹子的舌自由端牢固地锁定在闭合位置。当夹子朝着打开位置向牙龈滑动时，夹子的舌自由端将由主体的舌部分中的锥形开口引导。

[0056] 图 6E 是锁定夹子 1026e 的透视图，所述锁定夹子还可以包括围绕弯曲部分 1032e 延伸（例如，向唇 - 向舌）的至少一个凹槽 1086e。在一个具体例子中，锁定夹子 1026e 包括一对向唇 - 向舌延伸凹槽 1086e，但是不需要。凹槽 1086e 可以为锁定夹子 1026e 提供附加增强以抑制处于闭合位置时的锁定夹子 1026e 的移位和 / 或扭转。这是真的吗？

[0057] 图 7A-7C 是所示的自绑扎托架的另一替代实施例的各种视图，其中接收构件 1036f 可以包括类似于图 1A 中所示的替代实施例的全罩部分 1038f（例如，不具有减小的厚度），同时还包括舌台 1058f。在该具体实施例中，凸耳部分 1031f 的牙龈尖端部分 1033f 可以保持大体平坦。

[0058] 图 8A-8E 是图 4A-4D 中所示的自绑扎托架的另一替代实施例的各种视图，其中接收构件 1036g 还可以包括从相应的牙龈系翼 1016g 延伸的全罩部分 1038g，由此提供围绕牙龈系翼 1016g 的增加唇表面 1088g。这样做，牙龈系翼 1018g 的罩部分 1019g 可以向舌延伸，至少部分地覆盖通孔 1076g1 的牙龈侧。

[0059] 图 9A-9H 是本发明的自绑扎托架的另一实施例的各种视图，其中托架 1010h 包括经修改的锁定夹子 1026h 和经修改的接收构件 1036h。在该具体实施例中，接收构件 1036h 可以围绕托架主体 1012h 居中地定位并且可以包括连续保持（例如，靠置）通道 1090h 以允许用于保持锁定夹子 1026h 的形状配合容座。期望地，保持通道 1090h 大体上以平行于弓丝槽 1020h 的方式在托架主体 1012h 的相应近中侧和远侧之间延伸。在该具体实施例中，唇自由端 1030h 处的锁定夹子 1026h 的宽度可以减小到与托架主体 1012h 的近中 - 远侧宽度大体相同。此外，锁定夹子 1026h 的唇自由端 1030a 可以包括大体上与保持通道 1090h 对应的单个凸耳部分 1031h（例如，大体上没有槽口）。保持通道还可以由大体 c 形轮廓限定，从而不仅提供形状配合容座（并且限制唇自由端 1030h 的向舌运动），而且可以提供罩部分 1038h 以限制处于闭合位置时的唇自由端 1030h 的向唇运动。可选地，保持通道 1090h 的高度（例如，唇 - 舌高度）可以充分地尺寸确定成（例如，小于或等于弓丝的厚度）使得当锁定夹子 1026h 的自由端部分 1030h 处于闭合位置时可以基本上防止弓丝俘获在其中。

[0060] 图 9F 是包含舌开口 1064h（例如，通孔）的图 9A 中所示的自绑扎牙科托架 1010h 的牙龈视图，所述舌开口是在牙龈系翼 1016h 和牙合系翼 1018h 之间朝着主体的舌部分延伸以便于清洁俘获的牙石 / 牙垢的连续通道。

[0061] 图 9G 是处于闭合位置时的图 9A 中所示的自绑扎牙科托架的主体 1012h 和锁定夹子 1026h 的仰视图，其中基座被移除。在该具体实施例中，舌开口 1064h 完全延伸通过主体 1012h 的舌部分（如上所述），同时舌腔 1068h 的区域已减小。

[0062] 图 10A-10B、10C-10D、11A-11C、12A-12C、13A-13C、14A-14C、15A-15C 和 16A-16C 是本发明的自绑扎牙科托架的替代锁定机构的各种视图。

[0063] 图 10A-10D 是图 9G-9H 中所示的自绑扎牙科托架的替代实施例的各种视图，其中舌腔 1068m 具有。

[0064] 图 10A-10B 提供自绑扎托架 1010i，其可以包括具有锁定夹子 1026i 和舌腔 1068i 的经修改的锁定布置，所述舌腔具有带锁定凹槽 / 棘齿的居中定位的稳定构件以便于并且将锁定夹子的舌自由端牢固地锁定在打开和闭合位置。在该具体实施例中，锁定夹子 1026i 包括具有可变形指状件 1062i 的 Y 形 /U 形舌自由端 1028i。可变形指状件 1062i 可以包括配置成主动地接合稳定构件 1098i 的打开位置凹槽 1094i（以帮助将托架保持在打开位置）或闭合位置凹槽 1096i（以帮助将托架保持在闭合位置）的向内延伸凸缘部分 1066i。稳定构件 1098i 可以大体上位于舌腔 1068i 的中心区域中（例如，大体上平行于翼间区域 1024i），但是不需要。在该具体实施例中，稳定构件 1098i 从舌开口 1064 的牙龈侧延伸到舌腔 1068i 内的中间位置使得每个可变形指状件 1062i 沿着稳定构件 1098i 的至少一侧延伸。

[0065] 在使用中，可变形指状件朝着彼此压缩以减小用于插入舌开口中的舌自由端部分 1028i 的总宽度。一旦舌自由端部分延伸通过舌开口 1064i，可变形指状件返回非应力位置，其包括大体小于稳定构件 1098i 的接合肋的宽度的宽度。锁定夹子 1026h 的插入继续进入舌腔孔 1068i 中，其中当接触第一对接合肋 1100i 时凸缘部分 1066i 向外偏转直到凸缘部分 1066i 接收在一对打开位置凹槽 1094i 中并且当托架处于打开位置时将保持。为了获得闭合位置，锁定夹子 1026i 进一步插入（向牙龈）舌腔 1068i 中，其中当接触第二对接合肋 1102i 时凸缘部分 1066i 再次向外偏转直到凸缘部分 1066i 接收到一对闭合位置凹槽 1096i 中使得托架 1010i 大致保持在闭合位置。为了将托架返回打开位置，锁定夹子 1026i 朝着第二对接合环向牙合移动直到凸缘部分 1066i 接收到打开位置凹槽 1094i 中。可变形指状件 1062i（例如，凸缘部分 1066i）和稳定构件 1098i（闭合位置凹槽）的主动接合帮助抑制处于闭合位置时的锁定夹子 1026i 的运动（例如，扭转、近中 - 远侧运动和 / 或另外的运动）。

[0066] 自绑扎牙科托架 1010i 可以包含舌开口 1064i（例如，通孔），所述舌开口可以包括两个通道 1064i'，所述两个通道从牙龈系翼 1016i 朝着主体的舌部分延伸到牙合系翼 1018i 处的单个通道 1064i" 以便于清洁俘获的牙石 / 牙垢。

[0067] 图 10C-10D 提供自绑扎托架 1010j，其可以包括具有锁定夹子 1026j 和舌腔 1068j 的经修改的锁定布置，所述舌腔具有近中和远侧定位的锁定凹槽 / 棘齿以便于并且将锁定夹子的舌自由端牢固地锁定在打开和闭合位置。在该具体实施例中，锁定夹子 1026j 包括具有可变形指状件 1062j 的 Y 形 /U 形舌自由端 1028j。可变形指状件 1062i 可以包括配置

成主动地接合舌腔 1068j 的近中和远侧侧壁 1072j 的打开位置凹槽 1094j（以帮助将托架保持在打开位置）或闭合位置凹槽 1096j（以帮助将托架保持在闭合位置）的向外延伸凸缘部分 1066j。

[0068] 在使用中，可变形指状件朝着彼此向内压缩以减小用于通过舌开口插入的舌自由端部分 1028j 的总宽度。一旦舌自由端部分延伸经过第一对接合肋 1100j，当凸缘部分 1066j 接收在一对打开位置凹槽 1094j 中时可变形指状件试图返回非应力位置，并且当托架处于打开位置时将保持。为了获得闭合位置，锁定夹子 1026j 进一步插入（向牙龈）舌腔 1068j 中，其中当接触第二对接合肋 1102j 时凸缘部分 1066j 再次向内偏转直到凸缘部分 1066j 接收到一对闭合位置凹槽 1096j 中使得托架 1010j 大致保持在闭合位置。为了将托架返回打开位置，锁定夹子 1026j 朝着第二对接合肋 1102j 向牙合移动直到凸缘部分 1066j 接收到打开位置凹槽 1094i 中。可变形指状件 1062j（例如，凸缘部分 1066j）和稳定构件 1098j（闭合位置凹槽）上的主动接合（例如，处于压缩（应力位置）的凸缘部分使得提供作用于侧壁 1072j 的向外力）帮助抑制处于闭合位置时的锁定夹子 1026j 的运动（例如，扭转、近中 - 远侧运动和 / 或另外的运动）。

[0069] 图 11A-11B 是图 3E 中所示的自绑扎托架的另一替代实施例的各种视图，其中舌腔 1068k 还包括在大体中心位置从牙龈侧壁 1073k 延伸的稳定构件 1098k。在该具体实施例中，稳定构件 1098k 的宽度和可变形指状件 1062k 之间的间隔的宽度可以配置成彼此对应以帮助抑制处于闭合位置时的锁定夹子 1026k 的运动（例如，扭转、近中 - 远侧运动和 / 或另外的运动）。

[0070] 如图 11A-11B 中所示，舌腔 1068k 还可以包括倒角部分（例如，凹陷）1099k 以引导锁定夹子 1026k 的舌自由端部分 1028k 并且在从打开位置过渡到闭合位置期间帮助膨胀锁定夹子 1026。此外，倒角部分 1099k 可以配置成提供处于闭合位置时的锁定夹子 1026k 的弯曲部分 1032k 的间隙。

[0071] 图 12A-12C 是图 3E 中所示的自绑扎托架的另一替代实施例的各种视图，其中舌腔 10681 还可以包括肋 11041 和楔部分 11061 以主动地接合具有桥部分 11081 的锁定夹子 1026k。桥部分 11081 互连锁定夹子 10261 的舌自由端 10281 的牙龈部分处的可变形指状件 10621。肋部分 11041 从牙龈侧壁 10731 间隔地定位并且配置成接合具有用于形状配合锁定的相应近中 - 远侧凹槽 11111 的桥部分 11081 以将锁定夹子大致保持在闭合位置。楔部分在腔内向牙合定位在中心位置并且配置成基本上防止锁定夹子 10261 从舌腔 10681 移除。在该具体实施例中，桥部分与肋的形状配合锁定和 / 或楔 11061 配合在可变形指状件 10621 之间的相应间隔内配置成帮助抑制处于闭合位置时的锁定夹子 10261 的运动（例如，扭转、近中 - 远侧运动和 / 或另外的运动）。此外，颈部分 10291 的宽度可以对应（例如，配合）舌腔 10681（和舌开口 10641）的近中远侧宽度以进一步帮助抑制处于闭合位置时的锁定夹子 10261 的运动（例如，扭转、近中 - 远侧运动和 / 或另外的运动）。

[0072] 图 13A-13C 是图 11A 中所示的自绑扎托架的另一替代实施例的各种视图，其中舌腔 1068m 还可以包括多个近中 - 远侧间隔开的稳定构件 1098m，所述稳定构件在舌腔 1068m 的大体居中位置从牙龈侧壁 1073m 延伸。在该具体实施例中，锁定夹子 1026m 还可以包括从舌自由端 1028m 和可变形指状件 1062m 的中间延伸的稳定指状件 1110m。稳定指状件 1110m 的宽度和稳定构件 1098m 之间的间隔的宽度配置成彼此对应（例如，配合和 / 或主动地接

合）以帮助抑制处于闭合位置时的锁定夹子 1026m 的运动（例如，扭转、近中 - 远侧运动和 / 或另外的运动）。可选地，舌自由端 1028m 的近中 - 远侧宽度（例如，大体上横越凸缘部分 1066m 获得）配置成比舌腔 1068m 的近中 - 远侧宽度更宽（在非应力状态下）使得当插入舌腔 1068m 内时，凸缘部分 1066m 可以对相应的近中和远侧侧壁 1072m 施加向外力（例如，在应力状态下）以帮助抑制处于闭合位置时的锁定夹子 1026m 的运动（例如，扭转、近中 - 远侧运动和 / 或另外的运动）。

[0073] 图 14A-14C 是图 11A 中所示的自绑扎托架的另一替代实施例的各种视图，其中舌腔 1068m 还可以包括多个近中 - 远侧间隔开的稳定构件 1098m，所述稳定构件在舌腔 1068m 的大体居中位置从牙龈侧壁 1073m 延伸。在该具体实施例中，锁定夹子 1026m 还可以包括从舌自由端 1028m 和可变形指状件 1062m 的中间延伸的稳定指状件 1110m。稳定指状件 1110m 的宽度和稳定构件 1098m 之间的间隔的宽度配置成彼此对应（例如，配合和 / 或主动地接合）以帮助抑制处于闭合位置时的锁定夹子 1026m 的运动（例如，扭转、近中 - 远侧运动和 / 或另外的运动）。可选地，舌自由端 1028m 的近中 - 远侧宽度（例如，大体上横越凸缘部分 1066m 获得）配置成比舌腔 1068m 的近中 - 远侧宽度更宽（在非应力状态下）使得当插入舌腔 1068m 内时，凸缘部分 1066m 可以对相应的近中和远侧侧壁 1072m 施加向外力（例如，在应力状态下）以帮助抑制处于闭合位置时的锁定夹子 1026m 的运动（例如，扭转、近中 - 远侧运动和 / 或另外的运动）。

[0074] 图 14A-14C 是图 13A 中所示的自绑扎托架的另一替代实施例的各种视图，其中舌腔 1068n 还可以包括在大体中心位置从牙龈侧壁 1073n 延伸的单个稳定构件 1098n。在该具体实施例中，舌自由端 1028n 的近中 - 远侧宽度（例如，大体上横越凸缘部分 1066n 获得）可以配置成比舌腔 1068m 的近中 - 远侧宽度更宽（在非应力状态下）使得当插入舌腔 1068n 内时，凸缘部分 1066n 可以对相应的近中和远侧侧壁 1072n 施加向外力（例如，在应力状态下）以帮助抑制处于闭合位置时的锁定夹子 1026n 的运动（例如，扭转、近中 - 远侧运动和 / 或另外的运动）。此外，锁定机构还可以包括舌腔 1068n 的更宽稳定构件 1098n，增加的舌自由端部分 1028n 近中 - 远侧宽度与舌腔 1068 近中 - 远侧宽度的比率，或者两者，使得附加力可以由可变形指状件 1062n 的中间部分 1112n 提供给稳定构件 1098n 以进一步帮助抑制处于闭合位置时的锁定夹子 1026n 的运动（例如，扭转、近中 - 远侧运动和 / 或另外的运动）。

[0075] 图 15A-15C 是图 3E 中所示的自绑扎托架的另一替代实施例的各种视图，其中锁定夹子 1026o 的舌自由端 1028o 还可以包括颈部分 1029o 和中间凹槽 1114o 以帮助可变形指状件 1062 的变形。在该具体实施例中，舌自由端 1028o 的近中 - 远侧宽度（例如，大体上横越凸缘部分 1066o 获得）可以配置成比舌腔 1068o 的近中 - 远侧宽度更宽（在非应力状态下）使得当插入舌腔 1068o 内时，凸缘部分 1066o 可以对相应的近中和远侧侧壁 1072o 施加向外力（例如，在应力状态下）以帮助抑制处于闭合位置时的锁定夹子 1026o 的运动（例如，扭转、近中 - 远侧运动和 / 或另外的运动）。此外，颈部分 1029o 可以延伸到舌腔中（当处于闭合位置时）并且可以尺寸确定成对应于舌开口 1064o 的宽度以在打开和闭合位置之间的过渡期间帮助引导锁定夹子 1026o。

[0076] 图 16A-16C 是图 3E 中所示的自绑扎托架的另一替代实施例的各种视图，其中更宽的近中和远侧侧壁 1072p 可以被提供从而使舌开口 1064p 的近中和远侧边缘 1116p（主体

的牙合侧）大体上齐平，由此导致减小的舌腔 1068p。此外，锁定夹子 1026p 还可以包括具有可变形指状件 1062p 的 U 形舌自由端 1028p，所述可变形指状件具有在其间形成舌开口 1118p 的面向内凸缘部分 1066p。凸缘部分 1066p 可以包括相对边缘 1120p，所述相对边缘具有成角、弯曲和 / 或另外形式的部分以帮助将锁定夹子 1026p 固定到托架主体 1012p。更特别地，在锁定夹子 1026p 的插入期间舌自由端 1028p 向牙龈插入舌开口 1064p 的牙合侧，其中凸缘部分 1066p 的相对边缘 1120p 与舌腔 1068p 的牙合突起 1122p 接触。可变形指状件 1062p 可以向外变形，由此增加牙龈开口 1118p 的宽度以允许牙合突起 1122p 通过牙龈开口 1118p。这样做，允许舌自由端 1028p 进一步插入舌腔中以便将锁定夹子固定到主体 1012p。牙龈开口 1118p 可以配置成使得在锁定夹子的安装期间牙龈开口 1118p 的牙龈侧允许牙合突起 1122p 的通过，而牙龈开口的牙合侧基本上防止牙合突起 1122p 的通过使得锁定夹子可以保持固定到主体 1012p。期望地，颈部分 1029p 可以延伸到舌腔中（当处于闭合位置时）并且可以尺寸确定成对应于舌开口 1064p 的宽度以在打开和闭合位置之间的过渡期间帮助引导锁定夹子 1026p。期望地，颈部分 1029p 的宽度（例如，从远侧可变形指状件的远侧边缘到近中可变形指状件的近中边缘）可以对应（例如，配合）舌腔 1068p（和舌开口 1064p）的近中远侧宽度以进一步帮助在打开和闭合位置之间引导锁定夹子和 / 或抑制处于闭合位置时的锁定夹子 1026p 的运动（例如，扭转、近中 - 远侧运动和 / 或另外的运动）。

[0077] 在本发明的又一实施例中，自绑扎正畸托架在图 17A-17I 中被显示，并且大体上由附图标记 610 指示。可以看到，正畸托架 610 包括主体 612，附连到主体的舌安装基座 614，以及具有锁定夹子 626 和保持构件 627 的锁定机构。主体 612 可以包括从主体 612 的唇表面延伸的一对横向间隔的牙龈系翼 616 和一对横向间隔的牙合系翼 618。牙龈系翼 616 和牙合系翼 618 大体上向舌弯曲。弓丝槽 620 近中地 - 远侧地横越主体 612 并且在牙龈和牙合系翼 616 和 618 之间延伸。弓丝槽 620 向唇敞开以接收弓丝 622。

[0078] 第一桥部分 660 和第二桥部分 661 设在翼间区域 624 中，第一桥部分 660 跨越在牙龈系翼 616 之间并且第二桥部分 661 跨越在牙合系翼 618 之间。应当领会第一和第二桥部分 660 和 661 从弓丝槽的唇表面（并且限定其部分）一直延伸到相应的系翼 616 和 618 的唇表面。

[0079] 保持构件 627 可以包括在牙龈系翼 616 上的第一对止挡 644 和第二对止挡 646 以禁止锁定夹子 626 从闭合位置（例如，止挡 644 中的主动第一闭合位置或止挡 646 中的第二闭合位置）意外移动到打开位置并且可选地当锁定夹子 626 枢转到打开位置时保持它打开。每个止挡限定第一开口、至少一个引导部分和至少一个凸缘。第一对止挡 644 从相应的牙龈系翼 616 大体向外延伸并且包括第一开口 664、第一引导部分 674 和第一凸缘 668，所述第一凸缘用于与锁定夹子 626 接合以保持第一闭合位置（例如，用于主动第一闭合位置的主动托架）。类似地，第二对止挡 646 从相应的牙龈系翼 616 大体向外延伸并且包括第二开口 666、引导部分 675 和第二凸缘 669，所述第二凸缘用于与锁定夹子 626 接合以保持第二闭合位置（例如，用于被动第二闭合位置的被动托架）。应当领会第一和第二对止挡 644 和 646 可以定位成使得每对止挡 644 和 646 中的一个止挡与每对止挡 644 和 646 中的相应的另一个止挡向牙龈 - 向牙合并置。期望地，每个牙龈系翼上的两对止挡可以限定大体 W 形配置。还应当领会两对止挡可以位于任何地方，例如沿着围绕翼间区域 624 的牙龈

系翼 616 的相应内表面。

[0080] 锁定夹子 626 枢转地安装在牙合系翼 618 上并且在禁止接近弓丝槽 620 的两个闭合位置（图 34-37）和允许接近弓丝槽 620 的打开位置（图 31-33）之间可移动。应当领会锁定夹子 626 呈具有大体 Y 形配置的弹簧元件的形式。更特别地，锁定夹子 626 可以包括具有一对相对侧臂 650 和 652 的头部分 628，所述侧臂限定其间的开口 629。应当领会头部分 628 和 / 或侧臂 650 和 652 配置成延伸横越弓丝槽 620。

[0081] 臂 650 和 652 可以包括自由端（例如，大体近中和远侧延伸，但是不需要），所述自由端内弯以限定相对定向的间隔开的钩端 672。（牙龈）钩端 672 可以接收在形成于牙龈系翼 616 中的相应的第一开口 664 和相应的第二开口 666 中。

[0082] 锁定夹子 626 也可以包括连接头部 628 和具有相对自由端（例如，大体上近中和远侧延伸，但是不需要）的基部 692，所述自由端外弯以相应地限定相对定向的间隔开的尾端 632 和 634。尾端 632 和 634 的每一个接收在形成于牙合系翼 618 中的一个中的相应的腔孔 636 和 638 中。腔孔 636 和 638 可以完全延伸（例如，近中地 - 远侧地）通过相应的系翼 618 或部分地通过其中。

[0083] 为了在第一闭合位置闭合正畸托架 610，锁定夹子 626 围绕尾部 632 和 634 朝着锁定机构 627 的第一对止挡 644（例如，牙龈第一对止挡）围绕牙龈系翼 616 枢转。钩端 672（例如，672a 和 672b）与第一引导部分 674 的相应的唇表面进行接触并且沿其向牙龈被引导。钩端 672 沿着第一引导部分 674 的唇表面连续地被引导直到钩端 672 延伸超出第一对止挡 644 的凸缘 668。这允许锁定夹子 626 朝着其非应力状态回弹使得钩 672 接合相应的凸缘 668，由此将锁定夹子 626 保持在第一闭合位置。这样做，锁定夹子 626 向舌偏转使得当处于第一闭合位置时可以基本上或完全保持锁定夹子、弓丝和弓丝槽之间的接触（图 36A、36B 和 37）。

[0084] 更特别地，由钩端 672 施加到第一引导部分 674 的唇表面的作用力导致锁定夹子 676 偏转（例如，向牙龈 - 向牙合）到应力状态。当钩端 672 枢转超出相应的第一止挡 644 并且大体上向舌枢转到第一开口 664 中时，锁定夹子 626 朝着第一凸缘 668 回弹以试图返回其非应力状态。这样做，在其第一闭合位置期间第一对止挡 644 的第一凸缘 668 防止相应的钩端 672 从第一开口 664 移除。第一凸缘 668 禁止处于其应力状态时的锁定夹子 626 朝着打开位置往回移动。以该方式，弓丝槽 620 保持闭合，由此将弓丝 622a 主动地保持在弓丝槽中。

[0085] 为了在第二闭合位置闭合正畸托架 610，锁定夹子 626 围绕尾部 632 和 634 朝着锁定机构 627 的第二对止挡 646 围绕牙龈系翼 616 枢转。钩端 672 与第二引导部分 675 的相应的唇表面进行接触并且沿其向牙龈被引导。钩端 672 沿着第二引导部分 675 的唇表面连续地被引导直到钩端 672 延伸超出（例如，向牙龈 - 向牙合）第二对止挡 646 的第一凸缘 669。这允许锁定夹子 626 朝着其非应力状态回弹使得钩端 672 接合相应的第二凸缘 669，由此将锁定夹子 626 保持在第二闭合位置。这样做，锁定夹子 626 向舌稍稍偏转使得当处于第二闭合位置时可以保持锁定夹子 626 和弓丝之间的最小接触或无接触（图 34A、34B 和 35）。

[0086] 更特别地，由钩端 672 施加到第二引导部分 675 的唇表面的作用力导致锁定夹子 676 偏转（例如，向牙龈 - 向牙合）到应力状态。当钩端 672 枢转超出相应的第二止挡 646

并且大体上向舌枢转到第二开口 666 中时，锁定夹子 626 朝着第二凸缘 669 回弹以试图返回其非应力状态。这样做，在其第二闭合位置期间第二凸缘 669 防止相应的钩端 672 从第二开口 666 移除。因而，第二凸缘 669 禁止处于其应力状态时的锁定夹子 626 朝着打开位置往回移动。以该方式，弓丝槽 620 保持闭合，由此将弓丝 622b 主动地保持在弓丝槽中。

[0087] 为了释放弓丝，向牙龈 - 向牙合推动锁定夹子 626 以将钩端 672 从相应的第一或第二对止挡 644 和 646 脱离。在一个具体例子中为了从第一闭合位置释放弓丝，钩端 672 首先向牙龈 - 向舌移动（典型地沿着第三引导部分 676 的唇表面）超出第一凸缘 668。在另一具体例子中为了从第二闭合位置释放弓丝，钩端 672 首先向牙龈 - 向舌移动（典型地沿着第一引导部分 674 的唇表面）超出第二凸缘 669。其后，锁定夹子 626 可以从相应的第一和第二对止挡 644 和 646 中的任意一个移除使得锁定夹子 626（处于其非应力状态）围绕尾部 632 和 634 自由枢转。

[0088] 在一个具体例子中，可以预料当锁定夹子 626 沿着第一引导件 674 移动（例如，向牙龈引导或推动）时，锁定夹子 626 从第二对止挡 646 脱离。一旦锁定夹子 626 移动超出第一对止挡 644，钩端 672 向舌 - 向牙合偏压到第一开口 664 中，由此将锁定夹子从第二闭合位置过渡到第一闭合位置。

[0089] 可选地，托架 610 还可以包括用于接收可选的绑线的凹槽 680。当包括时，凹槽 680 可以沿着系翼 616 的外部定位。应当领会凹槽 680 可以配置成通过提供接近锁定夹子 626 的臂帮助从第二闭合位置和 / 或第一闭合位置释放锁定夹子 626。例如，当锁定夹子 626 正在沿着第三引导件 676 从第一闭合位置移动（例如，向牙龈引导或推动）时，钩端 672 将向舌并且在系翼的舌自由端下方被引导到凹槽 680 中使得锁定夹子的弹簧张力将自动地移动（例如，向唇引导）锁定夹子 626 通过凹槽 680 到达打开位置。

[0090] 图 17J-17L 是图 17A-17I 中所示的自绑扎托架的另一替代实施例的各种视图，其中锁定夹子 626a 的牙合部分包括用于与腔孔 636a 和 638a 枢转接合的一对向舌弯曲臂 696a。臂 696a 间隔开以限定锁定夹子 626a 的大体 Y 形牙合部分。

[0091] 具有棘齿设计的自绑扎托架可以包括可以附连到托架主体的系翼（例如，一个或多个牙龈系翼）的单个棘齿或多个棘齿。棘齿可以是牙龈系翼的一体部分（外部或内部），或者可以通过适当的制造方法永久地附连到系翼，或者可以附连到主体上的任何其它（适当的）位置。棘齿设计可以具有多个槽以当闭合时锁定夹子的顶部腿部（在弓丝夹子的唇部分处或优选地在夹子的唇自由端处）。

[0092] 据信该接合设计可以配置成使得可以通过用手指简单地推动夹子和 / 或以另外方式（例如，工具）而打开和 / 或闭合夹子。有利地，该基于棘齿的接合机构可以配置成使得相比于现有技术可以消除用器械打开或闭合夹子的需要。

[0093] 图 18A-18D 是图 17A 中所示的自绑扎托架的替代实施例的各种视图，其中具有锁定夹子 626b 和保持构件 627b 的经修改的基于“棘齿”的接合机构可以被提供。主体 612b 可以包括沿着主体 612b 延伸的一对横向间隔的牙龈系翼 616b 和一对横向间隔的牙合系翼 618b。牙龈系翼 616b 大体上向舌弯曲，由此形成保持构件 627b 的一部分。

[0094] 保持构件 627b 可以包括在牙龈系翼 616b 上的一对相对止挡 644b 以禁止锁定夹子 626b 从闭合位置意外移动到打开位置并且可选地当锁定夹子 626b 枢转到打开位置时保持它打开。止挡 644b 可以是相应的牙龈系翼 616b 的一体延伸部，从其向舌弯曲以形成开

口 664b、引导部分 674b 和凸缘 668b，所述凸缘用于与锁定夹子 626b 接合以保持闭合位置。期望地，每个牙龈系翼上的止挡 644b 可以限定大体钩状配置，但是不需要。

[0095] 锁定夹子 626b 可以包括基部 692b，所述基部具有枢转地安装在牙合系翼 618b 上的相对基部臂 693b。该间隔开的基部臂 693b 还可以相应地包括相对定向的尾端 632b 和 634b。尾端 632b 和 634b 的每一个接收在形成于牙合系翼 618b 中的一个中的相应腔孔 636b 和 638b 中。在该具体实施例中，基部臂 693b 是大体平坦的。

[0096] 应当领会锁定夹子 626b 可以呈具有大体 T 形配置的弹簧元件的形式。更特别地，锁定夹子 626b 可以包括头部分 628b 和当处于闭合位置时大体上覆盖弓丝槽 620b 的中间部分 649b。头部分 628b 和中间部分 649b 可以相应地包括一对侧壁 650b 和 652b，所述侧壁从头部分 628b 和中间部分 649b 近中地和远侧地延伸以限定其间的凹陷 651b。臂 650b 可以接收在相应的开口 664 中，所述开口形成于牙龈系翼 616 中以将锁定夹子 626b 固定在闭合位置。

[0097] 可选地，托架 610b 还可以包括用于接收可选的绑线的凹槽 680b。当包括时，凹槽 680b 可以沿着牙龈系翼 616b 的外部定位。应当领会凹槽 680b 可以配置成通过提供接近锁定夹子 626b 的臂 650b 帮助从闭合位置释放锁定夹子 626b（例如，臂 650b）。例如，当锁定夹子 626b 正在沿着引导件 674b 从闭合位置移动（例如，向牙龈引导或推动）时，臂 650b 将向舌并且在系翼的舌自由端下方被引导到凹槽 680b 中使得锁定夹子的弹簧张力将自动地移动（例如，向唇引导）锁定夹子 626b 通过凹槽 680 到达打开位置。

[0098] 图 19A-19E 是图 18A-18D 中所示的自绑扎托架的另一替代实施例的各种视图，其中保持构件 627c 已减小，从牙龈系翼 616c 的一部分向内延伸。这样做，牙龈系翼 616c 的钩部分可以可用于接收（一个或多个）可选的绑线。

[0099] 从临床的观点来看最后主动阶段中的锁定夹子 626c 和弓丝 622c 之间的互动性可能是关键的。据信夹子设计的变化可以允许夹子和弓丝之间的互动性。一般而言，互动性可以被定义为夹子具有一定空间以便移动（例如，当处于闭合位置时“浮动”和 / 或可移动）。例如如图 19D 中所示，提供“棘齿”构件的放大图，其可以单独地或与相对棘齿构件组合地配置成获得该类型的互动性。更特别地，如图 19D 中所示，在夹子处于闭合位置之后当夹子的唇自由端接合锁定棘齿槽时可以获得间隙。

[0100] 夹子的中间（例如，大体上可以与弓丝相接触的夹子的部段）可以具有足够的挠性以大体上保持预定互动性。几何形状变化（即，更少的材料）和 / 或夹子的更软材料两者可以被优化以获得夹子的中间部段和弓丝之间的预定互动性（图 19C）。

[0101] 一旦夹子处于最后锁定位置，张力（弹簧力）可以在夹子中生成。因此，应当领会当从最后锁定位置进一步向下（例如，向舌）推动夹子时，张力将牵引夹子的尖端（例如，在夹子的唇自由端处的 T 形或另外形状的柱）使得夹子可以从槽（例如，（一个或多个）牙龈棘齿槽）释放到打开位置。

[0102] 图 20A-20B 是图 19A-19E 中所示的自绑扎托架的另一替代实施例的各种视图，其中锁定夹子 626d 的基部 692d 可以包括弯曲基部臂 693d。

[0103] 图 21A-21C 是图 19A-19E 中所示的自绑扎托架的另一替代实施例的各种视图，其中尾端 632e 和 634e 可以作为从基部臂 693e 延伸的大体矩形构件被提供。这样做，相应的腔孔 636e 和 638e 已成为经修改的矩形开口以对应于矩形尾端 632e 和 634e。

[0104] 图 22A-22C 是图 19A-19E 中所示的自绑扎托架的另一替代实施例的各种视图，其中腔孔 636f 和 638f 已配置为 8 字形使得锁定夹子 626f 可以在打开位置（例如，相应的腔孔 636f、638f 的舌 - 牙合侧 636f' 和 638'）和闭合位置（例如，相应的腔孔 636f、638f 的唇 - 牙龈侧 636f" 和 638f"）之间滑动 - 旋转。

[0105] 图 23A-23B 是图 19A-19E 中所示的自绑扎托架的另一替代实施例的各种视图，其中腔孔 636g 和 638g 已配置为 8 字形使得锁定夹子 626g 可以在打开位置（例如，相应的腔孔 636g、638g 的唇 - 牙合侧 636g' 和 638g'）和闭合位置（例如，相应的腔孔 636g、638g 的舌 - 牙龈侧 636g" 和 638g"）之间滑动 - 旋转。

[0106] 不同于仅仅围绕支点旋转的自由旋转铰接夹子设计，如本文中所述，该附加实施例可以独立地或优选同时包括旋转和滑动运动两者。据信在夹子闭合期间的向上滑动运动中，图 23D-23E，较小的应力可以在夹子中生成使得可以防止永久变形。

[0107] 图 24A-24B 是图 19A-19E 中所示的自绑扎托架的另一替代实施例的各种视图，其中还可以提供第二对保持（舌）开口 666h。在该具体实施例中，保持构件 627h 可以包括在牙龈系翼 616h 上的第一对止挡 644h 和第二对止挡 646h 以禁止锁定夹子 626h 从闭合位置（例如，止挡 644h 中的主动第一闭合位置或止挡 646h 中的第二闭合位置）意外移动到打开位置并且可选地当锁定夹子 626h 枢转到打开位置时保持它打开。每个止挡限定第一开口、至少一个引导部分和至少一个凸缘。第一对止挡 644h 从相应的牙龈系翼 616 大体向外延伸并且包括第一开口 664h、第一引导部分 674h 和第一凸缘 668h，所述第一凸缘用于与锁定夹子 626h 接合以保持第一闭合位置（例如，用于主动第一闭合位置的主动托架）。类似地，第二对止挡 646h 从相应的牙龈系翼 616 大体向外延伸并且包括第二开口 666h、引导部分 675h 和第二凸缘 669，所述第二凸缘用于与锁定夹子 626h 接合以保持第二闭合位置（例如，用于被动第二闭合位置的被动托架）。应当领会第一和第二对止挡 644h 和 646h 可以定位成使得每对止挡 644h 和 646h 中的一个止挡与每对止挡 644h 和 646h 中的相应的另一个止挡向牙龈 - 向牙合并置。期望地，每个牙龈系翼上的两对止挡可以限定大体 W 形配置。

[0108] 如图 22 和 24 中所示，本发明可以包括具有夹子滑动 / 枢转机构的自绑扎托架的另一实施例，所述夹子滑动 / 枢转机构可以配置成减小夹子中的张力和 / 或防止夹子的任何由此产生的永久变形从而大体上保持夹子的功能性。

[0109] 本发明还可以提供自绑扎托架的另一实施例，如图 25A-25H 中所示。一般而言，自绑扎托架可以包括与基座模制的主体和 C 形夹子。夹子具有在弓丝槽上在牙龈和牙合两个方向上滑动的两个弯曲端部，并且取决于闭合的模式（牙龈或牙合），系统将在处理的过程期间表现主动或被动。更特别地，该托架概念具有三个部件（在上面的图中看到）：主体、夹子和基座。夹子可以成形为类似 C 并且能够在牙龈和牙合两种模式下闭合。在矩形 / 方形弓丝就座在主体的槽中的情况下，该夹子可以表现与相同弓丝被动和主动接合，这取决于夹子的哪个端部覆盖弓丝的槽。该概念的独特性是能够从被动阶段变为主动阶段（反之亦然）而不改变丝。然而，可以预料圆形丝将倾向于在牙龈和牙合两种闭合模式下保持被动阶段。夹子具有 C 形侧面形状（参见下面的图）并且具有两个弯曲端部。夹子的两个端部具有两个不同的夹子跨度（参见下面的图中的红色箭头）。在正畸治疗阶段中，托架具有被动阶段（弓丝和夹子之间无接触）和主动阶段（弓丝和夹子之间干涉接触）。对于细节

参见下面的图。在被动阶段中（图 25G）当夹子的较大端部（例如，牙龈端）覆盖弓丝时，在夹子和弓丝之间没有接触。当夹子处于打开位置时，它不会覆盖弓丝，图 25H。在主动阶段中（图 25I）当夹子的较小端部覆盖弓丝时，在夹子和弓丝之间有干涉接触。期望地，双阶段托架可以设计成在被动阶段和主动阶段具有夹子和弓丝之间的互动性。

[0110] 图 25J 显示被动阶段中的弓丝和夹子的牙合端之间的互动性。相同设计概念可以在主动阶段中用于夹子的牙龈端以便获得弓丝和夹子的牙龈端之间的互动性。期望地，在被动阶段期间，在弓丝和夹子之间没有物理接触。然而，在一些错牙合情况中，弓丝将开始与夹子接触。由于在保持通道中的夹子上方的间隙（夹子的牙合自由端和保持壁（例如，罩）的舌表面之间的区域），因此将获得夹子和弓丝之间的互动性。

[0111] 在该具体实施例中，本发明的自绑扎托架，其中托架 1010q 包括经修改的锁定夹子 1026q 和经修改的接收构件 1036q。接收构件 1036q 可以包括第一接收构件 1036q'，所述第一接收构件可以围绕托架主体 1012q 的牙龈系翼 1016q 近中地和远侧地定位并且可以包括非连续保持（例如，靠置）通道 1090q，所述保持通道包括近中和远侧部分 1091q 以允许用于锁定夹子 1026q 的相应凸耳部分 1031q 的形状配合容座。期望地，保持通道 1090q 的近中和远侧部分 1027q 大体上以平行于弓丝槽 1020q 的方式延伸。在该具体实施例中，唇自由端 1030q 处的锁定夹子 1026q 的宽度可以与托架主体 1012q 的近中－远侧宽度大体相同。此外，锁定夹子 1026q 的唇自由端 1030q 可以包括布置在凸耳部分 1031q 之间的槽口部分 1034q。保持通道还可以由大体 c 形轮廓限定从而不仅提供形状配合容座（并且限制唇自由端 1030q 的向舌运动），而且可以提供罩部分 1038h 以限制处于闭合位置时的唇自由端 1030h 的向唇运动。可选地，保持通道 1090q 的高度（例如，唇－舌高度）可以充分地尺寸确定成（例如，小于或等于弓丝的厚度）使得当锁定夹子 1026q 的自由端部分 1030q 处于闭合位置时可以基本上防止弓丝俘获在其中。

[0112] 接收构件 1036q 还可以包括第二接收构件 1036q"，所述第二接收构件可以围绕牙合系翼 1018q 之间的翼间区域 1024q 居中地定位。翼间区域 1024q 可以包括具有突起 1044q 的敞开停止凹槽 1042 以帮助夹子从打开位置移动到闭合位置。期望地，唇－牙合自由端 1122q 的宽度对应于翼间区域 1024q 的宽度以便接收唇－牙合自由端 1122q。

[0113] 在该实施例中托架 1010q 可以配置成用于两个闭合位置（主动闭合位置和被动闭合位置）和打开位置。在主动闭合位置（图 25G），锁定夹子 1026q 向牙合移位使得唇－牙龈自由端 1130q 主动地接合弓丝 1022q 锁定夹子 1026。在被动闭合位置（图 25H），锁定夹子 1026q 向牙龈移位使得唇－牙合自由端 1122q 闭合（例如，覆盖）弓丝槽 1020，同时基本上不与弓丝接触。有利地，锁定夹子 1026q 可以进一步向牙龈移位，如图 25I 中所示，从而在被动闭合位置容纳更小的弓丝。在打开位置（图 25F），锁定夹子 1026q 大体上定位成使得唇－牙龈自由端 1030q 和唇－牙合自由端 1122q 之间的间隔 1124q 大体上平行于弓丝槽 1020 定向从而允许位于其中的弓丝 1022 的移除。

[0114] 图 26A-26H 是本发明的自绑扎托架的另一实施例的各种视图，其可以包括与基座 1014r 模制的主体 1012r（例如，菱形主体设计）和至少一个夹子 1026r（例如，多个夹子）。更特别地，夹子 1026r（例如，金属夹子）和主体齿条 1126r 可以通过微加工过程形成。夹子 1026r 和主体 1012r 可以设计成匹配齿条机构或以另外方式沿着唇－舌方向，允许夹子锁定在不同位置以用于不同的丝尺寸。可调节夹子 1026r 包括与相应的主体齿条 1126r 对

应和/或匹配的齿条 1128r 以用于夹子 1026r 的棘齿作用/调节。可调节夹子 1026r 也可以允许弓丝上的被动、主动和互动接合之间的调节（例如，被动接合指的是当夹子不接触弓丝时，而主动接合可以指的是当夹子正在对弓丝直接施加力时）。当夹子与弓丝接合、但是不对弓丝施加力或基本上不施加力时互动接合可以发生。当包括多个夹子时，两个夹子期望地彼此独立，因此能够具有在单独一侧的弓丝上的接合。

[0115] 夹子－丝互动可以以各种方式被调节。例如，夹子－丝互动可以由以下的一种或多种调节，但是不限于：在托架主体的近中侧和远侧的弓丝上的主动接合；在托架主体的近中侧和远侧的弓丝上的被动接合；在托架主体的近中侧和远侧的弓丝上的互动接合；在托架主体的近中侧的弓丝上的主动接合和远侧的被动接合；在托架主体的远侧的弓丝上的主动接合和近中侧的被动接合；在托架主体的近中侧的弓丝上的互动接合和远侧的被动接合；在托架主体的远侧的弓丝上的互动接合和近中侧的被动接合；在托架主体的近中侧的弓丝上的主动接合和远侧的互动接合；在托架主体的远侧的弓丝上的主动接合和近中侧的互动接合；以及它们的任何组合。

[0116] 可以使用刮牙器或其它常用牙科器械通过在夹子上的齿条 1128r（例如，棘齿系统）的边缘处施加力并且在向唇方向上牵引夹子而打开夹子 1026r。齿条 1128r 的取向允许通过朝着向唇方向推动而闭合夹子。如图 26G-26H 中所示，在齿条的相对侧的夹子上的圆形鼓起 1130r 允许夹子在向唇方向上容易地滑动到构建在托架的主体中的止挡 1132r。当圆形鼓起 1130r 到达主体上的止挡 1132r 时，夹子上的齿条 1128r 从主体上的匹配齿条 1126r 脱离并且然后夹子可以枢转使得它不再阻塞弓丝槽 1020r 并且弓丝 1022r 可以被移除或插入（图 26I）。柱 1134r（例如，钩）可以附连到每个夹子以便弹性物绑扎。可以绑扎的弹性物可以用于美学目的，允许不同颜色的绑线被附连，影响托架的性能。弹性物可以被附连以帮助找平和对准牙合向牵引。

[0117] 图 27A-27G 是图 24A-24B 中所示的自绑扎托架的另一替代实施例的各种视图，其中第一和第二对保持构件设在牙龈系翼的牙合侧。一般而言，自绑扎托架可以包括与基座 614i 模制的主体 612i 和滑动锁定夹子 626i。更特别地，托架主体可以包括两个保持通道（例如，开口）664i、666i，所述保持通道可以用于允许夹子 626i 用相同的弓丝使用两个治疗阶段（被动和主动）。该托架概念也可以设计成具有三个不同的方向（向牙龈、向牙合、向舌）以相应地打开、闭合和改变治疗阶段（主动对被动）。

[0118] 托架可以包括三个部件，如主体、基座和夹子。为了示例目的，矩形/方形弓丝就座在主体的槽中。请注意槽也能够容纳圆形丝。如图中所示，夹子的唇自由端 692i 可以设计成具有“柱”（例如，T 形自由端）状特征，当闭合时所述柱状特征首先就座在被动夹子保持通道（例如，纵向定位的间隔开的唇开口）中。在该位置（图 27F）可以基本上没有或完全没有夹子和弓丝之间的接触，这是正畸治疗的被动阶段。

[0119] 典型地，当治疗进行时，夹子可能需要从被动阶段（在夹子和弓丝之间无接触，图 27F）变为主动阶段（夹子和弓丝之间干涉接触，图 27G），其中柱特征就座在主动夹子保持通道（例如，纵向间隔开的舌开口大体上定位在被动保持通道的下方）中。将夹子（图 27I）从被动阶段变为主动阶段的机制可以是简单地施加力并且下推夹子的唇自由端部分（在图 27D 中以箭头显示）到达主动夹子靠置通道。如图 27F 中所示，当处于打开位置时夹子的唇自由端部分可以定位在近中－远侧靠置凹槽 1042 中。需要时夹子保持通道的数量可

以减小或增加，并且必要时也可以改变通道位置（相对于弓丝槽的底部）。

[0120] 在该具体实施例中，保持构件627可以包括在牙龈系翼616i的牙合侧的第一对止挡644i和第二对止挡646i以禁止锁定夹子626i从闭合位置（例如，止挡644i中的主动第一闭合位置或止挡646i中的第二闭合位置）意外移动到打开位置并且可选地当锁定夹子626i枢转到打开位置时保持它打开。每个止挡限定第一开口、至少一个引导部分和至少一个凸缘。第一对止挡644i从相应的牙龈系翼616i大体向外延伸并且包括第一开口664i、第一引导部分674i和第一凸缘668i，所述第一凸缘用于与锁定夹子626i接合以保持第一闭合位置（例如，用于主动第一闭合位置的主动托架）。类似地，第二对止挡646i从相应的牙龈系翼616大体向外延伸并且包括第二开口666、引导部分675i和第二凸缘669i，所述第二凸缘用于与锁定夹子626i接合以保持第二闭合位置（例如，用于被动第二闭合位置的被动托架）。应当领会第一和第二对止挡644i和646i可以定位成使得每对止挡644i和646i中的一个止挡与每对止挡644i和646i中的相应的另一个止挡向牙龈-向牙合并置。期望地，每个牙龈系翼上的两对止挡可以限定大体W形配置。

[0121] 锁定夹子626i在牙合系翼618i上滑动并且在禁止接近弓丝槽620i的两个闭合位置（图27D-27E）和允许接近弓丝槽620i的打开位置（图27F）之间可移动。应当领会锁定夹子626i呈具有大体U形头部配置的弹簧元件的形式。更特别地，锁定夹子626可以包括具有一对相对侧臂650i和652i的头部分628i，所述侧臂限定开口T形配置。应当领会头部分628i和/或侧臂650i和652i配置成延伸横越弓丝槽620i。

[0122] 臂650i和652i可以包括大体上近中地和远侧地向外延伸的自由端，但是不需要。臂650i和652i可以接收在形成于牙龈系翼616i的牙合侧中的相应的第一开口664i或相应的第二开口666i中。

[0123] 为了在第一闭合位置（主动闭合位置）闭合正畸托架610i，锁定夹子626朝着锁定机构627i的第一对止挡644i（例如，牙龈第一对止挡）围绕牙龈系翼616i向牙龈滑动。臂650i和652i与第一引导部分674i的相应的唇表面进行接触并且沿其向牙龈被引导。臂650i和652i沿着第一引导部分674i的唇表面连续地被引导直到钩端672i延伸超出第一对止挡644i的凸缘668i。这允许锁定夹子626i朝着其非应力状态回弹使得臂650i和652i接合相应的凸缘668i，由此将锁定夹子626i保持在第一闭合位置。这样做，锁定夹子626i向舌偏转使得当处于第一闭合位置时可以基本上或完全保持锁定夹子、弓丝和弓丝槽之间的接触（图27E）。

[0124] 为了在第二闭合位置闭合正畸托架610i，锁定夹子626朝着锁定机构627i的第二对止挡646i围绕牙龈系翼616i的牙合侧滑动。臂650i和652i与第二引导部分675i的相应的唇表面进行接触并且沿其向牙龈被引导。臂650i和652i沿着第二引导部分675i的唇表面连续地被引导直到钩端672i延伸超出（例如，向牙龈-向牙合）第二对止挡646i的第一凸缘669i。这允许锁定夹子626i朝着其非应力状态回弹使得钩端672i接合相应的第二凸缘669i，由此将锁定夹子626i保持在第二闭合位置。这样做，锁定夹子626i向舌稍稍偏转使得当处于第二闭合位置时可以保持锁定夹子626i和弓丝之间的最小接触或无接触（图27D）。

[0125] 如上面参考图27A-27G所述，不同的槽位置可以提供不同的夹子状态。例如，向唇定位的（一个或多个）槽和/或（一个或多个）开口可以提供被动阶段闭合位置（例如，

图 27D- 弓丝和夹子之间大体上无接触）或者向舌定位的（一个或多个）槽和 / 或（一个或多个）开口可以提供主动阶段闭合位置（例如，图 27E- 弓丝和夹子之间接触和干涉）。应当领会（一个或多个）棘齿和 / 或（一个或多个）槽可以定位成使得可以产生被动阶段闭合位置，其中在弓丝和夹子之间发生最小接触。

[0126] 现在参考图 28A-28B，白绑扎正畸托架被显示并且大体上由附图标记 10 指示。可以看到，正畸托架 10 包括主体 12 和附连到主体的舌安装基座 14。安装基座 14 具有待附连到牙齿的舌表面。主体 12 可以包括在基座 14 和唇表面 19 之间延伸的侧壁 15 以限定大体弯曲形状的周边。期望地，主体 12 的周边限定圆形、卵形或另外形状的构件。然而，应当领会主体 12 可以由各种其它形状的配置限定，如方形、矩形、菱形或另外形状的构件。当提供时，据信弯曲形状（例如，卵形）主体 12 可以减小牙石或围绕主体 12 的周边积累的它物和 / 或允许更容易移除它们。

[0127] 一对横向间隔的牙龈系翼 16 和一对横向间隔的牙合系翼 18 从主体 12 的唇表面 19 延伸。牙龈系翼 16 和牙合系翼 18 大体上向舌弯曲。翼间区域 24 横越主体 12 向牙龈 - 向牙合延伸并且可以大体上由牙龈系翼 16 的横向间隔和 / 或牙合系翼 18 的横向间隔限定。翼间区域 24 可以是敞开（例如，无阻塞）通道或者可以是闭合（部分或完全阻塞）通道，或以另外方式。弓丝槽 20 近中地 - 远侧地横越主体 12 并且在牙龈和牙合系翼 16 和 18 之间延伸。弓丝槽 20 向唇敞开以接收弓丝 22。弓丝槽 20 在主体的翼间区域 24 中被中断。

[0128] 应当领会主体 12 也可以包括用于接收可选的辅助丝的内部槽。期望地，主体 12 可以包括向牙合 - 向牙龈（例如，大体上平行于翼间区域 24）延伸通过主体 12 的至少一个内部竖直槽 25，但是不需要。

[0129] 托架 10 还可以包括锁定机构，所述锁定机构包括锁定夹子 26 和用于将锁定夹子 26 保持在闭合位置的保持构件 27。在一个实施例中，保持构件 27 可以包括在牙龈系翼 16 上的止挡 44 和 46 以禁止锁定夹子 26 从闭合位置意外移动到打开位置并且可选地当锁定夹子 26 枢转到打开位置时保持它打开。止挡 44 和 46 大体上朝着彼此从相应的牙龈系翼 16 延伸从而限定翼间区域 24 中的减小开口 48。期望地，止挡 44 和 46 可以形成从翼间区域 24 中的牙龈系翼 16 的相应的近中和远侧表面延伸的圆形（例如，半圆形）。然而，应当领会止挡 44 和 46 可以形成其它形状，包括弯曲的、弓形的、成角的、平坦的或另外形状的部分。

[0130] 锁定夹子 26 枢转地安装在牙合系翼 18 上并且在由止挡 44 和 46 禁止接近弓丝槽 20 的闭合位置和允许接近弓丝槽 20 的打开位置之间可移动。应当领会锁定夹子 26 呈具有大体十字形轮廓线的弹簧元件的形式。在一个实施例中，锁定夹子 26 可以包括牙龈头部 28，所述牙龈头部向舌弯曲以限定向前（例如，向牙龈）突出钩 72。头部 28 可以包括互连的相对侧部分 30，所述相对侧部分限定的宽度（例如，近中地 - 远侧地）典型地大于减小开口 48 的宽度。

[0131] 锁定夹子 26 也可以包括大体上沿着和横越弓丝槽 20 延伸的一对相对定向臂 50 和 52（例如，近中和远侧延伸臂部分）。应当领会，臂 50 和 52 可以至少部分地或基本上以平行于弓丝槽 20 的方式延伸。每个臂 50 和 52 可以形成具有延伸到牙合部分的牙龈部分的大体 U 形配置，在其间具有端部分 58 以限定其间的开口 60。应当领会端部分 58 可以在

近中和远侧方向上尽可能宽地延伸以获得弓丝的最佳旋转控制。

[0132] 当包括时，臂 50 和 52 的牙龈和牙合部分可以配置成期望地获得力沿着面部轴线 FA（例如，大体垂直于弓丝槽 20）从锁定夹子 26 直接传递到弓丝 22。在图 28D 中可以看到，弓丝 22 的牙龈和牙合部分（例如，角部 86 和 87）两者可以在闭合位置由臂 50 和 52（例如，臂 50 和 52 的牙龈和牙合部分）接合从而将力从弓丝 22 直接传递到牙齿上的 FA 点，从而优化患者的治疗时间。

[0133] 锁定夹子 26 也可以包括相对的自由端（例如，大体上近中和远侧延伸，但是不需要），所述自由端相应地外弯以限定相对定向的间隔开的尾端 32 和 34。尾端 32 和 34 的每一个接收在形成于牙合系翼 18 中的一个中的相应的腔孔 36 和 38 中。腔孔 36 和 38 可以完全延伸（例如，近中地 - 远侧地）通过相应的系翼 18 或部分地通过其中。尾端 32 和 34 可以包括从夹子 26 延伸（例如，径向地）的凸缘部分 40 和 42。当插入相应的腔孔 36 和 38 中时凸缘部分 40 和 42 可以配置成用作尾端 32 和 34 的止挡。期望地，凸缘部分 40 和 42 可以防止尾端 32 和 34 延伸超出预定深度进入和 / 或超出腔孔 36 和 38。

[0134] 还应当预料到锁定夹子 26 可以处于压缩状态使得尾端 32 和 34 对相应的系翼 16（对于近中 - 牙龈系翼 16 近中地和对于远侧 - 牙龈系翼 16 远侧地）施加大体连续向外力，由此将尾端 32 和 34 保持在相应的腔孔 36 和 38 内。这样做，尾端 32 和 34 大体上在相应的腔孔 36 和 38 内自由旋转以允许锁定夹子 26 在打开和闭合位置之间的枢转运动。

[0135] 在另一实施例中，止挡 44 和 46 可以形成多个止挡部分（例如，半圆形部分）（未显示），每组止挡部分从牙龈系翼 16 的相应内表面延伸（例如，进入翼间区域 24）。例如，多个止挡部分可以包括沿着牙龈系翼 16 的每一个的内表面的一对向唇 - 向舌间隔开的止挡。当包括时，相对的止挡对的对可以配置成允许锁定夹子 26 在打开位置和两个不同的闭合位置之间可移动。更特别地，第一对相对唇止挡可以包括唇 - 近中止挡和唇 - 远侧止挡，而第二对相对舌止挡可以包括舌 - 近中止挡和舌 - 远侧止挡，第一对相对唇止挡从第二对相对舌止挡向舌间隔。在第一闭合位置，钩 72 可以定位在第二对相对舌止挡和牙龈翼间区域 24 中的主体 12 的唇表面 19 下方以限定主动第一闭合位置。在第二闭合位置，钩 72 可以定位在牙龈翼间区域中的第一对相对唇止挡和第二对相对舌止挡之间下方以限定第二闭合位置。

[0136] 锁定夹子 26 大体上配置成耐受当将锁定夹子 26 基本上保持在闭合位置时由托架引起的典型力。典型力可以包括但不限于由弓丝、夹子和 / 或托架相对于彼此的运动或以另外方式（例如由刷牙和 / 或进食导致的运动）产生的力。然而，应当领会夹子 26 也可以配置成允许由足够大小的力产生的它的变形，所述力大体上大于上述的典型力。例如，当牙科医生用足够大小的力推动头部 28 抵靠止挡 44 和 46 时，相对侧部分 30 朝着彼此变形从而减小头部 28 的宽度，由此当在打开位置和闭合位置之间移动锁定夹子时允许头部 28 穿过减小开口 48。在穿过减小开口 48 之后，头部 28 大体上返回其典型的非变形状态（例如，非应力状态）。

[0137] 当锁定夹子 26 处于闭合位置时止挡 44 和 46 接触围绕钩部分 72 的锁定夹子 26 的唇表面，从而在患者的口中应用期间禁止锁定夹子意外打开。

[0138] 在图 28A 中可以看到，止挡 44 和 46 保持锁定夹子 26 抵靠弓丝 22 并且禁止弓丝 22 和正畸托架 10 的主体 12 之间的相对运动。为了释放弓丝 22，锁定夹子 26 围绕尾部 32

和 34 枢转，同时对止挡 44 和 46 施加足够大小的力。在止挡 44 和 46 的接合期间当足够大小的力施加到头部 28 时，头部 28 的宽度减小，由此允许它穿过减小开口 48。

[0139] 在另一实施例中，如图 28C-28D 中所示，提供自绑扎正畸托架 110。托架 110 可以包括锁定机构，所述锁定机构包括锁定夹子 126 和替代的保持构件 127。在该实施例中，保持构件 127 呈第一构件 121 和第二构件 123 的形式，其间具有减小开口 148。第一和第二构件 121、123 可以从主体 112 的唇表面 119 以相对于彼此向牙合 - 向牙龈关系围绕牙龈翼间区域 124 向唇延伸。

[0140] 类似于先前实施例的至少一个止挡可以设在第一和第二构件 121、123 中的一个上以禁止锁定夹子 126 从闭合位置意外移动到打开位置并且可选地当锁定夹子 126 枢转到打开位置时保持锁定夹子 126 打开。止挡可以以各种形状和 / 或配置被包括使得它们提供第一和第二构件 121、123 之间的减小开口 148。在一个具体例子中，第二构件 123（例如，相对于第一构件 121 向牙合定位）可以包括在自由端 128 处从第二构件 123 的牙龈表面延伸的止挡 144。止挡 144 可以在形状上大体上类似于止挡 44，如上所述，包括弯曲部分以帮助在打开和闭合位置之间引导夹子 126 的头部 128。第一构件 121（相对于第二构件 123 向牙龈定位）可以包括在自由端 130 处从第一构件 121 的牙合表面延伸的止挡 146。止挡 146 可以大体上成形为斜坡部分，当它在自由端 130 处朝着平坦部分延伸时逐渐减小厚度（例如，呈锥形），从而帮助在打开和闭合位置之间引导夹子 126 的头部 128 的钩部分 172。止挡 144 和 146 大体上彼此相对以形成其间的减小开口 148。期望地，在非应力状态下，减小开口 148 可以尺寸确定成（向牙合 - 向牙龈）具有小于头部 128 的厚度的最大间隔以基本上防止夹子 126 在打开位置和闭合位置之间的运动。应当领会本文中的非应力状态可以被定义为（在非应力状态下，例如在图 6 和 7 中所示的托架 110 的打开和闭合位置）。

[0141] 应当领会第一和第二构件 121、123 中的至少一个或两者可以配置成远离另一个变形以允许夹子 126 在打开和闭合位置之间的运动。当用足够的力（例如，由牙科医生）由夹子 126（例如头部 128）接触时可以发生第一构件 121 和 / 或第二构件 123 的变形。例如，当牙科医生用足够大小的力推动头部 128 抵靠止挡 144 和 146 时，第一和第二构件 121、123 中的至少一个（例如，或两者）朝着另一个变形从而增加止挡 144、146 之间的减小开口 148 的间隔，由此当在打开位置和闭合位置之间移动锁定夹子 126 时允许头部 128 的钩部分 172 穿过加宽减小开口 148。在穿过减小开口 148 之后，第一构件 121 和第二构件 123 大体上返回它们的典型非变形形状（例如，非应力状态），同时将减小开口 148 返回它的最大间隔，由此将夹子 126 保持在打开或闭合位置。还应当领会钩部分 172（或头部 128 的（一个或多个）其它部分）可以偏转、变形和 / 或压缩以穿过减小开口 148，但是不需要。

[0142] 更特别地，为了闭合正畸托架 110，锁定夹子 126 围绕尾部 132 和 134 枢转。当锁定夹子枢转时，夹子 126 的头部 128 被推动到翼间区域 124 的牙龈部分中抵靠止挡 144、146。由锁定夹子 126 的头部 128 施加到止挡 144、146 的作用力导致第一和第二构件 121、123 中的至少一个在远离彼此的方向上向牙合 - 向牙龈移动。当锁定夹子 126 枢转超出止挡 144 和 146 时，第一构件 121 和 / 或第二构件 123 回弹到它的非应力状态（例如，大体上直立和 / 或垂直于唇表面 119）并且头部 126 朝着唇表面 119 偏压到止挡 144 和 146 下方的它的闭合位置。止挡 144 和 146 在该状态下禁止锁定夹子 126 朝着打开位置往回移动。以该方式，弓丝槽 120 保持闭合，将弓丝 122 固定在弓丝槽中。

[0143] 现在参考图 28E，显示自绑扎正畸托架 210 的又一实施例。托架 210 可以包括主体 212，基座 214，以及包括锁定夹子 226 和保持构件 227 的锁定机构。主体 212 可以包括牙龈系翼 216 和牙合系翼 218，在其间具有近中地 - 远侧地延伸的弓丝槽 220。在该具体例子中，主体 212 具有矩形主体并且包括在翼间区域 224 中跨越在牙龈系翼 216 之间的第一桥部分 260。第一桥部分 260 从弓丝槽 220 的唇表面延伸到牙龈系翼的唇表面。主体 212 也可以包括在翼间区域 224 中跨越在牙合系翼 218 之间的第二桥部分 261。应当领会第二桥部分 261 从弓丝槽 220 的唇表面部分地延伸以允许锁定夹子 226 的旋转。主体 212 也可以包括用于接收可选的辅助丝的内部槽，但是不需要。在一个具体实施例中，主体 212 可以包括向牙合 - 向牙龈（例如，大体上横向于弓丝槽 220）延伸通过主体 212 的内部竖直槽 225。

[0144] 锁定夹子 226 可以呈大体 U 形弹簧元件的形式，其具有限定横向间隔的尾部 232 和 234 的外弯自由近中和远侧端部。每个尾部枢转地接收在形成于牙合系翼 218 中的相应的一个中的相应的腔孔 236 和 238 内。

[0145] 保持构件 227 设在第一桥部分 260 中并且可以包括类似于第一实施例的相对止挡 244 和 246 的组，所述止挡的组可以设在桥 260 上以在闭合位置将锁定夹子 226 保持在凹陷 262 内。

[0146] 更特别地，为了闭合正畸托架 210，锁定夹子 226 围绕尾部 232 和 234 枢转。当锁定夹子 226 枢转时，头部分 228 的夹臂 250 和 252 被推动到桥部分 260 中抵靠相对止挡 244 和 246 的相应对。由夹臂 250 和 252 施加到相对止挡 244 和 246 的组的作用力导致夹臂 250 和 252 和 / 或相对止挡 244 和 246 变形，由此允许夹臂 250 和 252 穿过打开和闭合位置之间的减小开口 248。当夹子头部 228 枢转超出相对止挡 244 和 246 的组时，夹臂 250 和 252、相对止挡 244 和 246 或两者的组合回弹到它们的非应力状态并且头部 226 朝着唇表面 219 围绕凹陷 262 偏压到相对止挡 244 和 246 的相应组下方的它的闭合位置。相对止挡 244 和 246 的组在该状态（例如，非应力状态）下禁止锁定夹子 226 朝着打开位置往回移动。以该方式，弓丝槽 220 保持闭合，由此将弓丝（未显示）固定在弓丝槽 220 中。

[0147] 现在参考图 28F-28G，自绑扎正畸托架的另一实施例被显示并且大体上由附图标记 310 指示。在该实施例中，托架 310 可以包括卵形主体 312，基座 314，以及包括锁定夹子 326 和保持构件 327 的锁定机构。主体 312 可以包括牙龈系翼 316 和牙合系翼 318，在其间具有近中地 - 远侧地延伸的弓丝槽 320。第一桥部分 360 和第二桥部分 361 可以在翼间区域 324 中，第一桥部分 360 跨越在牙龈系翼 316 之间并且第二桥部分 361 跨越在牙合系翼 318 之间。应当领会第一桥部分 360 和 / 或第二桥部分 361 可以从弓丝槽的唇表面部分地或完全地延伸到相应的系翼 316 和 318 的唇表面。在一个具体例子中，第一和第二桥部分 360 和 362 从弓丝槽的唇表面一直延伸到相应的系翼 316 和 318 的唇表面。

[0148] 主体 312 也可以包括用于接收可选的辅助丝的内部槽，但是不需要。例如，主体 312 可以包括向牙合 - 向牙龈（例如，大体上横向于弓丝槽 320）延伸通过主体 312 的内部竖直槽 325。

[0149] 锁定夹子 326 可以呈大体 U 形弹簧元件的形式，其具有近中地 - 远侧地延伸的牙龈头部分 328，一对相对定向臂部分 350 和 352，以及限定从臂 350 和 352 和其间的自由端 358 相应地延伸的横向间隔的尾部 332 和 334 的内弯自由近中和远侧端部。尾部 332 和 334 的每一个枢转地接收在形成于牙合系翼 318 中的相应的一个中的相应的腔孔 336 和 338

内。更特别地，尾部 332 和 334 接收在沿着相应的牙合系翼的外表面（例如，近中 - 牙合系翼的近中侧和远侧 - 牙合系翼 318 的远侧）的相应的腔孔 336 和 338 内。在该具体实施例中，锁定夹子 326 可以包括偏压构件 370，所述偏压构件从头部分 328 向舌延伸以限定向前突出唇钩 372 和舌引导部分 374。

[0150] 保持构件 327 可以设在第一桥部分 360 中并且期望地包括在第一桥部分 360 的唇面中的第一开口 364 和在第一桥部分 360 的牙龈面中的第二开口 366。期望地，第一开口 364 和第二开口 366 限定其间的通孔 362 以便接收偏压构件 370 从而将锁定夹子 326 保持在闭合位置。

[0151] 桥部分 360 的牙龈表面上的第二开口 366 包括舌凸缘 368，当锁定夹子 326 处于闭合位置时所述舌凸缘接合唇钩 372。凸缘 368 和唇钩 372 之间的接合将锁定夹子保持在闭合位置，同时保持锁定夹子 326 抵靠弓丝，由此禁止弓丝和正畸托架 310 的主体 312 之间的相对运动。为了闭合正畸托架 310，锁定夹子 326 围绕尾部 332 和 334 朝着第一桥部分 360 枢转。当舌引导件 374 接触第一开口 364 的牙龈边缘 376 时，偏压构件向牙合偏转（例如，偏压），由此允许舌引导件 374 进入通孔 362。

[0152] 期望地，舌引导件 374 设在偏压构件 370 的自由端处并且包括配置成将偏压构件 370 引导到第一开口 360 和通孔 362 中的一部分。应当领会引导部分可以是弯曲的、弓形的、成角的、平坦的或另外形状以帮助将偏压构件 370 引导到闭合位置。

[0153] 由舌引导件 374 施加到第一开口 364 的牙龈边缘 376 的作用力导致偏压构件 370 偏转（例如，向牙合），由此允许唇钩 372 穿过第一开口 364 并且进入打开和闭合位置之间的通孔 362。当钩部分 372 向舌枢转超出通孔 362 中的凸缘 368 时，偏压构件 370 朝着它的非应力状态回弹并且舌钩 372 接合通孔 362 的凸缘 368 到达它的闭合位置。偏压构件 370 在该状态（例如，非应力状态）下禁止锁定夹子 326 朝着打开位置往回移动。以该方式，弓丝槽 320 保持闭合，由此将弓丝固定在弓丝槽中。

[0154] 牙龈系翼 316 的至少一个唇面和桥部分 360 可以包括凹槽 380，所述凹槽具有互补形状以便接收处于闭合位置时的锁定夹子 326 的一部分（例如，头部分 328）。可以预料凹槽 380 可以配置成具有成角或弯曲部分以帮助将偏压构件 370 的舌引导件 374 引导到第一开口 364 中。期望地，牙龈系翼 316 的唇面（沿着弓丝槽）和在其间延伸的桥部分 360 包括具有大体半圆形横截面的凹槽 380。

[0155] 为了释放弓丝，舌引导件 374 大体上向牙合移动（例如，推动）通过第二开口 366 并且进入通孔 362 使得钩部分 372 向牙合移动超出凸缘 368，由此将钩 374 从凸缘 368 脱离。其后，偏压构件 370 可以通过第一开口 364 从保持构件 327 移除并且锁定夹子 326 围绕尾部 332 和 334 自由枢转。

[0156] 现在参考图 28H-28I，自绑扎正畸托架的另一实施例被显示并且大体上由附图标记 410 指示。在该实施例中，托架 410 可以包括矩形主体 412，基座 414，以及包括锁定夹子 426 和保持构件 427 的锁定机构。主体 412 可以包括牙龈系翼 416 和牙合系翼 418，在其间具有近中地 - 远侧地延伸的弓丝槽 420。第一桥部分 460 和第二桥部分 461 设在翼间区域 424 中，第一桥部分 460 跨越在牙龈系翼 416 之间并且第二桥部分 461 跨越在牙合系翼 418 之间。更特别地，第一桥部分 460 从弓丝槽的唇表面一直延伸到牙龈系翼 416 的唇表面，而第二桥部分 461 仅仅部分地延伸到牙合系翼 418 的唇表面。

[0157] 主体 412 还可以包括向牙合 - 向牙龈（例如，大体上横向于弓丝槽 420）延伸通过主体 412 的内部竖直槽 425。

[0158] 锁定夹子 426 可以呈大体 U 形弹簧元件的形式，其具有近中地 - 远侧地延伸的牙龈头部分 428，一对相对定向臂端 458，以及限定从臂 450 和 452 相应地延伸的横向间隔的尾部 432 和 434 的内弯自由近中和远侧端部。尾部的每一个枢转地接收在形成于牙合系翼 418 中的相应的一个中的相应的腔孔 436 和 438 内。更特别地，尾部 432 和 434 接收在沿着相应的牙合系翼的外表面（例如，近中 - 牙合系翼 418 的近中侧和远侧 - 牙合系翼 418 的远侧）的相应的腔孔 436 和 438 内。在该实施例中，锁定夹子 426 可以包括一对间隔布置的偏压构件 470a 和 470b，所述偏压构件从头部分 428 向舌延伸以限定相应的近中和远侧突出唇钩 472a 和 472b 以及相应的唇引导部分 474a 和 474b。

[0159] 保持构件 427 围绕牙龈系翼 416 被提供。更特别地，每个牙龈系翼 416 从主体 412 的牙龈表面向外延伸以限定凸缘 468，当锁定夹子 426 处于闭合位置时所述凸缘接合相应的唇钩 472a 和 472b。凸缘 468 和唇钩 472a、472b 之间的接合将锁定夹子 426 保持在闭合位置，由此保持锁定夹子 426 抵靠弓丝从而禁止弓丝和正畸托架 410 的主体 412 之间的相对运动。

[0160] 为了闭合正畸托架 410，锁定夹子 426 围绕尾部 432 和 434 朝着锁定机构 427 围绕牙龈系翼 416 枢转。舌引导件 474a 和 474b 接触相应的牙龈系翼 416 到的唇表面使得舌引导件 474a 和 474b 的弯曲自由端 482 沿着牙龈系翼 416 的相应的内表面向内被引导。这样做，偏压构件 470a、470b 朝着彼此偏转使得当锁定夹子 426 朝着闭合位置枢转时它们可以定位到牙龈系翼 416 之间的翼间区域 424 中。舌引导件 474a 和 474b 继续沿着牙龈系翼 416 的内表面被引导直到唇钩 472a 和 472b 定位在锁定机构 427a 和 427b 的凸缘 468 下方。这允许偏压构件 470a 和 470b 回弹到它们的非应力状态使得唇钩 472a 和 472b 接合凸缘 468，由此将锁定夹子 426 保持在闭合位置。

[0161] 更特别地，由舌引导件 474a 和 474b 施加到牙龈系翼 416 的唇和内表面的作用力导致偏压构件 470a 和 470b 偏转（例如，近中地或远侧地向内），由此允许唇钩 472a 和 472b 进入打开和闭合位置之间的翼间区域 424 的减小开口 448。当舌引导件 474a 和 474b 向舌枢转超出凸缘 468 时，偏压构件 470a 和 470b 朝着它们的非应力状态回弹并且舌钩 472a 和 472b 接合保持构件 427a 和 427b 的凸缘 468 到达它的闭合位置。偏压构件 470a 和 470b 在该状态下禁止锁定夹子 426 朝着打开位置往回移动。以该方式，弓丝槽 420 保持闭合，由此将弓丝固定在弓丝槽中。

[0162] 为了释放弓丝，偏压构件 470a 和 470b（例如，舌引导部分 474a 和 474b）大体上朝着彼此（例如，近中地 - 远侧地）被推动以将每个唇钩 472a 和 472b 从相应的凸缘 468 脱离。其后，偏压构件 470a 和 470b 可以从保持构件 427 的凸缘 468 移除（例如，向唇）使得锁定夹子 426 围绕尾部 432 和 434 自由枢转。

[0163] 在该具体实施例中，锁定夹子 426 的头部 428 向牙龈延伸超出第一桥部分 460。牙龈系翼 416 的唇表面可以包括凹槽 480，所述凹槽具有互补形状以便接收处于闭合位置时的锁定夹子 426 的一部分（例如，头部分 428）。可以预料凹槽 480 可以配置成具有成角或弯曲部分以帮助将锁定夹子 426 保持在闭合位置。期望地，牙龈系翼 316 的唇面包括具有大体半圆形横截面的凹槽 480，所述凹槽可以与锁定夹子 426 互补。

[0164] 现在参考图 28J-28K，自绑扎正畸托架的另一实施例被显示并且大体上由附图标记 510 指示。托架 510 可以包括矩形主体 512，基座 514，以及包括锁定夹子 526 和保持构件 527 的锁定机构。主体 512 可以包括牙龈系翼 516 和牙合系翼 518，在其间具有近中地 - 远侧地延伸的弓丝槽 520。第一桥部分 560 和第二桥部分 561 设在翼间区域 524 中，第一桥部分 560 跨越在牙龈系翼 516 之间并且第二桥部分 561 跨越在牙合系翼 518 之间。应当领会第一和第二桥部分 560 和 561 可以从弓丝槽的唇表面一直延伸到牙龈系翼 516 和 518 的唇表面，由此限定在相应的牙龈和牙合系翼之间的弓丝槽的牙龈和牙合壁的一部分。

[0165] 在该实施例中，锁定夹子 526 呈具有大体十字形轮廓线的弹簧元件的形式。锁定夹子 526 可以包括具有向舌 - 向牙龈突出钩 572 和弯曲舌引导件 574 的牙龈头部 528。头部 528 可以与一对相对定向臂 550 和 552（例如，近中地和远侧地延伸的臂部分）互连，所述臂横越弓丝槽 520 延伸到臂自由端 558。应当领会，臂 550 和 552 可以至少部分地或基本上以平行于弓丝槽 520 的方式延伸。每个臂 550 和 552 可以形成大体 U 形配置，具有延伸到牙合部分的牙龈部分，在其间具有臂自由端 558。

[0166] 锁定夹子 526 也可以包括相对自由端（例如，大体上近中和远侧延伸，但是不需要），所述自由端外弯以相应地限定相对定向的间隔开的尾端 532 和 534。尾端 532 和 534 的每一个在主体 512 的舌部分中的牙合开口 596 处接收在形成于牙合系翼 518 中的一个中的相应的腔孔 536 和 538 中。

[0167] 保持构件 527 包括在牙龈系翼 516 之间以大体平行于第一桥部分 560 的关系延伸以限定第一开口 564 的近中 - 远侧定向唇构件 590。唇构件 590 包括舌凸缘 568，当锁定夹子 426 处于闭合位置时所述舌凸缘接合钩 572。凸缘 568 和钩 572 之间的接合将锁定夹子 526 保持在闭合位置使得锁定夹子 526 保持抵靠弓丝，由此禁止弓丝和正畸托架 510 的主体 512 之间的相对运动。

[0168] 为了闭合正畸托架 510，锁定夹子 526 围绕尾部 532 和 534 朝着锁定机构 527（例如，唇构件 590）围绕牙龈系翼 516 枢转。舌引导件 574 接触唇构件 590 的唇 - 牙合表面使得钩 572 沿着唇构件 590 的牙合内表面相牙合引导。这样做，头部 528 朝着第一桥部分 560 向牙合偏转使得当锁定夹子 526 朝着闭合位置枢转时头部 528 可以定位到牙龈系翼 516 之间的第一开口 564 中。舌引导件 574 继续沿着唇构件 590 的牙合内表面被引导直到钩 572 的自由端 584 定位在唇构件 590 的凸缘 468 下方。这允许偏压构件 570 朝着它的非应力状态回弹使得钩 572 接合凸缘 568，由此将锁定夹子 526 保持在闭合位置。

[0169] 更特别地，由舌引导件 574 施加到唇构件 590 的牙合 - 内表面的作用力导致头部 528 偏转（例如，向牙合），由此允许钩 572 进入打开和闭合位置之间的第一开口 564。当舌引导件 574 枢转（向舌 - 向牙龈）超出凸缘 568 时，锁定夹子 526 朝着它的非应力状态回弹使得钩 572 接合凸缘 468，由在其闭合位置期间防止钩 572 从凸缘 568 和第一开口 564 移除。头部 528 在该状态下禁止锁定夹子 526 朝着打开位置往回移动。以该方式，弓丝槽 520 保持闭合，由此将弓丝固定在弓丝槽中。

[0170] 为了释放弓丝，头部 528（例如，钩 572）向舌和向牙合被推动以将钩 572 从唇构件 590 脱离。其后，偏压构件 570 可以从唇构件 590 和第一开口 564 移除使得锁定夹子 526 围绕尾部 532 和 534 自由枢转。

[0171] 可选地，锁定夹子 26 还可以包括盖部分 90，如图 29A 中所示。盖部分 90 限定大体

卵形并且可以包括唇表面 92，当包括时所述唇表面大体上在弓丝槽的长度和宽度上延伸。盖部分 90 也可以包括用于连接到锁定夹子 26 的附连构件 94。应当领会附连构件 94 围绕盖部分 90 的舌表面 96 定位并且具有与夹子开口 60 互补的尺寸和形状。当包括时，附连构件 94 接合锁定夹子 26 的夹子开口 60 使得它可移除地附着在那里。当处于闭合位置时，应当领会盖部分 90 基本上或完全覆盖在其中具有弓丝的弓丝槽从而为托架提供更美的外观。此外，应当领会盖部分 90 可以帮助防止食物和 / 或斑块积累在托架 10 中。如图中所示盖部分 90 可以是锁定夹子 26 的独立部件，然而应当领会盖部分 90 和锁定夹子 26 可以是整体件。

[0172] 可选地，锁定夹子 326 还可以包括盖部分 390a，如图 29B 中所示。盖部分 390a 可以限定具有卵形和 / 或矩形的大体平坦和 / 或弯曲部分，并且可以包括唇表面 392a，当包括时所述唇表面大体上在弓丝槽的长度和宽度上延伸。盖部分 390a 也可以包括用于连接到锁定夹子 326 的多个附连构件 394a（例如，可变形附连构件）。应当领会附连构件 394a 可以围绕盖部分 390a 的舌表面 396a 定位在其相应的角部处并且具有与锁定夹子 326 的厚度互补的尺寸和形状。当包括时，附连构件 394a 接合锁定夹子 326 的多个部分使得盖部分 390a 可移除地附着在那里。当处于闭合位置时，应当领会盖部分 390a 可以基本上或完全覆盖在其中具有弓丝的弓丝槽从而为托架提供更美的外观。此外，应当领会盖部分 390a 可以帮助防止食物和 / 或斑块积累在托架 310 中。如图中所示，盖部分 390a 可以是锁定夹子 326 的独立部件；然而应当领会盖部分 390a 和锁定夹子 326 可以是整体件。

[0173] 可选地，锁定夹子 326b 还可以包括盖部分 390b，如图 29C 中所示。盖部分 390b 可以限定大体卵形和 / 或矩形并且可以包括唇表面 392b，当包括时所述唇表面大体上在弓丝槽的长度和宽度上延伸。盖部分 390b 也可以包括用于连接到锁定夹子 326b 的第一附连构件 394b 和第二附连构件 395b（例如，可变形附连构件）。应当领会附连构件 394b 可以围绕盖部分 390b 的牙龈自由端 398b 定位并且可以包括管状，沿其整个长度具有近中 - 远侧开口 399b 以便接收锁定夹子 326b。附连构件 394b 具有与锁定夹子 326b 的厚度互补的尺寸和形状。在该实施例中，偏压构件 370（具有引导部分 374b 和用于接合保持构件的钩部分 372b）已从夹子 326 移除使得盖部分 390b 还包括用于将凸缘 368 接合在闭合位置的偏压构件 370b。当包括时，附连构件 394b（可变形）卡扣在锁定夹子 326b 的牙龈部分上（附连构件大体上为管状，具有用于接收锁定夹子的一部分的纵向开口）使得盖部分 390b 可移除地附着在那里。当处于闭合位置时，应当领会盖部分 390b 可以基本上或完全覆盖在其中具有弓丝的弓丝槽从而为托架提供更美的外观。此外，应当领会盖部分 390b 可以帮助防止食物和 / 或斑块积累在托架 310 中。如图中所示，盖部分 390b 可以是锁定夹子 326b 的独立部件；然而应当领会盖部分 390b 和锁定夹子 326b 可以是整体件。

[0174] 图 30A-30D 是图 28E 中所示的自绑扎托架的另一替代实施例的各种视图，其中托架 210a 可以包括主体 212a，基座 214a，以及包括锁定夹子 226a 和保持构件 227a 的锁定机构。主体 212a 可以包括牙龈系翼 216a 和牙合系翼 218a，在其间具有近中地 - 远侧地延伸的弓丝槽 220a。在该具体例子中，主体 212a 具有矩形主体并且包括在翼间区域 224a 中跨越在牙龈系翼 216a 之间的第一桥部分 260a。第一桥部分 260a 从弓丝槽 220a 的唇表面延伸到牙龈系翼的唇表面。主体 212a 也可以包括在翼间区域 224a 中跨越在牙合系翼 218a 之间的第二桥部分 261a。应当领会第二桥部分 261a 从弓丝槽 220a 的唇表面部分地延伸以

允许锁定夹子 226a 的旋转。

[0175] 锁定夹子 226a 可以呈大体十字形弹簧元件的形式，其具有限定横向间隔的尾部 232a 和 234a 的外弯自由近中和远侧端部。每个尾部枢转地接收在形成于牙合系翼 218a 中的相应的一个中的相应的腔孔 236a 和 238a 内。

[0176] 保持构件 227a 设在第一桥部分 260a 中并且可以包括相对止挡 244a 和 246a 的组。更特别地，为了闭合正畸托架 210a，锁定夹子 226a 可以围绕尾部 232a 和 234a 枢转。当锁定夹子 226a 枢转时，头部分 228a 的夹臂 250a 和 252a 被推动到桥部分 260a 中抵靠相对止挡 244a 和 246a 的相应对。由夹臂 250a 和 252a 施加到相对止挡 244a 和 246a 的组的作用力导致夹臂 250a 和 252a 和 / 或相对止挡 244a 和 246a 变形，由此允许夹臂 250a 和 252a 穿过打开和闭合位置之间的减小开口 248。当夹子头部 228a 枢转超出相对止挡 244a 和 246a 的组时，夹臂 250a 和 252a、相对止挡 244a 和 246a 或两者的组合回弹到它们的非应力状态并且头部 226a 朝着唇表面 219a 围绕凹陷 262a 偏压到相对止挡 244a 和 246a 的相应组下方的它的闭合位置。相对止挡 244a 和 246a 的组在该状态（例如，非应力状态）下禁止锁定夹子 226a 朝着打开位置往回移动。以该方式，弓丝槽 220a 保持闭合，由此将弓丝（未显示）固定在弓丝槽 220a 中。此外，弓丝槽可以包括大体非平坦近中 - 远侧延伸部分（例如，弯曲部分，如凹部分或凸部分和 / 或成角部分）。例如，向唇定位托架可以包括具有向舌定向基部表面的弓丝槽，由此形成弓丝槽的大体凸部分，或者向舌定位托架可以包括具有向唇定向基部表面的弓丝槽，由此形成弓丝槽的大体凹部分，但是不需要。更特别地，弓丝槽可以包括向舌定向部分，所述向舌定向部分也沿着近中 - 远侧方向延伸以限定弓丝槽的至少一个非平坦部分。期望地，具有弯曲和 / 或成角唇表面 721a 的弯曲和 / 或成角弓丝 720a 可以被提供用于具有低型面的更美观的托架。

[0177] 现在参考图 30E-30L，自绑扎正畸托架的附加实施例被显示并且大体上由附图标记 710(710a、710b、710c 和 710d) 指示。正畸托架 710a 和 710b 大体上类似于图 28A-28B 的实施例，而正畸托架 710c 和 710d 大体上类似于图 28H-28I 的实施例。然而，这些实施例不是限制并且应当领会本文中所述或另外的任何托架可以包括具有大体非平坦近中 - 远侧延伸部分（例如，弯曲部分，如凹部分或凸部分和 / 或成角部分）的弓丝槽。例如，向唇定位托架可以包括具有向舌定向基部表面的弓丝槽，由此形成弓丝槽的大体凸部分，或者向舌定位托架可以包括具有向唇定向基部表面的弓丝槽，由此形成弓丝槽的大体凹部分，但是不需要。

[0178] 更特别地，弓丝槽可以包括向舌定向部分，所述向舌定向部分也沿着近中 - 远侧方向延伸以限定弓丝槽的至少一个非平坦部分。期望地，具有弯曲和 / 或成角唇表面 721 的弯曲和 / 或成角弓丝 720 可以被提供用于具有带有竖直槽 725 的低型面（图 30E-30F 和 30I-30J）或没有竖直槽 725 的很低型面（图 30G-30H 和 30K-30L）的更美观的托架。应当领会弓丝槽可以以大体平行方式相对于基座的舌表面、基座的唇表面、牙齿的唇表面或以另外方式近中地 - 远侧地延伸，但是不需要。

[0179] 弓丝槽的一部分可以朝着基座 714 相对于弓丝槽的至少一个向唇定向部分向舌定向。更特别地，至少一个向唇定向部分可以包括相对于弓丝槽的至少一个其它近中 - 远侧定位部分（例如，弓丝槽 720 的近中和远侧端部 794）向唇偏移或移位的顶点部分 796。应当领会弓丝槽可以包括沿其近中 - 远侧长度的恒定曲线半径或锥度；然而，也可以预料

可变曲线半径或可变锥度。期望地，顶点部分 796 可以设在弓丝槽的中心部分（例如，翼间区域 724）中。优选地，顶点部分 796 设在弓丝槽的中途，使得弓丝槽是对称的，如图 30F、30H、30J 和 30L 的横截面中所示。然而，应当领会顶点部分 796 可以设在沿着弓丝槽从近中端到远端的各种位置处或者可以设在近中和远端 794 中的一个处。此外，也应当领会弓丝槽可以包括在翼间区域中的大体平坦部分，同时具有可以相对于中心（例如，中途）平坦部分成角和 / 或弯曲的向舌定向端部分。

[0180] 如上所述，弓丝槽的基部表面也可以包括凹部分。当包括时，弓丝槽基部表面的一部分可以远离托架的基座相对于弓丝槽基部表面的另一部分向唇定向。这可以沿着曲线或以成角方式实现。此外，如上所述，弓丝槽基部表面的任何弯曲和 / 或成角部分可以沿着沿着弓丝槽的基部的一个或多个部分（例如，在边缘部分、在相对边缘部分、在中心部分、或在之间或沿着弓丝槽的基部表面的任何地方）定位。

[0181] 图 31A-31D 是图 9A-9G 中所示的自绑扎牙科托架的替代实施例的各种视图，其中舌自由端 1028s 枢转地接合形成于敞开停止凹槽 1042s 的舌部分中的舌开口 1064s。在该具体实施例中，锁定夹子 1026s 可以包括大体 J 形配置并且包括具有凸缘部分 1066 的可变形指状件 1062s。一旦接收在舌腔中，可变形指状件可以由于凸缘部分的外边缘 1070s 与牙合系翼 1018s 的相应的内部近中和远侧侧壁 1136s 主动接合而保持在部分应力状态以帮助抑制处于闭合位置时的锁定夹子 1026s 的运动（例如，扭转、近中 - 远侧运动和 / 或另外的运动）。另外，该主动接合还允许锁定夹子的旋转和 / 或锁定夹子固定到托架主体。

[0182] 应当领会本文中所述的锁定夹子可以由超弹性构件（如镍 - 钛合金）形成，即使锁定构件已相对大地变形，也没有负荷的大变化，并且弓丝可以在超弹性下适度地下压。另外，治疗操作的有利的操作效率可以被保持。例如，从窄圆丝到全尺寸方丝的范围的丝可以用实质上等效的负荷压入槽中，并且从活体中用最佳力治疗的早期开始三维控制成为可能。除了丝的恢复力以外，锁定构件下压弓丝所用的力也产生矫正力，并且更高维度的治疗成为可能。

[0183] 在一个具体例子中，锁定夹子可以由合金形成，所述合金包括 35-55（例如，40-50）wt % Co、10-30（例如，15-25）wt % Ni、10-30（例如，15-25）wt % Cr、0.5-15（例如，1-10）wt % Fe、0.01-15（例如，0.1-10）wt % W、0.01-15（例如，0.1-10）wt % Mo 和 / 或 0.01-10（例如，0.1-5）wt % Ti。

[0184] 应当领会本发明可以包括以下特征中的一个或多个：基座可以包括用于最佳粘结 / 去粘结的 80 号微网垫；主体可以呈菱形、方形或卵形主体设计的形式；锁定夹子可以是金属、塑料或复合材料；锁定夹子可以呈丝配置的形式；可以通过使用弯丝或类似制造过程形成锁定夹子；锁定夹子可以具有施加力以将弓丝固定在槽中从而促进牙齿运动和保持锁定夹子中的丝性质的挠性以对弓丝施加旋转控制之间的最佳平衡；锁定夹子的边缘可以保持足够的弹性以由用户通过内或外铰链设计组装或拆卸；可以通过简单地挤压下部杆（例如，用镊子）以允许锁定夹子的压缩和膨胀而插入或移除锁定夹子；锁定夹子可以通过在铰接轴上旋转而打开和 / 或闭合；锁定夹子可以通过以下方法锁定就位：1）推锁设计，其通过使用围绕托架的主体中的侧斜面的锁定夹子的弹性将锁定夹子锁定就位，2）推锁设计，其通过使用围绕托架的主体中的顶斜面的锁定夹子的弹性将锁定夹子锁定就位，所述顶斜面具有对锁定夹子的向下力，3）推锁设计，其通过使用托架的主体中的腔将锁定夹子锁定

就位，所述腔将锁定夹子保持就位，4）具有中心定位锁定机构的卡扣配合设计，当推入主体的槽中时在膨胀到主体的敞开腔中的锁定位置之前所述中心定位锁定机构压缩，和 5）具有两个横向定位锁定机构的卡扣配合设计，当推入斜面中时在膨胀到锁定位置之前当机构跳过斜面时所述横向定位锁定机构压缩；弓丝的最佳旋转控制，原因是锁定夹子可以尽可能远地近中地和远侧地延伸而不影响锁定夹子 / 主体组件的机构；当接合丝时锁定夹子跨越托架基座的（例如，弓丝槽的）整个宽度，因此提供可能的最大扭矩；系统中的低摩擦，原因是相比于仅仅沿着弓丝的牙龈部分或牙合部分的连续接触线，在锁定夹子和弓丝之间将有两个接触点（弓丝的近中和远端处的牙龈和牙合角部）。弓丝槽可以设计成在底部和 / 或侧壁中具有至少一个隆起（例如，多个隆起）和 / 或至少一个凹槽（例如，多个凹槽）以最小化弓丝和弓丝槽之间的接触面积，（从而可选地在任何丝尺寸下具有内在扭矩）；锁定夹子可以设计成具有至少一个隆起（例如，多个隆起）和 / 或至少一个凹槽（例如，多个凹槽）以减小弓丝和弓丝槽之间的接触面积，（从而可选地在任何丝尺寸下具有内在扭矩）；锁定夹子可以与任何类型的主体可互换而不管材料（金属、陶瓷、塑料等），从而保持系统的内外尺度一致；本申请中的打开 / 闭合机构可以是自由旋转铰链；当移除锁定夹子时，自绑扎托架可以用作常规（双）托架；系翼可以用于绑扎；系翼可以张开以提供最大扭矩；发生从锁定夹子到弓丝、到托架上的受力点和到牙齿的面部轴线（FA）点的力的直接传递；锁定夹子可以在牙龈和牙合角部处接合弓丝并且直接传递到牙齿上的 FA 点以优化患者的治疗时间；锁定夹子可以为了美学目的用塑料包覆模制或夹物模制；用于形成锁定夹子和 / 或托架的材料可以是塑料，其可以具有由患者指定的任何颜色；系统的低摩擦特性仍然可以保持，原因是在模制塑料和弓丝之间没有或基本没有接触；基座和主体可以涂覆有美学材料、抗生物膜材料或两者（例如，银纳米颗粒、PEG）；托架的主体可以与菱形、方形或卵形主体可互换；基座可以构型成边缘脊以便增加放置的精度和美观（可应用于臼齿和双尖牙）；主体可以用软塑料材料包覆模制（期望地在中心和横向托架中）以减小上切缘的碎裂；由软塑料材料形成的帽和 / 或盖部分可以附连到托架以减小 / 消除上切缘的碎裂，在治疗的第一阶段之后帽和 / 或盖部分可以被移除；以及它们的任何组合。

[0185] 还将领会多个部件或步骤的功能或结构可以组合成单个部件或步骤，或者一个步骤或部件的功能或结构可以在多个步骤或部件之间分配。本发明预料到所有这些组合。本文中描绘的各种结构的尺度和几何形状不旨在限制本发明，并且其它尺度或几何形状是可能的。对方向的参考旨在澄清描述并且不以任何方式限制本发明的范围。在其它实施例中，参考方向可以不同于所示的、所公开的或不同布置的。而且，应当理解本文中所使用的措词和术语是为了描述目的并且不应当被视为限制。另外，尽管已在示例的实施例中的仅仅一个的背景下描述了本发明的特征，但是对于任何指定应用，这样的特征可以与其它实施例的一个或多个其它特征组合。从上面也将领会本文中的独特结构的制造及其操作也构成根据本发明的方法。本发明也包含由本文中的方法的实施产生的中间和最终产品。“包括”或“包含”的使用也预料到“基本上由所述特征组成”或“由所述特征组成”的实施例。

[0186] 本文中提供的解释和示例旨在使本领域的其他技术人员知道本发明、它的原理和它的实际应用。本领域的技术人员可以以其多种形式采用和应用本发明，其可以最佳地适合于特定使用的要求。因此，如上所述的本发明的具体实施例不旨在是本发明的穷举或限制。所以本发明的范围不参考以上描述被确定，而是应当改为参考附带的权利要求以及这

样的权利要求的等效物的完整范围被确定。包括专利申请和出版物的所有文章和参考文献的公开为了所有目的通过引用被合并。

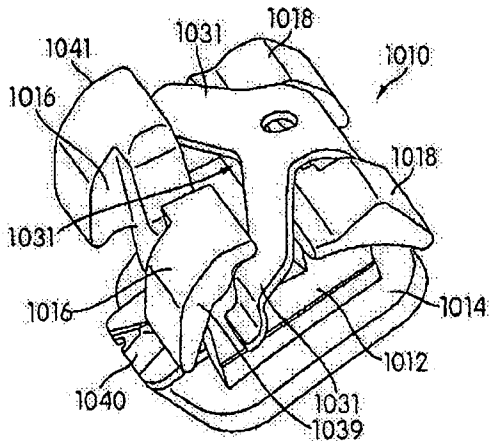


图 1A

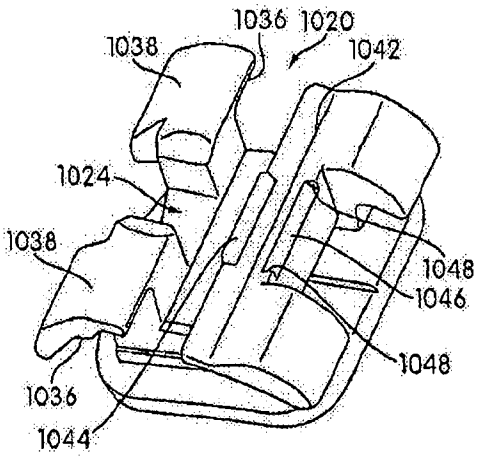


图 1B

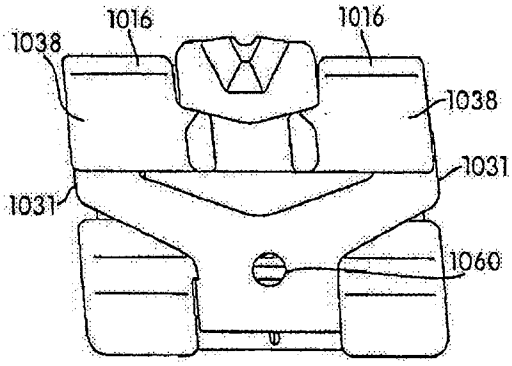


图 1C

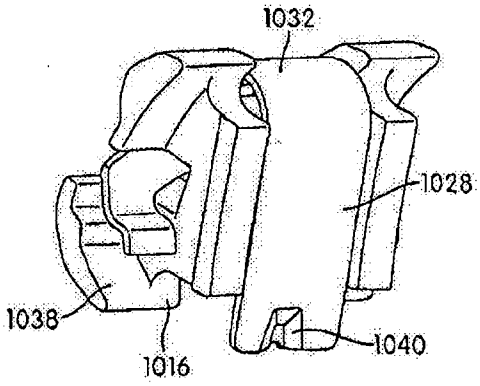


图 1D

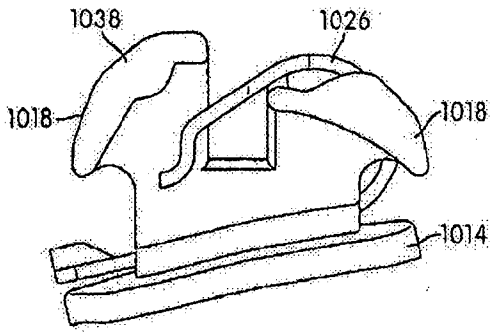


图 1E

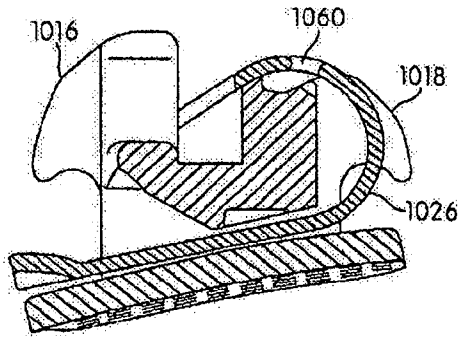


图 1F

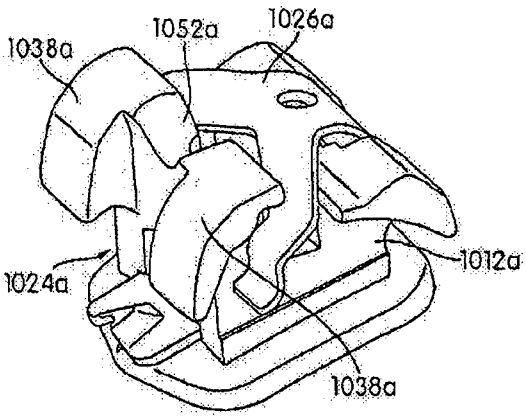


图 2A

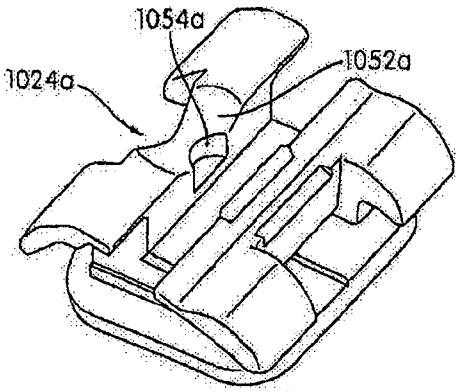


图 2B

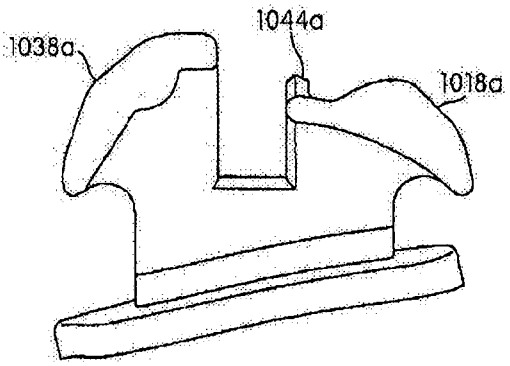


图 2C

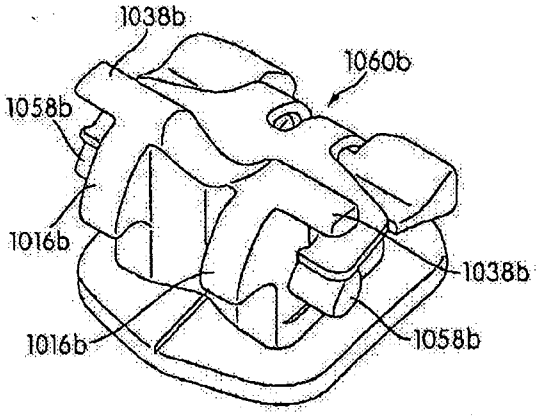


图 3A

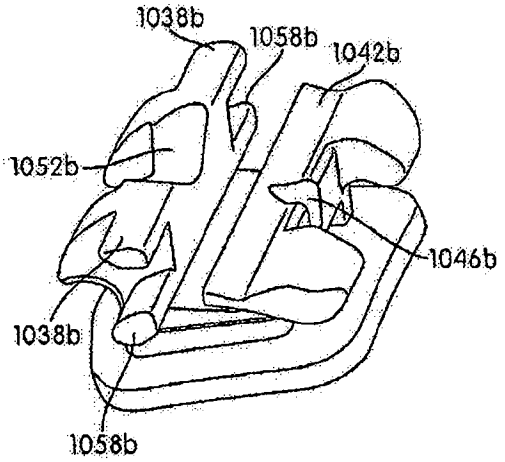


图 3B

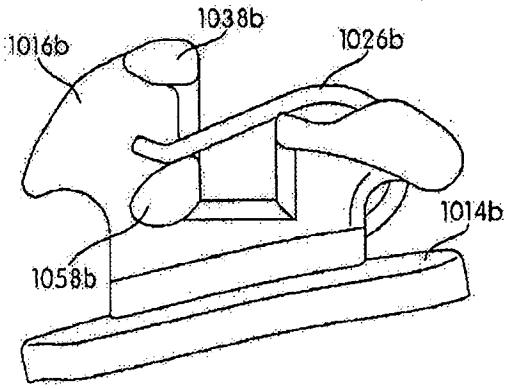


图 3C

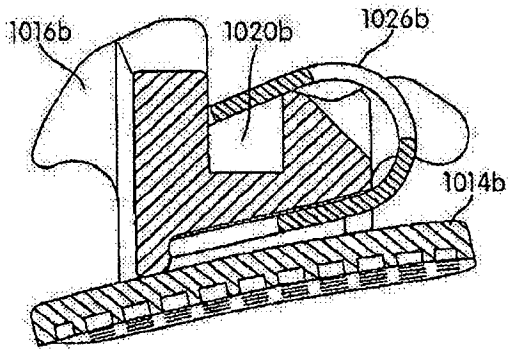


图 3D

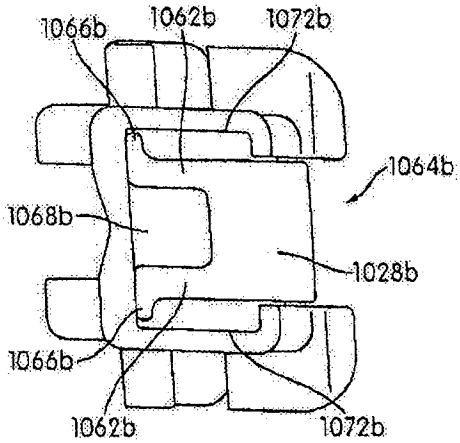


图 3E

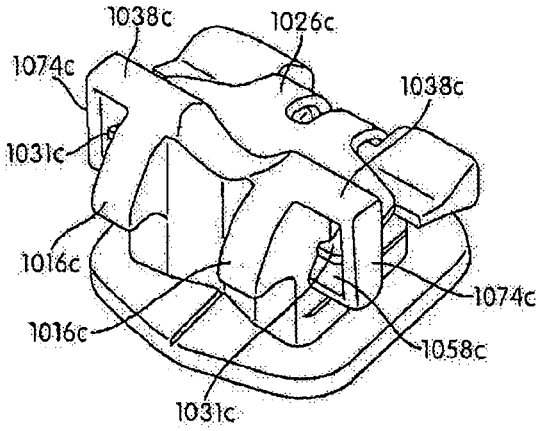

1038c
1026c
1074c
1038c
1031c
1016c
1074c
1016c
1058c
1031c

图 4A

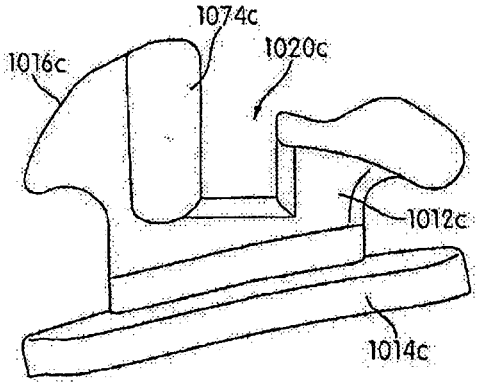
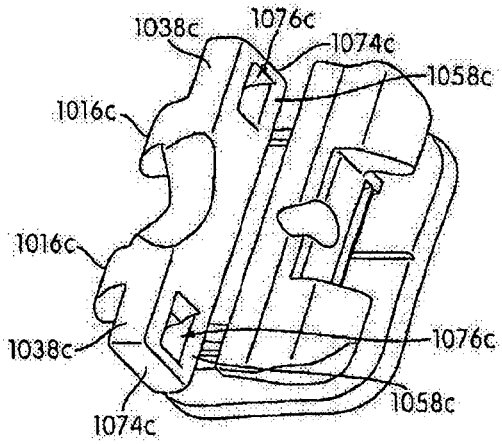

1074c
1020c
1016c
1012c
1014c

图 4B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1058c
1074c

图 4C

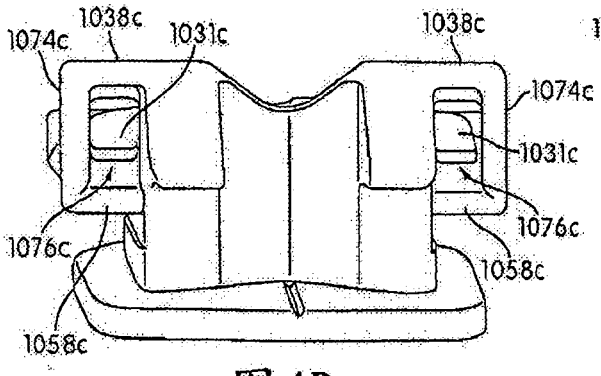


图 4D

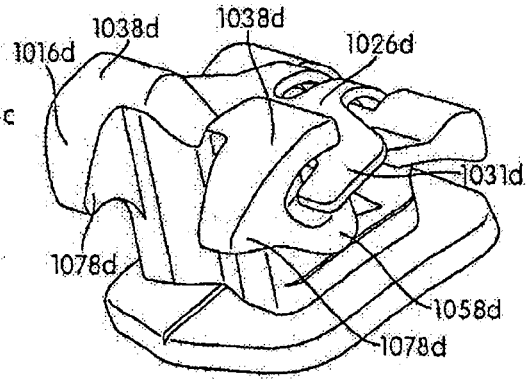


图 5A

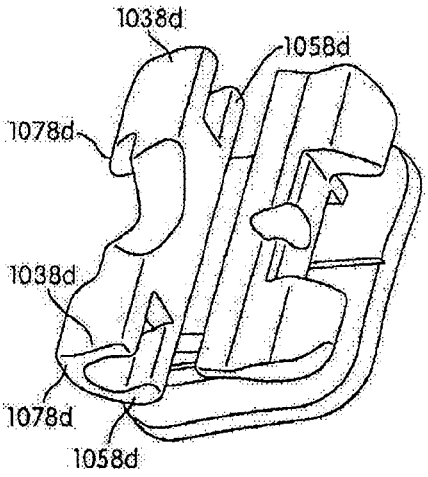


图 5B

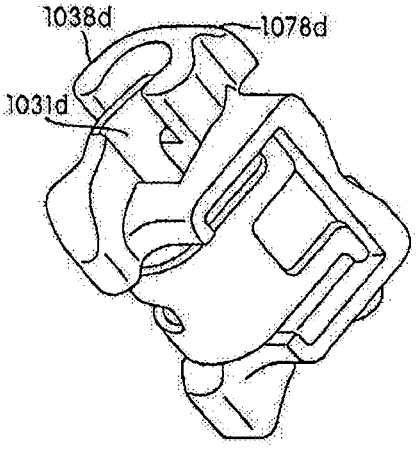


图 5C

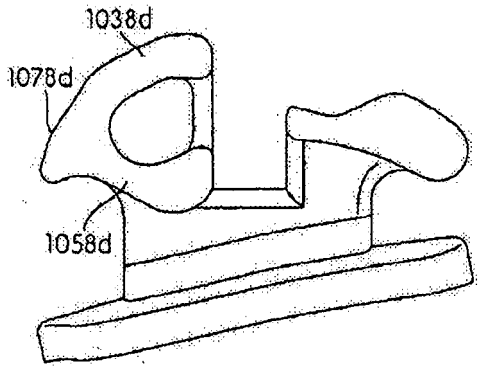


图 5D

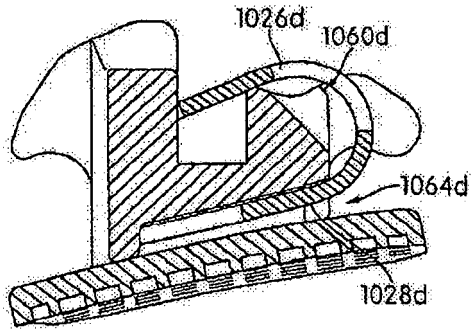


图 5E

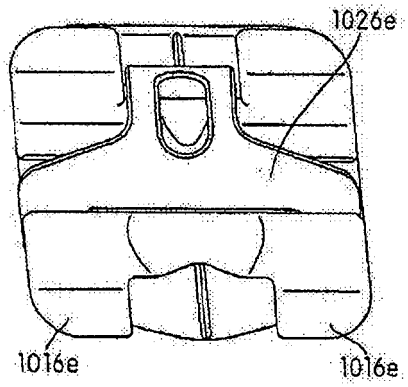


图 6A

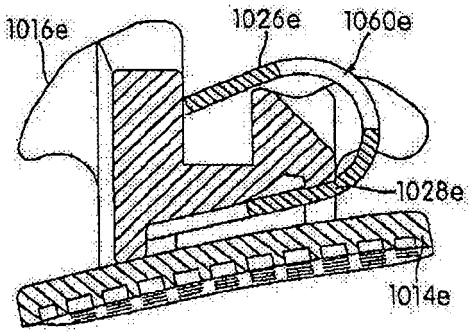


图 6B

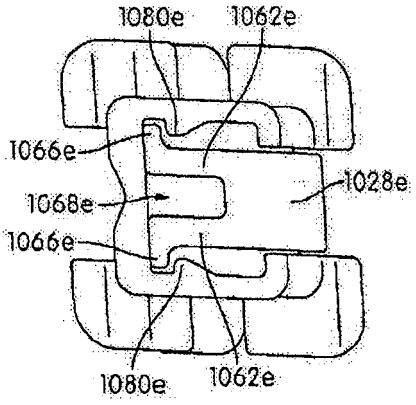


图 6C

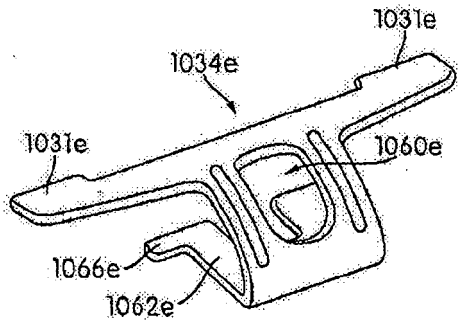


图 6D

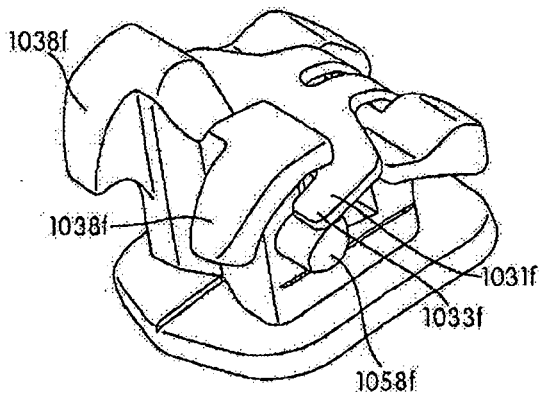


图 7A

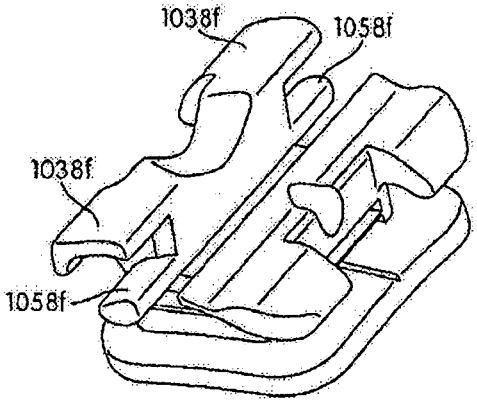


图 7B

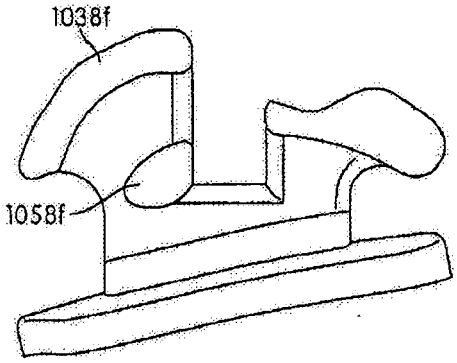


图 7C

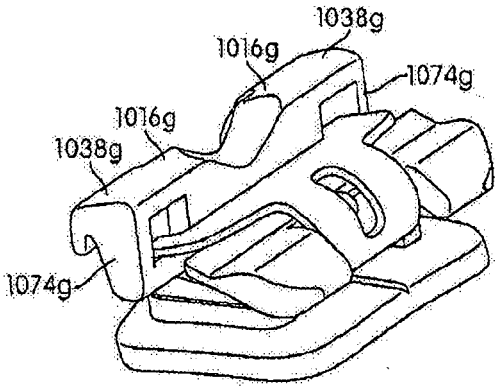


图 8A

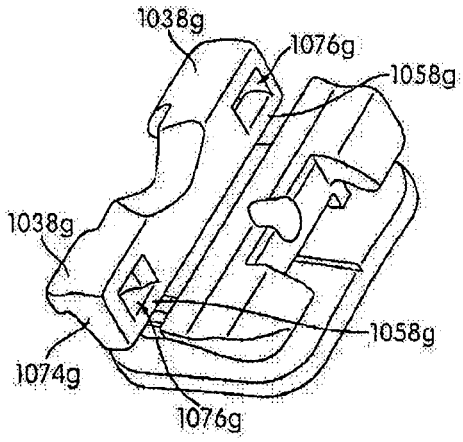


图 8B

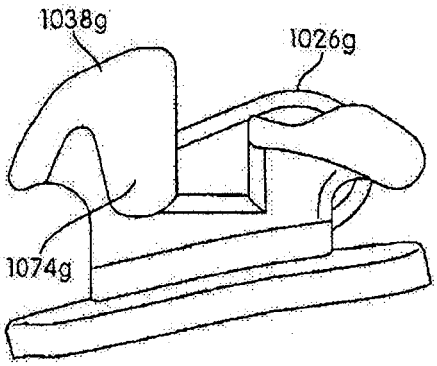


图 8C

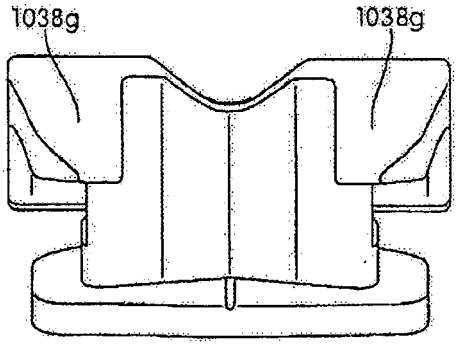


图 8D

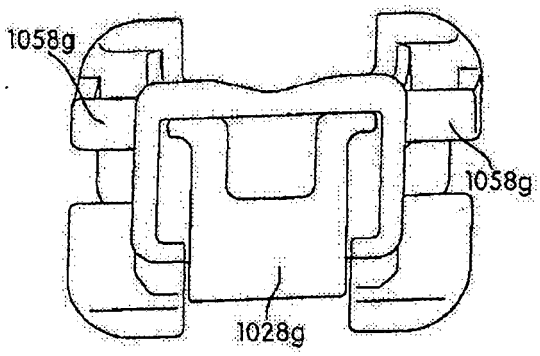


图 8E

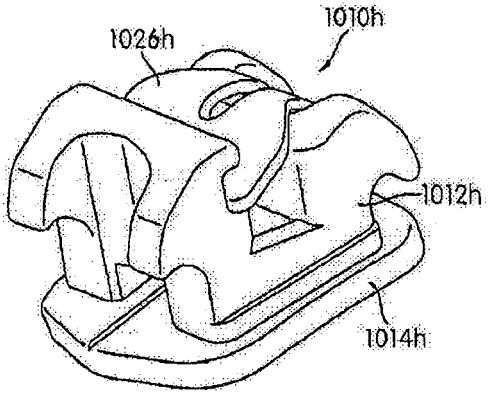


图 9A

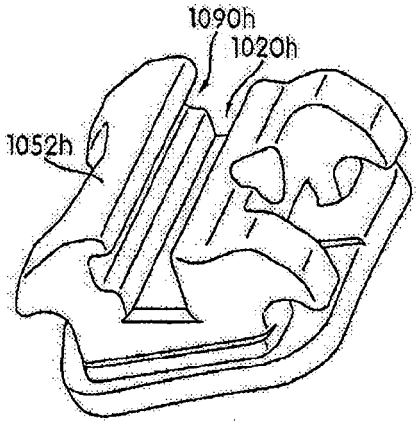


图 9B

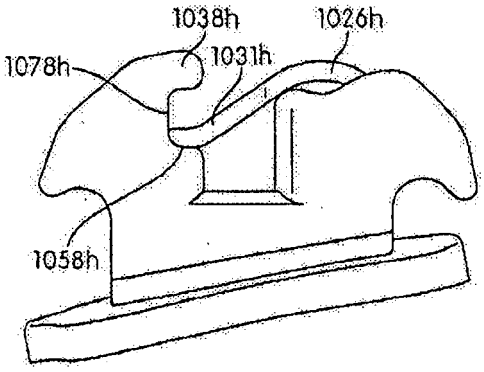


图 9C

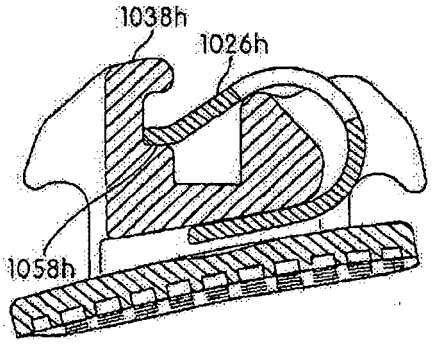
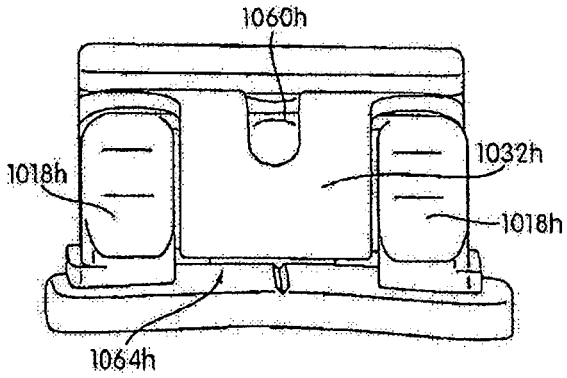


图 9D



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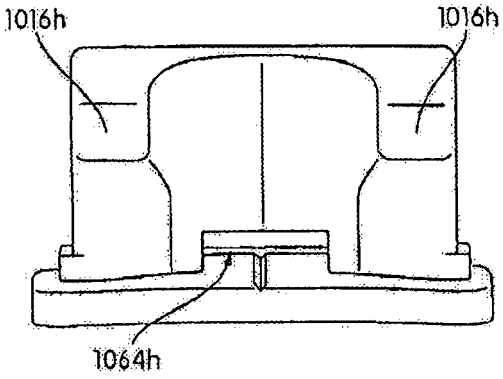

图 9F

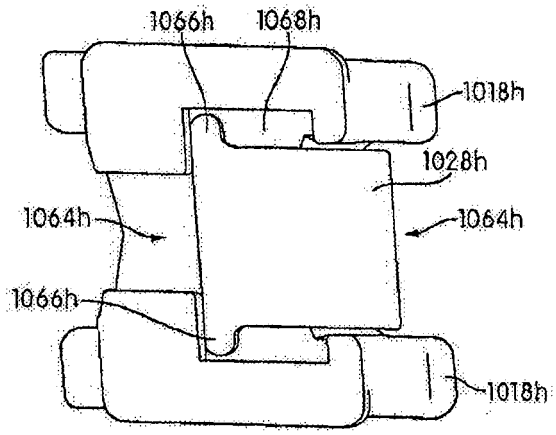

图 9G

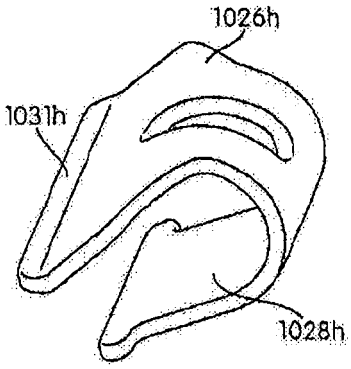

图 9H

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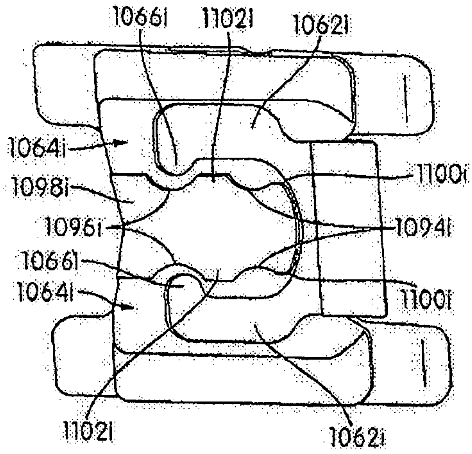

图 10A

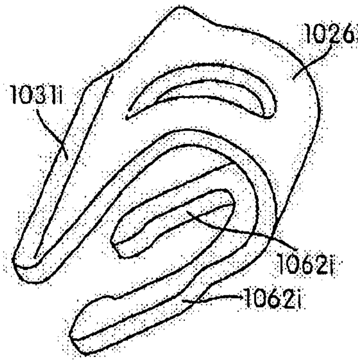

图 10B

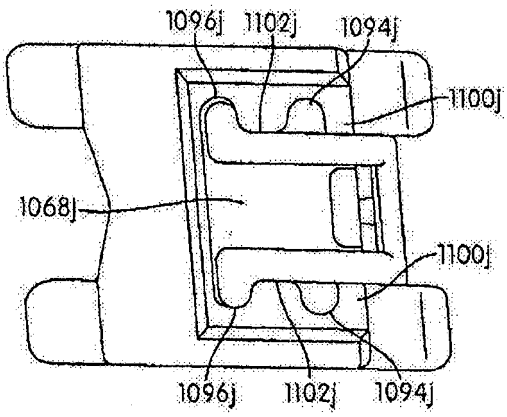

图 10C

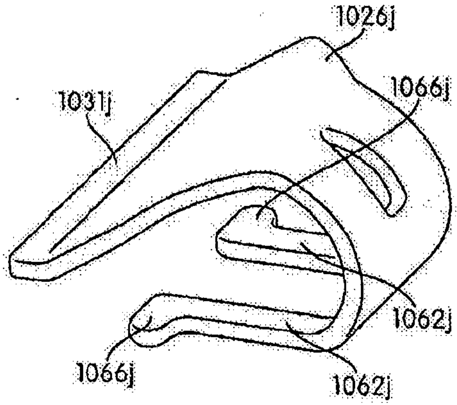

图 10D

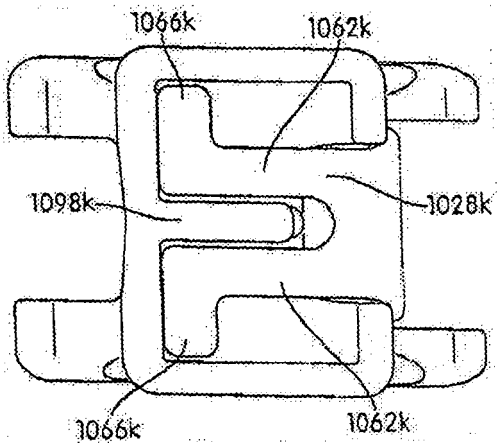

图 11A

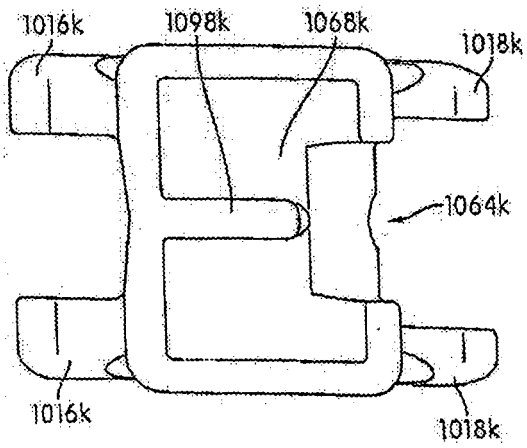

图 11B

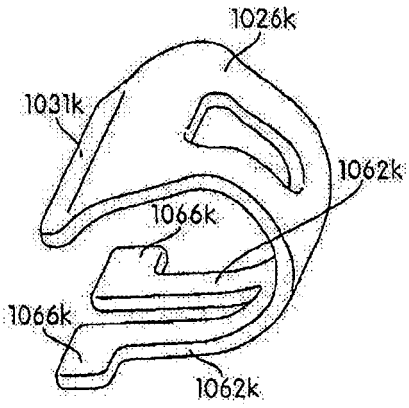

图 11C

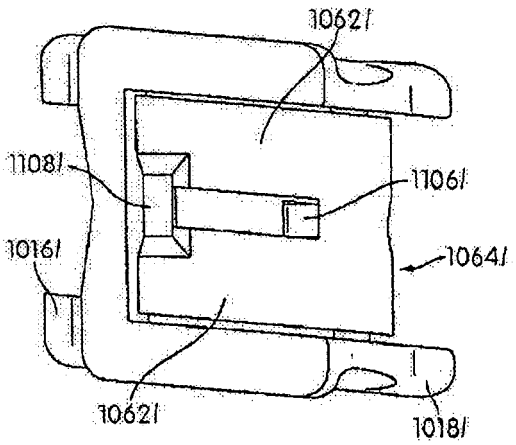

图 12A

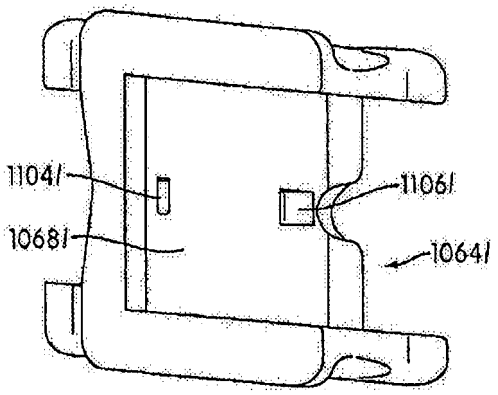

图 12B

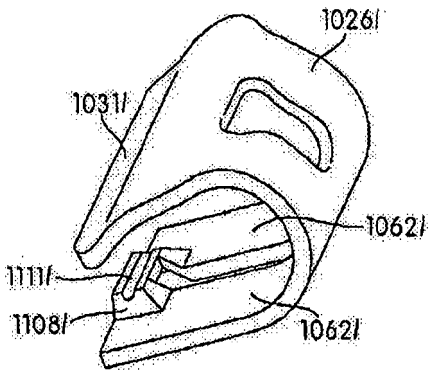

图 12C

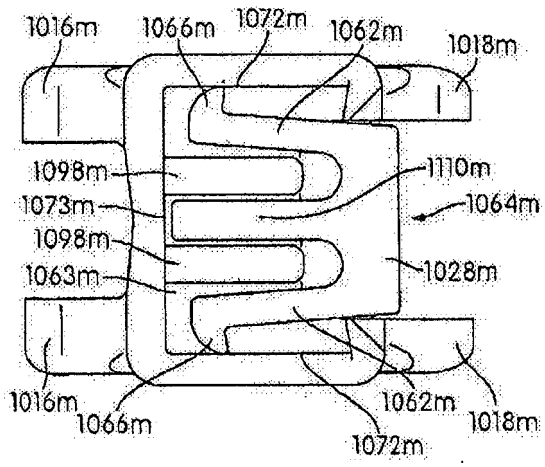

图 13A

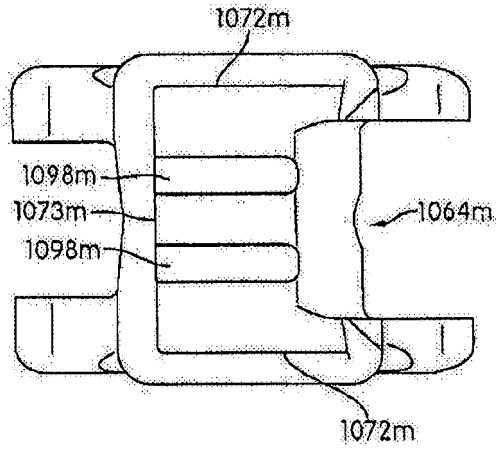

图 13B

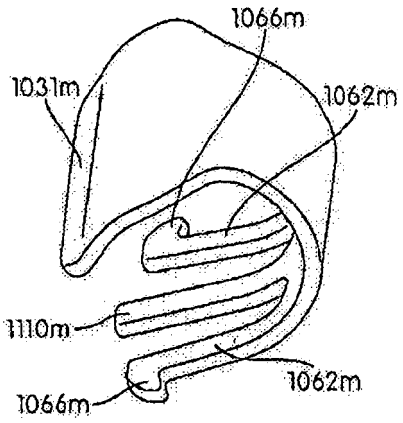

图 13C

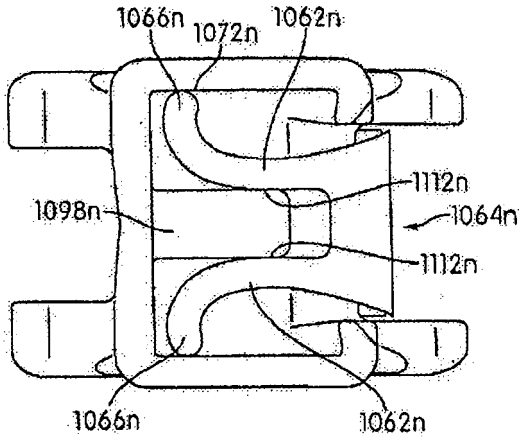

图 14A

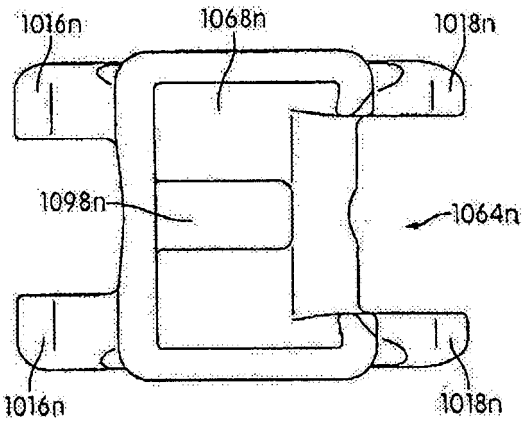

图 14B

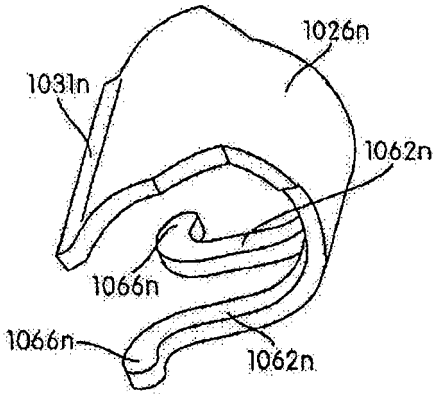

图 14C

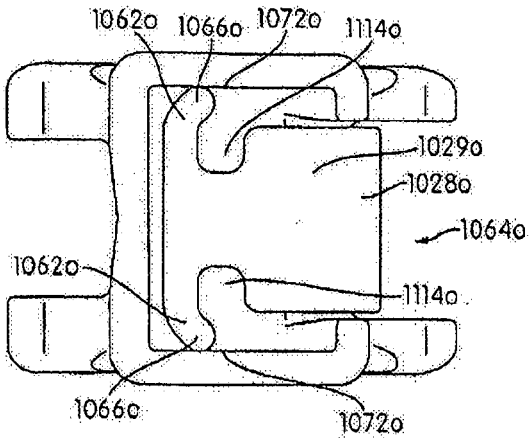

图 15A

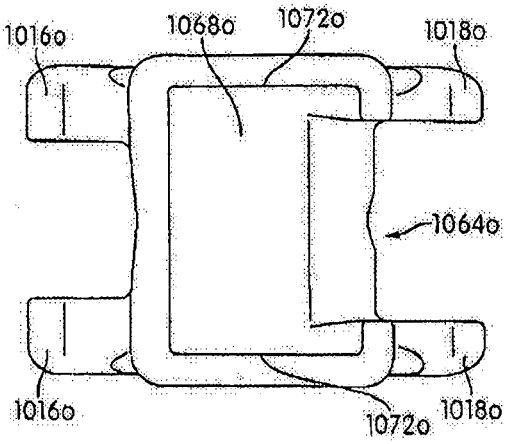

图 15B

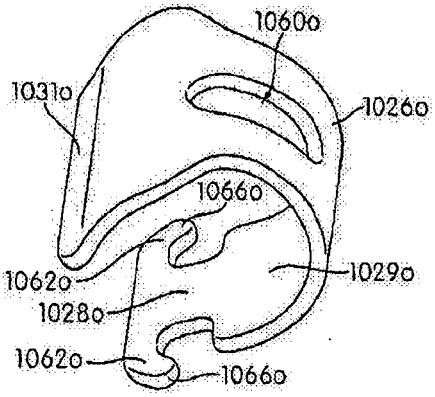

图 15C

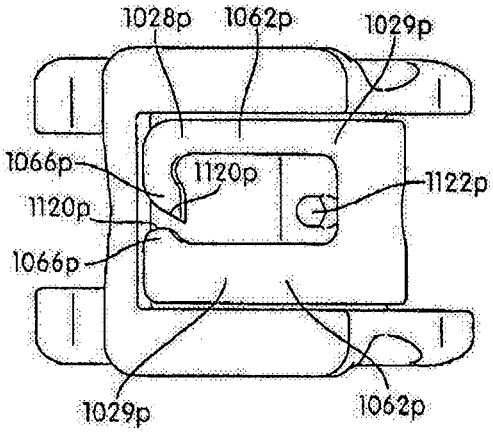

图 16A

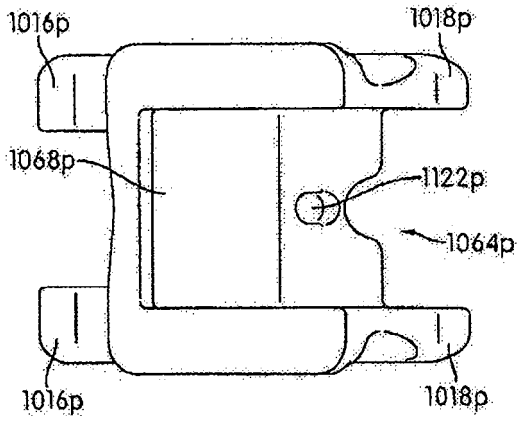

图 16B

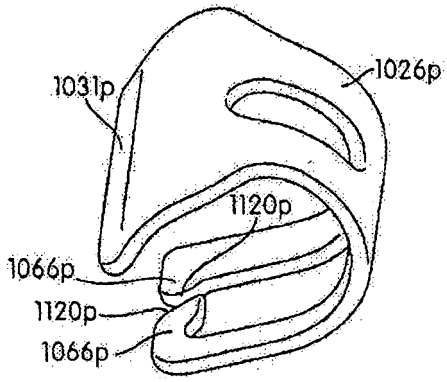

图 16C

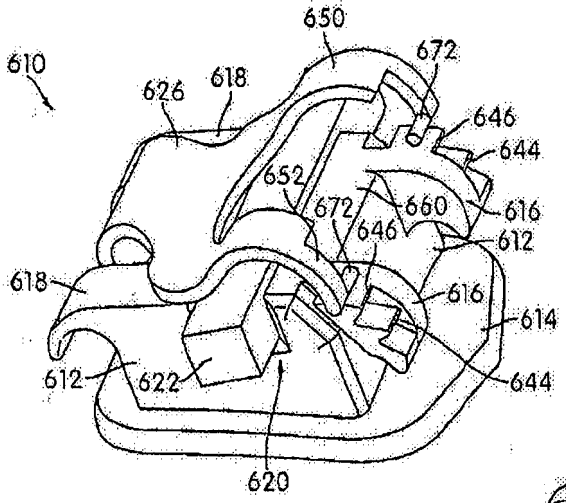

图17A

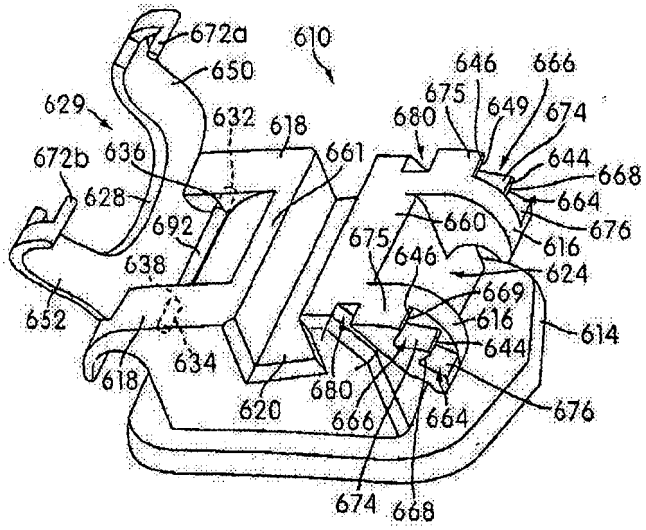

图17B

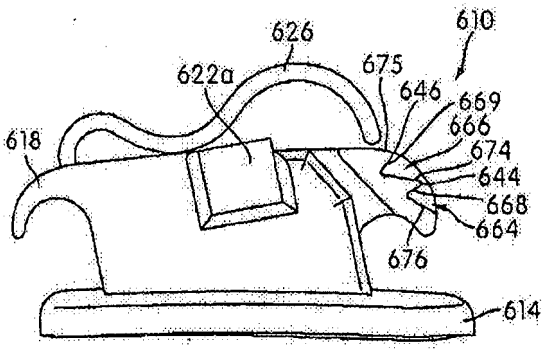

图17C

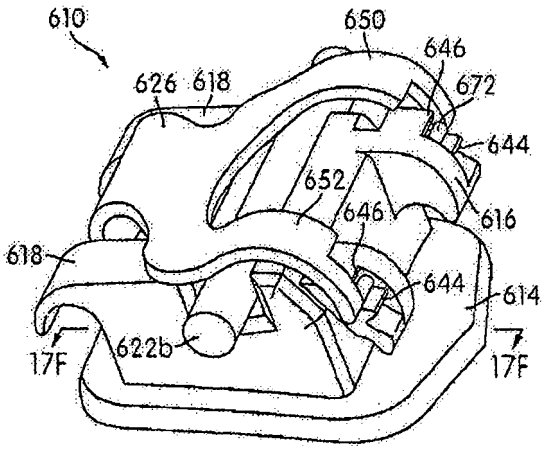

图17D

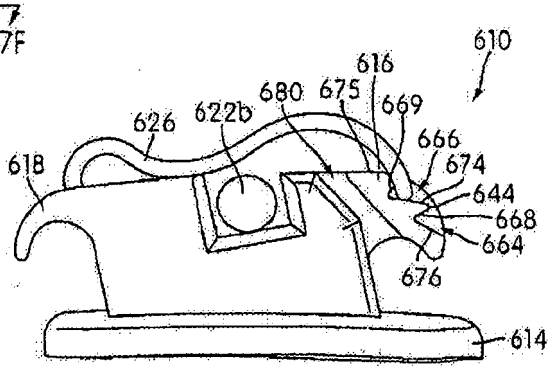

图17E

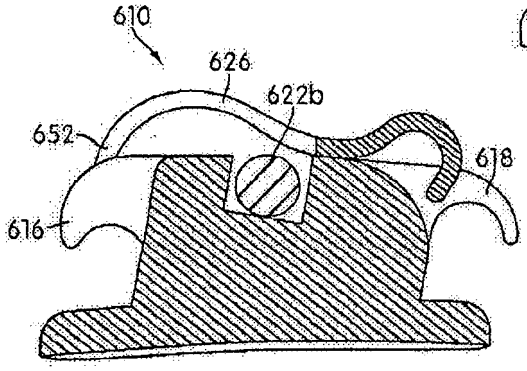

图17F

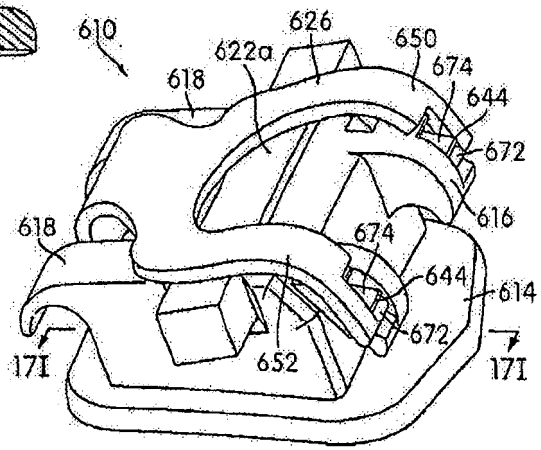

图17G

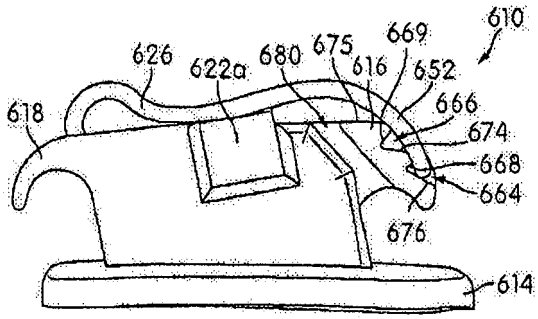

图 17H

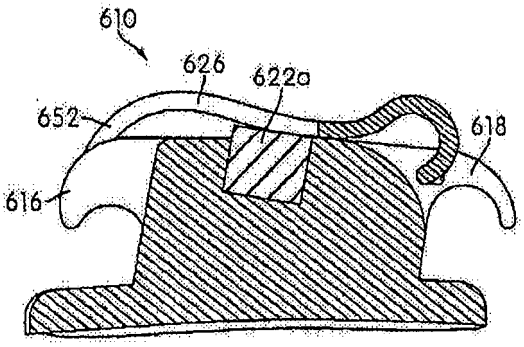

图 17I

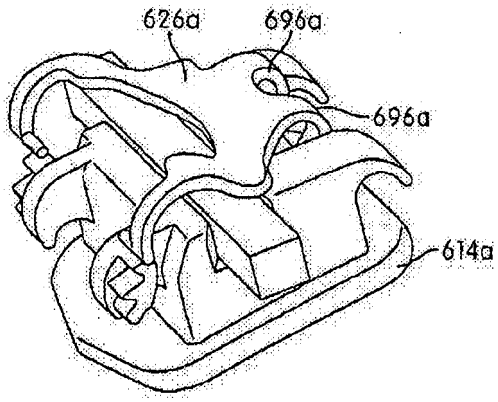

图 17J

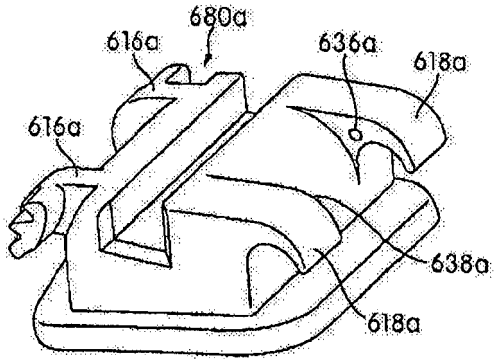

图 17K

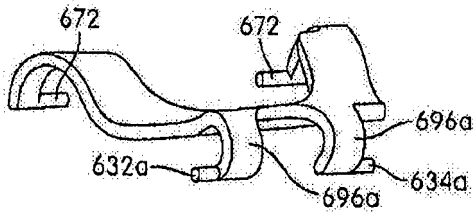

图 17L

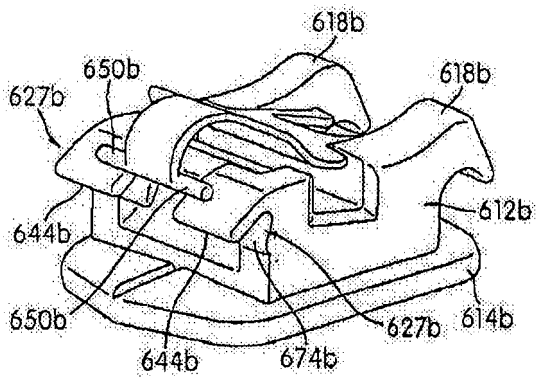

图 18A

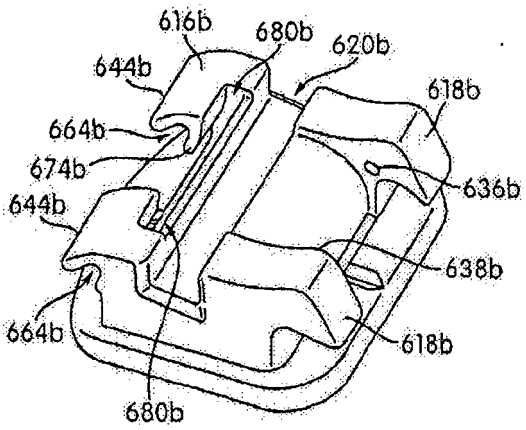

图 18B

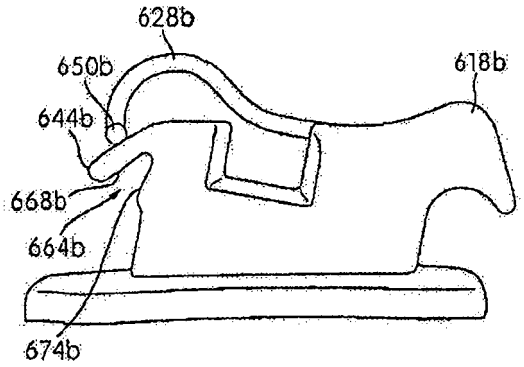

图 18C

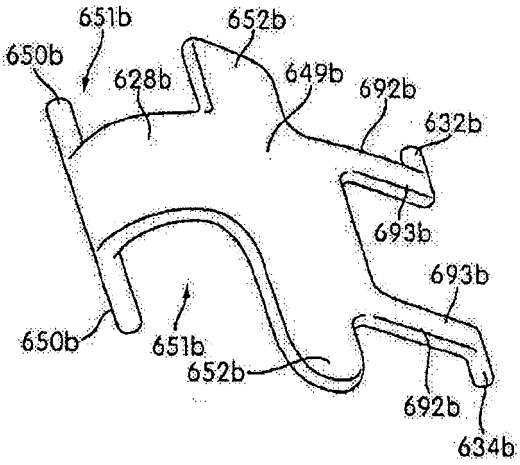

图 18D

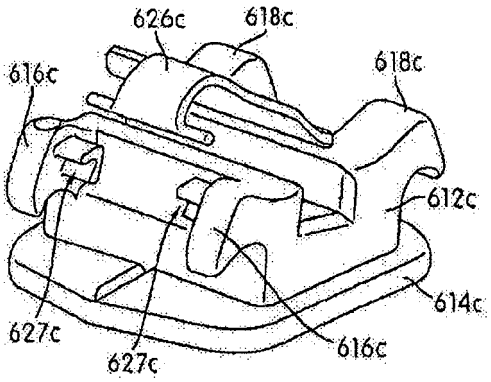

图 19A

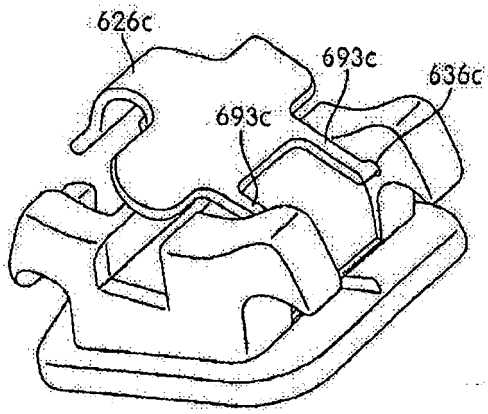

图 19B

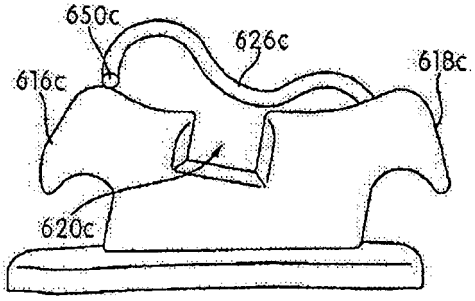

图 19C

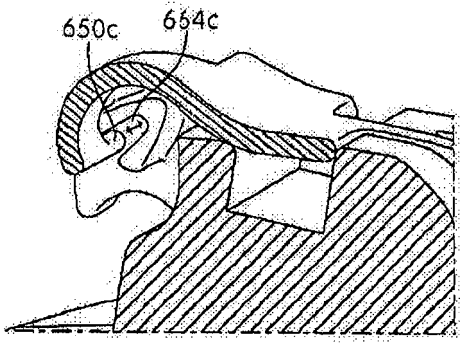

图 19D

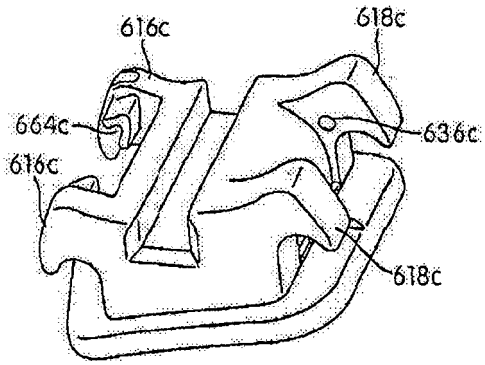

图 19E

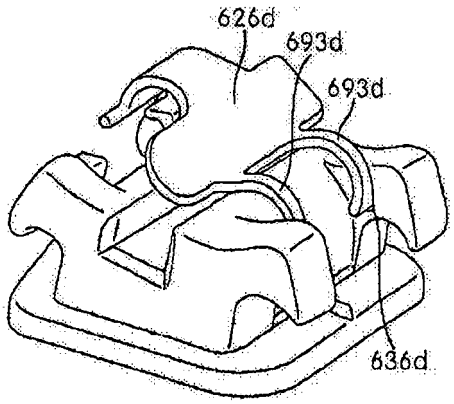

图 20A

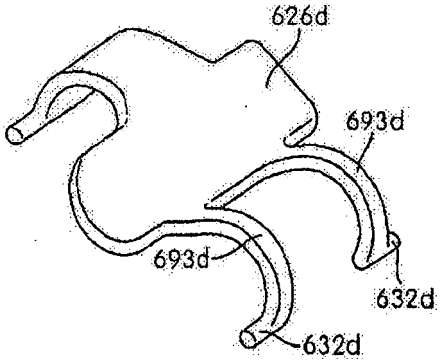

图 20B

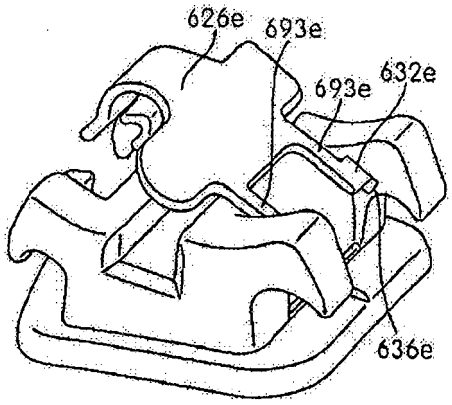

图 21A

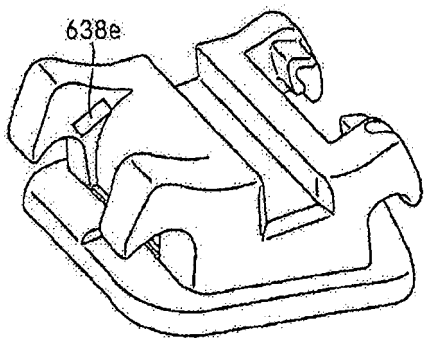

图 21B

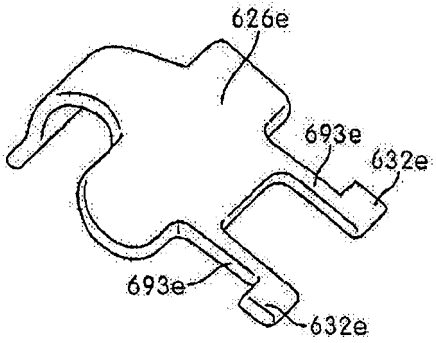

图 21C

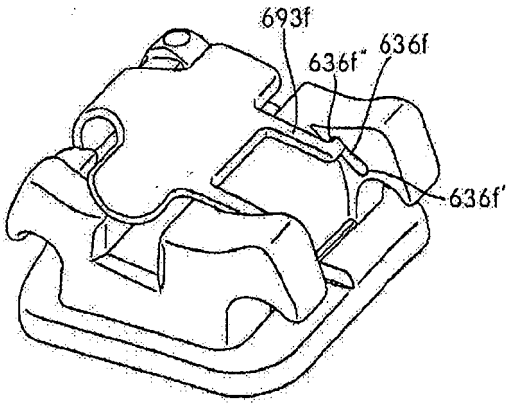

图 22A

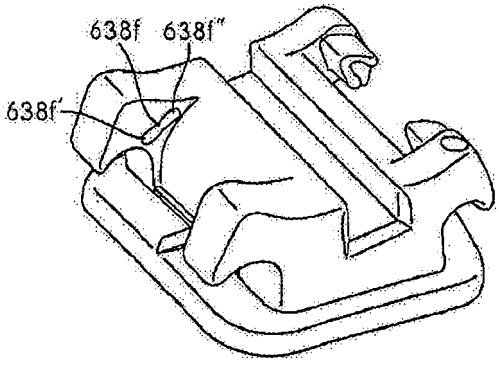

图 22B

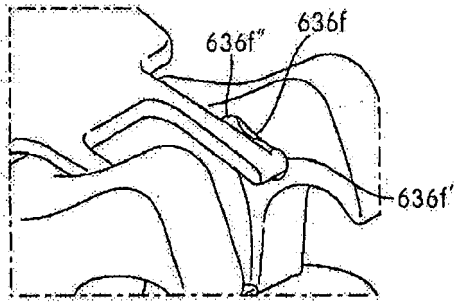

图 22C

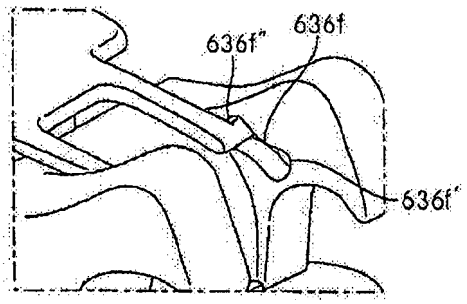

图 22D

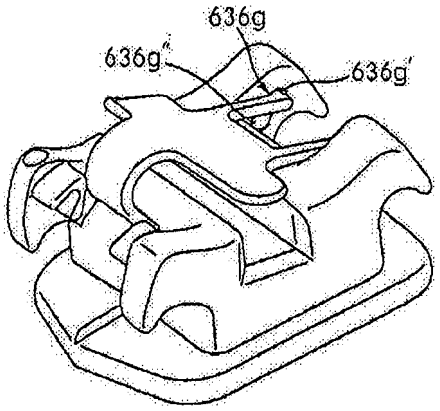

图 23A

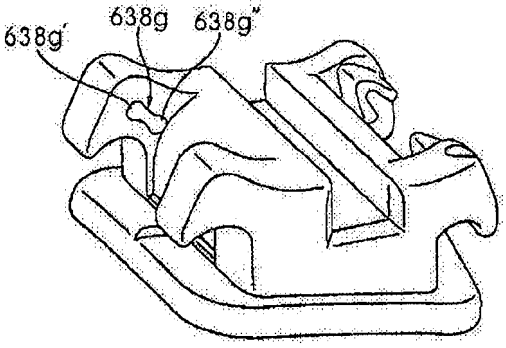

图 23B

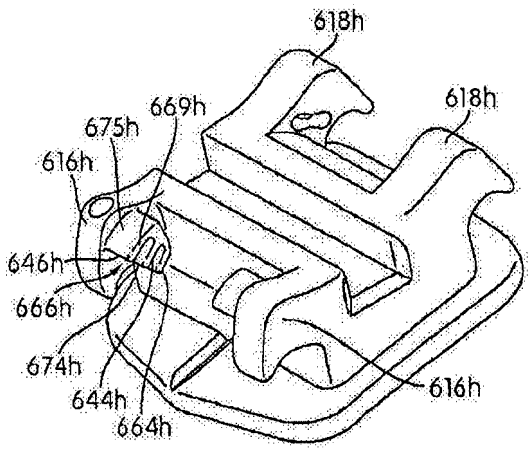

图 24A

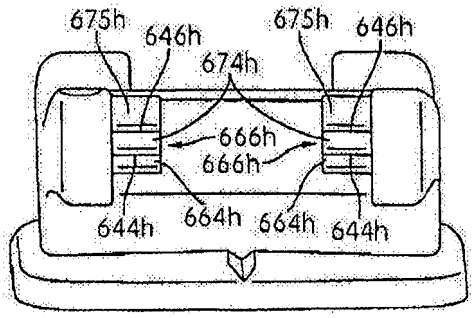

图 24B

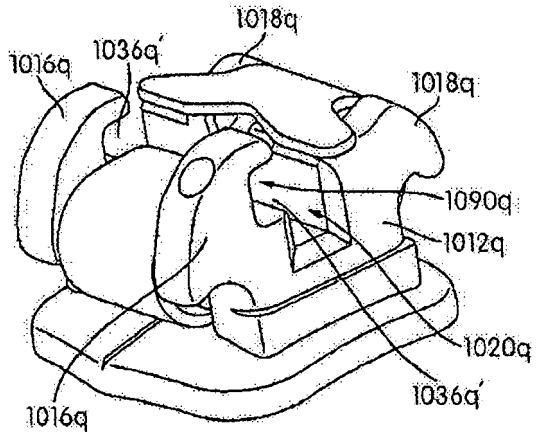

图 25A

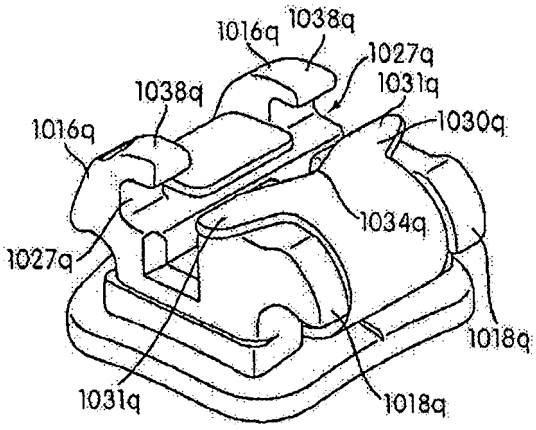

图 25B

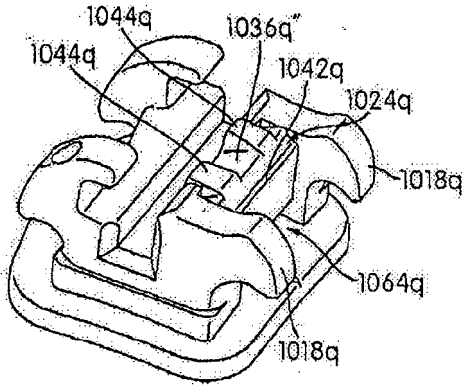

图 25C

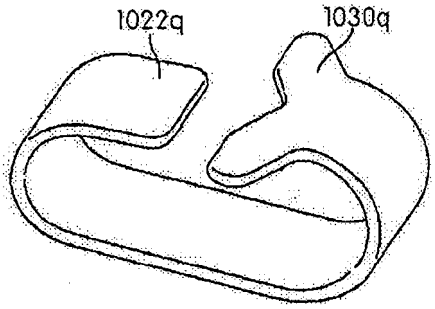

图 25D

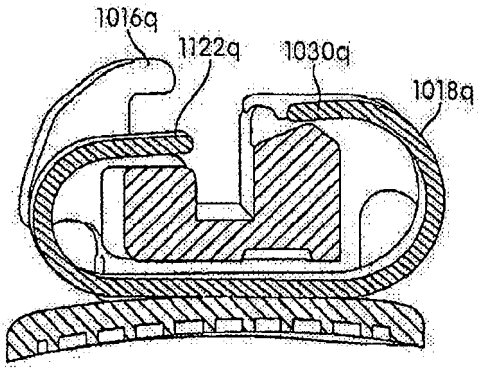

图 25E

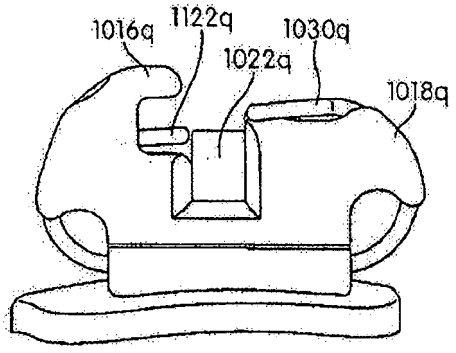

图 25F

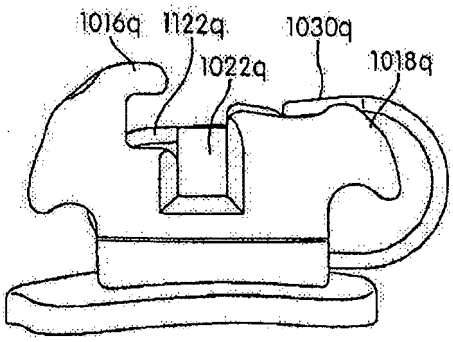

图 25G

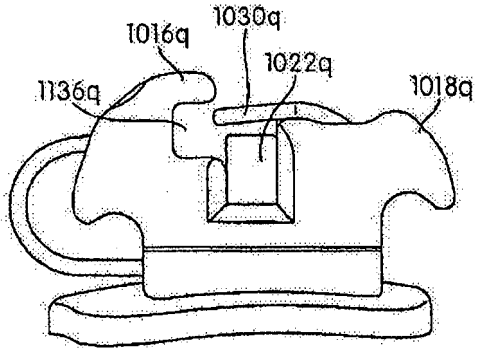

图 25H

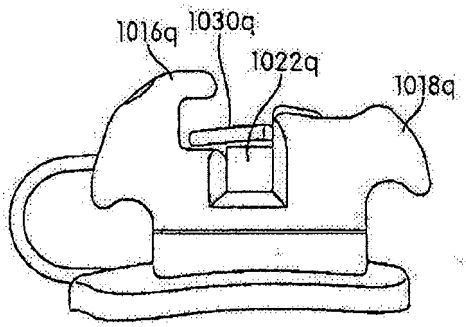

图 25I

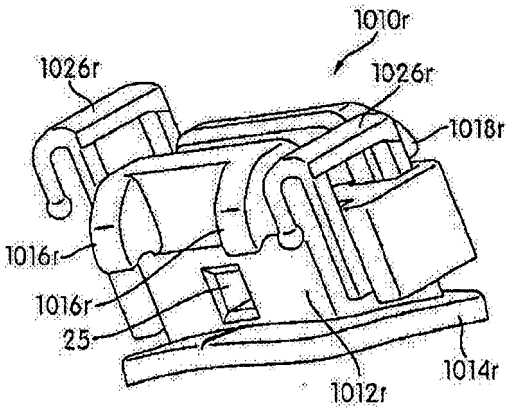

图 26A

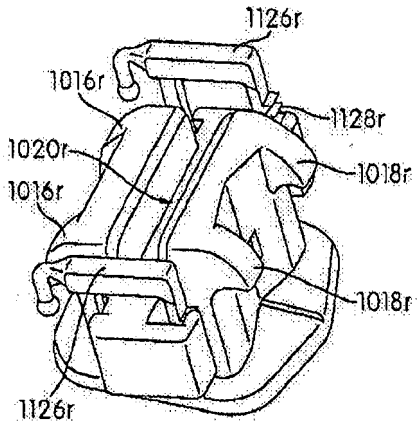

图 26B

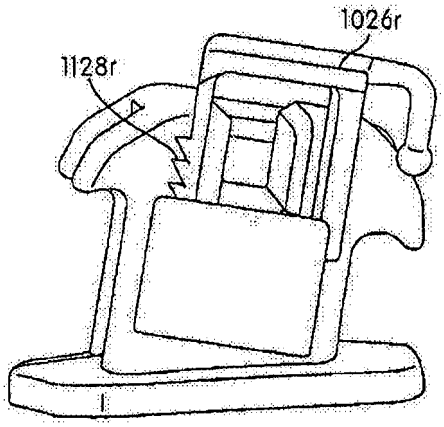

图 26C

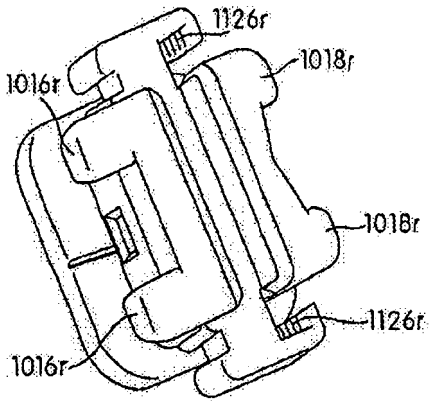

图 26D

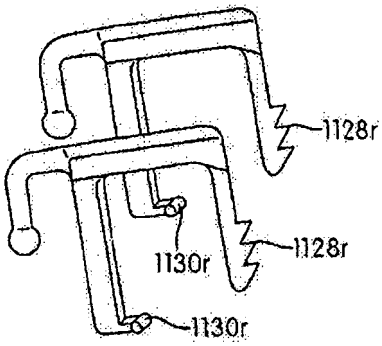

图 26E

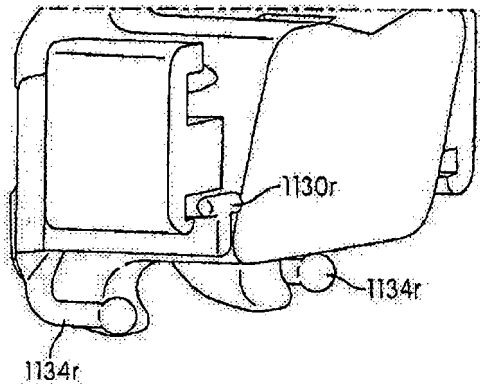

图 26F

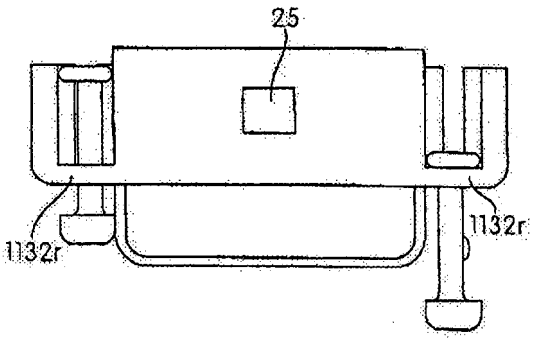

图 26G

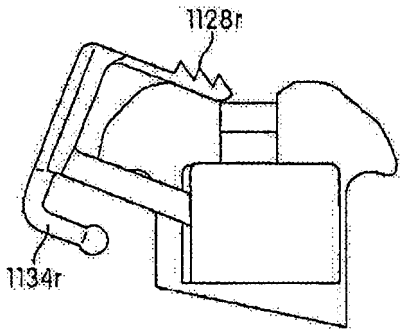

图 26H

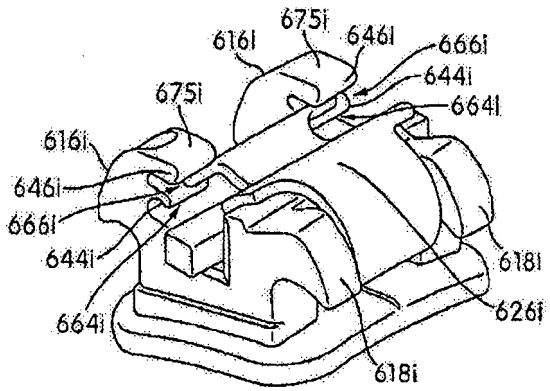

图 27A

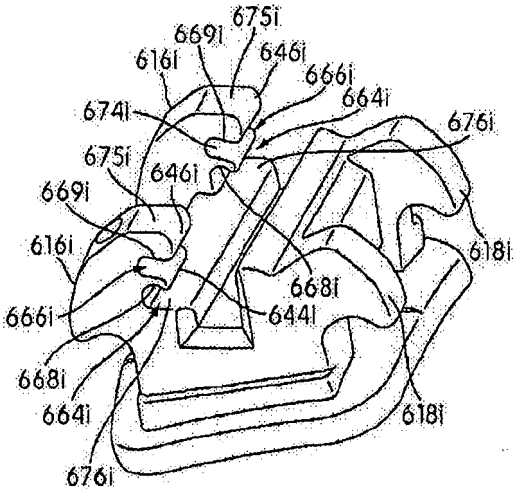

图 27B

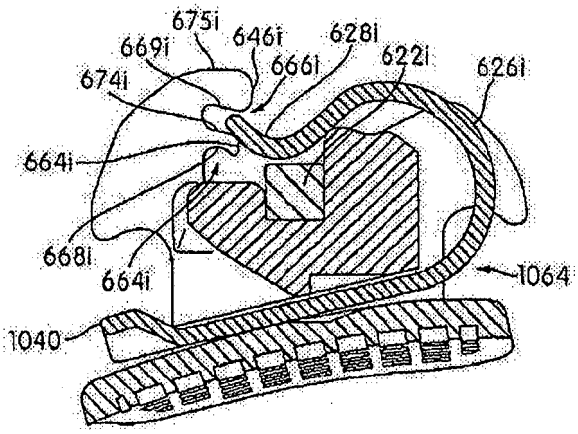

图 27C

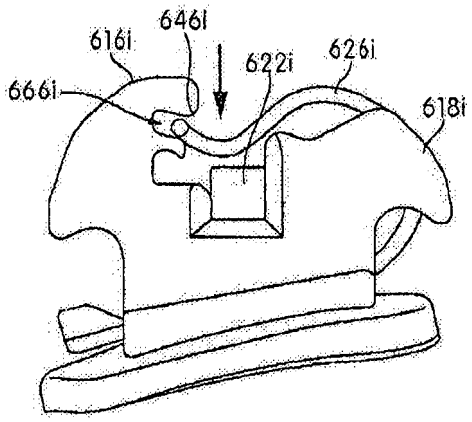

图 27D

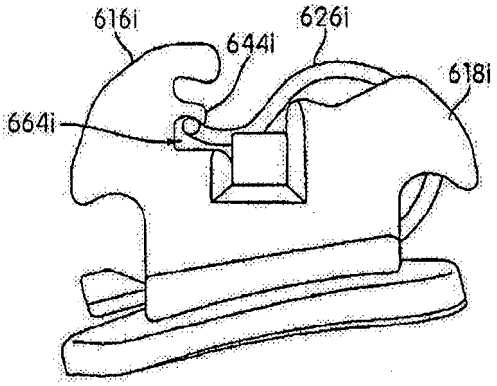

图 27E

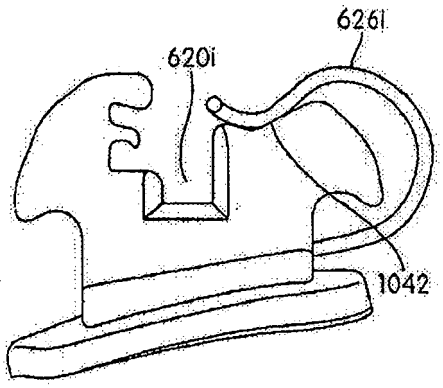

图 27F

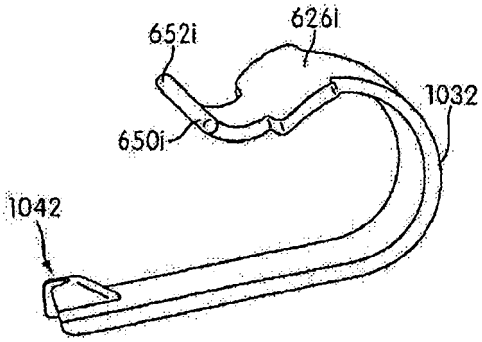

图 27G

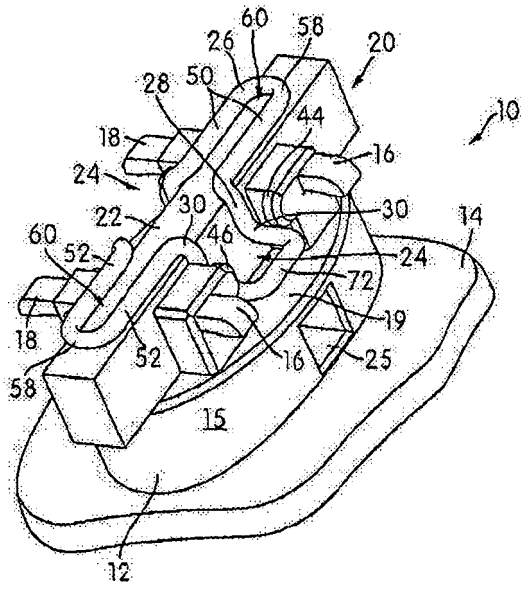

图 28A

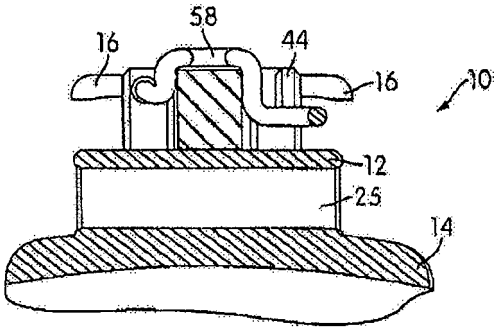

图 28B

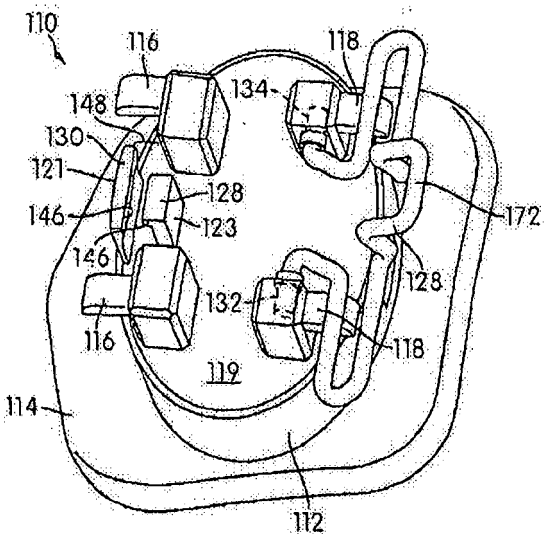

图 28C

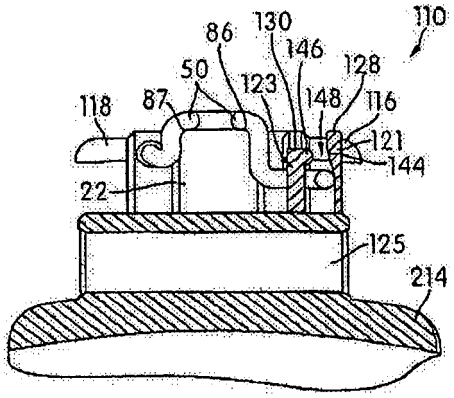

图 28D

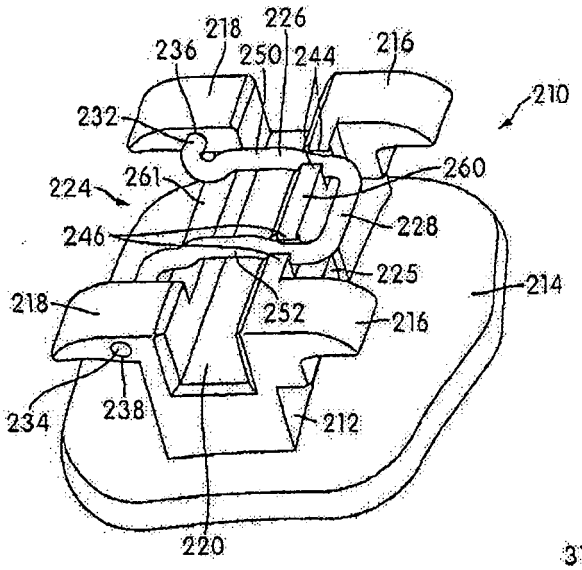

图28E

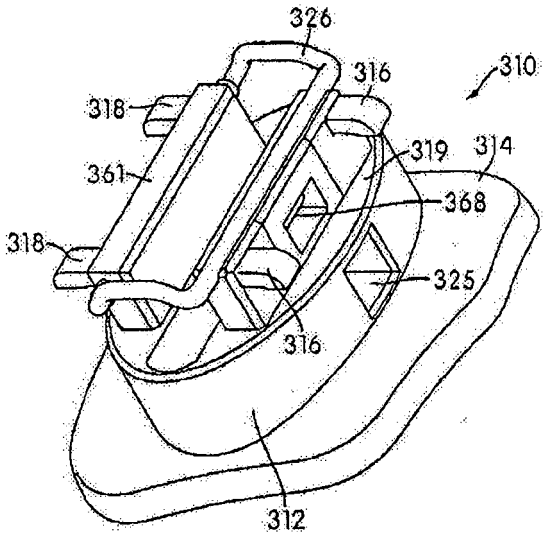

图28F

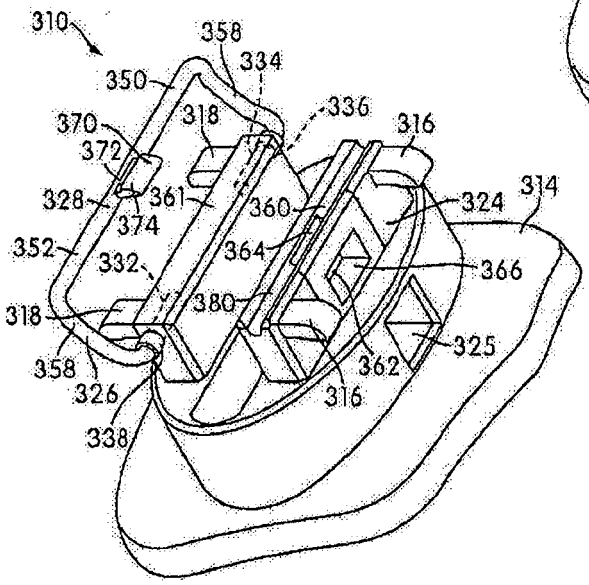

图28G

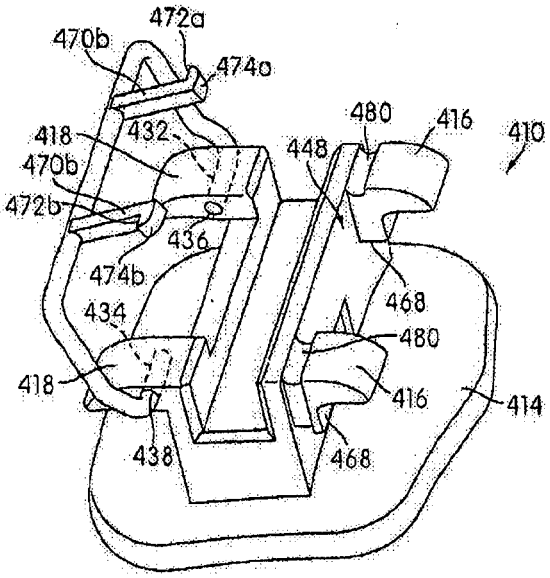

图 28H

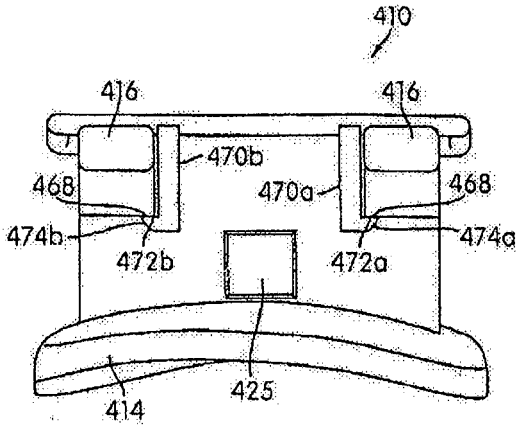

图 28I

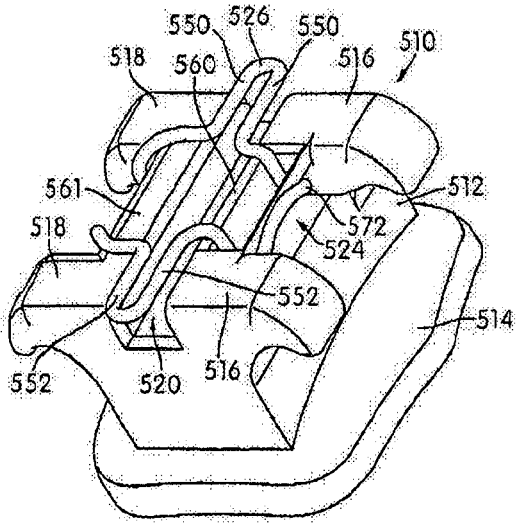

图 28J

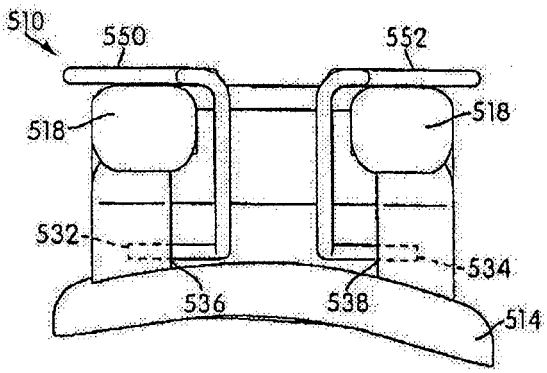

图 28K

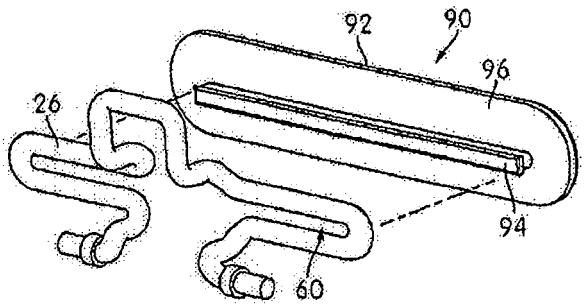

图 29A

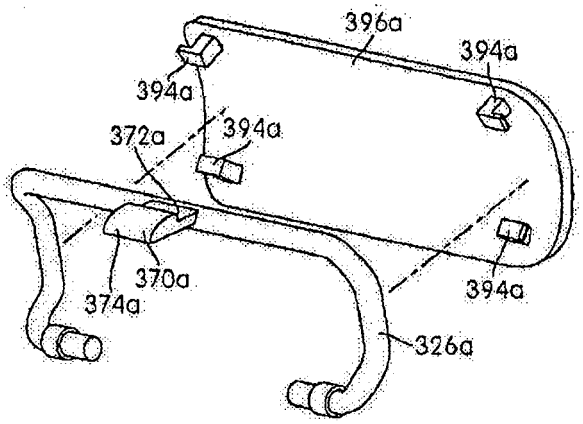

图 29B

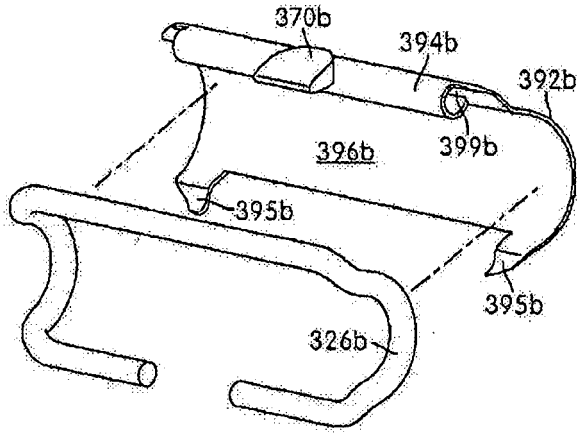

图 29C

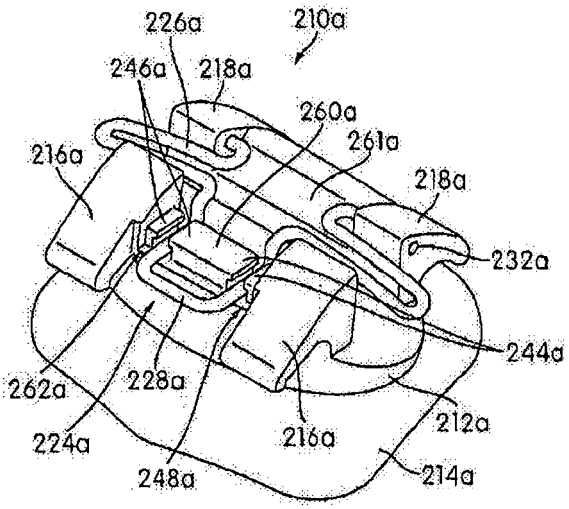

图 30A

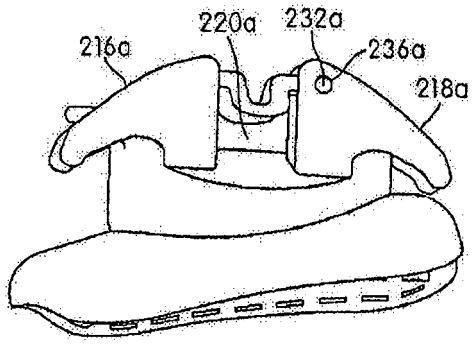

图 30B

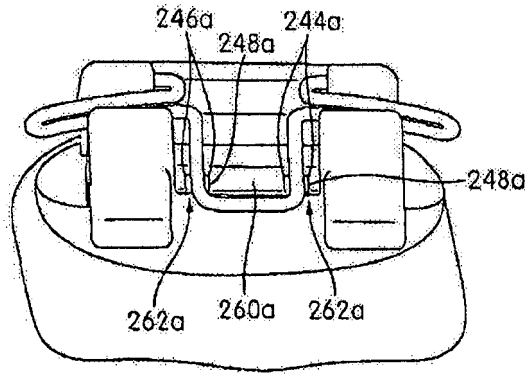

图 30C

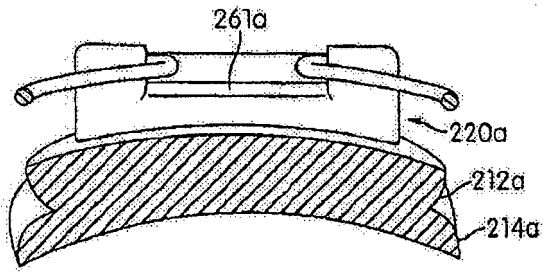

图 30D

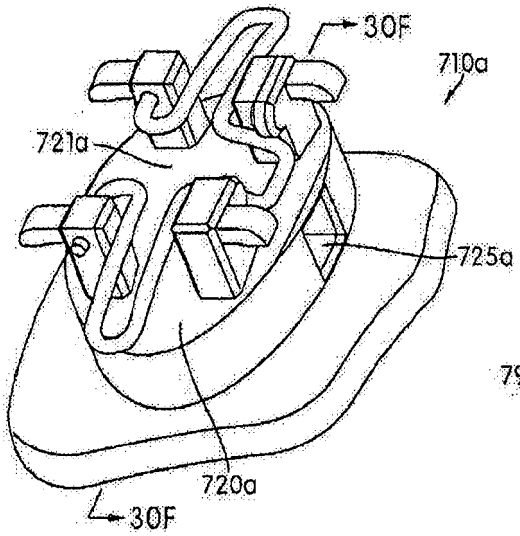

图 30E

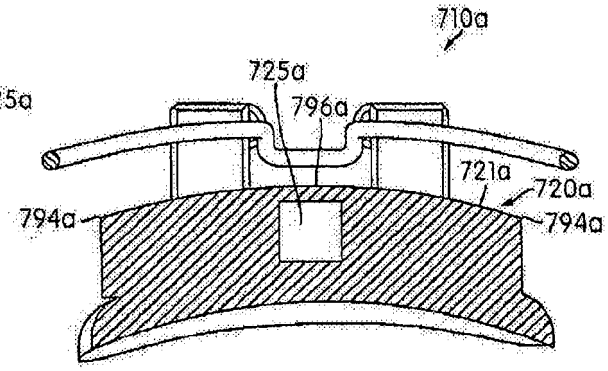

图 30F

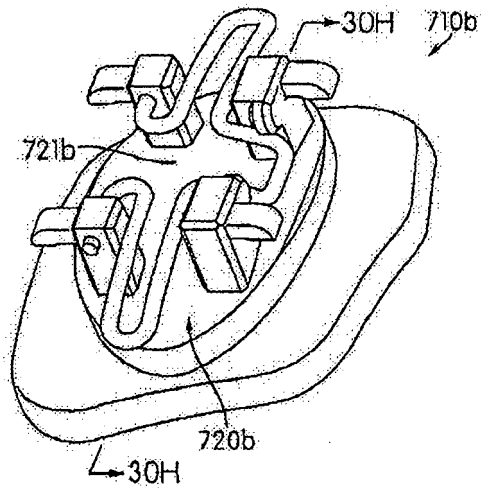

图 30G

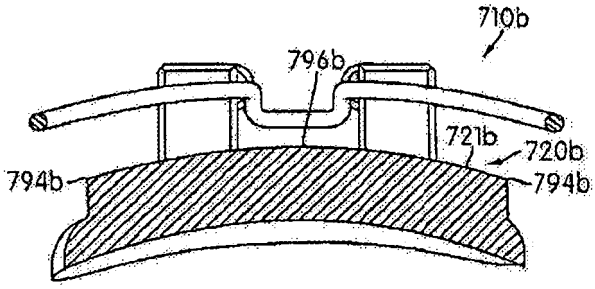

图 30H

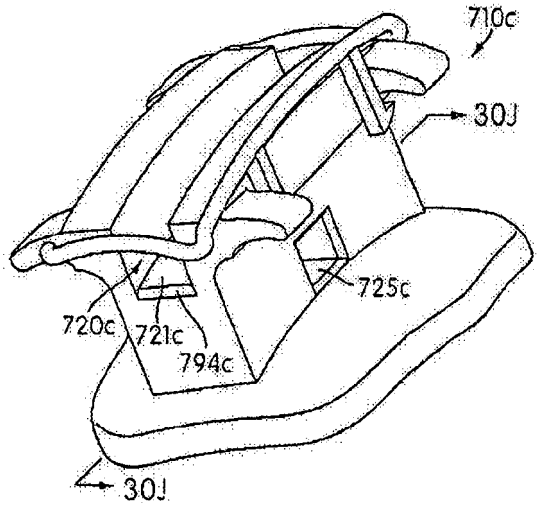

图 30I

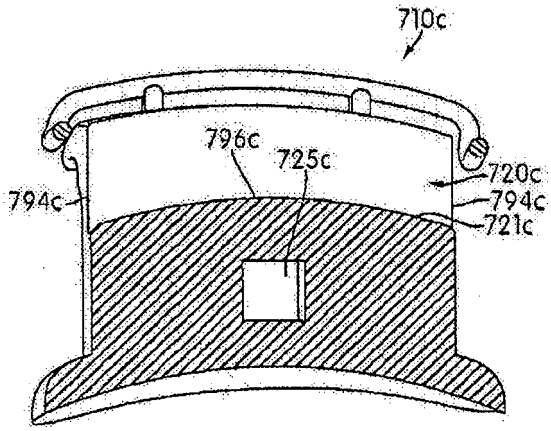

图 30J

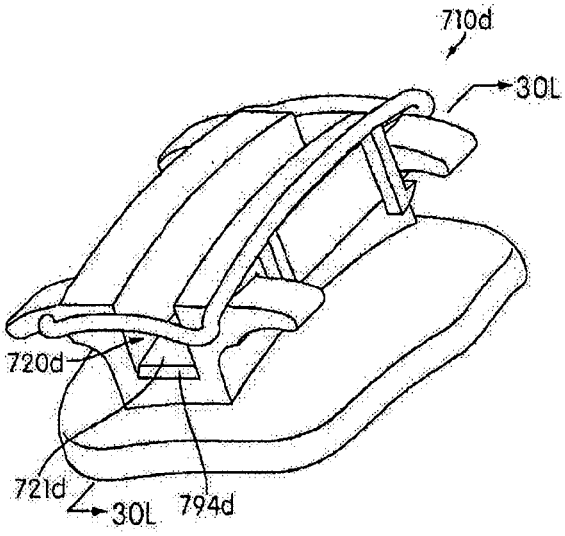

图 30K

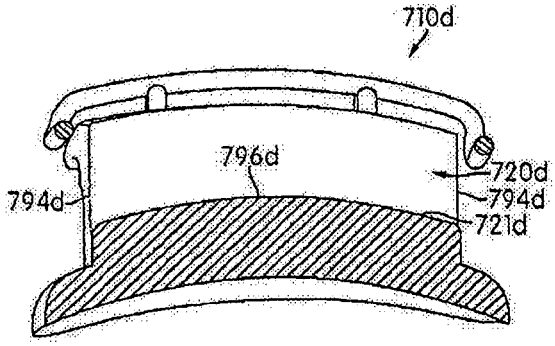

图 30L

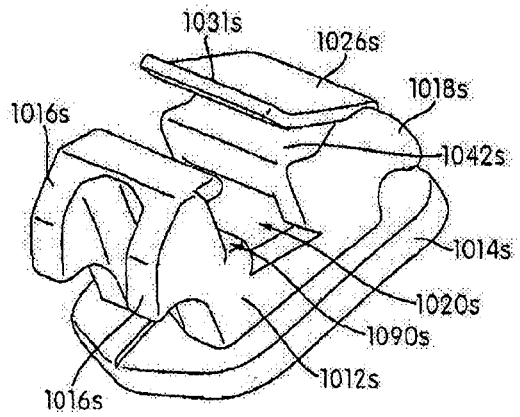

图 31A

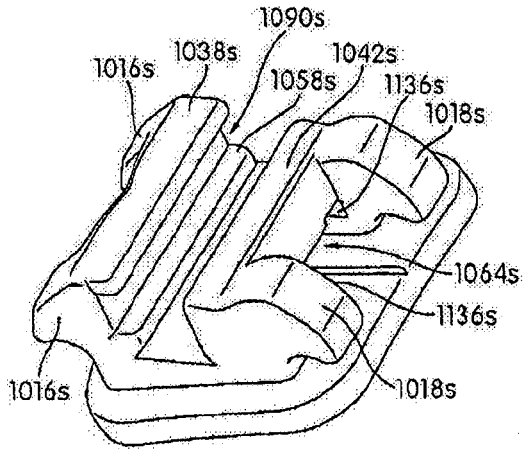

图 31B

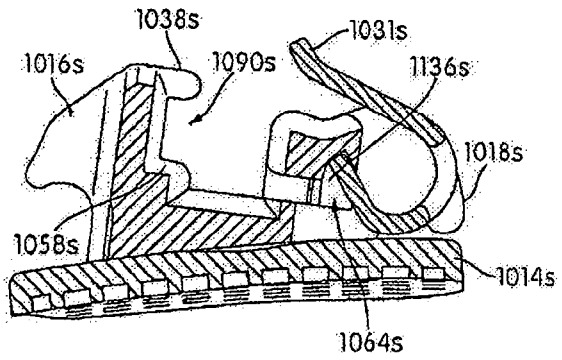
1038s
1031s
1016s
1090s
1136s
1018s
1058s
1014s
1064s

图 31C

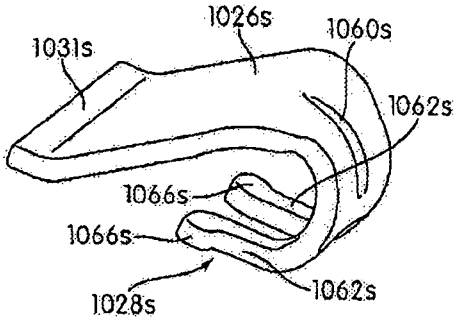
1026s
1060s
1031s
1062s
1066s
1066s
1028s
1062s

图 31D