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(54) **ORTHODONTIC BRACKET**

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Related U.S. Application Data

(63) Continuation of application No. 09/327,732, filed on Jun. 8, 1999, now Pat. No. 6,257,883, which is a continuation of application No. 08/745,512, filed on Nov. 12, 1996, now Pat. No. 5,913,680, which is a continuation-in-part of application No. 08/625,944, filed on Apr. 1, 1996, now Pat. No. 5,857,850, which is a continuation-in-part of application No. 08/412,338, filed on Mar. 31, 1995, now abandoned, which is a continuation-in-part of application No. 08/206,724, filed on Mar. 7, 1994, now Pat. No. 5,474,445.

Publication Classification

(51) **Int. Cl.**[7] **A61C 3/00**

(52) **U.S. Cl.** **433/11**; 433/10

(57) **ABSTRACT**

In one embodiment, a pre-engaging orthodontic bracket includes a body having a lingual surface for attachment to a tooth, a pair of laterally spaced gingival tie wings and a pair of laterally spaced occlusal tie wings. The gingival and occlusal tie wings project from a labial surface of the body. An archwire slot extends mesiodistally across the body and between the gingival and occlusal tie wings at opposed mesial and distal sides of the body to accommodate an archwire. A pivot pin extends between a pair of the tie wings at opposed mesial and distal sides of the body. A shutter is moveable relative to the body between an open position in which placement and removal of an archwire into the archwire slot is facilitated and a closed position in which placement and removal of an archwire into the archwire slot is inhibited.

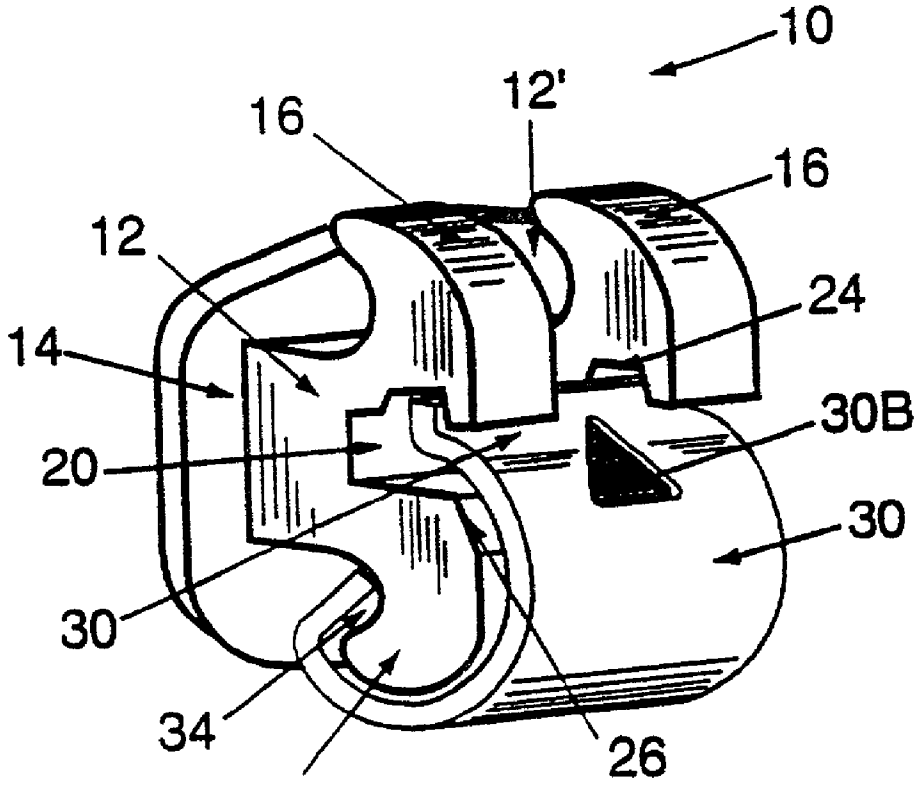
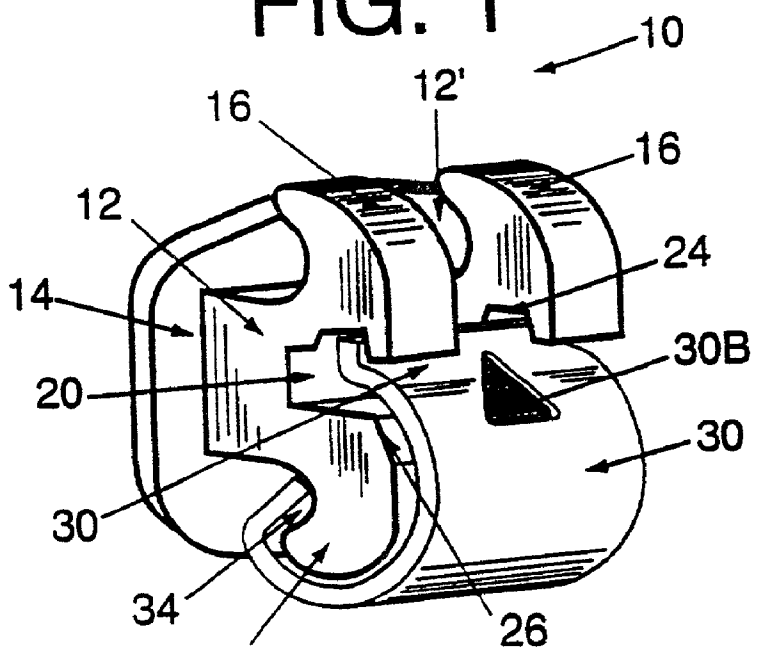


FIG. 1


10
12'
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30B
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FIG. 2A

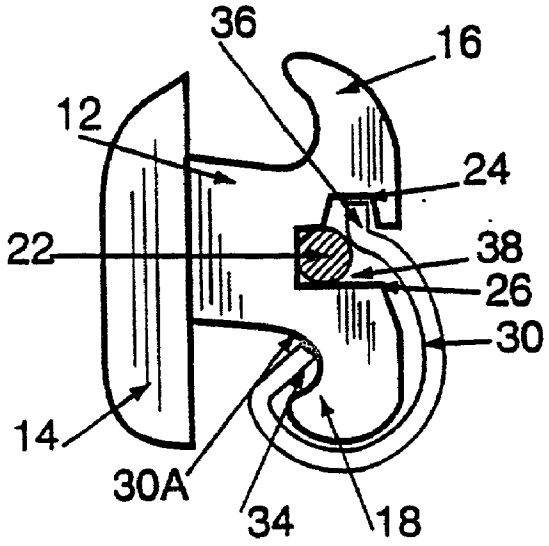
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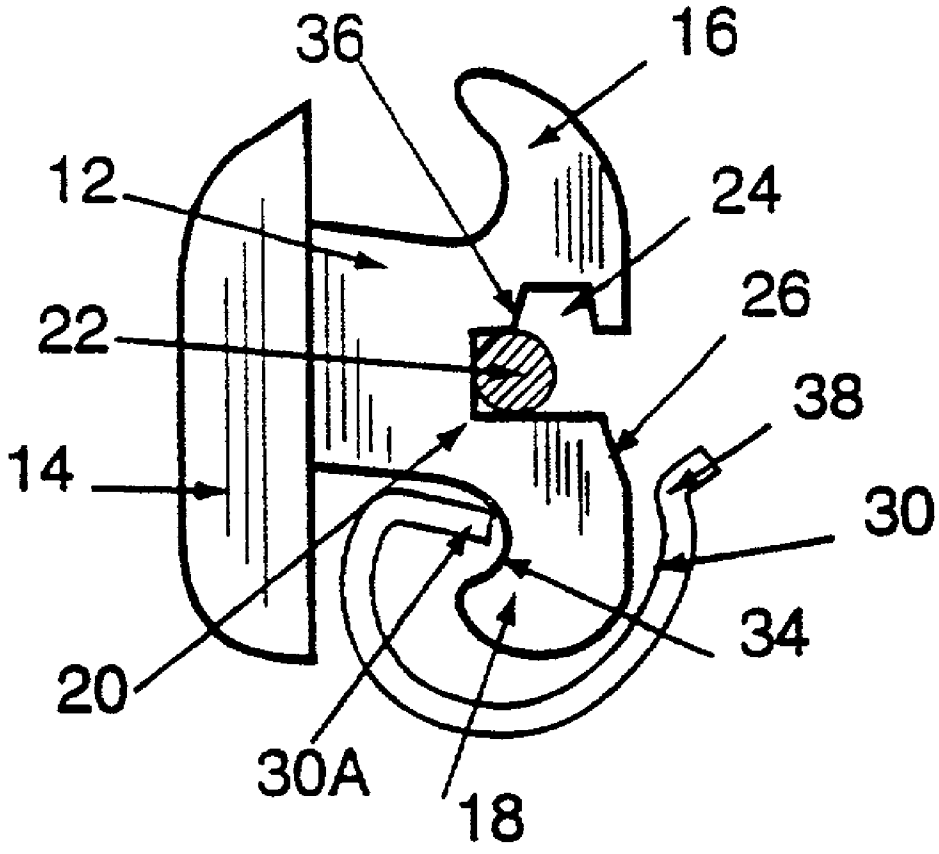
FIG. 2B



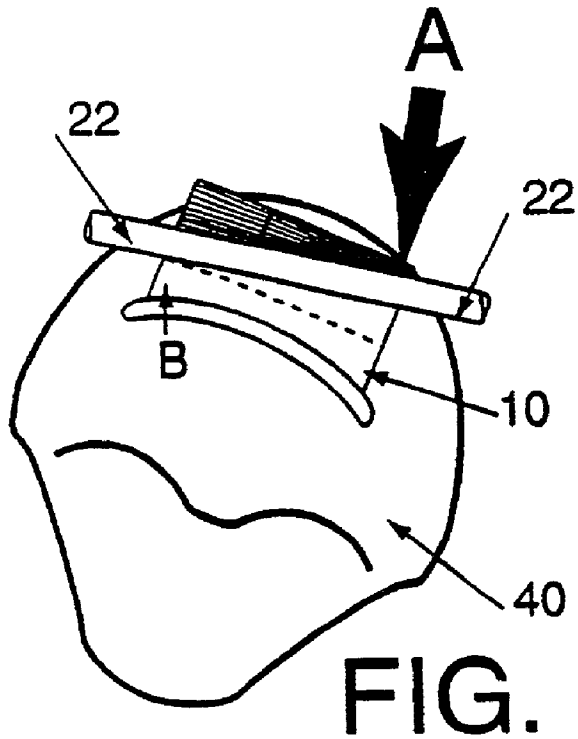


FIG. 3A

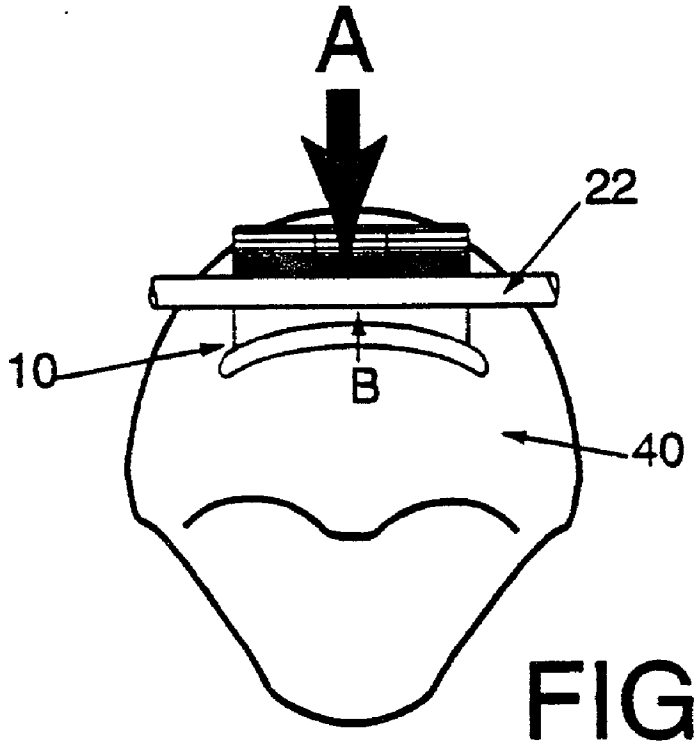


FIG. 3B

FIG. 4

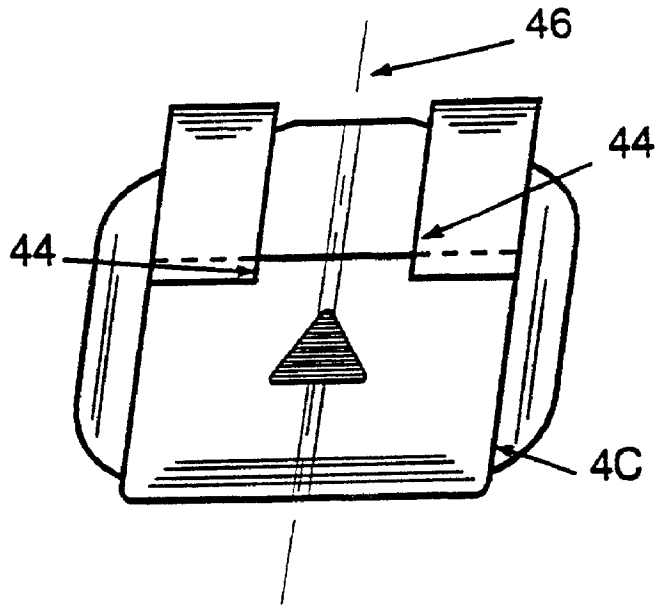


FIG. 5

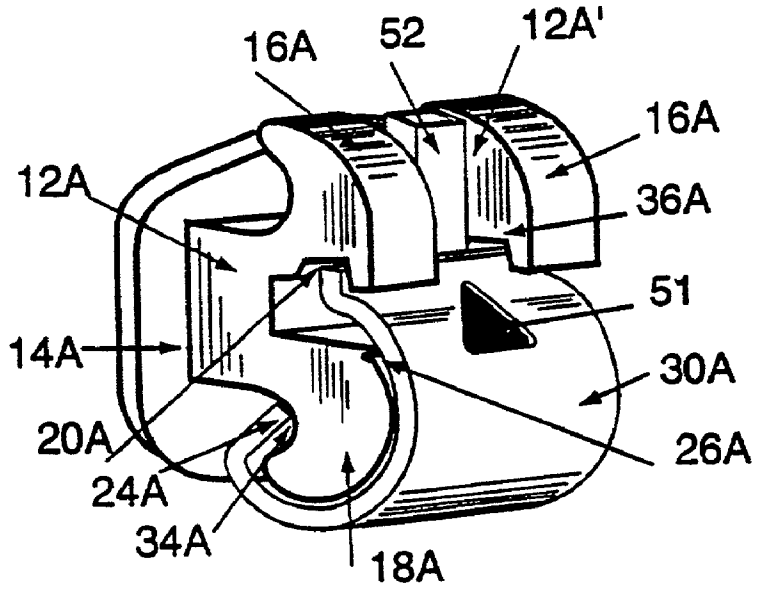
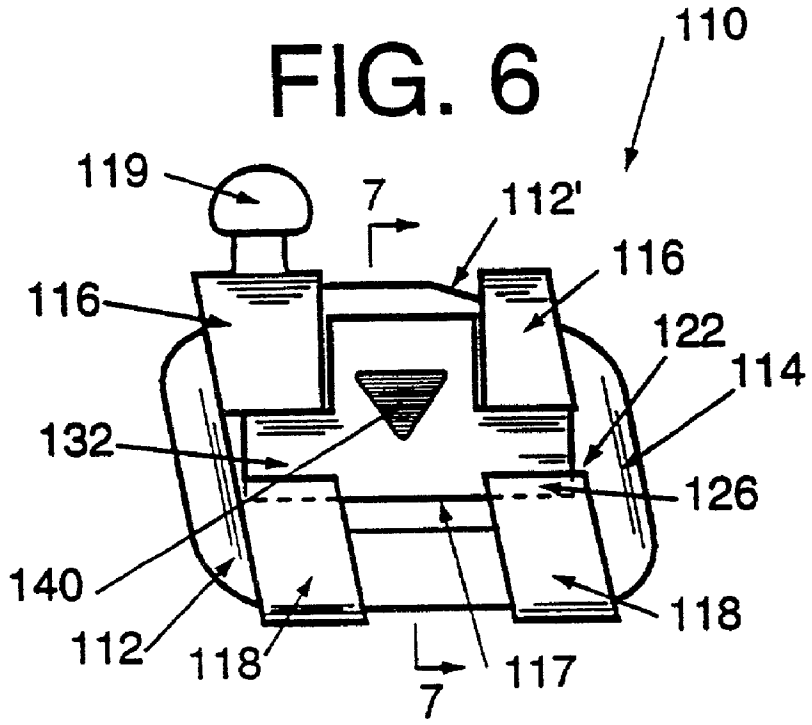


FIG. 6


110
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112'
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FIG. 7

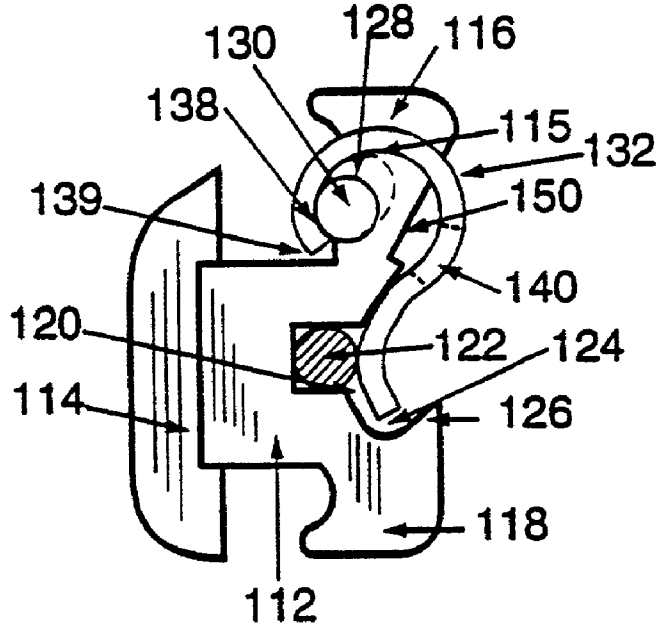
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FIG. 8

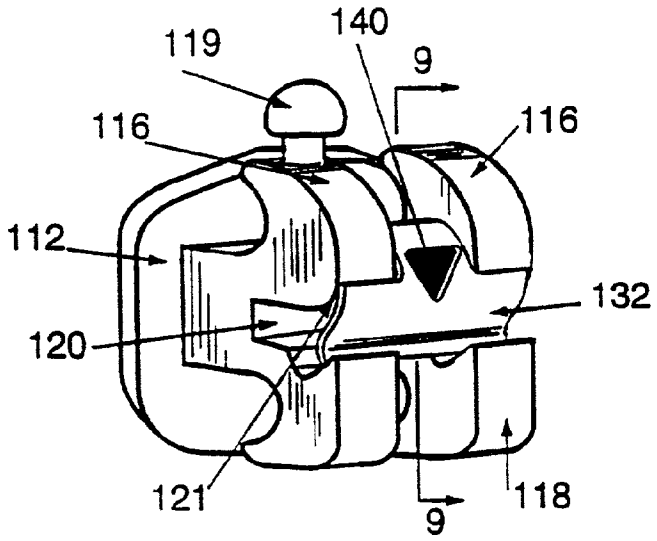

FIG. 9A

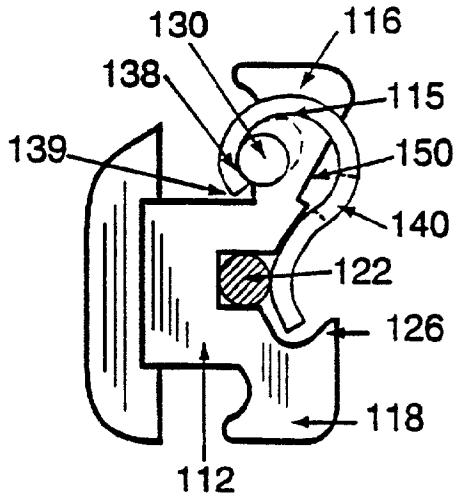

FIG. 9B

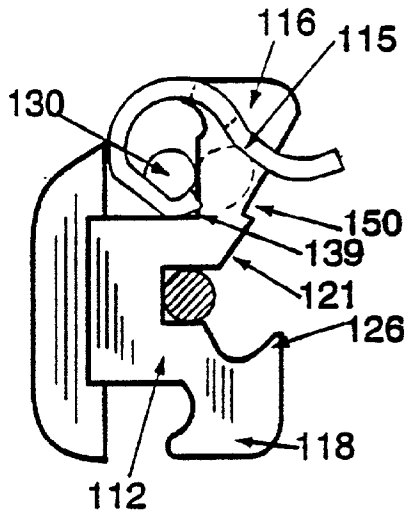

FIG. 10

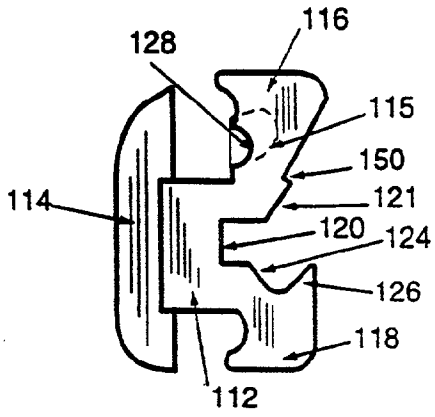

FIG. 11A

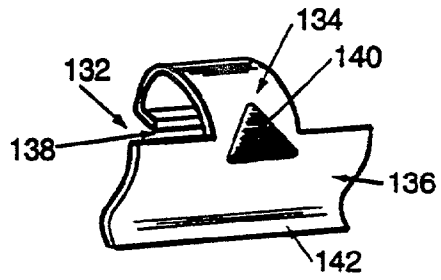

FIG. 11B

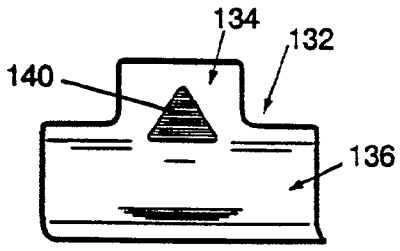

FIG. 12

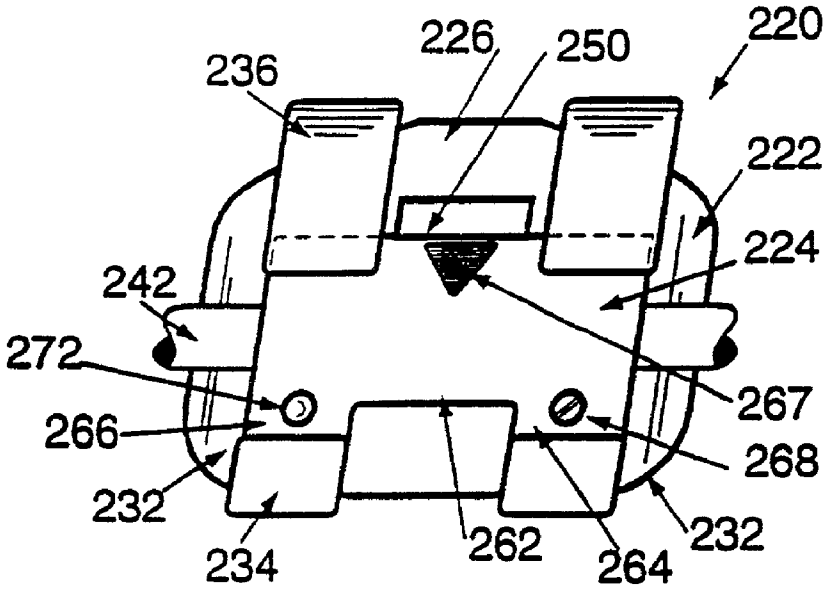
220
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FIG. 13

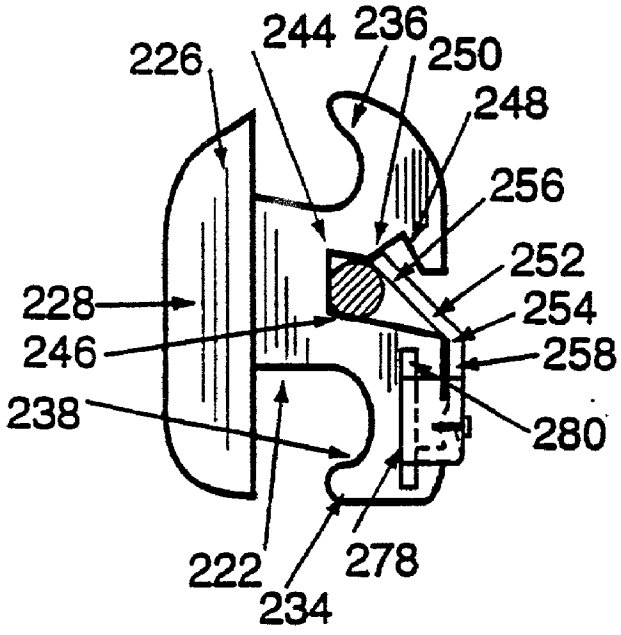
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FIG. 14

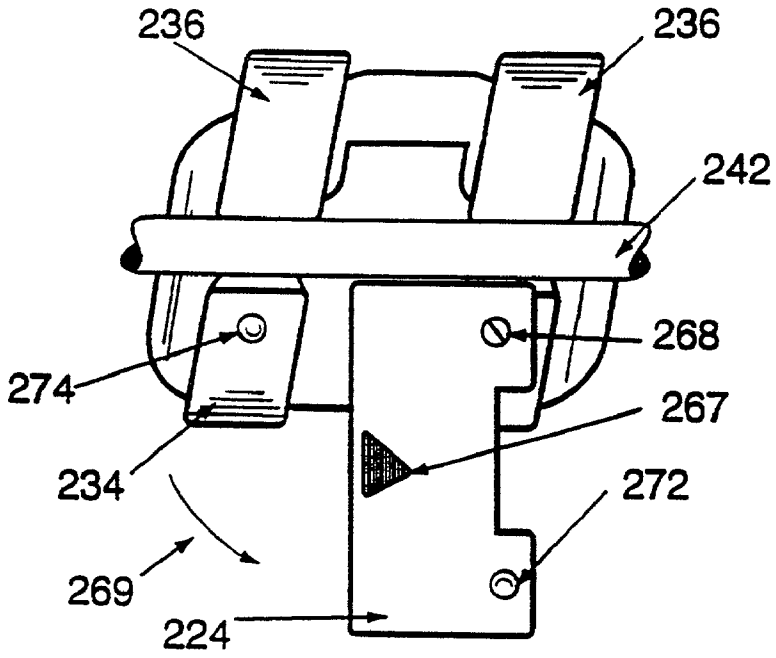
236
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FIG. 15

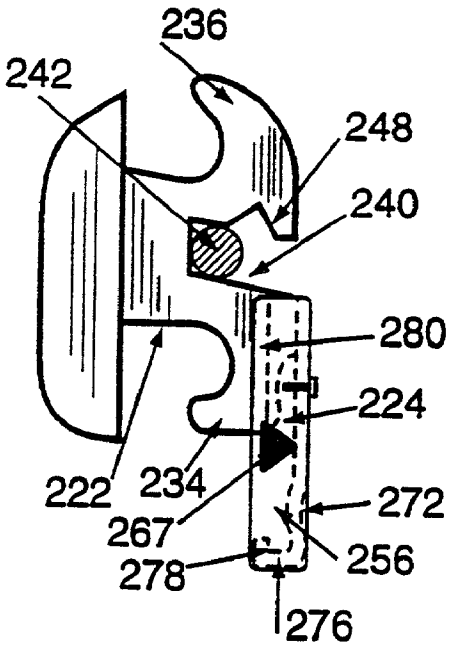
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FIG. 16A

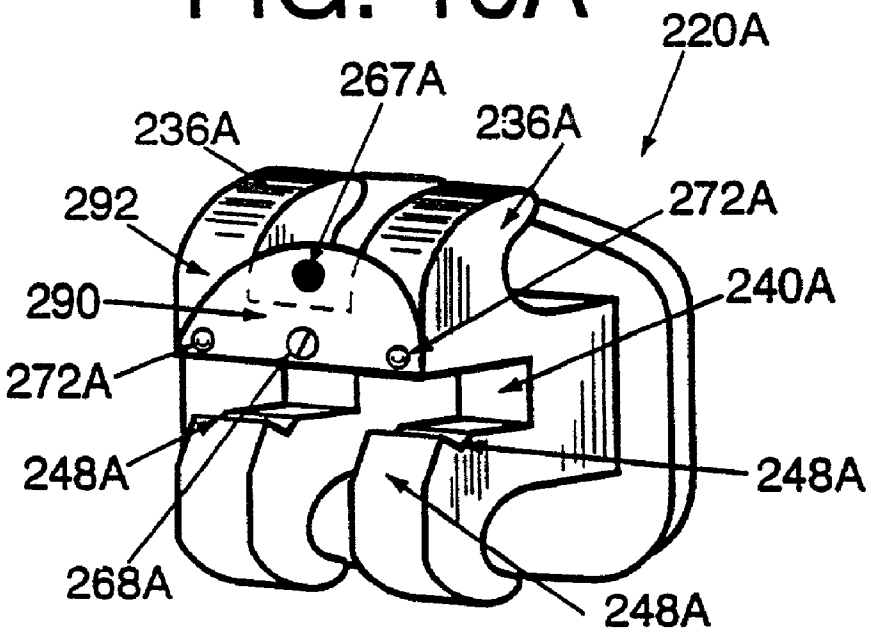


FIG. 16B

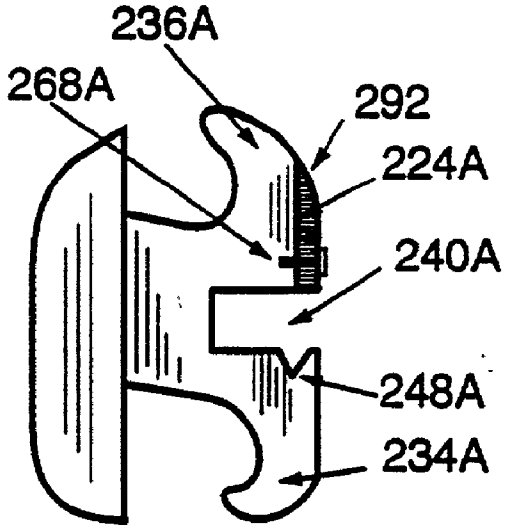


FIG. 17A

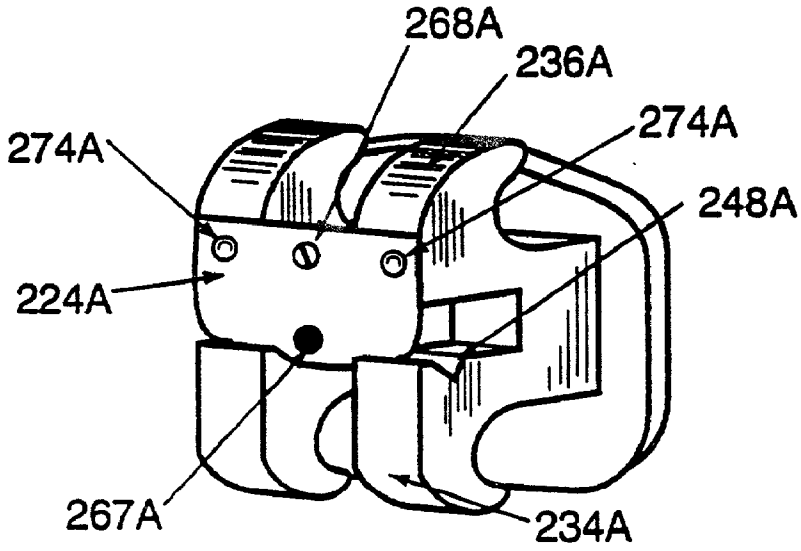
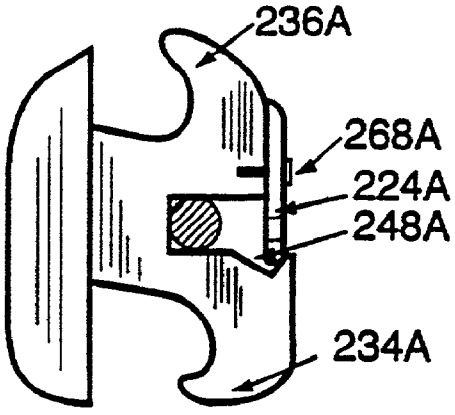


FIG. 17B



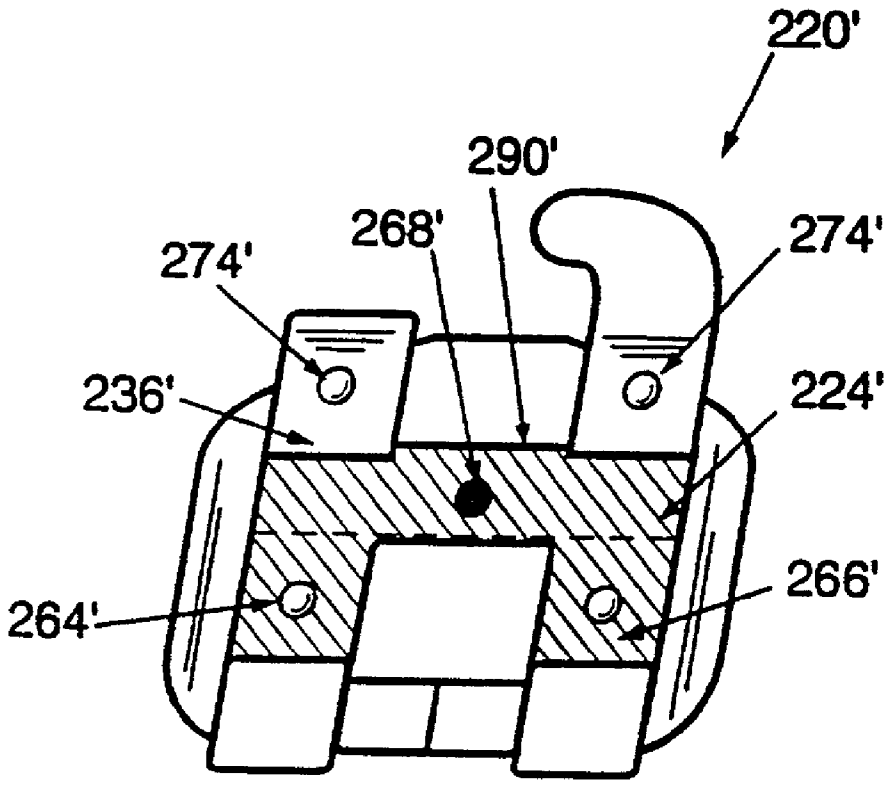


FIG. 18

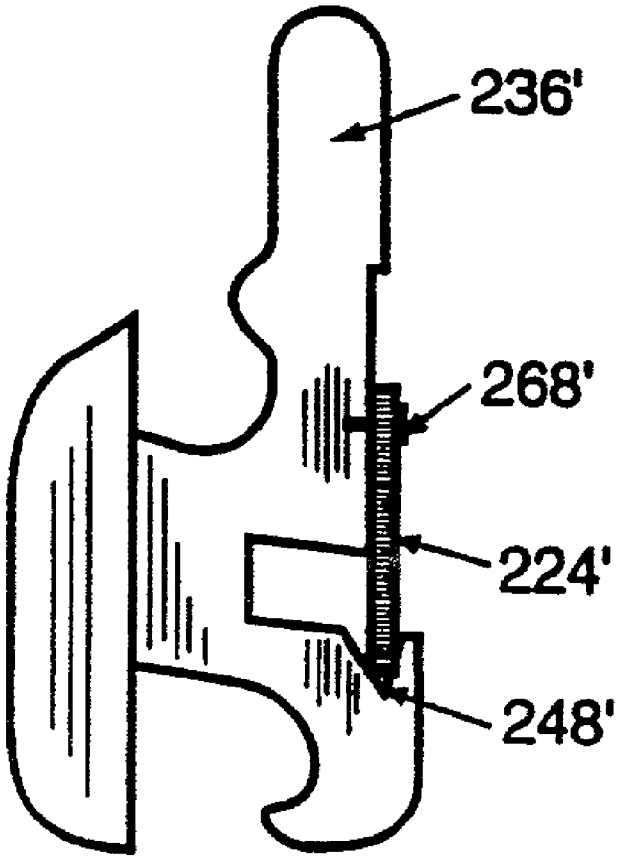


FIG. 19

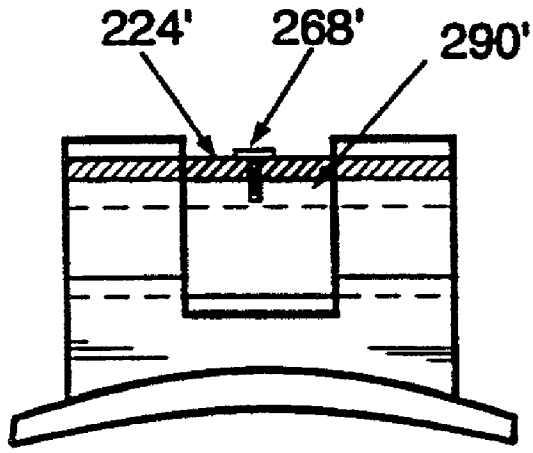


FIG. 20

FIG. 21

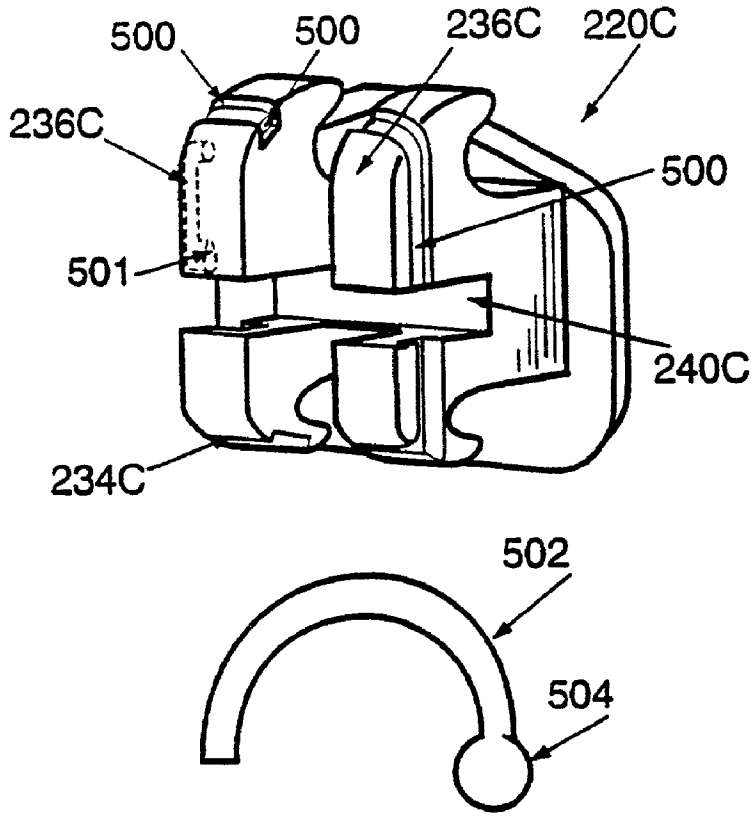

500
500
236C
220C
236C
500
501
240C
234C
502
504

FIG. 22

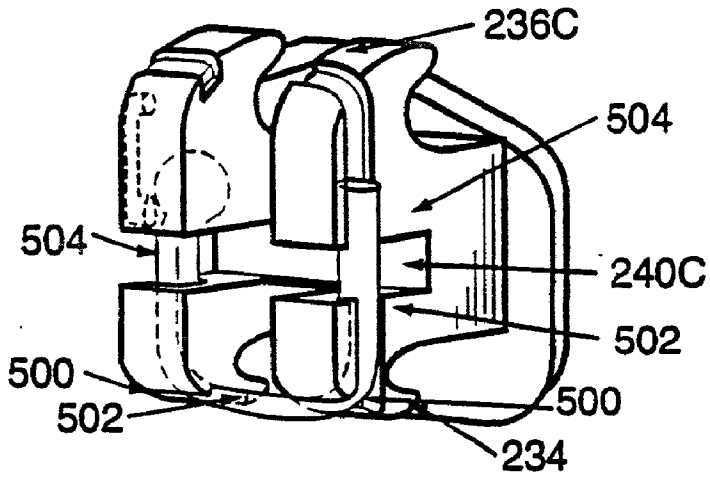

236C
504
504
240C
502
500
502
500
234

FIG. 23

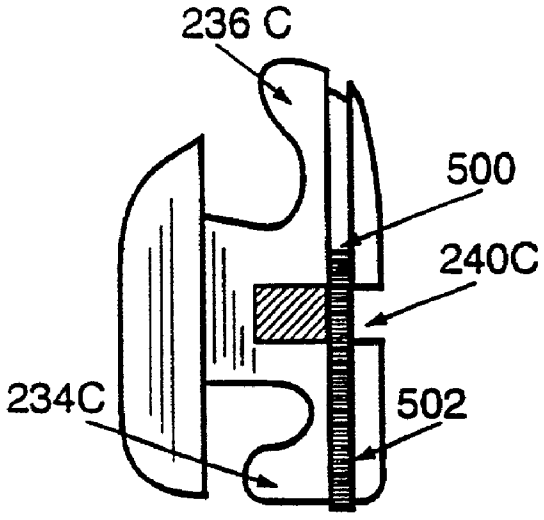


FIG. 24

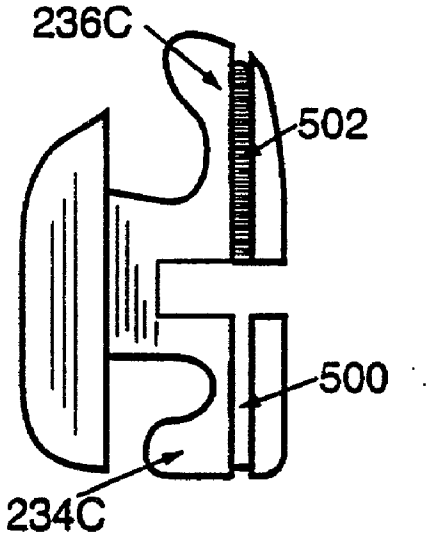


FIG. 25

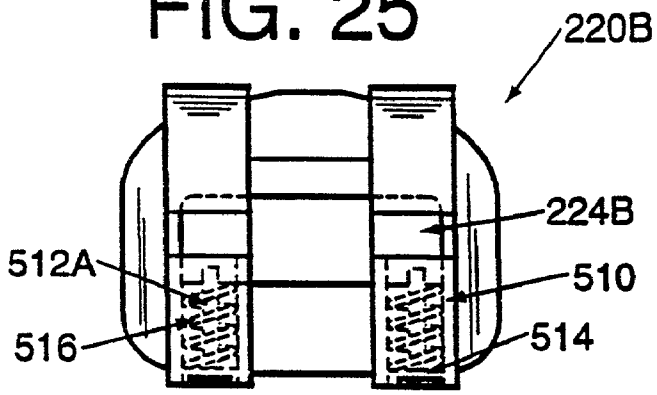


FIG. 26

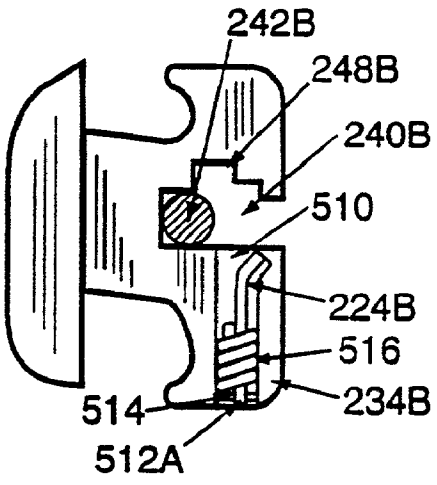


FIG. 27

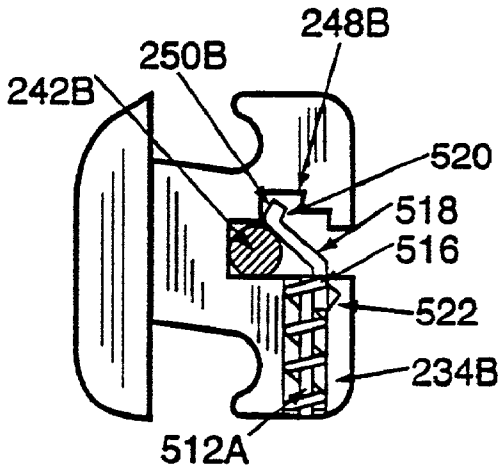


FIG. 28

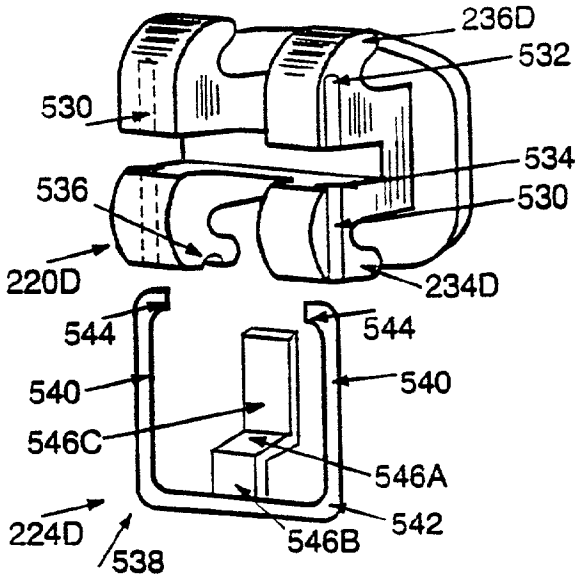


FIG. 29

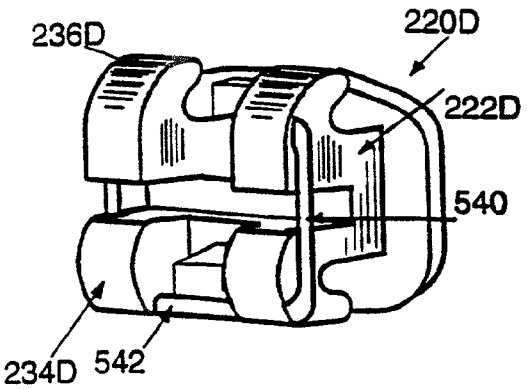


FIG. 30A

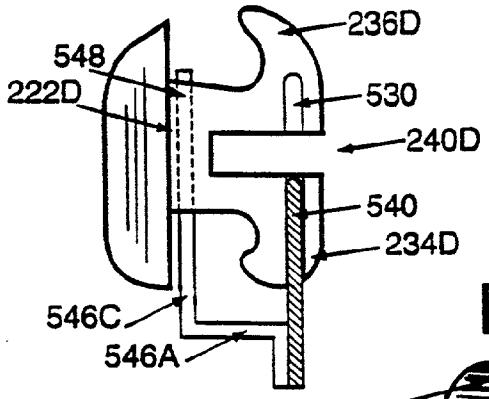


FIG. 30B

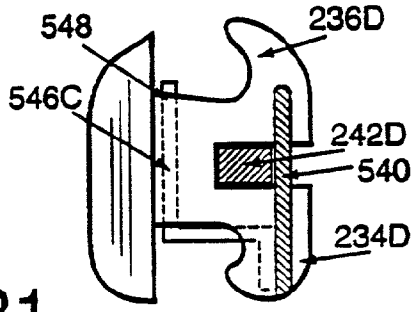


FIG. 31

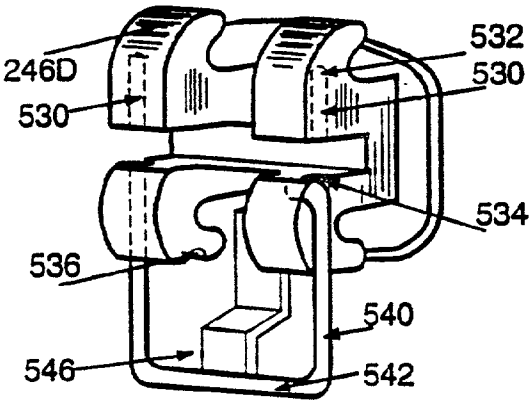


FIG. 32

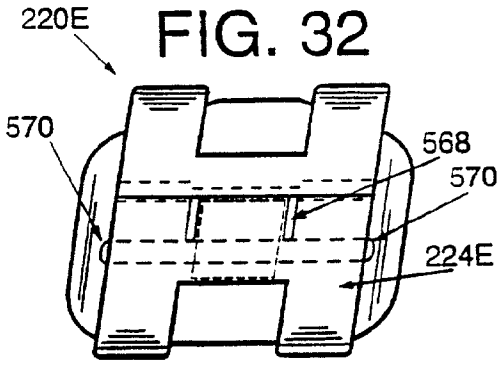


FIG. 33

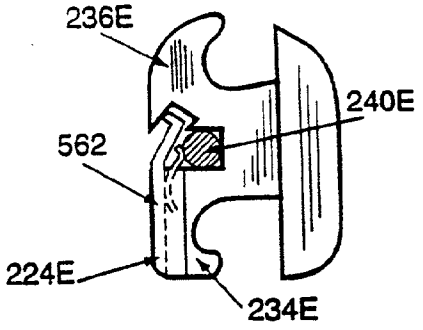


FIG. 34

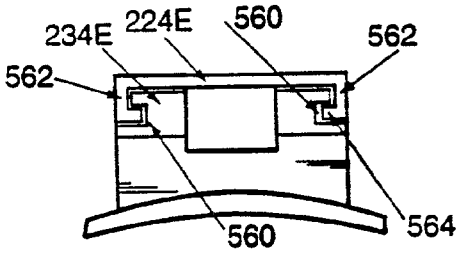


FIG. 35

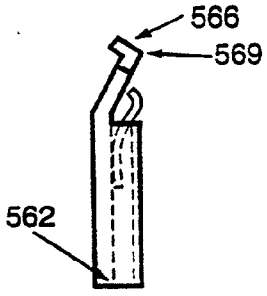


FIG. 36

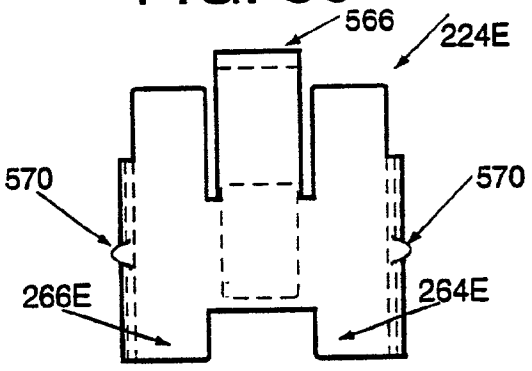


FIG. 37

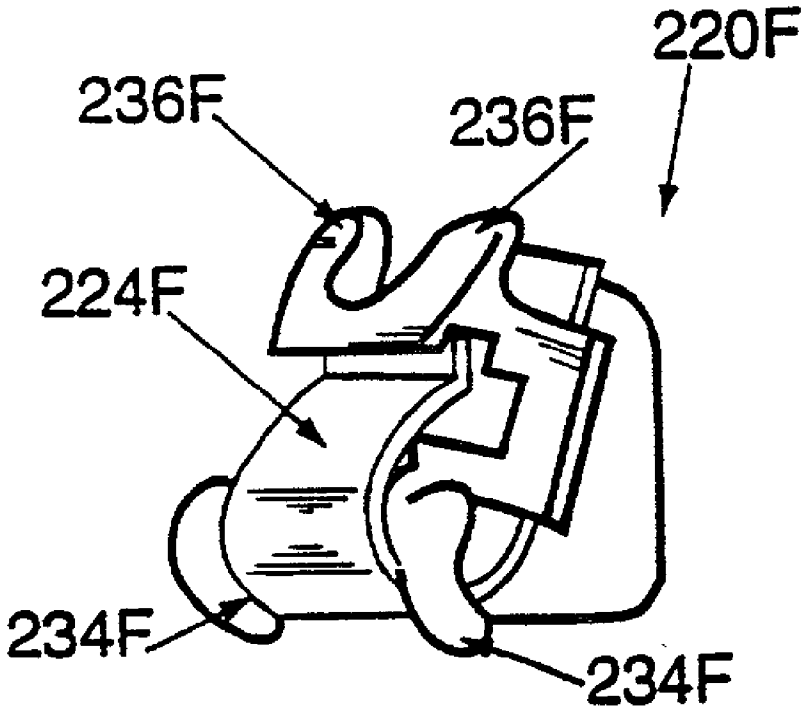


FIG. 38

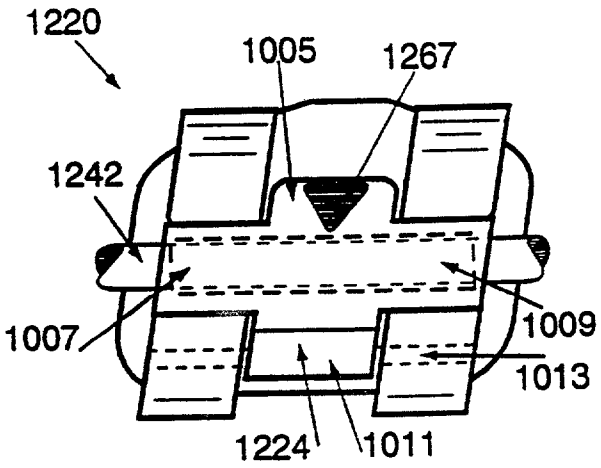


FIG. 40

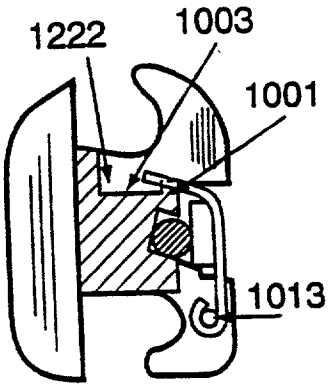


FIG. 39

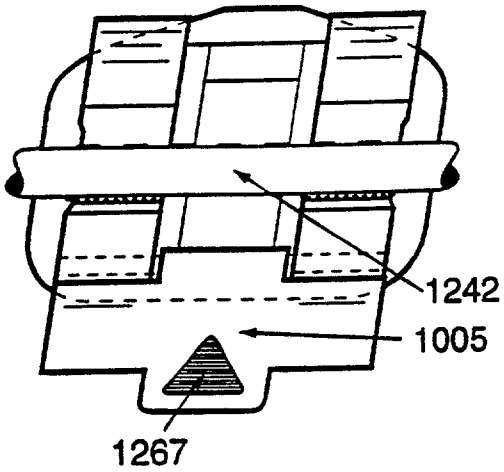


FIG. 41

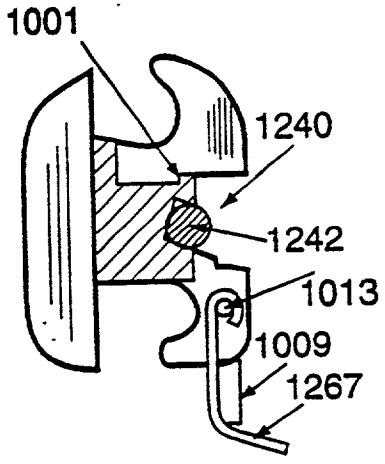


FIG. 45A

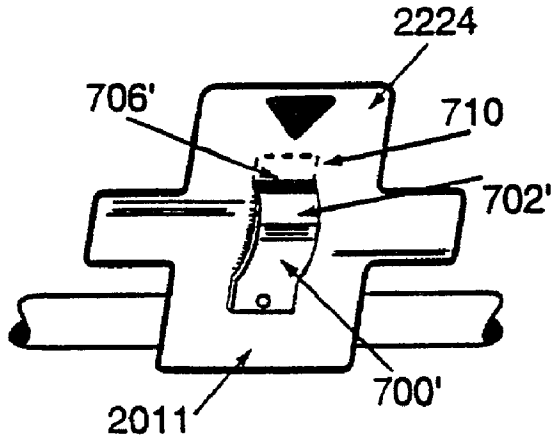


FIG. 41B

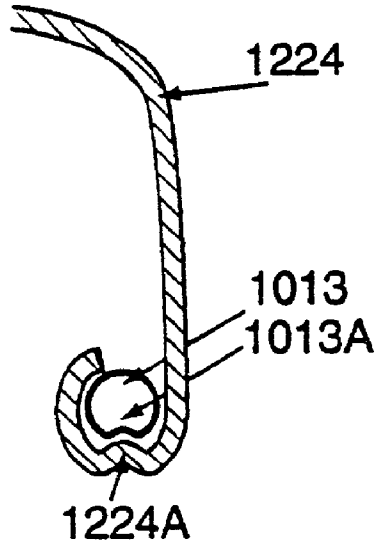


FIG. 42

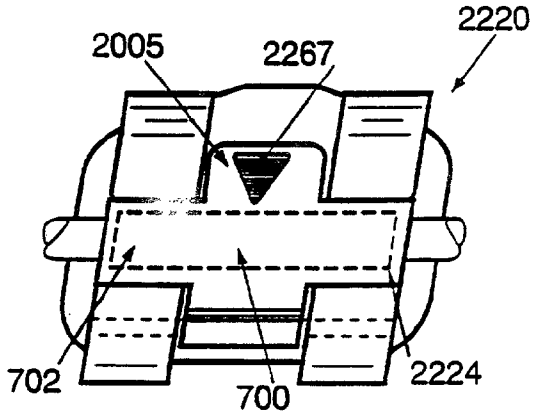


FIG. 44

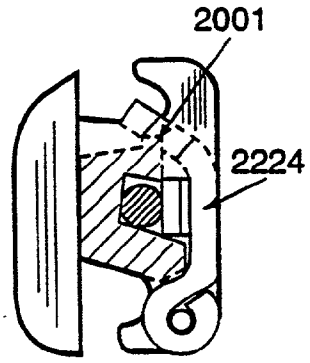


FIG. 43

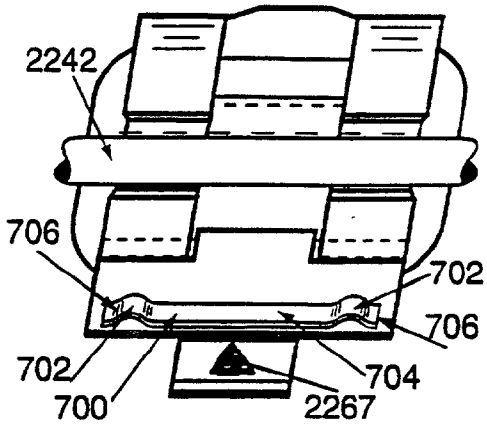


FIG. 45

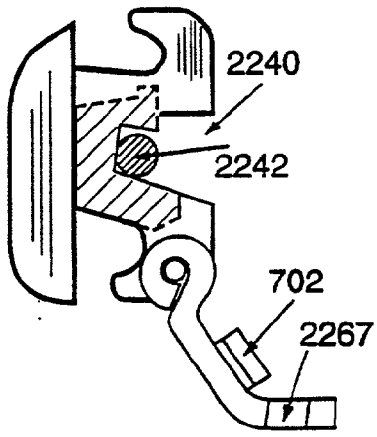


FIG. 46

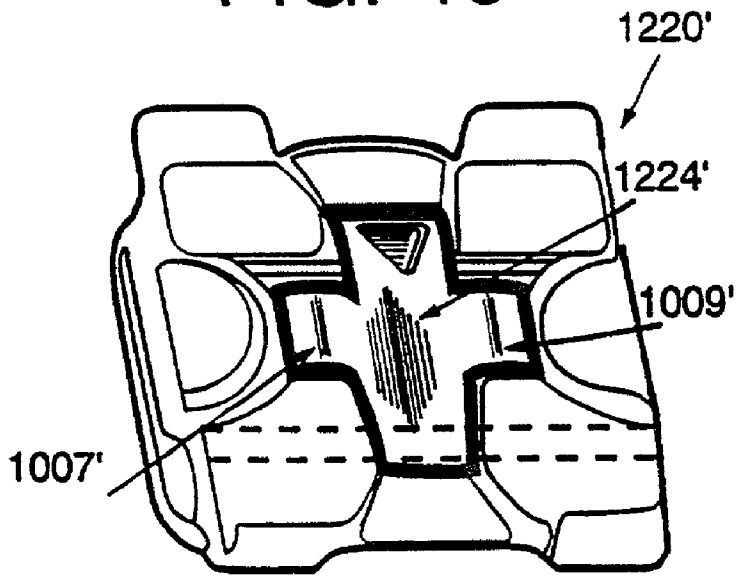


FIG. 47

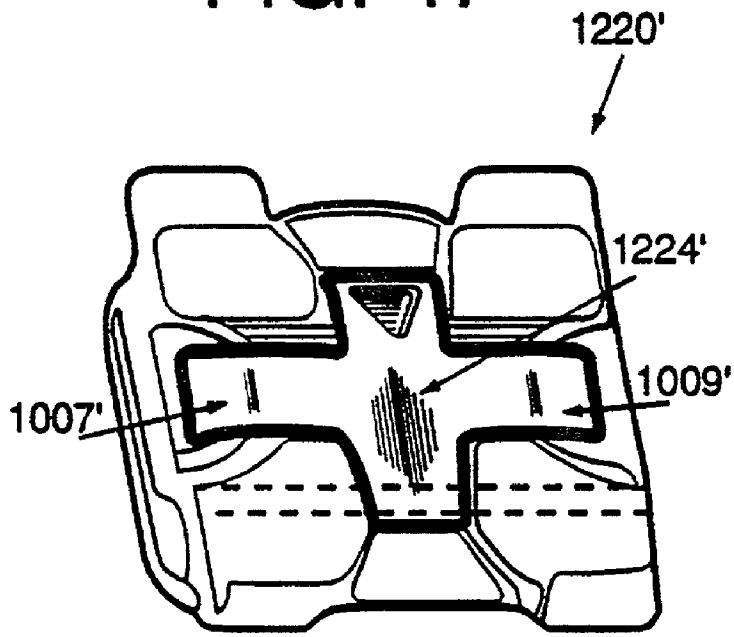


FIG. 48

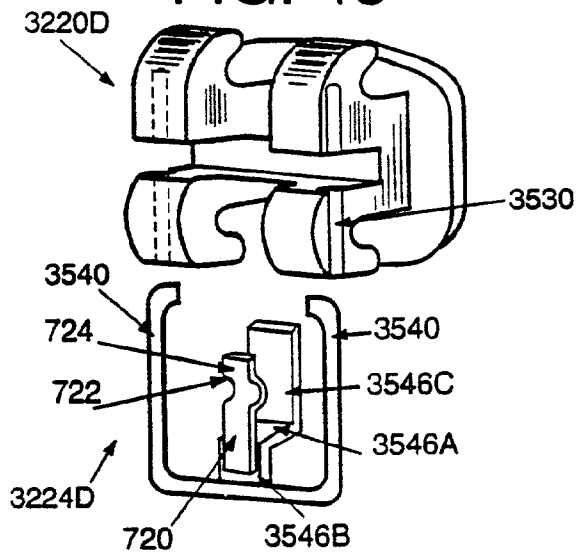


FIG. 49

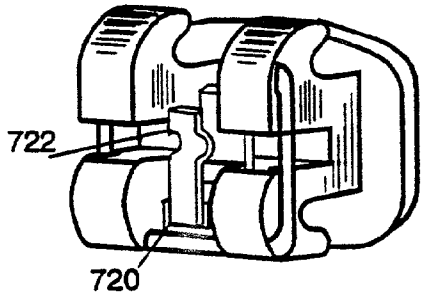


FIG. 50

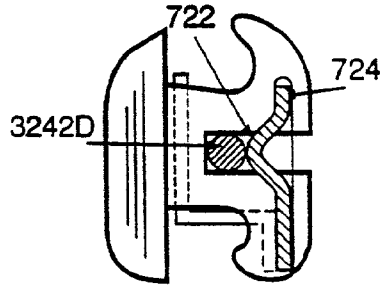


FIG. 51

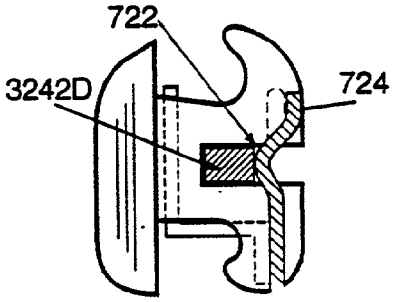


FIG. 52

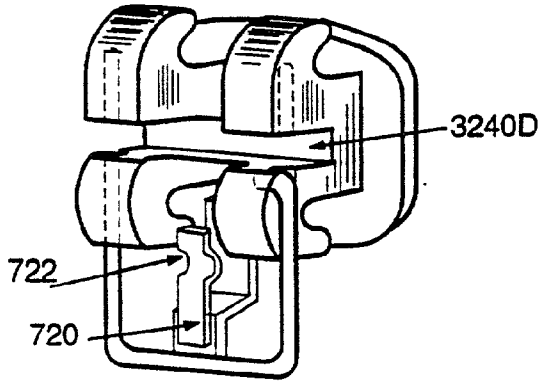


FIG. 53

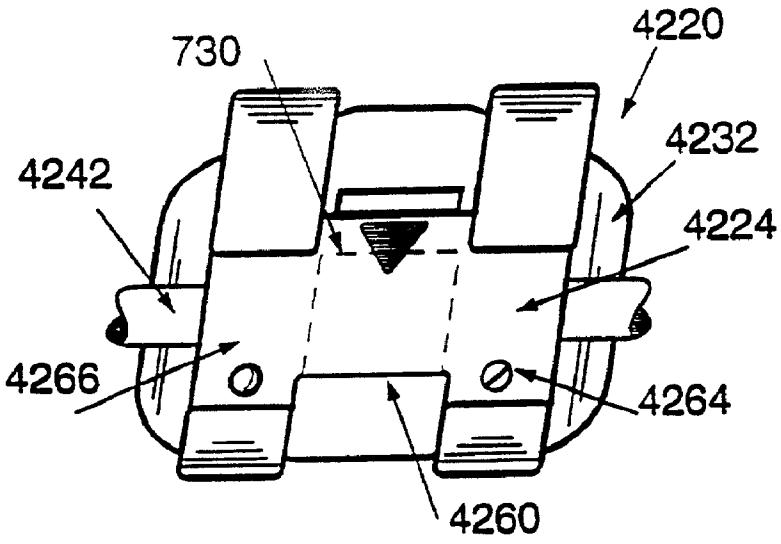


FIG. 55

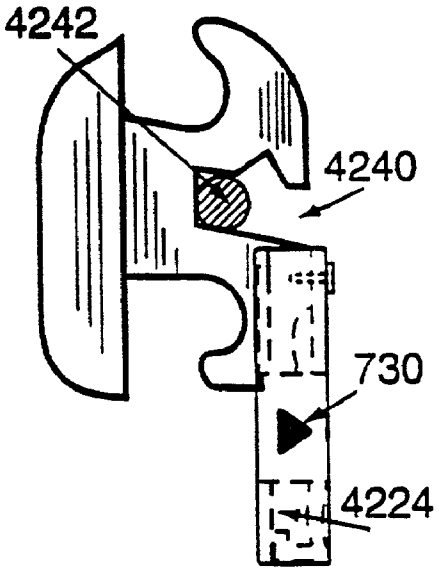


FIG. 54

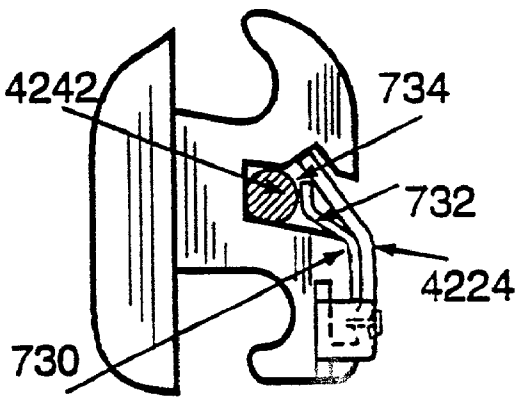


FIG. 56

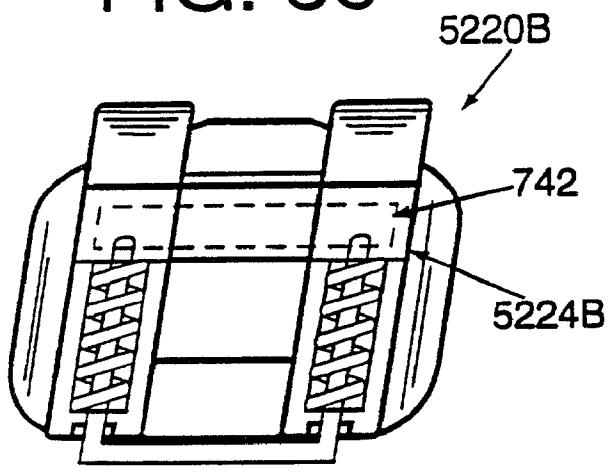


FIG. 57

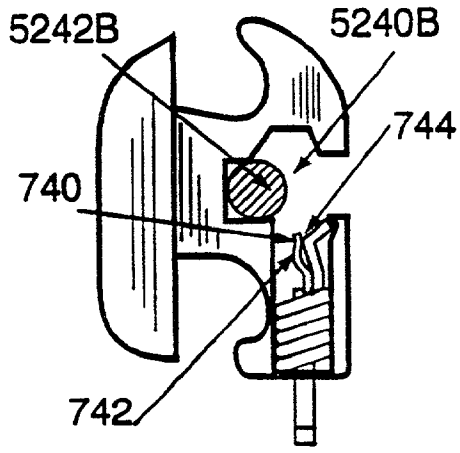


FIG. 58

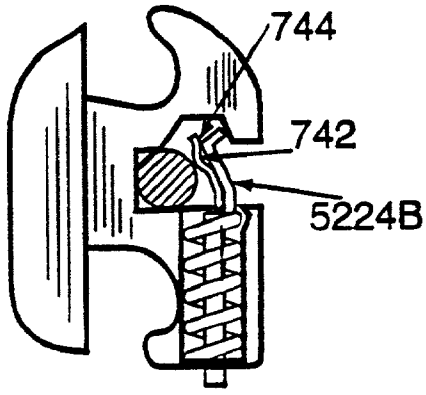


FIG. 59

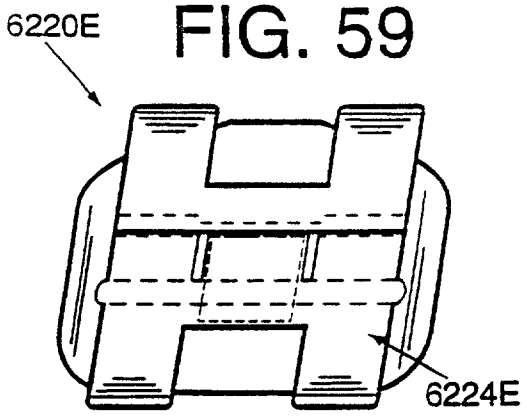


FIG. 60A

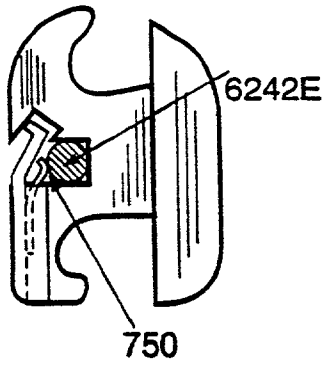


FIG. 61

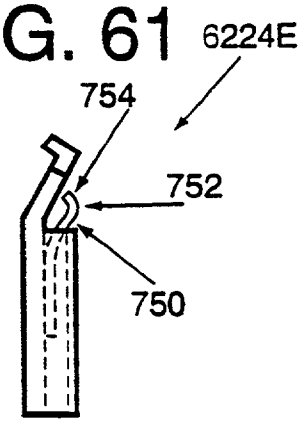


FIG. 62

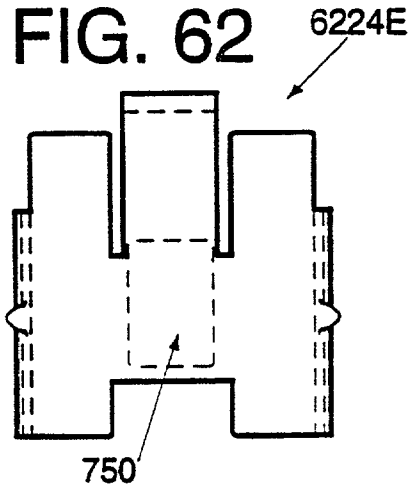


FIG. 60B

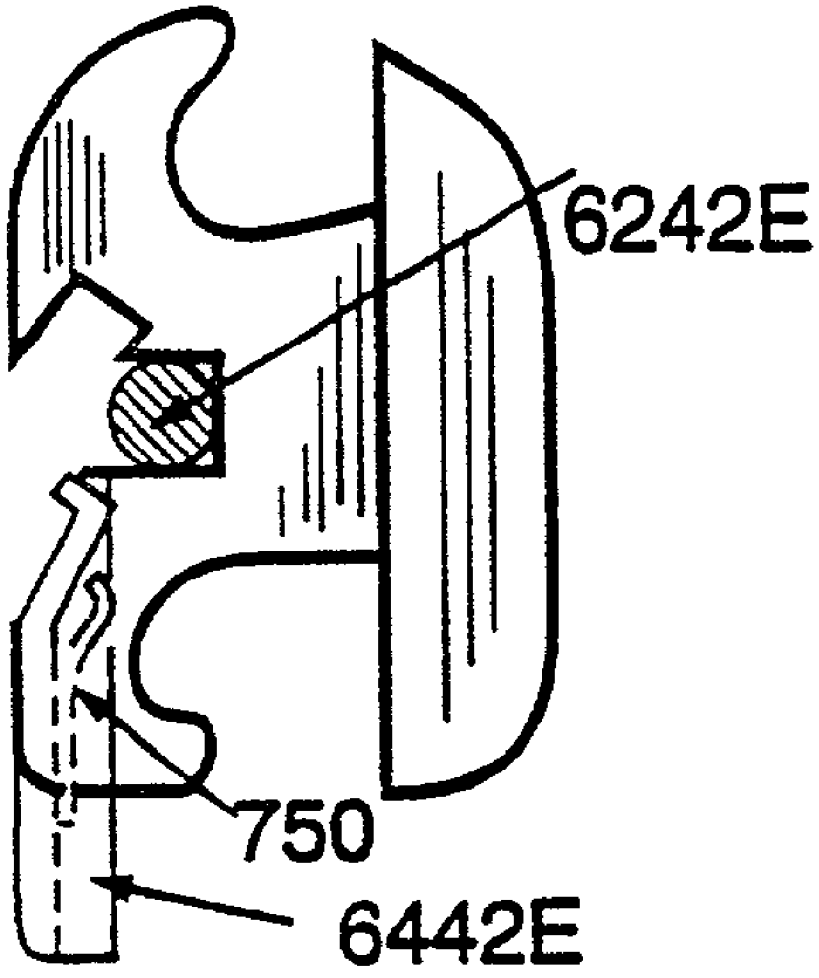


FIG. 63

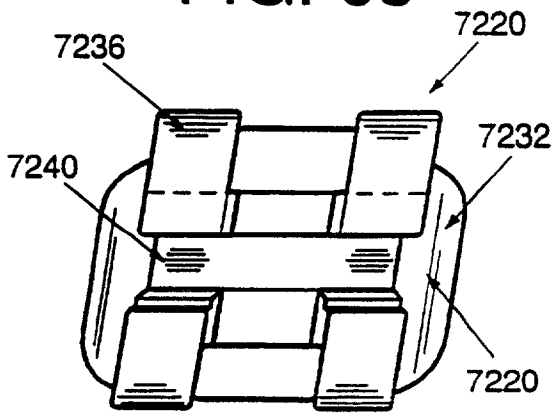


FIG. 64

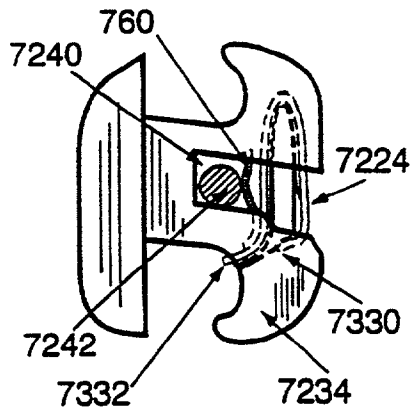


FIG. 65

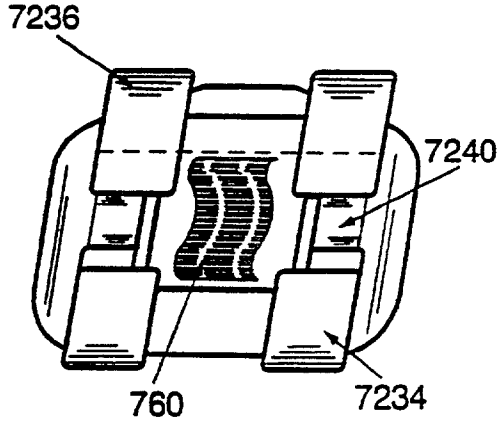


FIG. 66

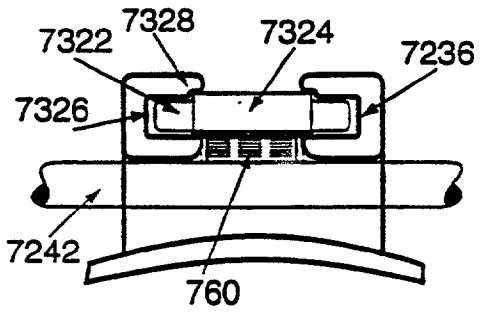


FIG. 67

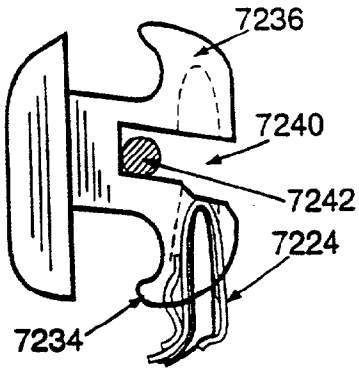


FIG. 69

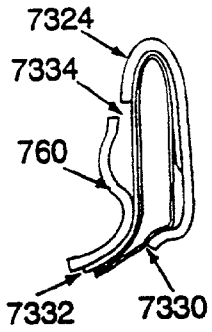


FIG. 68

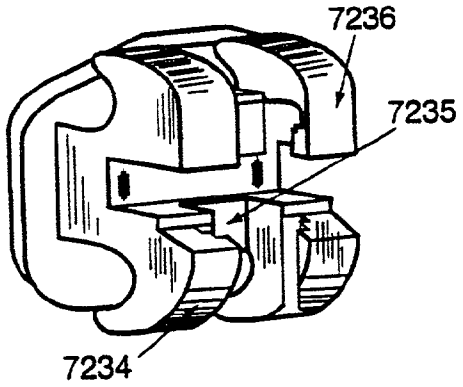


FIG. 70

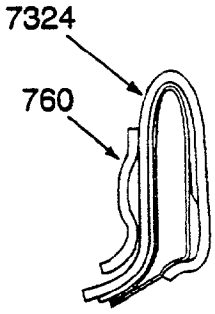


FIG. 71

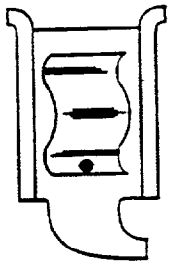


FIG. 72

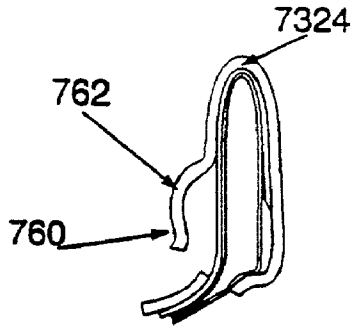


FIG. 73

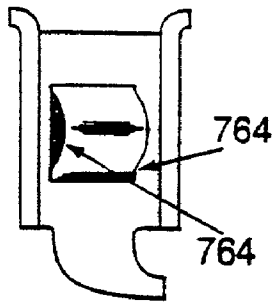


FIG. 74

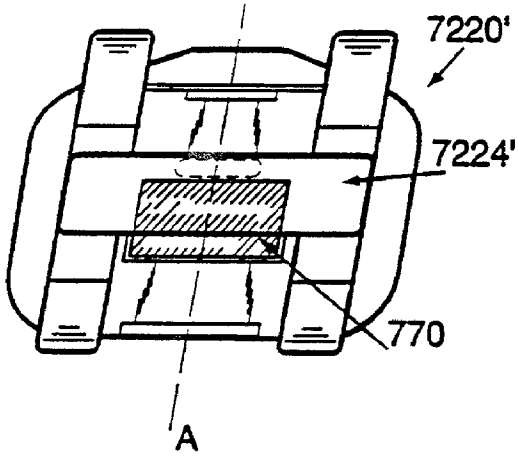


FIG. 75

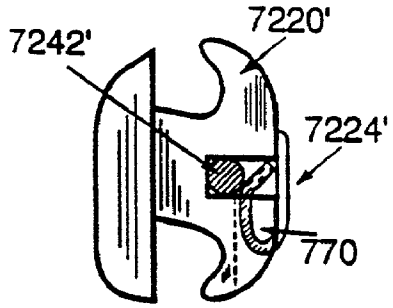


FIG. 76

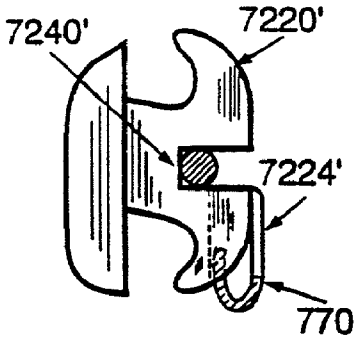


FIG. 77

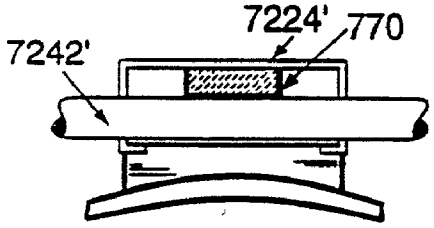


FIG. 78

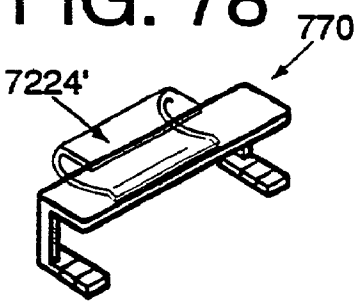
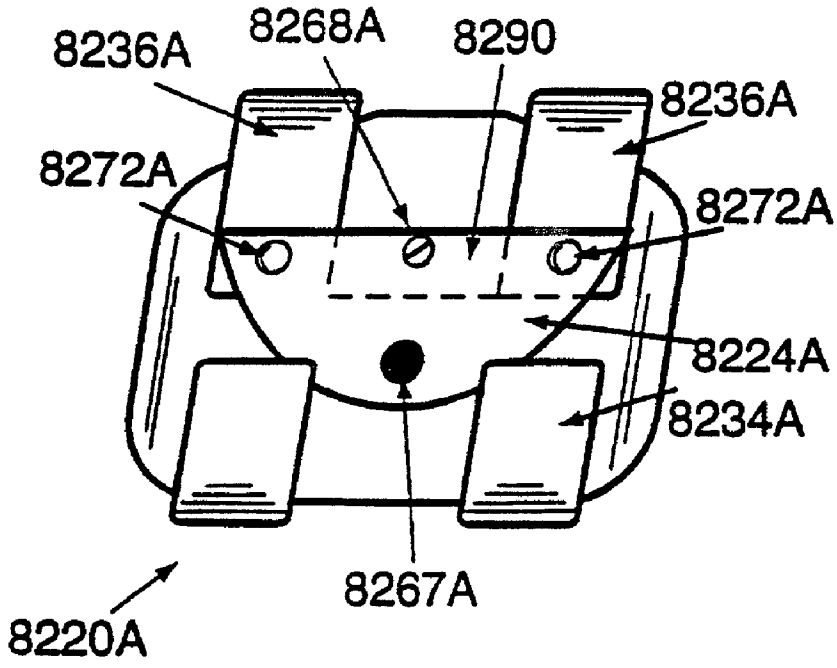


FIG. 79


8236A
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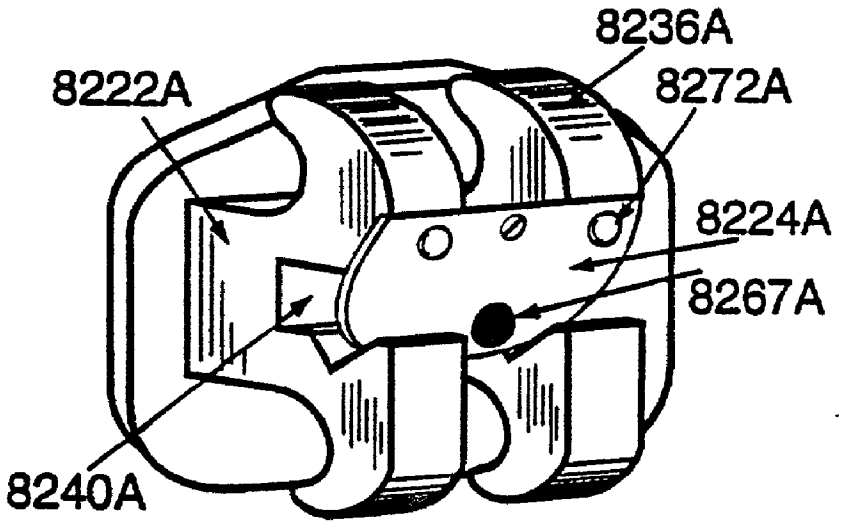
8290
8236A
8272A
8272A
8224A
8234A
8267A
8220A

FIG. 80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8222A
8272A
8224A
8267A
8240A

FIG. 81

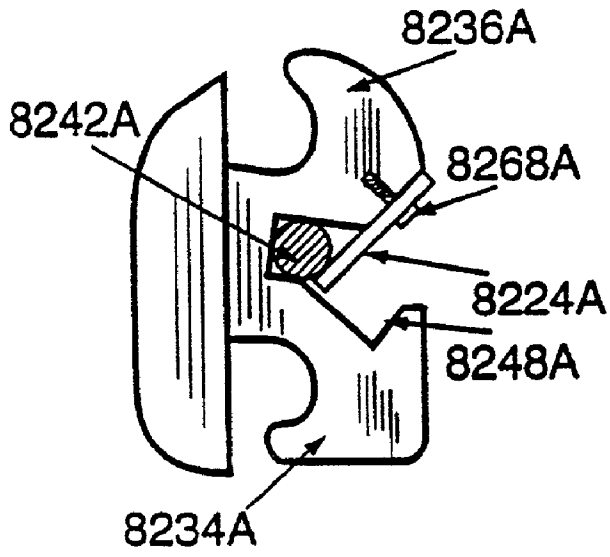


FIG. 82

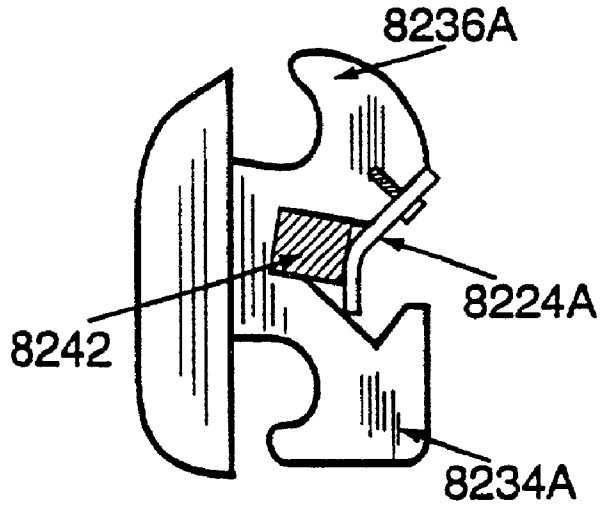
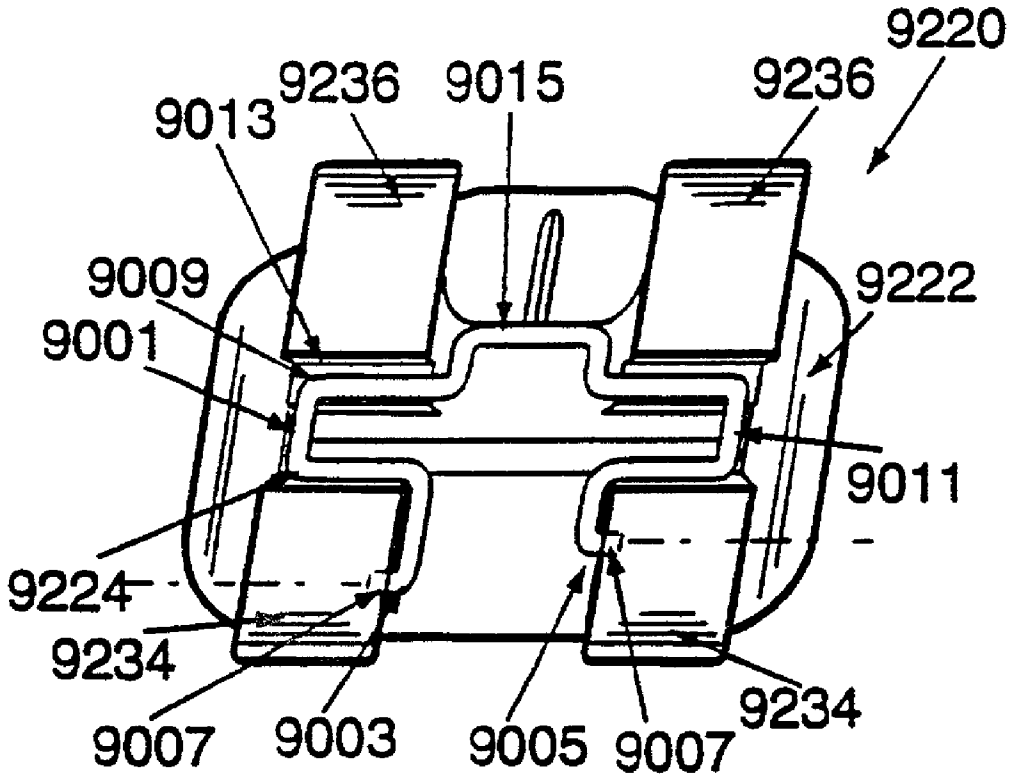


FIG. 83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9236
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9009
9222
9001
9011
9224
9234
9234
9007
9003
9005
9007

FIG. 84

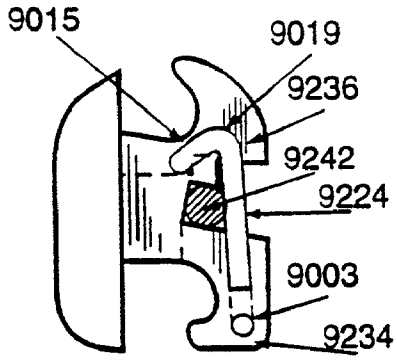


FIG. 85

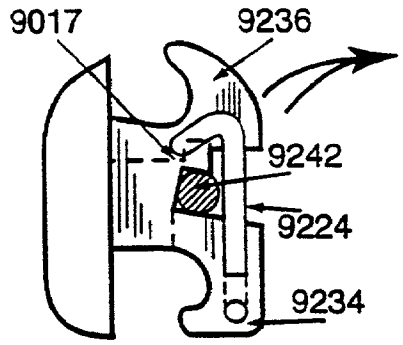


FIG. 86

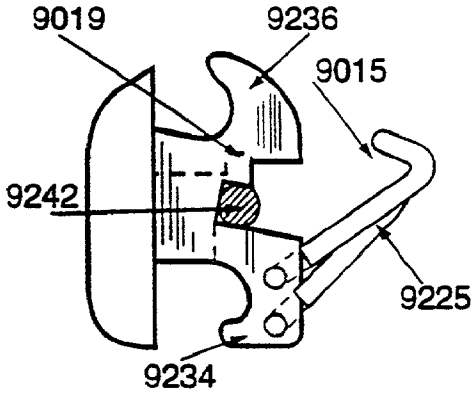


FIG. 87

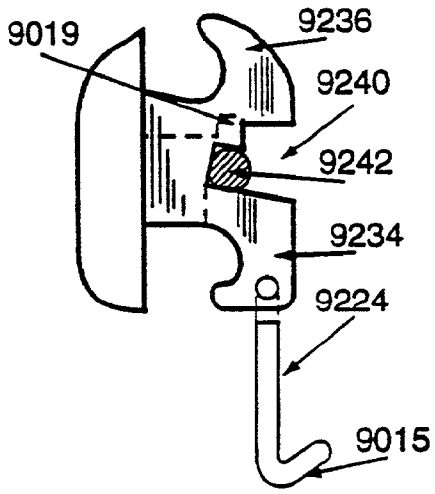


FIG. 88

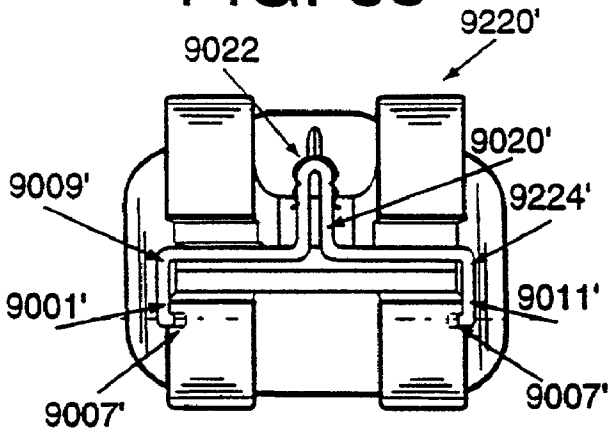


FIG. 89

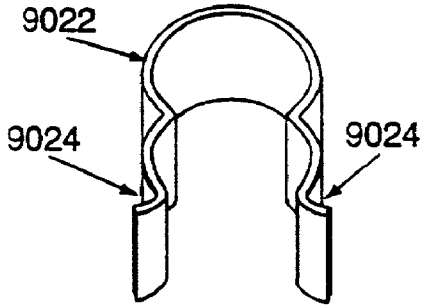


FIG. 90

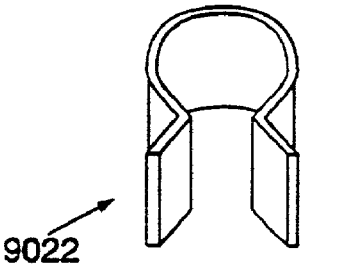


FIG. 91A

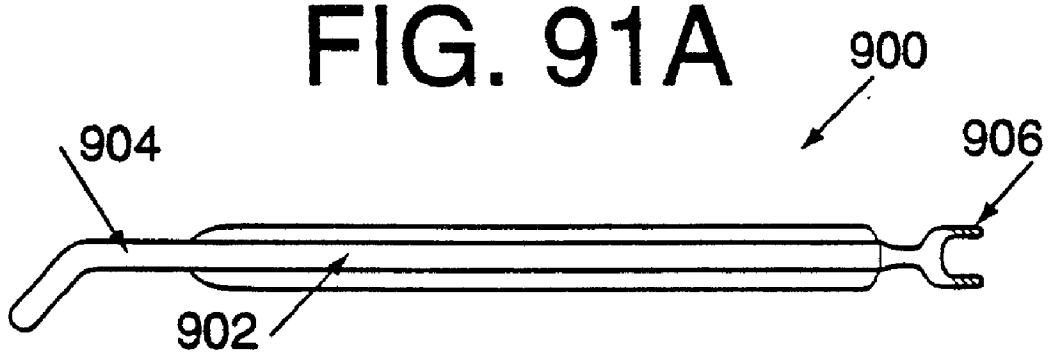


FIG. 91B

FIG. 92A

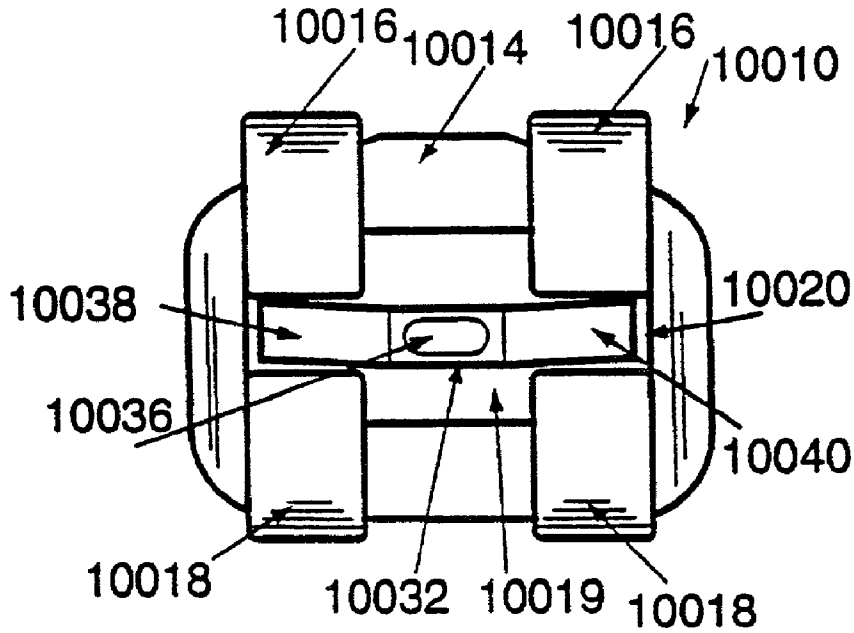


FIG. 92B

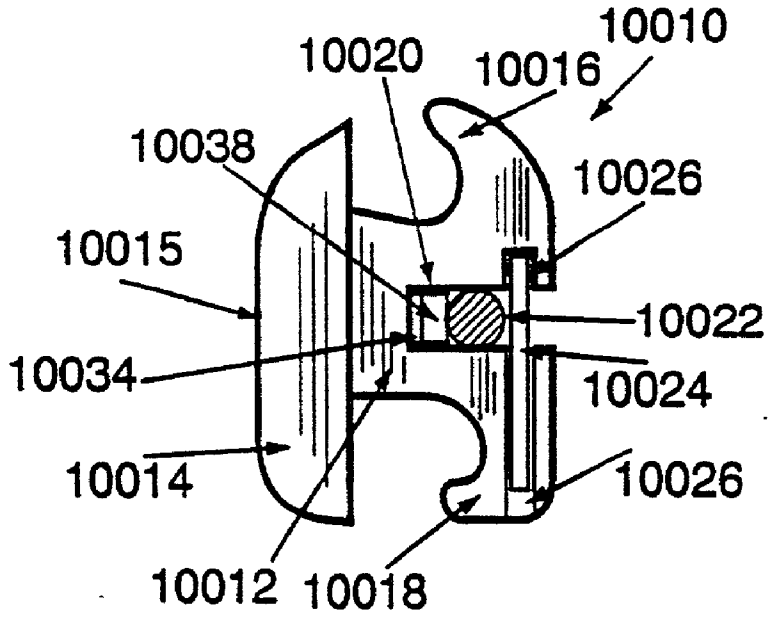


FIG. 92C

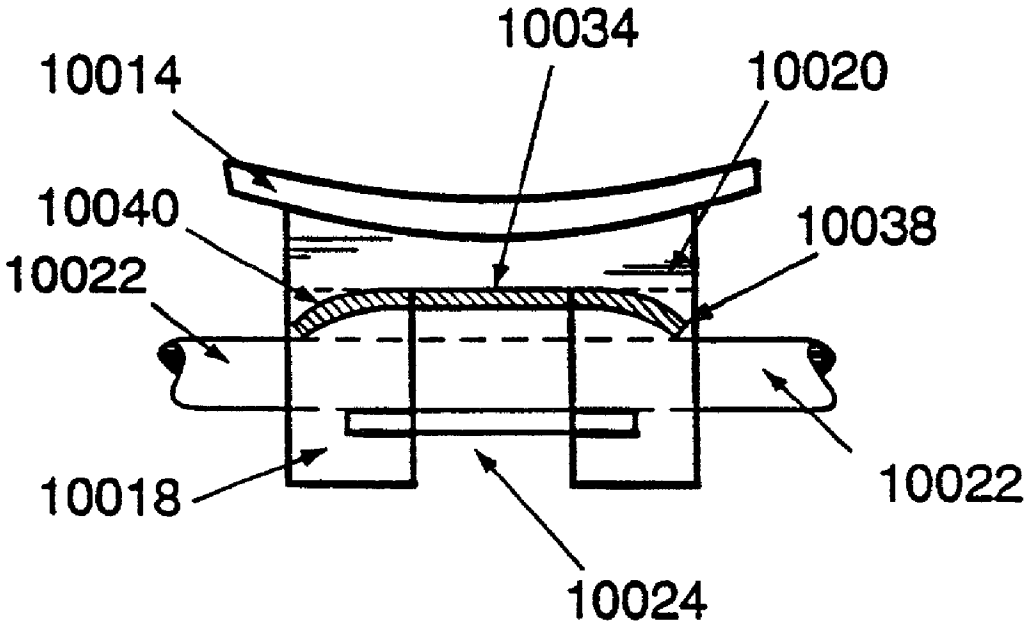
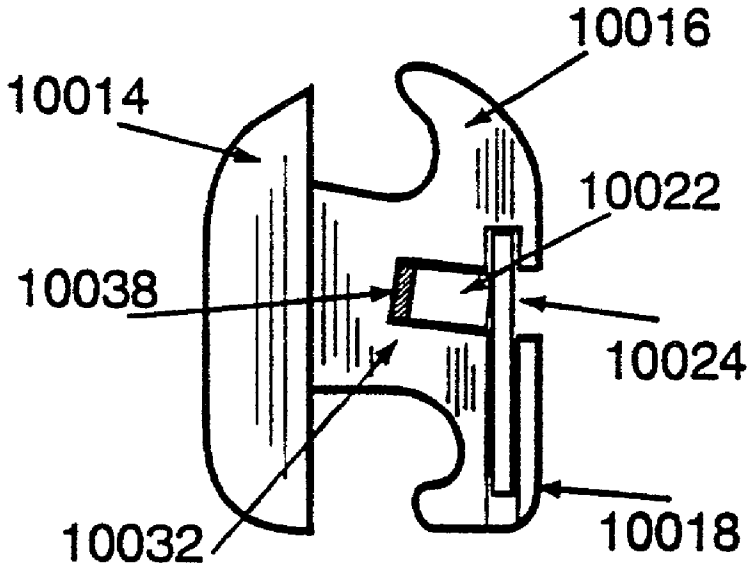


FIG. 92D



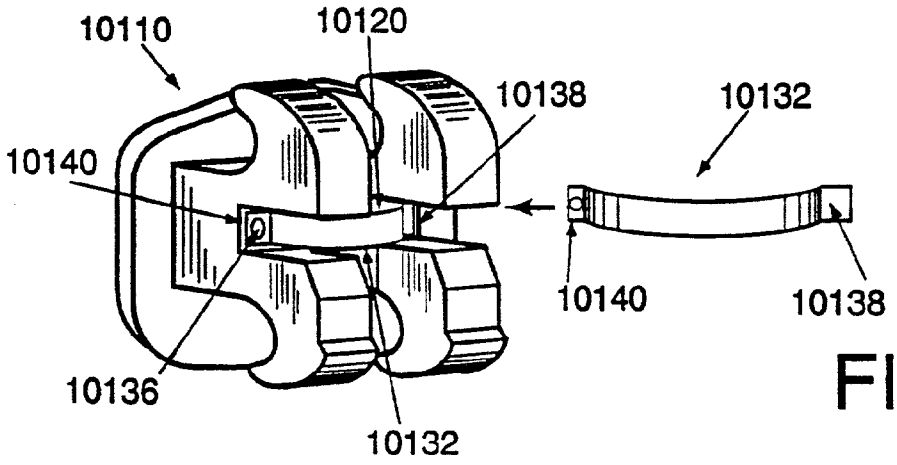
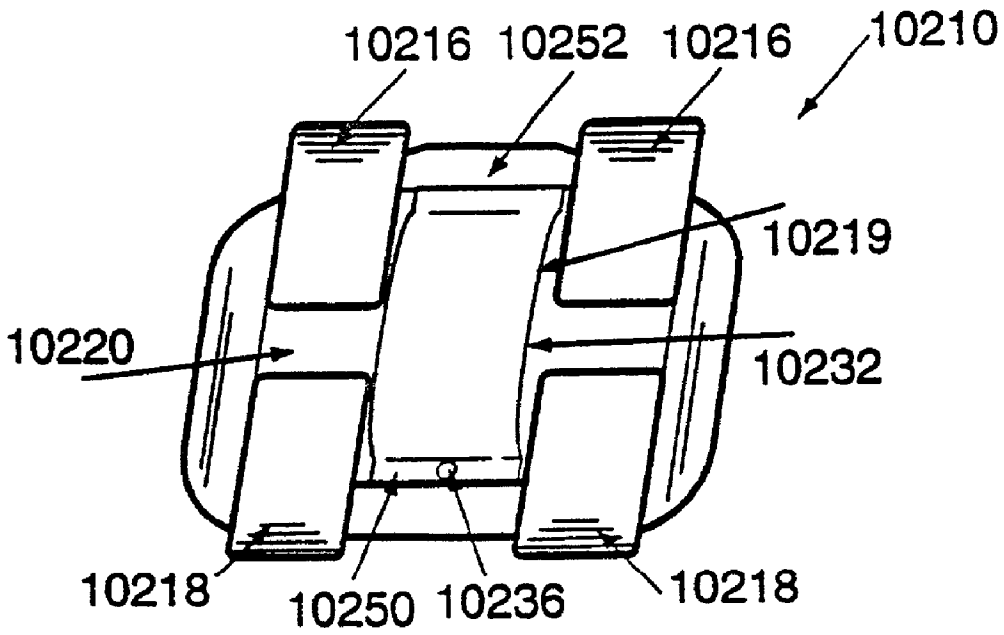


FIG. 93

FIG. 94


10216
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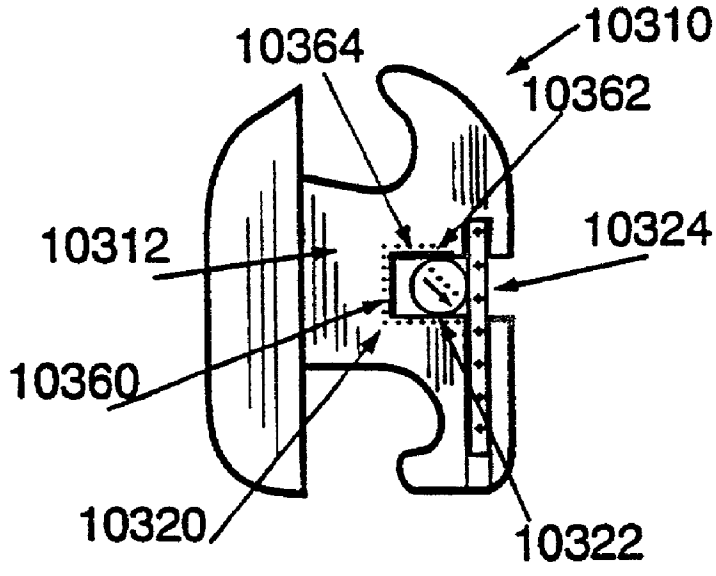
10216
10210
10219
10220
10232
10218
10250
10236
10218

FIG. 95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10312
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10320
10322

FIG. 96A

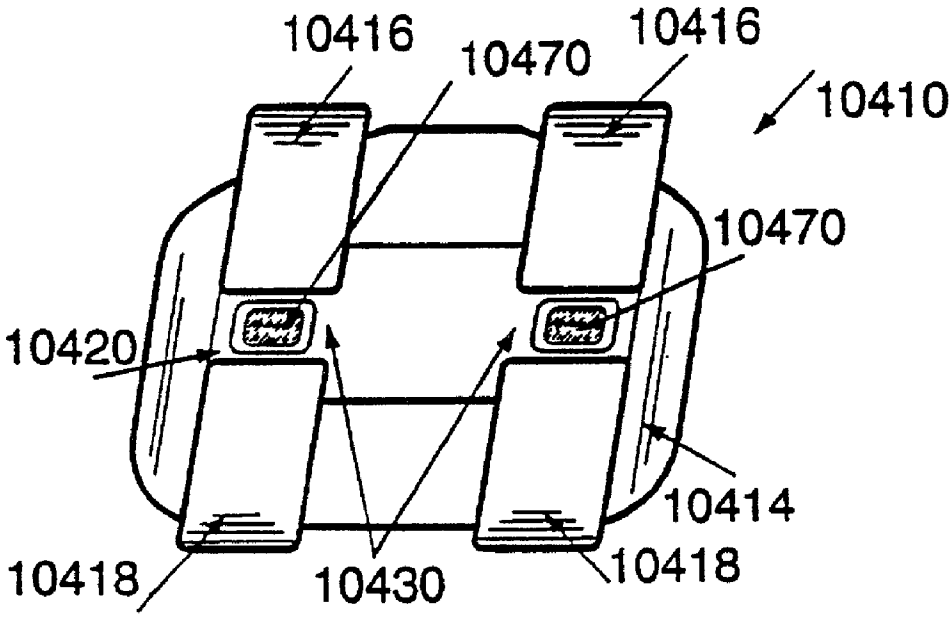


FIG. 96B

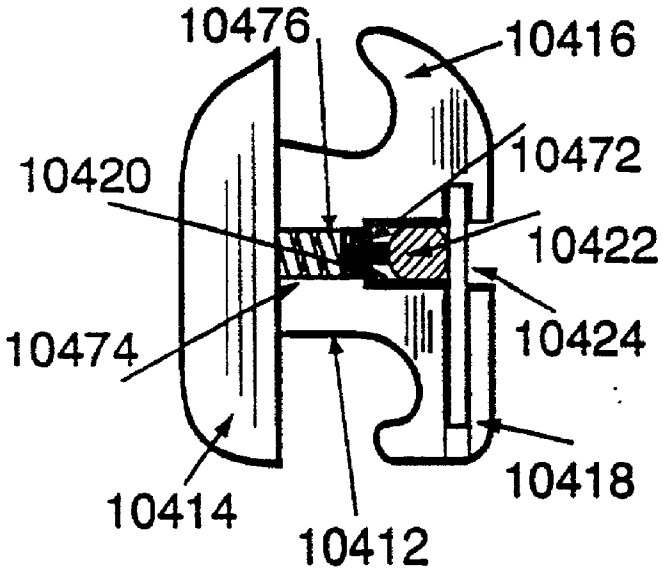


FIG. 97A

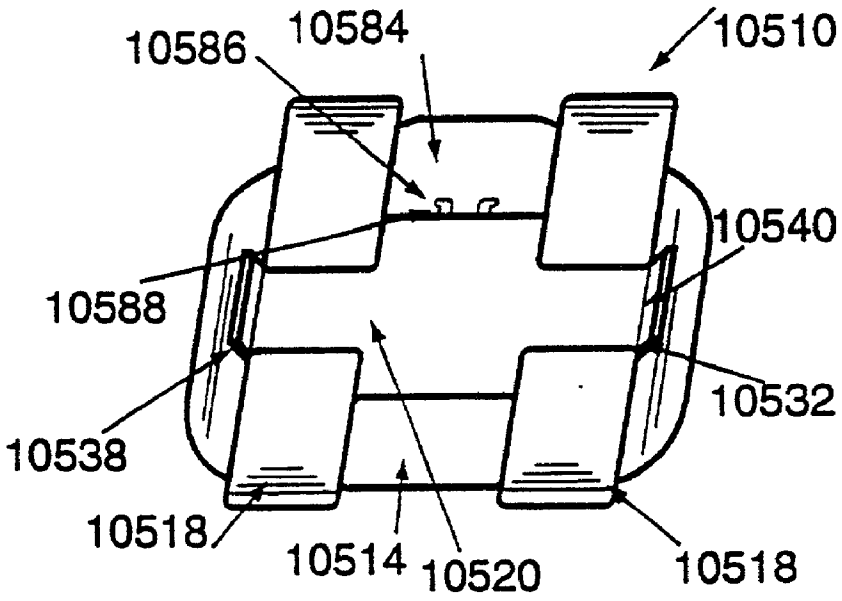


FIG. 97B

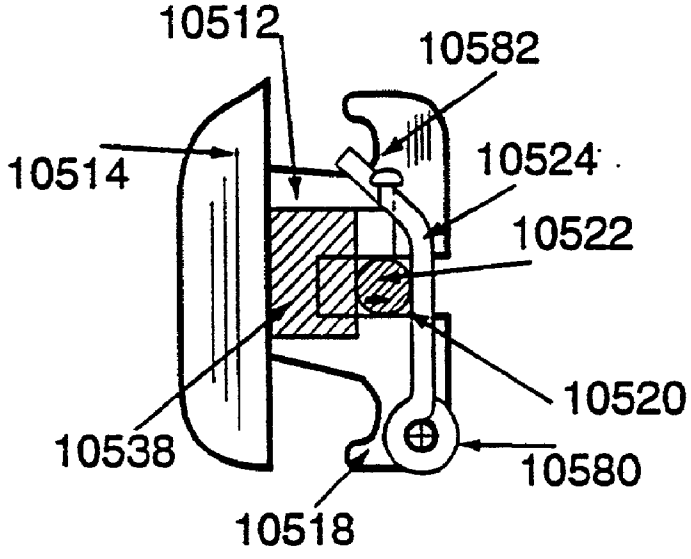


FIG. 97C

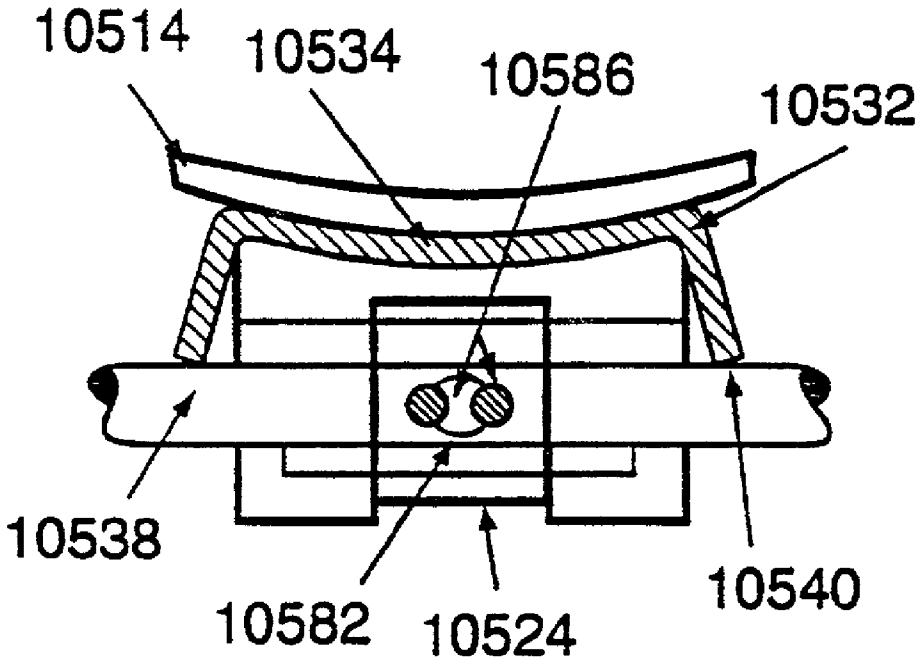


FIG. 98A

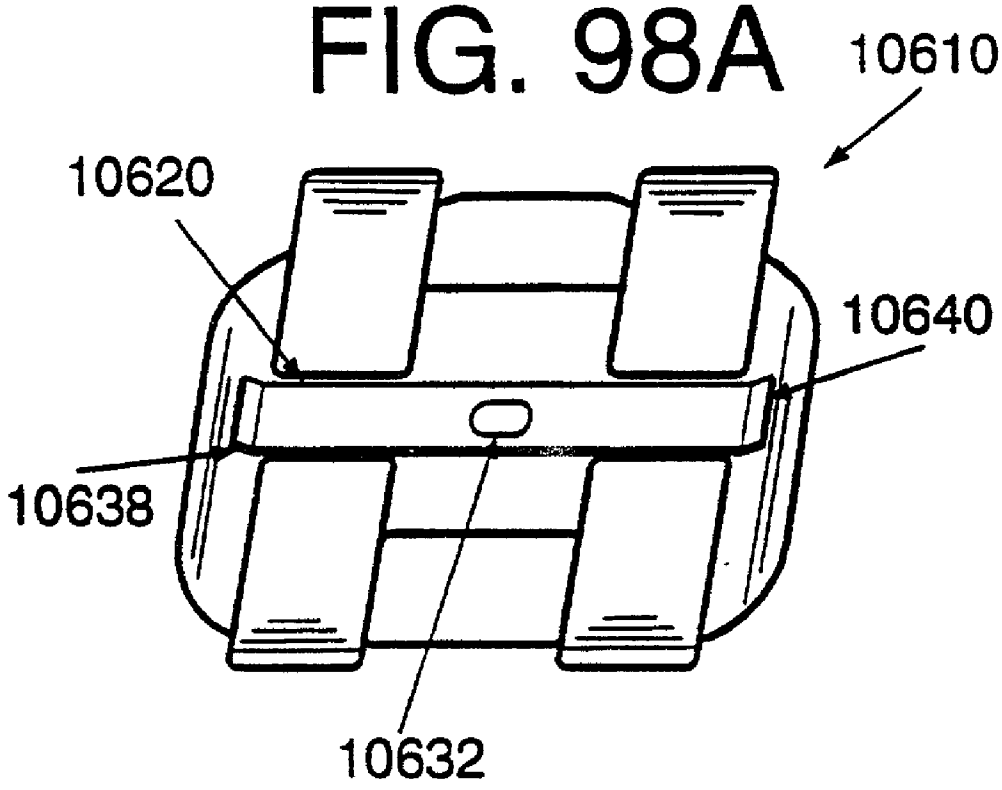


FIG. 98B

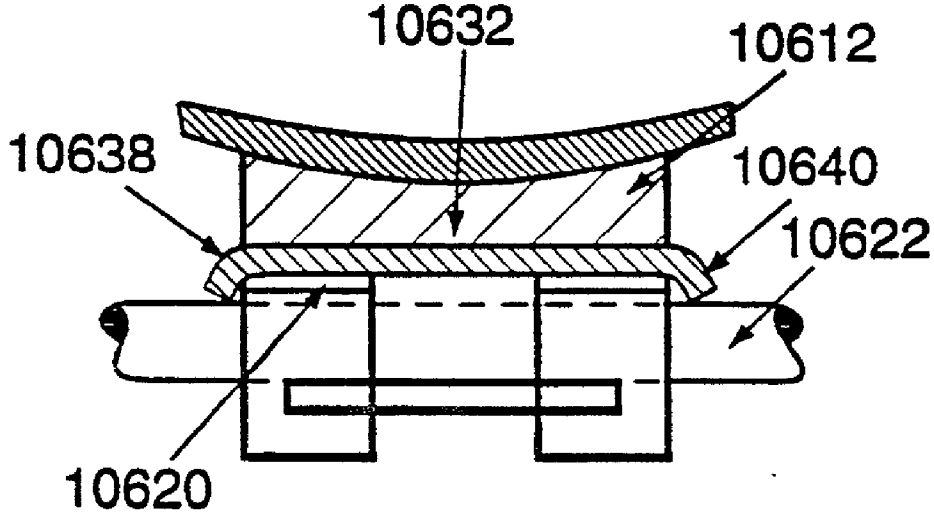


FIG. 98C

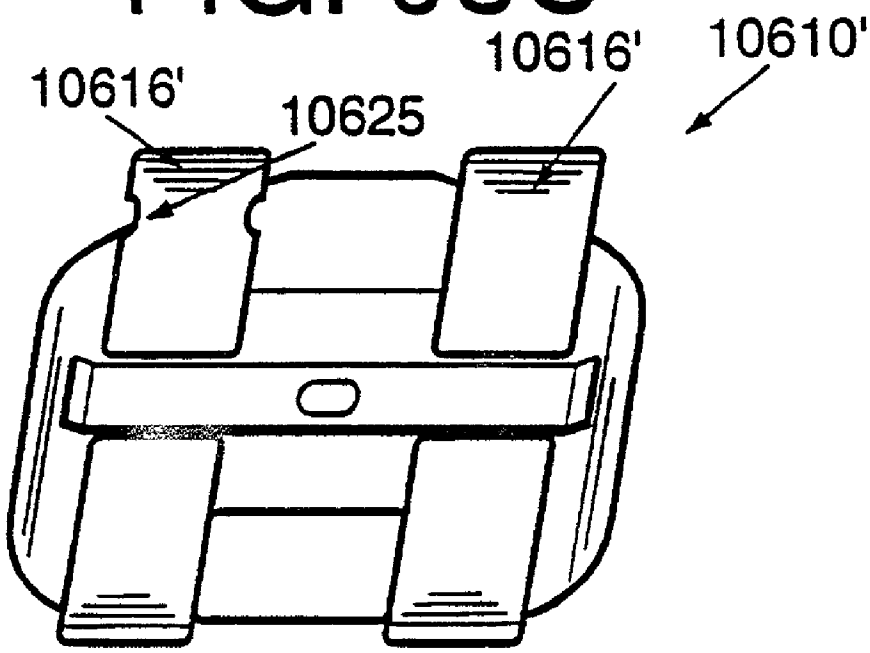


FIG. 98D

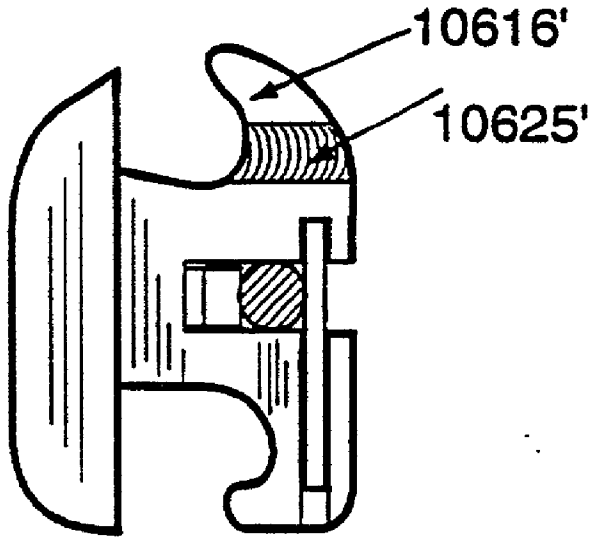


FIG. 99A

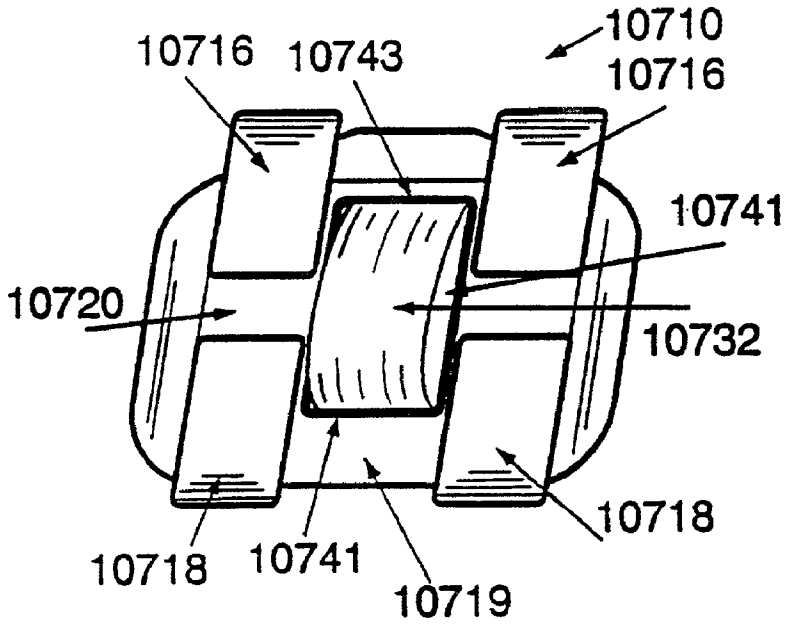


FIG. 99B

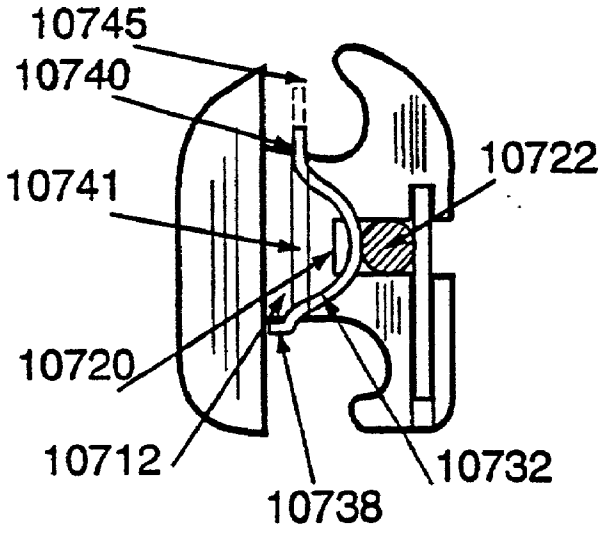


FIG. 100A

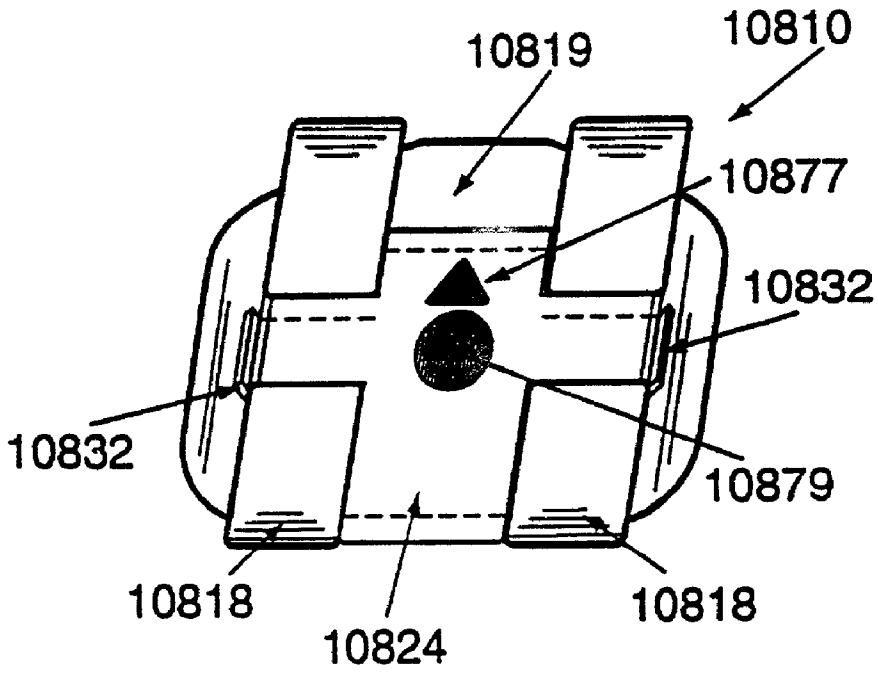


FIG. 100B

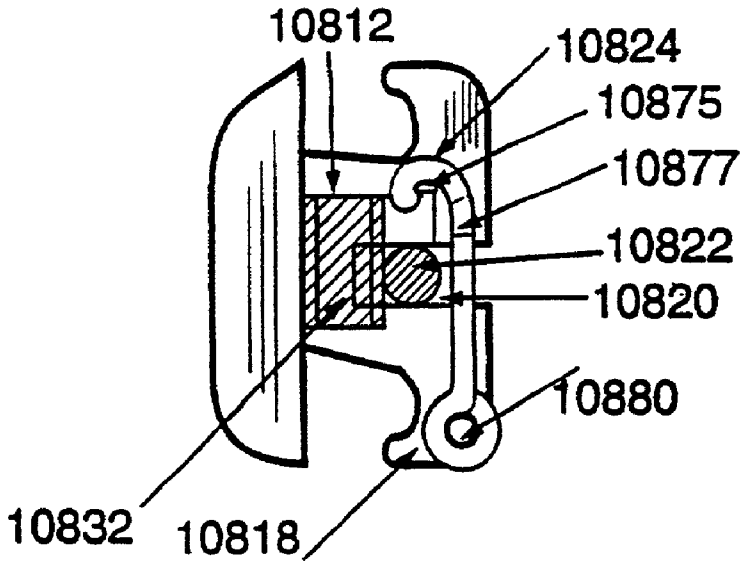


FIG. 100C

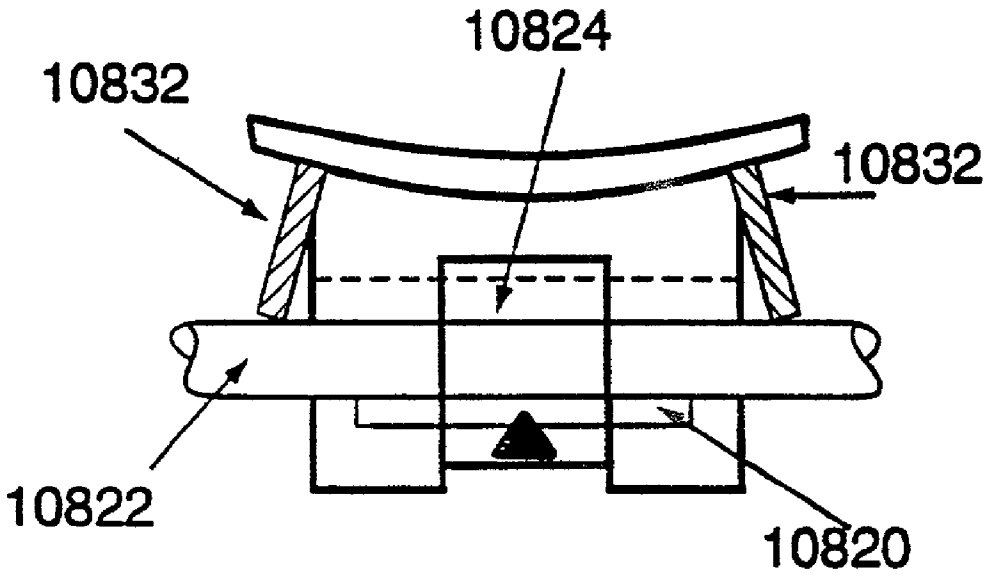


FIG. 100D

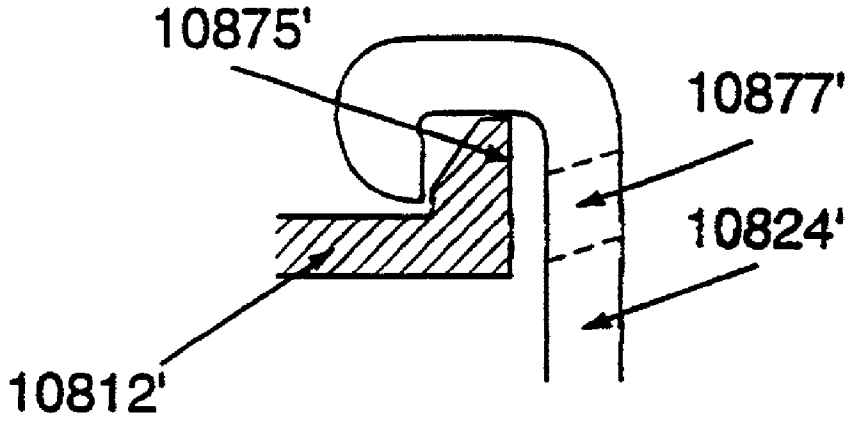


FIG. 101A

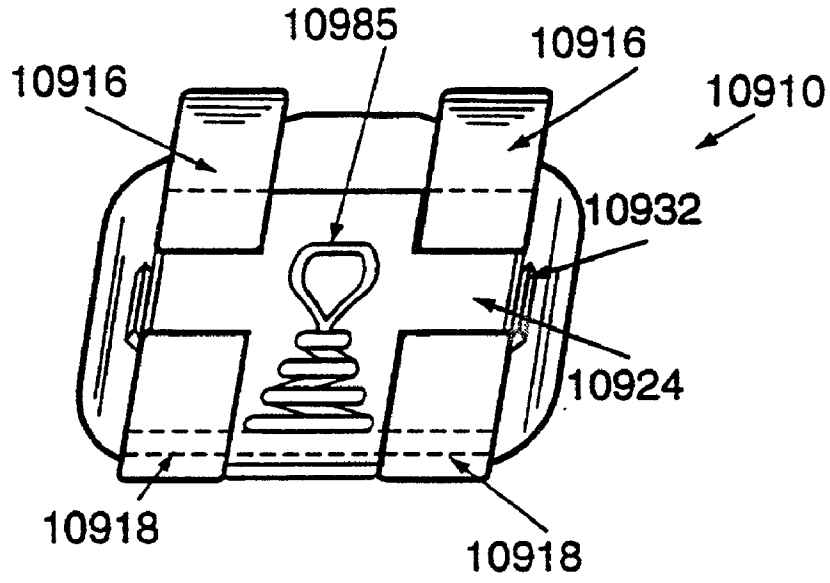


FIG. 101B

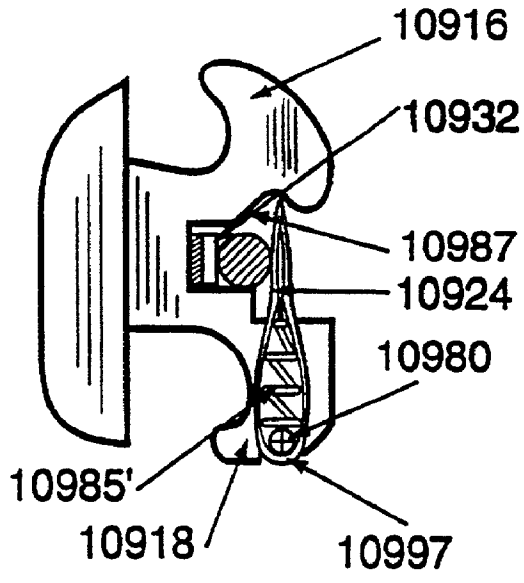


FIG. 101C

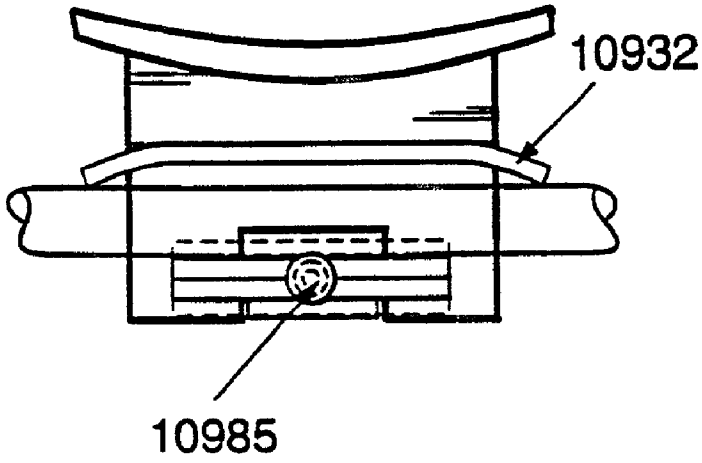


FIG. 101D

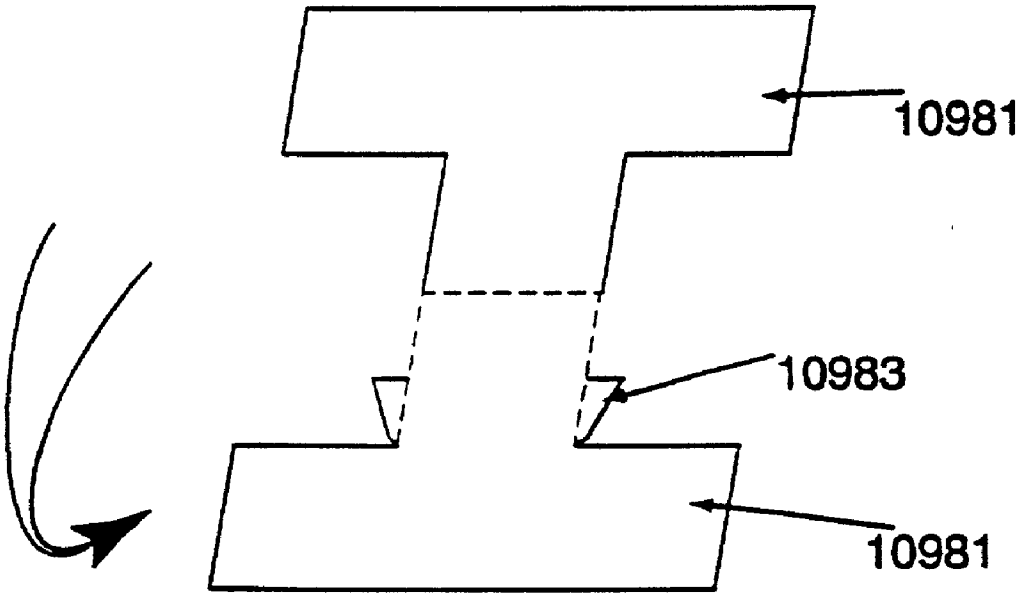


FIG. 102

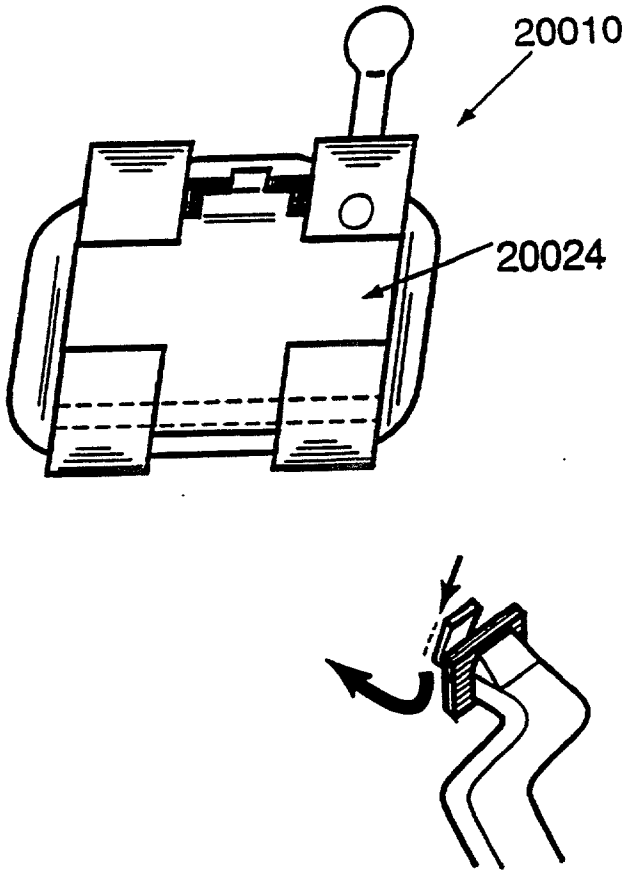


FIG 103

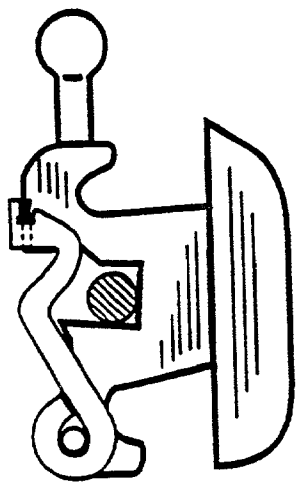


FIG. 104

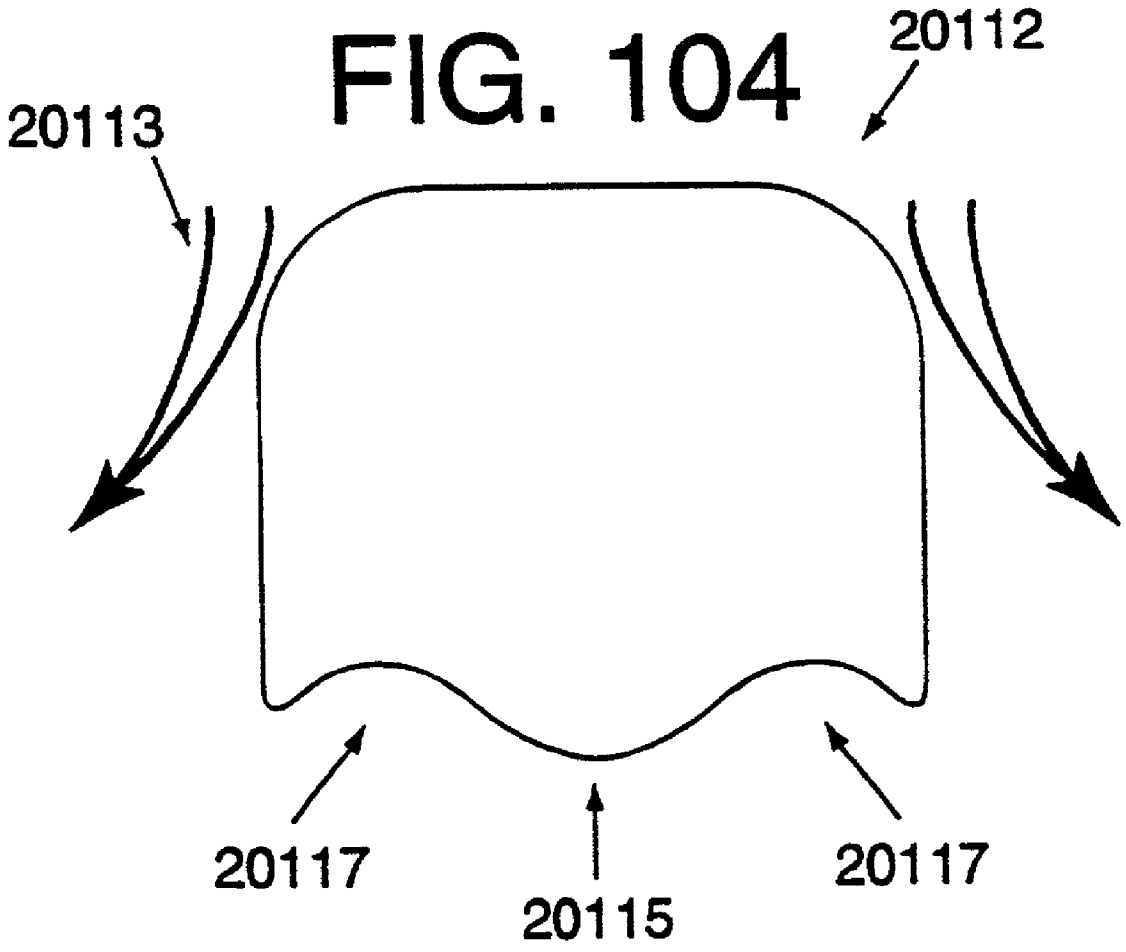


FIG. 105

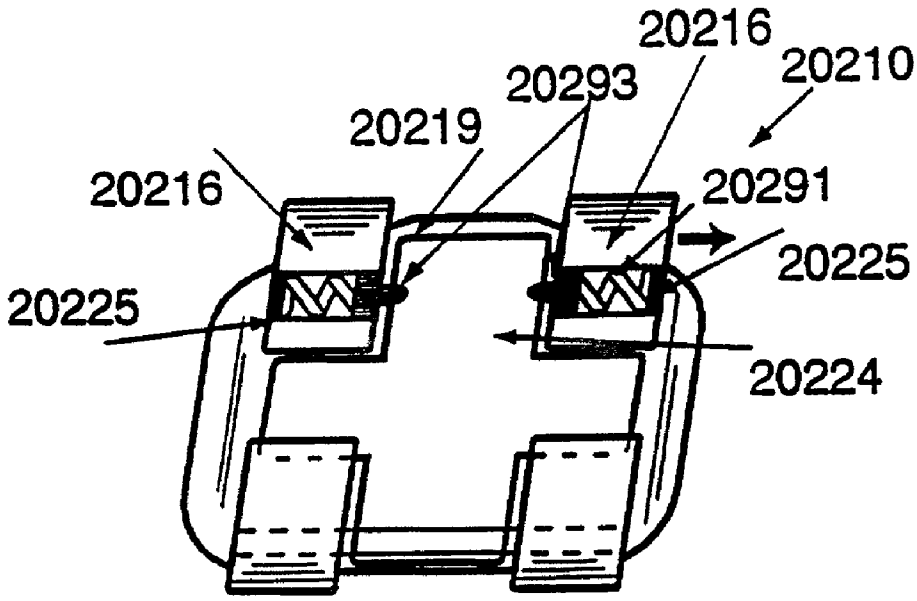
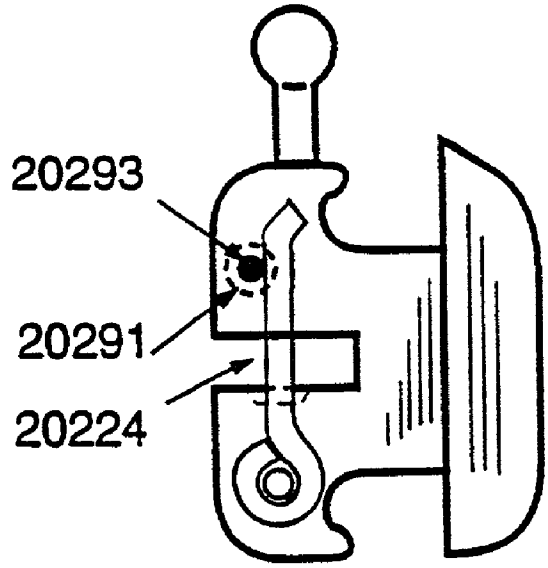


FIG. 106



ORTHODONTIC BRACKET

RELATED APPLICATIONS

[0001] The present application is a continuation-in-part of U.S. application Ser. No. 08/625,944, filed on Apr. 1, 1996 which is a continuation-in-part of U.S. application Ser. No. 08/412,338 filed on Mar. 31, 1995 now abandoned which is a continuation-in-part of U.S. application Ser. No. 08/206,724 filed on Mar. 7, 1994 now issued and granted under U.S. Pat. No. 5,474,445.

FIELD OF THE INVENTION

[0002] The present invention relates in general to pre-engaging orthodontic brackets and in particular to a pre-engaging twin orthodontic bracket and to a plurality of orthodontic brackets forming a set of braces.

BACKGROUND OF THE INVENTION

[0003] According to established orthodontic techniques, it is well known that one is able to ligate an archwire to a bracket utilizing an elastic, elastomeric or metal ligature. In a twin edgewise orthodontic bracket, the elastic ligature is stretched around respective undercuts of gingival and occlusal tie wings so as to overlay the archwire at mesial and distal ends of the bracket.

[0004] The ligating procedure involves carefully stretching the elastic or elastomeric ligature (or wrapping and twisting a metal ligature) around the tie wings utilizing appropriate orthodontic instruments. It has been found that the time-consuming ligation procedure contributes to lengthy chair time. Furthermore, the elastic ligatures are known to lose their elasticity with time and are subject to degradation. Also, the elastic and metal ligatures have been known to trap food particles in areas of the bracket which are difficult for the patient to clean, and to increase the level of friction against the archwire. Finally, the use of sharp metal ligatures around the bracket can subject the clinician to unnecessary exposure to infectious bacteria, or viruses such as hepatitis B, or possibly the HIV virus particularly in blood.

[0005] In an effort to overcome these disadvantages of elastic ligatures, certain advances have been made in the area of pre-engaging orthodontic brackets. Each of U.S. Pat. Nos. 4,144,642; 4,248,588; 4,698,017; 3,772,787; 4,786,242; 4,559,012; 4,561,844; 4,655,708; 4,077,126; 4,419,078; 4,634,661; 4,197,642; and 4,712,999 illustrate one or more designs of pre-engaging brackets. These prior art devices overcome some of the disadvantages associated with elastic ligatures. For example, pre-engaging orthodontic brackets eliminate, or at least reduce, exposure of the clinician to sharp ligatures, thereby alleviating the problem of contracting harmful bacteria or viruses. In addition, pre-engaging orthodontic brackets permit continuous low deflection differential archwire contact separately for both round and rectangular archwires at at least two different levels of contact, which is not possible with degrading elastic, elastomeric or rigid, high deflection metal ligatures. However, most of the known prior art pre-engaging orthodontic brackets lack the reliability and the accessible ease of operability that most clinicians require. In addition, the majority of prior art pre-engaging orthodontic brackets are of a single design that have three or fewer tie wings.

[0006] It is therefore an object of the present invention to provide a novel twin pre-engaging orthodontic bracket which obviates or mitigates at least one of the above-identified disadvantages associated with prior art orthodontic brackets.

SUMMARY OF THE INVENTION

[0007] According to one aspect of the present invention there is provided a pre-engaging orthodontic bracket for attaching an archwire to a tooth comprising:

[0008] a body having a lingual surface for attachment to a tooth, a pair of laterally spaced gingival tie wings and a pair of laterally spaced occlusal tie wings, said gingival and occlusal tie wings projecting from a labial surface of said body, both said gingival tie wings and occlusal tie wings at opposed mesial and distal sides of said body being separated by an interwing region of said body;

[0009] an archwire slot extending mesiodistally across said body and between the gingival and occlusal tie wings at opposed mesial and distal sides of said body to accommodate an archwire, said archwire slot being interrupted by said interwing region;

[0010] a locking shutter moveable relative to said body between an open position in which placement and removal of said archwire in said archwire slot is facilitated and a closed position in which placement and removal of said archwire in said archwire slot is inhibited; and

[0011] biasing means carried by said locking shutter and engageable with an archwire in said archwire slot when said locking shutter is in said closed position, said biasing means resiliently urging said archwire into said archwire slot to provide a continuous corrective force thereon.

[0012] In one embodiment, the biasing means is in the form of a leaf spring secured to the locking shutter. The leaf spring can extend mesiodistally or occlusiogingivally. In another embodiment, the locking shutter is formed of resilient material and biases the archwire when the locking shutter is in the closed position thereby to constitute the biasing means.

[0013] According to another aspect of the present invention there is provided a pre-engaging orthodontic bracket for attaching an archwire to a tooth comprising:

[0014] a body having a lingual surface for attachment to a tooth, a pair of laterally spaced gingival tie wings and a pair of laterally spaced occlusal tie wings, said gingival and occlusal tie wings projecting from a labial surface of said body, both said gingival tie wings and occlusal tie wings at opposed mesial and distal sides of said body being separated by an interwing region of said body;

[0015] an archwire slot extending mesiodistally across said body and between the gingival and occlusal tie wings at opposed mesial and distal sides of said body to accommodate an archwire, said archwire slot being interrupted by said interwing region;

[0016] a locking shutter movable relative to said body between an open position in which placement and removal of said archwire in said archwire slot is facilitated and a closed position in which placement and removal of said archwire from said archwire slot is inhibited; and

[0017] biasing means engageable with an archwire in said archwire slot when said locking shutter is in said closed position to urge said archwire toward said locking shutter to provide a continuous corrective force thereon.

[0018] In one embodiment, the biasing means is in the form of a resilient spring member extending mesiodistally along the archwire slot and secured to the body. The spring member has at least one free end and can be dimensioned to engage an archwire either within the archwire slot or exterior to the archwire slot. In another embodiment, the resilient spring member extends occlusiodistally across the archwire slot in the interwing region and is secured to the body adjacent one end thereof.

[0019] In another embodiment, the biasing means is in the form of magnetized elements within the body adjacent the archwire slot to present a repelling magnetic force to the archwire to bias the archwire towards the locking shutter. In yet another embodiment, the biasing means is in the form of a pair of spring-loaded pistons accommodated by the body adjacent opposed mesial and distal ends of the archwire slot to urge the archwire towards the locking shutter.

[0020] According to still yet another aspect of the present invention there is provided a pre-engaging orthodontic bracket for attaching an archwire to a tooth comprising:

[0021] a body having a lingual surface for attachment to a tooth, a pair of laterally spaced gingival tie wings and a pair of laterally spaced occlusal tie wings, said gingival and occlusal tie wings projecting from a labial surface of said body, both said gingival tie wings and occlusal tie wings at opposed mesial and distal sides of said body being separated by an interwing region of said body;

[0022] an archwire slot extending mesiodistally across said body and between the gingival and occlusal tie wings at opposed mesial and distal sides of said body to accommodate an archwire, said archwire slot being interrupted by said interwing region; and

[0023] a locking shutter pivotal about at least one pivot pin between an open position in which placement and removal of said archwire in said archwire slot is facilitated and a closed position in which placement of said archwire in said archwire slot is inhibited.

[0024] In one embodiment, the orthodontic bracket includes one pivot pin extending between the tie wings of one of the two pairs and wherein the locking shutter includes a single loop at one end thereof to surround the pivot pin. In another embodiment, the orthodontic bracket includes a pair of pivot pins, each accommodated by each tie wing of one of the two pairs. In this case, the locking shutter includes a pair of laterally spaced single loops surrounding the pivot pins.

[0025] Preferably, the locking shutter includes a marker thereon to identify generally the center of the archwire slot when the locking shutter is in the closed position. It is also preferred that the orthodontic bracket further includes a lubricating or sealing agent carried by one or more of the body, archwire slot, locking shutter and archwire.

[0026] According to still yet another aspect of the present invention there is provided a body for an orthodontic bracket having a mesiodistally extending archwire slot formed therein and gingival and occlusal surfaces shaped to deflect food debris and plaque mesially and distally therefrom when secured to a tooth.

[0027] According to still yet another aspect of the present invention there is provided a set of braces including a plurality of orthodontic brackets to be attached to an individual's teeth, said braces including self-engaging twin orthodontic brackets to be attached to the central and lateral teeth and first and second molars of said individual and single orthodontic brackets to be attached to the cuspid and premolar teeth of said individual.

[0028] The present invention provides advantages in that the orthodontic brackets provide predictability and accurate control of tooth movement while enhancing treatment progress. The orthodontic brackets are aesthetically pleasing due to their symmetrical designs and provide for easier hygiene than prior art orthodontic brackets.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] Preferred embodiments of the present invention will now be described more fully with reference to the accompanying drawings, in which:

[0030] **FIG. 1** is a perspective view of a pre-engaging twin orthodontic bracket in accordance with the present invention;

[0031] **FIG. 2***a* is a side elevational view of the orthodontic bracket of **FIG. 1**;

[0032] **FIG. 2***b* is a side elevational view of the orthodontic bracket of **FIG. 1** in an open position;

[0033] **FIGS. 3***a* and **3***b* are occlusal views of an incisor section to which the orthodontic bracket of **FIG. 1** of the present invention is attached, showing low deflection moment during movement of the tooth;

[0034] **FIG. 4** is a front elevational view of an orthodontic bracket of the type shown in **FIG. 1** positioned on a tooth;

[0035] **FIG. 5** is a perspective view of an alternative embodiment of a pre-engaging twin orthodontic bracket in accordance with the present invention;

[0036] **FIG. 6** is a front elevational view of yet another alternative embodiment of a pre-engaging twin orthodontic bracket in accordance with the present invention;

[0037] **FIG. 7** is a cross-sectional view of **FIG. 6** taken along line **7-7**;

[0038] **FIG. 8** is a three-quarter perspective view of the orthodontic bracket of **FIG. 6**;

[0039] **FIGS. 9***a* and **9***b* are cross-sectional views of **FIG. 8** taken along line **9-9** with the shutter in closed and open positions respectively;

[0040] **FIG. 10** is an enlarged cross-sectional view of a portion of the orthodontic bracket of **FIG. 8** with the pivot pin omitted;

[0041] **FIGS. 11***a* and **11***b* are perspective and front elevational views respectively of a shutter forming part of the orthodontic bracket of **FIG. 6**.

[0042] **FIG. 12** is a front elevational view of an alternative embodiment of an orthodontic bracket in accordance with the present invention having a sliding shutter;

[0043] **FIG. 13** is a side elevational view of the orthodontic bracket of **FIG. 12**;

[0044] **FIG. 14** is a view similar to **FIG. 12** of the orthodontic bracket showing movement of the shutter to an open position;

[0045] **FIG. 15** is a side elevational view of the orthodontic bracket of **FIG. 14** with the shutter in the open position;

[0046] **FIG. 16***a* is a perspective view of another alternative embodiment of an orthodontic bracket in accordance with the present invention having a sliding shutter shown in an open position;

[0047] **FIG. 16***b* is a side elevational view of the orthodontic bracket shown in **FIG. 16***b;*

[0048] **FIG. 17***a* is a perspective view of the orthodontic bracket of **FIG. 16***a* showing the shutter in a closed position;

[0049] **FIG. 17***b* is a side elevational view of the orthodontic bracket shown in **FIG. 17***a;*

[0050] **FIG. 18** is a front elevational view of an alternative embodiment of an orthodontic bracket in accordance with the present invention;

[0051] **FIG. 19** is a side elevational view of the orthodontic bracket of **FIG. 18**;

[0052] **FIG. 20** is a top plan view of the orthodontic bracket of **FIG. 18**;

[0053] **FIG. 21** is a partially exploded three-quarter perspective view of a still yet another embodiment of an orthodontic bracket in accordance with the present invention;

[0054] **FIG. 22** is a three-quarter perspective view similar to **FIG. 21** of the orthodontic bracket in a closed position;

[0055] **FIG. 23** is a side elevational view of the orthodontic bracket of **FIG. 22** accommodating an archwire;

[0056] **FIG. 24** is a side elevational view of the orthodontic bracket of **FIG. 22** in an open position;

[0057] **FIG. 25** is a front elevational view of a further embodiment of an orthodontic bracket in accordance with the present invention having a resiliently biased locking shutter;

[0058] **FIG. 26** is a side elevational view of the orthodontic bracket of **FIG. 25** in an open position;

[0059] **FIG. 27** is a side elevational view of the orthodontic bracket of **FIG. 25** in a closed position;

[0060] **FIG. 28** is an exploded three-quarter perspective view of yet another alternative embodiment of an orthodontic bracket in accordance with the present invention;

[0061] **FIG. 29** is a three-quarter perspective view of the orthodontic bracket of **FIG. 28** in a closed position;

[0062] **FIG. 30***a* is a side elevational view of the orthodontic bracket of **FIG. 29** in an open position;

[0063] **FIG. 30***b* is a side elevational view of the orthodontic bracket of **FIG. 29** in a closed position;

[0064] **FIG. 31** is a three-quarter perspective view of the orthodontic bracket of **FIG. 29** in the open position;

[0065] **FIG. 32** is a front elevational view of yet another embodiment of an orthodontic bracket in accordance with the present invention;

[0066] **FIG. 33** is a side elevational view of the orthodontic bracket of **FIG. 32**;

[0067] **FIG. 34** is an occlusal view of the orthodontic bracket of **FIG. 32**;

[0068] **FIG. 35** is a side elevational view of a shutter forming part of the orthodontic bracket of **FIG. 32**;

[0069] **FIG. 36** is a front elevational view of the shutter of **FIG. 35**;

[0070] **FIG. 37** is a three-quarter perspective view of still yet a further embodiment of an orthodontic bracket in accordance with the present invention;

[0071] **FIG. 38** is a front elevational view of yet another alternative embodiment of an orthodontic bracket in accordance with the present invention in a closed position;

[0072] **FIG. 39** is a front elevational view of the orthodontic bracket of **FIG. 38** in an open position;

[0073] **FIG. 40** is a side elevational view of the orthodontic bracket of **FIG. 38** accommodating a round archwire;

[0074] **FIG. 41 a** is a cross-sectional view of an alternative embodiment of a pivot pin and shutter for use with the orthodontic bracket of **FIG. 38**;

[0075] **FIG. 41** is a side elevational view of the orthodontic bracket of **FIG. 39** accommodating a round archwire;

[0076] **FIG. 42** is a front elevational view of yet another alternative embodiment of an orthodontic bracket in accordance with the present invention in a closed position;

[0077] **FIG. 43** is a front elevational view of the orthodontic bracket of **FIG. 42** in an open position;

[0078] **FIG. 44** is a side elevational view of the orthodontic bracket of **FIG. 42** accommodating a round archwire;

[0079] **FIG. 45** is a side elevational view of the orthodontic bracket of **FIG. 43** accommodating a round archwire;

[0080] **FIG. 45***a* is a front elevational view of an alternative embodiment of a shutter for use with the orthodontic bracket of **FIG. 42**;

[0081] **FIG. 46** is a front elevational view of yet another alternative embodiment of an orthodontic bracket in accordance with the present invention in a closed position;

[0082] **FIG. 47** is a front elevational view of yet another alternative embodiment of an orthodontic bracket in accordance with the present invention in a closed position;

[0083] **FIG. 48** is an exploded three-quarter perspective view of yet another alternative embodiment of an orthodontic bracket in accordance with the present invention similar to that shown in FIGS. **28** to **31**;

[0084] **FIG. 49** is a three-quarter perspective view of the orthodontic bracket of **FIG. 48** in a closed position;

[0085] **FIG. 50** is a side elevational view of the orthodontic bracket of **FIG. 49** in an open position;

[0086] **FIG. 51** is a side elevational view of the orthodontic bracket of **FIG. 49** in a closed position;

[0087] **FIG. 52** is a three-quarter perspective view of the orthodontic bracket of **FIG. 49** in the open position;

[0088] **FIG. 53** is a front elevational view of an alternative embodiment of an orthodontic bracket in accordance with the present invention having a sliding shutter similar to that shown in FIGS. **12** to **15**;

[0089] **FIG. 54** is a side elevational view of the orthodontic bracket of **FIG. 53**;

[0090] **FIG. 55** is a side elevational view of the orthodontic bracket of **FIG. 53** with the shutter in the open position;

[0091] **FIG. 56** is a front elevational view of a further embodiment of an orthodontic bracket in accordance with the present invention having a resiliently biased locking shutter similar to that shown in FIGS. **25** to **27**;

[0092] **FIG. 57** is a side elevational view of the orthodontic bracket of **FIG. 56** in an open position;

[0093] **FIG. 58** is a side elevational view of the orthodontic bracket of **FIG. 56** in a closed position;

[0094] **FIG. 59** is a front elevational view of yet another embodiment of an orthodontic bracket in accordance with the present invention similar to that shown in FIGS. **32** to **36**;

[0095] **FIG. 60***a* is a side elevational view of the orthodontic bracket of **FIG. 59**;

[0096] **FIG. 60***b* is a side elevational view of the orthodontic bracket of **FIG. 59** in an open position;

[0097] **FIG. 61** is a side elevational view of a shutter forming part of the orthodontic bracket of **FIG. 59**;

[0098] **FIG. 62** is a front elevational view of the shutter of **FIG. 61**;

[0099] **FIG. 63** is a front elevational view of still a further embodiment of an orthodontic bracket in accordance with the present invention with the shutter removed;

[0100] **FIG. 64** is a side elevational view of the orthodontic bracket of **FIG. 63** with the shutter installed;

[0101] **FIG. 65** is a front elevational view of the orthodontic bracket of **FIG. 63** with the shutter installed;

[0102] **FIG. 66** is a top plan view of the orthodontic bracket of **FIG. 65**;

[0103] **FIG. 67** is a side elevational view of the orthodontic bracket of **FIG. 63**, similar to **FIG. 64**, with the shutter in an open position;

[0104] **FIG. 68** is a three-quarter perspective view of the orthodontic bracket of **FIG. 63**;

[0105] **FIG. 69** is a side elevational view of an alternative embodiment of a shutter for use with the orthodontic bracket of **FIG. 63**;

[0106] **FIG. 70** is a side elevational view of a further alternative embodiment of a shutter for use with the orthodontic bracket of **FIG. 63**;

[0107] **FIG. 71** is a rear elevational view of the shutter of **FIG. 70**;

[0108] **FIG. 72** is a side elevational view of a still further embodiment of a shutter for use with the orthodontic bracket of **FIG. 63**;

[0109] **FIG. 73** is a rear elevational view of the shutter of **FIG. 72**;

[0110] **FIG. 74** is a front elevational view of yet another alternative embodiment of an orthodontic bracket in accordance with the present invention;

[0111] **FIG. 75** is a side elevational view of the orthodontic bracket of **FIG. 74** in a closed position;

[0112] **FIG. 76** is a side elevational view of the orthodontic bracket of **FIG. 75** in an open position;

[0113] **FIG. 77** is a cross-sectional view of **FIG. 76**;

[0114] **FIG. 78** is a perspective view of a shutter used in the orthodontic bracket of **FIG. 74**;

[0115] **FIG. 79** is a front elevational view of yet another alternative embodiment of an orthodontic bracket in accordance with the present invention;

[0116] **FIG. 80** is a perspective view of the orthodontic bracket of **FIG. 79**;

[0117] **FIG. 81** is a side elevational view of the orthodontic bracket of **FIG. 79**;

[0118] **FIG. 82** is a side elevational view of the orthodontic bracket of **FIG. 79** accommodating a larger archwire;

[0119] **FIG. 83** is a front elevational view of yet another alternative embodiment of an orthodontic bracket in accordance with the present invention;

[0120] **FIG. 84** is a side elevational view of the orthodontic bracket of **FIG. 83** in a closed position and accommodating an archwire;

[0121] **FIG. 85** is a side elevational view of the orthodontic bracket of **FIG. 83** showing the initial release of the shutter;

[0122] **FIG. 86** is a side elevational view of the orthodontic bracket of **FIG. 83** showing further movement of the shutter;

[0123] **FIG. 87** is a side elevational view of the orthodontic bracket of **FIG. 83** showing the shutter in a fully open position;

[0124] **FIG. 88** is a front elevational view of yet another alternative embodiment of an orthodontic bracket in accordance with the present invention;

[0125] **FIG. 89** is a perspective view of a component forming part of the orthodontic bracket of **FIG. 88**;

[0126] **FIG. 90** is a perspective view of an alternative embodiment of the component of **FIG. 89**;

[0127] **FIGS. 91***a* and **91***b* are side elevational views of embodiments of an orthodontic tool;

[0128] **FIG. 92***a* is a front elevational view of another embodiment of an orthodontic bracket in accordance with the present invention;

[0129] **FIG. 92***b* is a side elevational view of the orthodontic bracket of **FIG. 92***a;*

[0130] **FIG. 92***c* is a top plan view of the orthodontic bracket of **FIG. 92***a;*

[0131] **FIG. 92***d* is another side elevational view of the orthodontic bracket of **FIG. 92***a;*

[0132] **FIG. 93** is a perspective view of a portion of another embodiment of an orthodontic bracket in accordance the present invention;

[0133] **FIG. 94** is a front elevational view of yet another embodiment of an orthodontic bracket in accordance with the present invention;

[0134] **FIG. 95** is a side elevational view of still yet another alternative embodiment of an orthodontic bracket in accordance with the present invention;

[0135] **FIGS. 96***a* and **96***b* are front elevational and cross-sectional views of another embodiment of an orthodontic bracket in accordance with the present invention;

[0136] **FIGS. 97***a* to **97***c* are front elevational, side elevational and top plan views of another embodiment of an orthodontic bracket in accordance with the present invention;

[0137] **FIGS. 98***a* and **98***b* are front elevational and cross-sectional views of another embodiment of an orthodontic bracket in accordance with the present invention;

[0138] **FIGS. 98***c* and **98***d* are front and side elevational views of another embodiment of an orthodontic bracket in accordance with the present invention;

[0139] **FIGS. 99***a* and **99***b* are front and side elevational views of another embodiment of an orthodontic bracket in accordance with the present invention;

[0140] **FIGS. 100***a* to **100***c* are front elevational, side elevational and top plan views of another embodiment of an orthodontic bracket in accordance with the present invention;

[0141] **FIG. 100***d* is a cross-sectional view of an alternative embodiment of a locking shutter retainer for the orthodontic bracket of **FIG. 100***a;*

[0142] **FIGS. 101***a* to **101***c* are front elevational, side elevational and top plan views of another embodiment of an orthodontic bracket in accordance with the present invention;

[0143] **FIG. 101***d* is a plan view of a locking shutter used in the orthodontic bracket of **FIG. 101***a* in an unfolded condition;

[0144] **FIGS. 102 and 103** are front and side elevational views of another embodiment of an orthodontic bracket in accordance with the present invention;

[0145] **FIG. 104** is a front elevational view of an alternative embodiment of a body for an orthodontic bracket; and

[0146] **FIGS. 105 and 106** are front and side elevational views of yet another alternative of an orthodontic bracket in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0147] Referring now to **FIGS. 1 and 2**, a pre-engaging twin 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 pad **14** attached to the body. The mounting pad **14** has a lingual surface to be attached to a tooth. A pair of laterally spaced gingival tie wings **16** and a pair of laterally spaced occlusal tie wings **18** extend from a labial surface of the body **12**. The gingival tie wings **16** and the occlusal tie wings **18** curve lingually. An archwire slot **20** extends mesiodistally across the body and between the gingival and occlusal tie wings at opposed mesial and distal sides of the body and opens labially to receive an archwire **22**. The archwire slot **20** is interrupted in the interwing region **12'** of the body. A V-shaped deflection notch is formed in the gingival wall of the archwire slot **20** at its mesial and distal ends extends to define mesial and distal bevelled deflection surfaces **24** above the archwire slot. Resting grooves **26** are formed in the labial surface of the wings **15** below the archwire slot **20**.

[0148] A shutter **30** formed of resilient stainless steel is pivotally mounted on the occlusal tie wings **18** and is movable between a closed position where access to the archwire slot **20** is inhibited and an open position where access to the archwire slot is permitted (see **FIGS. 2***a* and **2***b*). One end **30***a* of the shutter **30** is accommodated in undercuts **34** defined by the occlusal tie wings **18**. The end **30***a* of the shutter **30** accommodated by the undercuts **34** generally resembles an open "D" and is configured to remain in the undercuts **34** throughout movement of the shutter between the open and closed positions. As the shutter **30** moves between the open and closed positions, the end **30***a* of the shutter translates within the undercuts **34**. An aperture **30***b* is formed in the shutter **30** to accommodate a tool to facilitate opening of the shutter.

[0149] The shutter **30** curves labially and gingivally around the occlusal tie wings **18** and then curves lingually towards the archwire slot **20**. When the shutter **30** is in the closed position and the archwire applies a labially directed force to the shutter **30**, the gingival end **36** of the shutter **30** contacts the deflection surfaces **24** to inhibit the shutter from being accidentally removed from the archwire slot **20**. At the same time, the lingual surface **38** of the shutter **30** contacts the archwire **22** to urge it continuously into the archwire slot **20**. When the shutter **30** is pivoted and translated to remove it from the archwire slot **20**, the gingival end **36** can be accommodated by the resting grooves **26** to hold the shutter in the open position although this is not necessary as shown by the dotted line in **FIG. 2***b*. This is due to the fact that as the compressed shutter **30** is opened, it flexes over the occlusal tie wings **18** as the shutter pivots and translates in the occlusal undercuts **34** to maintain the shutter open. The shutter **30** can be closed using a finger by simply pushing on the shutter until the gingival end **36** of the shutter enters the archwire slot **20** with the lingual surface **38** in contact with the archwire **22**. The shutter **30** can be opened by inserting a one or two prong ligature director into the aperture **30***b* and applying an occlusally directed force on the shutter in the interwing region **12'** of the body **12**.

[0150] The design of the shutter **30** is such that a rectangular archwire **22** is seated to apply torque to the archwire slot **20** depending on the rectangular cross-sectional shape of the archwire **22**. The continuous active seating or biasing of the archwire **22** by the shutter **30** provides for accurate tooth movement. Referring now to **FIGS. 3***a* and **3***b*, a tooth **40** with an orthodontic bracket **10** on it is shown. In **FIG. 3***a*, the tooth **40** is shown in an original "rotated" position while in **FIG. 3***b*, the tooth is shown in a final "straight" position. The designations A and B in **FIGS. 3***a* and **3***b* denote coupled sets of force vectors applied by the shutter **30** on the orthodontic bracket **10** and archwire. As can be seen, the archwire **22** in **FIG. 3***a* deflects the shutter **30** labially on the right side reducing the initial force and moment applied to the tooth **40** until the shutter gradually seats itself into the archwire slot **20** as shown in **FIG. 3***b* with less patient discomfort.

[0151] Referring now to **FIG. 4**, an orthodontic bracket **10** is shown on a tooth **40**. The occlusal edges of the orthodontic bracket **10** are preferably parallel to the incisal edges and parallel to the archwire slot. Two scribe lines **44** on the orthodontic bracket **10** delineate the long axis **46** of the tooth **40** for ideal placement of the orthodontic bracket. Also, the external lingual surface of the mounting pad **14** is angulated or biased to assist alignment and placement of the orthodontic bracket **10** against the long axis of the tooth. Larger brackets may be used for larger molars.

[0152] Referring now to **FIG. 5**, an alternative embodiment of an orthodontic bracket is shown and is generally indicated to by reference numeral **10***a*. In this embodiment, like reference numerals will be used to indicate like components of the first embodiment with an "a" added for clarity. As can be seen, the shutter **24***a* is received in undercuts **34***a* defined by the occlusal tie wings **18***a*. The shutter **30***a* has an aperture **51** formed in it to receive a tool and facilitate pivoting of the shutter from the closed to open positions using a tool. A hollow vertical slot **52** is provided on the body **12***a* in the interwing region **12***a*'. The hollow slot **52** allows the orthodontic bracket **10***a* to provide for more tooth inclination, torque control and overcorrection than prior art orthodontic brackets.

[0153] Referring now to FIGS. **6** to **10**, yet another embodiment of a pre-engaging twin orthodontic bracket is shown and is generally indicated to by reference numeral **110**. As can be seen, orthodontic bracket **110** includes a body **112** and a lingual mounting pad **114** attached to the body. The mounting pad **114** has a lingual surface to be attached to a tooth. A pair of laterally spaced gingival tie wings **116** and a pair of laterally spaced occlusal tie wings **118** extend from a labial surface of the body **112**. The gingival tie wings **116** and the occlusal tie wings **118** curve lingually. A horizontal crossbar **117** extends across the interwing region **112**' of the body **112** and interconnects the occlusal tie wings **118**. A ball hook **119** extends from one of the gingival tie wings **116**.

[0154] The gingival surface **115** of the body in the interwing region **112**' between the gingival tie wings **116** is convex and is generally semi-elliptical. The labial surface of the body in the interwing region **112** has a notch **150** formed in it. The gingival tie wings **116** are bevelled as indicated by reference numeral **121**. An archwire slot **120** extends mesiodistally across the body **112** and between the gingival and occlusal tie wings located at opposed mesial and distal sides of the body and opens labially to receive an archwire **122**. The occlusal wall of the archwire slot **120** is continuous and is constituted by the occlusal tie wings **118** and the crossbar **117**. The occlusal wall of the archwire slot **120** has a notch formed in it to define two deflection surfaces **124** and **126** respectively. Deflection surface **124** is constituted by a labial bevel while deflection surface **126** is constituted by a lingual bevel.

[0155] Looking at **FIGS. 7 and 10**, it can be seen that a curved groove **128** is formed in the gingival tie wings **116** and interwing region **112**' of the body and extends mesiodistally. The groove **128** is spaced above the gingival surface of the body **112** and accommodates a pivot pin **130**. The pivot pin **130** is bonded to the gingival tie wings **116** by suitable means such as brazing, soldering, welding or the like. A shutter **132** resembling an inverted "T" in front elevation is pivotally mounted on the pivot pin **130** in the interwing region **112**' and is movable between a closed position where access to the archwire slot **120** is inhibited and an open position where access to the archwire slot **120** is permitted.

[0156] Referring now to **FIGS. 11***a* and **11***b*, the shutter **132** is better illustrated. As can be seen, the shutter **132** includes a lingually curved upright stem **134** and a transverse arm **136** at the occlusal end of the stem. The edges of the shutter are curved at the intersection between the stem **134** and transverse arm **136** to strengthen the shutter. The stem **134** curves over itself at its gingival end and terminates in an open D-shaped cup **138** which partially surrounds the pivot pin **130** and is accommodated in an undercut **39** formed in the interwing region **112**' occlusally of the pivot pin to secure the shutter to the orthodontic bracket **110**. A generally triangular aperture **140** is formed in the stem **134** to receive a tool to facilitate pivoting of the shutter **132** from the closed position to the open position. The occlusal portion of the transverse arm **136** of the shutter is generally convex when viewed in profile and is dimensioned to be accommodated in the archwire slot **120**. The occlusal edge **142** of the transverse arm **136** is slightly concave.

[0157] The archwire slot **120** is designed to accommodate circular cross-section or rectangular cross-section archwires **122**. When the archwire **122** is positioned in the archwire slot and the shutter is closed, the lingual surface of the shutter **132** contacts the archwire to urge it continuously against the body **112** (see **FIG. 9***a*). The deflection surface **126** inhibits the shutter **132** from being accidentally removed from the archwire slot **120** when the archwire **122** applies a labially directed force to the archwire. When it is desired to open the shutter **132**, a tool is inserted into the aperture **140** and is accommodated by the notch **150**. The tool can then be used to pivot the shutter with sufficient force so that the occlusal edge **142** of the transverse arm **136** passes over the deflection surface **126** and so that the end of the cup **138** rotates into the undercut **139** allowing the shutter **132** to open.

[0158] During this pivotal movement of the shutter **132**, the convex interwing gingival surface **115** of the body **112** and the flexing of the initially compressed shutter over the convex surface **115** as the shutter **132** pivots around the pivot pin **130** with the end of the shutter in the notch as shown in **FIG. 9***b*, maintains the shutter in an open condition. The

undercut **139** occlusally of the pivot pin **130** provides sufficient clearance for the shutter **132** to pivot freely in a rotary fashion.

[**0159**] Although the shutter **132** has been described as having a D-shaped cup **138** to surround the pivot pin **130**, the shutter can curl back around itself to surround substantially the pivot pin **130** between the gingival tie wings. Also, although the pivot pin has been described as being accommodated in curved slots and bonded to the orthodontic bracket, it should be apparent to those of skill in the art that the pivot pin may be integrally formed with and extend between the gingival tie wings.

[**0160**] Although the gingival surface of the body in the interwing region has been described as being semi-elliptical, it should be appreciated that other surface configurations are suitable. Also, although the pivot pin has been described as being accommodated in a groove extending across the gingival tie wings and the body, the pivot pin may only extend between the gingival tie wings in the interwing region **112'** making the gingival tie wings more accessible. Also, although the shutter has been shown as pivoting about a pivot pin extending between the gingival tie wings, the pivot pin may extend between the occlusal tie wings.

[**0161**] Referring now to FIGS. **12** to **15**, yet another embodiment of an orthodontic bracket is shown and is generally indicated to by reference numeral **220**. As can be seen, orthodontic bracket **220** includes a body **222** and a locking shutter **224**. For illustrative purposes, the orthodontic bracket **220** is configured for a maxillary tooth but it can be appreciated that the orthodontic bracket **220** could be used on a mandibular tooth.

[**0162**] Body **222** includes a lingual mounting pad **226** having a lingual tooth attaching surface **228** adapted for direct attachment to a tooth or to a pad that may be attached to a tooth. A pair of laterally spaced occlusal tie wings **234** and a pair of laterally spaced gingival tie wings **236** project from a labial surface of the body **222**. Each tie wing **234,236** curves lingually to define an undercut **238** for receiving a ligature. An archwire slot **240** extends mesiodistally across the body **222** and between the occlusal and gingival tie wings at opposed mesial and distal sides of the body. The archwire slot **240** accommodates an archwire **242**. The archwire slot **240** has a pair of opposed surfaces **244,246** at its mesial and distal ends. Inverted V-shaped deflection notches **248** are provided in the gingival tie wings **236** above the archwire slot. The deflection notches **248** are provided to receive a gingival edge **250** of the locking shutter **224** in the closed position.

[**0163**] The locking shutter **224** extends between the occlusal and gingival tie wings at opposed mesial and distal sides of the body **222** and across the archwire slot **240**. The locking shutter **224** has a body **252** which is cranked as indicated at **254** to provide a pair of relatively inclined portions **256,258**. Occlusal edge **260** of the shutter body **252** is provided with a recess **262** (as seen in **FIGS. 12 and 14**) so as to define a pair of downwardly projecting arms **264,266** that overlie respective ones of the occlusal tie wings **234** when the shutter **224** is in a closed position. An aperture **267** is centrally positioned on the shutter **224** to accommodate a tool to facilitate movement of the locking shutter.

[**0164**] The locking shutter **224** is retained on the orthodontic bracket **220** by means of an off-center pivot pin **268** that passes through an aperture (not shown) formed in the arm **264** and is secured to the occlusal tie wing **234**. The shutter **224** is thus able to slide in a generally occlusal-gingival plane about the pin **268** as indicated by arrow **269** in **FIG. 14**.

[**0165**] An indentation **272** is formed in the arm **266** and a corresponding dimple **274** formed in the underlying occlusal tie wing **234**. Arm **266** includes a buccally-extending return **276** that passes around the distal side of the occlusal tie wing **234** and has a retaining plate **278** that is received within a slot **280** formed in the side of the occlusal tie wing **234**.

[**0166**] The indentation **272** cooperates with the dimple **274** to form a detent which inhibits pivotal movement of the shutter **224** about the pivot pin **268** and retains the locking shutter **224** in the closed position. The retaining plate **278** cooperates with the slot **280** and the shutter cooperates with the deflection notches **248** to inhibit labial movement of the locking shutter when in the closed position and an archwire applies a labially directed force to the shutter so that the locking shutter **224** retains the archwire **242** within the archwire slot **240**.

[**0167**] To open the locking shutter **224**, it is simply necessary to overcome the detent provided by the indentation **272** and dimple **274** and rotate the locking shutter **224** about the pivot pin **268**. Access to the archwire slot **240** is thus obtained. Similarly, to close the locking shutter **224**, it is simply necessary to pivot the locking shutter about the pivot pin **268** so that the gingival edge **250** engages the deflection notches **248** and the indentation **272** engages the dimple **274**. The locking shutter **224** is thus held securely and cooperates with the archwire **242** to apply the requisite forces to the archwire within the archwire slot.

[**0168**] An alternative embodiment of an orthodontic bracket is shown in **FIGS. 16*a*** to **17*b*** and is generally indicated to by reference numeral **220*a***. In this embodiment, like components of the previous embodiment will be identified with like reference numerals, with the suffix "a" added for clarity.

[**0169**] As can be seen, the locking shutter **224*a*** is pivotally secured to a boss **290** that extends between the gingival tie wings **236*a*** by way of centrally positioned pivot pin **268*a***. One edge **292** of the locking shutter **224*a*** is arcuate giving the shutter **224*a*** a generally semi-circular appearance. Deflection notches **248*a*** are formed in the occlusal tie wings **234*a*** adjacent the archwire slot **240*a***. It will be noted that the labial surfaces of the occlusal tie wings **234*a*** are labially protrusive so that the arcuate edge **292** of the locking shutter **224*a*** is aligned with the deflection notches **248*a***.

[**0170**] Dimples (not shown) are formed on each of the gingival tie wings **236*a*** and corresponding indentations **272*a*** are formed on the locking shutter **224*a***. The dimples and indentations **272*a*** cooperate when the locking shutter **224*a*** is either in the open or closed positions to retain the locking shutter in that position. An aperture **267*a*** is provided in the shutter to receive a tool and facilitate movement of the shutter **224*a***. The locking shutter **224*a*** can be pivoted about pivot pin **268*a*** so as to bring the arcuate edge **292** into engagement with the notches **248*a*** as shown in **FIGS. 17*a*** and **17*b*** by overcoming the detent provided by the indentations **272*a*** and dimples. In this position, the locking shutter **224*a*** is effective to inhibit removal of an archwire

from the archwire slot **240***a*. The locking shutter **224***a* can be readily moved to the open position by rotating the locking shutter about the pivot pin **268***a* to allow access to the archwire slot **240***a* as shown in **FIG. 16***a*.

[**0171**] Another alternative arrangement of an orthodontic bracket **220'** is shown in FIGS. **18** to **20**. In this embodiment, like reference numerals will be used to indicate like components of the embodiment of FIGS. **12** to **15** with the suffix "'" added for clarity. In this embodiment, the locking shutter **224'** is relieved and is generally C-shaped to provide a pair of arms **264'** and **266'**. Similar to the previous embodiment, the locking shutter **224'** is pivotally secured to a boss **290'** extending between the gingival tie wings **236'** by way of a pivot pin **268'**. A dimple **274'** is provided on both gingival tie wings **236'**. Indentations **272'** on the arms **264'** and **266'** co-operate with the dimples **274'** with the detent formed between the indentations and dimples maintaining the locking shutter **224'** in the open position. The notches **248'** define deflection surfaces to inhibit labial movement of the shutter **224'** and its removal from the archwire slot **240'** when the shutter **224'** is in the closed position and an archwire applies a labially directed force to the shutter. In order to move the shutter from the open to closed position, it is necessary to overcome the detent provided by the indentations **272'** and the dimples **274'** and pivot the shutter **224'** about the pivot pin **268'**.

[**0172**] In embodiments of the orthodontic brackets illustrated in FIGS. **12** to **20**, it will be observed that movement of the locking shutter between open and closed positions is obtained by simple rotation of the locking shutter about the pivot pin so that the locking shutter remains captive to the body but at the same time is securely held in the closed and/or open positions by the action of the detent formed between the indentations and dimples.

[**0173**] A further embodiment of an orthodontic bracket is shown in FIGS. **21** to **24**, in which like reference numerals will be used to denote like components of the embodiment of FIGS. **12** to **15** with a suffix 'c' added for clarity. As can be seen, a circular track **500** is formed on the mesial, distal, occlusal and gingival sides of the orthodontic bracket **220***c*. The circular track **500** passes through the occlusal and gingival tie wings **234***c* and **236***c* respectively to intersect the archwire slot **240***c*. Bores **501** are formed in the circular tracks **500** in the mesial and distal sides of the gingival tie wings **236***c* slightly above the archwire slot **240***c*. The archwire slot **240***c* is offset occlusally so that the gingival tie wings **236***c* are longer than the occlusal tie wings **234***c*.

[**0174**] The track **500** receives a shutter in the form of a part circular clip **502** having a circular protrusion **504** at one end. The clip **502** is slidable in the track **500** but provides a friction grip against the track to inhibit unintentional movement. The circular protrusion **504** is accommodated by one of the bores **501** to hold the clip **502** in either the closed or open positions.

[**0175**] The clip **502** may be rotated in the track **500** between an open position in which access to the archwire slot **240***c* is available (see **FIG. 24**) and a closed position in which access is inhibited (see **FIGS. 22 and 23**). As can best be seen in **FIG. 22**, the offset of the archwire slot **240***c* allows the clip **502** to overlie the archwire slot **240***c* to retain an archwire within the archwire slot. Rotation of the clip **502** through approximately 180 degrees moves the clip to the position shown in **FIG. 24** at which the archwire slot **240***c* is open and access to the archwire is provided. The circular protrusion **504** facilitates rotation of the clip **502** between open and closed positions, with the friction between the clip and the track **500** and the cooperating protrusion **504** and bore **501** retaining the clip **502** in the desired position.

[**0176**] A still further embodiment of an orthodontic bracket **220***b* is shown in FIGS. **25** to **27** in which like reference numerals will be used to denote like components of the embodiment of FIGS. **12** to **15**, with a suffix "b" added for clarity. As can be seen, the shutter **224***b* is slidable within a slot **510** formed in each of the occlusal wings **234***b*. A U-shaped strap **512** is secured to the labial face of shutter **224***b* and extends through a guide slot **514** and a washer **515** in the base of each of the slots **510**. A coil spring **516** is positioned in each slot beneath the shutter **224***b* and surrounds each arm **512***a* of the strap **512**. The arms **512***a* are cranked slightly above the coil springs **516** toward the archwire slot **240***b* as indicated to by reference numeral **518**. The springs **516** bias the shutter **224***b* to a closed position in which the gingival edge **250***b* of the shutter **224***b* engages the notches **248***b*.

[**0177**] The labial surface of the shutter **224***b* carries a wedge **520** that cooperates with a complementary recess **522** formed in the slots. The wedge **520** retains the shutter **224***b* in the open position and may be released by application of a force to the bight **512***b* of the strap **512** to release the shutter **224***b* under the action of the springs **516**. The shutter **224***b* is thus retained in the closed position to resist labial movement of an archwire **242***b* in the archwire slot **240***b*. The spring loaded shutter **224***b* may also be applied in a similar manner to two single orthodontic brackets or a 3 wing orthodontic bracket.

[**0178**] A still further embodiment of an orthodontic bracket **220***d* is shown in FIGS. **28** to **31** where like reference numerals will be used to indicate like components of the embodiment illustrated in FIGS. **12** to **15** with the suffix "d" added for clarity. In this embodiment, grooves **530** are formed in the mesial and distal sides of the body **222***d*. Each groove **530** extends through the gingival and occlusal tie wings **236***d* and **234***d*. The grooves **530** terminate in blind bores **532** in the gingival tie wings **236***d*. Blind bores **534** are also formed in the grooves **530** in the occlusal tie wings **236***d* adjacent the archwire slot **240***d* (see **FIG. 31**). The occlusal surfaces of the occlusal tie wings **236***d* are undercut to provide a lateral groove **536** that extends mesiodistally between the occlusal tie wings.

[**0179**] A shutter **224***d* in the form of a generally U-shaped clip **538** is formed with a pair of outer arms **540** interconnected by a lateral bight **542**. The ends of the arms **540** are formed with inwardly-directed projections **544** for receipt within the bores **532** or **534**.

[**0180**] A support arm **546** is secured to the lateral bight **542** and is jogged to provide a horizontal arm **546***a* between a pair of vertical arms **546***b* and **546***c* respectively. One of the vertical arms **546***c* is received within a vertical slot **548** in the body **220***d* and maintains alignment of the clip **538** as it is moved between the open and closed positions. The slot **548** is located in the interwing region of the body **222***d* to provide uniform support.

[**0181**] The clip **538** is assembled on the orthodontic bracket **220***d* so that the arms **540** are received within the

respective grooves **530**. The projections **544** are received within the blind bores **534** so that the archwire slot **240***d* is open for receipt of an archwire as shown in **FIG. 30***a*. With the archwire **242***d* inserted into the archwire slot **240***a* as shown in **FIG. 30***b*, the clip **538** may be advanced along the grooves **530** until the projections **544** are received within the blind bores **532**. In this position, the lateral bight **542** is received within the lateral groove **536** to provide further security for the clip **538**. The vertical arm **546***c* and slot **548** serve to guide and align the clip **538** during sliding motion to facilitate the relative movement between the clip and the orthodontic bracket **220***d*.

[**0182**] A further embodiment of an orthodontic bracket **220***e* is shown in FIGS. **32** to **36**. In this embodiment like reference numerals will be used to denote like components of the embodiment of FIGS. **12** to **15** with a suffix "e" added for clarity. In the embodiment of FIGS. **32** to **36**, grooves **560** are formed in the occlusal tie wings **234***e* only. The shutter **224***e* includes side flanges **562** that have inwardly directed protrusions **564** to engage the grooves **560**. The shutter **224***e* has a pair of lingually angulated occlusal arms **264***e* and **266***e* and a centrally positioned gingival arm **566** defined partly by a pair of slits **568** in the shutter **224***e* (best seen in **FIG. 36**). The gingival arm **566** is recurved in a labial direction as indicated by reference numeral **569** and is resilient to engage the labial notches **248***e* at the mesial and distal ends of the archwire slot **240***e* and inhibit labial movement of shutter **224***e* when an archwire applies a labially directed force to the shutter. Protrusions **570** are provided on the sides of the shutter **224***e* to form a handle and facilitate sliding movement of the shutter **224***e* between the open and closed positions. Again therefore, a sliding shutter is provided on the orthodontic bracket **220***e* to retain an archwire in the archwire slot **240***e*.

[**0183**] In a further embodiment shown in **FIG. 37, a** known orthodontic bracket **220***f* sold under the trade name "SPEED" is shown and includes a pair of occlusal tie wings **234***f* below a shutter **224***f* and a pair of gingival tie wings above the shutter **224***f* to provide a twin orthodontic bracket. The gingival tie wings can be spaced further apart to make the orthodontic bracket more symmetrical.

[**0184**] Referring now to FIGS. **38** to **41**, still yet another embodiment of an orthodontic bracket is shown. In this embodiment, like reference numerals will be used to denote like components of the embodiment of FIGS. **12** to **15** with a "**1000**" added for clarity. As can be seen, the orthodontic bracket 1220 is similar to one of the orthodontic brackets disclosed in Applicant's U.S. Pat. No. 5,474,445 issued on Dec. 12, 1995, the contents of which are incorporated herein by reference. In this embodiment, a projection **1001** is formed on the gingival surface **1003** of the body **1222** in the interwing region. The shutter **1224** generally resembles a cruciform and has a gingival arm **1005** with an inverted doghouse shaped aperture **1267** in it to accommodate the projection **1001** and retain the shutter **1224** in the closed position. The shape of the aperture **1267** also permits a tool to enter the aperture so that a labially directed force can be applied to the shutter **1224** using the tool to release the shutter **1224** from the projection **1001**. The mesial and distal arms **1007** and **1009** respectively of the shutter **1224** curve lingually into the archwire slot **1240**. The arms **1007** and **1009** are resilient and are somewhat flattened when contacting a full dimension rectangular archwire **1242** accommodated in the archwire slot **1240** to apply a bias to move the archwire **1242** into the base of the archwire slot. In this way, a continuous rotation action and torque is applied to the archwire whether round or rectangular (even where that archwire is of relatively small cross-sectional dimension) to apply a continuous force to the tooth through the orthodontic bracket **1220**. The occlusal arm **1011** of the shutter **1224** curves labially to define a single loop which surrounds a pivot pin **1013** to secure the shutter **1224** to the orthodontic bracket **1220** and to provide a shutter with a continuous smooth lingual surface.

[**0185**] **FIG. 41***a* shows an alternative embodiment of the shutter and pivot pin design. In this embodiment, a dimple **1013***a* is formed in the pivot pin **1013** and an indentation **1224***a* is provided in the shutter **1224**. The indentation **1224***a* and dimple **1013***a* cooperate when the shutter is in a closed position to provide further security to inhibit accidental opening of the shutter.

[**0186**] A similar arrangement of an orthodontic bracket **2220** to that described above is shown in FIGS. **42** to **45**. In this embodiment, like reference numerals will be used to denote like components of the embodiment of FIGS. **12** to **15** with a "**2000**" added for clarity. As can be seen, the orthodontic bracket **2220** also has a shutter **2224** generally resembling a cruciform. The gingival arm **2005** of the shutter **2224** has a doghouse shaped aperture **2267** in it to accommodate a projection **2001** and retain the shutter **2224** in the closed position. Unlike the previous embodiment, the mesial and distal arms **2007** and **2009** on the shutter **2224** are relatively rigid. A spring member in the form of a ribbon **700** is located on the lingual surface of the shutter **2224** and extends mesiodistally. The ribbon **700** is configured to provide a pair of convex lingually extending formations **702** that are aligned with the occlusal and gingival tie wings at opposed mesial and distal sides of the body **2222** and thus bear against an archwire **2242** located in the archwire slot **2240**. The central portion **704** of the ribbon **700** is secured to the shutter **2224** with the lateral extremities **706** of the ribbon being free to slide horizontally over the lingual surface of the shutter **2224** and thereby allow flexure of the formations **702**. In this manner, different thicknesses of archwires **2242** can be accommodated by the orthodontic bracket **2220** while still ensuring that a continuous force is applied to the tooth through the orthodontic bracket.

[**0187**] **FIG. 45***a* illustrates an alternative embodiment of a ribbon **700'** for use with the orthodontic bracket **2220**. In this embodiment, the ribbon **700'** is secured to the lingual surface of the occlusal arm **2011** of the shutter **2224** adjacent one of its ends and extends in a gingival-occlusal direction. The other end **706'** of the ribbon **700'** is free to slide relative to the lingual surface of the shutter **2224** as indicated by the dotted line **710**. The tong **700'** presents a convex surface **702'** which enters the archwire slot **2240** when the shutter is in a closed position to bias the archwire **2242** into the archwire slot.

[**0188**] **FIGS. 46 and 47** illustrate alternative embodiments of orthodontic brackets **1220'** similar to that illustrate in FIGS. **38** to **41**. In these embodiments, like reference numerals will be used to indicate like components of the embodiment of FIGS. **38** to **41** with a "'" added for clarity. In the embodiment of **FIG. 46**, the shutter **1224'** has short mesial and distal arms **1007'** and **1009'** which curve lingually

into the archwire slot **1240'** to apply a bias to an archwire **1242'** accommodated by the archwire slot **1240'**. In the embodiment of **FIG. 47**, the shutter **1224'** has longer mesial and distal arms **1007'** and **1009'** which curve lingually into the archwire slot **1240'** to apply a bias to an archwire **1242'** accommodated by the archwire slot **1240'**.

[**0189**] Referring now to FIGS. **48** to **52**, still yet another embodiment of an orthodontic bracket **3220***d* is shown similar to that shown in FIGS. **28** to **31**. In this embodiment, like reference numerals will be used to denote like components of the embodiment of FIGS. **28** to **31** with a "**3000**" added for clarity. As can be seen, the orthodontic bracket **3220***d* can be modified to provide a continuous seating action bias to an archwire accommodated in the archwire slot. In this arrangement, a spring member in the form of a resilient shim **720** is attached to the vertical arm **3546***b* of the support arm **3546**. The shim **720** thus projects gingivally from the labial edge of the horizontal arm **3546***a* so as to be spaced from the lingual vertical arm **3546***c*. The shim **720** has a jog directed lingually toward the archwire slot **3240***d* and presents a generally convex surface **722** towards the archwire slot **3240***d*. The gingival edge **724** of the shim **720** recurves labially.

[**0190**] As the arms **3540** slide within the slots **3530** to the move the clip **3538** to a closed position as shown in **FIG. 49**, the convex surface **722** of the shim **720** engages the archwire **3242***d* and provides a continuous biasing action against the archwire (best seen in **FIG. 50**). As may be seen in **FIG. 51**, the resilience of the shim **720** allows the orthodontic bracket **3220***d* to accommodate different sizes and configurations of archwires **3242***d* while maintaining a continuous action against the archwire.

[**0191**] Referring now to FIGS. **53** to **55**, still yet another embodiment of an orthodontic bracket **4220** is shown similar to that shown in FIGS. **12** to **15**. In this embodiment, like reference numerals will be used to denote like components of the embodiment of FIGS. **12** to **15** with a "**4000**" added for clarity. As can be seen, the orthodontic bracket **4220** can be modified to provide a continuous bias to an archwire accommodated in the archwire slot. In this embodiment, a spring member in the form of a resilient shim **730** is secured to the lingual surface of the shutter **4224** adjacent the interwing region of the body **4220**. The shim **730** is integrally formed with the shutter **4224** and is folded lingually about the occlusal edge **4260** of the shutter between the arms **4264** and **4266** respectively. The shim **730** is curved lingually to present a generally convex surface **732** spaced from the shutter **4224** and its end **734** recurved to form a smooth lip engaged with the lingual face of the shutter **4224**. The end **734** of the shim **730** is free to slide relative to the shutter **4224** when the convex surface **731** is flattened due to contact with an archwire **4242** in the archwire slot **4240**. The shim **730** is thus able to continuously exert a corrective force upon different configurations of archwires **4242** within the archwire slot **4240** when the shutter **4224** is in the closed position.

[**0192**] Referring now to FIGS. **56** to **58**, still yet another embodiment of an orthodontic bracket **5220***b* is shown similar to that shown in FIGS. **25** to **27**. In this embodiment, like reference numerals will be used to denote like components of the embodiment of FIGS. **25** to **27** with a "**5000**" added for clarity. As can be seen, the orthodontic bracket **5220***b* can be modified to provide a continuous bias to an archwire accommodated in the archwire slot. In the arrangement shown, a spring member in the form of a resilient shim **740** is formed on the lingual face of the shutter **5224***b* in the archwire slot **5240***b*. The shim **740** is formed with a convex lingual surface **742** that engages an archwire **5242***b* when the shutter **5224***b* is in the closed position. The shim **740** is secured to the shutter **5224***b* adjacent its occlusal end only and therefore, the gingival end **744** of the shim **740** is free to slide relative to the shutter **5224***b*. In this manner, the shim **740** may flex to accommodate different sizes and shapes of archwires **5242***b* accommodated in the archwire slot **5240***b* to provide a continuous action on the archwire wire.

[**0193**] Referring now to FIGS. **59** to **62**, still yet another embodiment of an orthodontic bracket **6220***e* is shown similar to that shown in FIGS. **32** to **36**. In this embodiment, like reference numerals will be used to denote like components of the embodiment of FIGS. **32** to **36** with a "**6000**" added for clarity. As can be seen, the orthodontic bracket **6220***e* can be modified to provide a continuous bias to an archwire accommodated in the archwire slot. In the arrangement shown, a spring member in the form of a shim **750** is secured to the lingual surface of the shutter **6224***e* and presents a convex surface **752** toward the archwire slot **6240***e* to engage an archwire **6242***b* in the same manner as described above to provide a continuous action on the archwire wire. The gingival edge **754** of the shim is free to slide relative to the lingual surface of the shutter **6224***e*.

[**0194**] A continuously acting orthodontic bracket may also be provided with self-locking labial brackets such as those shown in U.S. Pat. No. 5,094,614 to Wildman, the contents of which are incorporated herein by reference. As shown in FIGS. **63** to **71**, the orthodontic bracket **7220** has a pair of wings **7242** with an archwire slot **7240** to receive an archwire **7242**.

[**0195**] A shutter **7224** is located between the gingival and occlusal tie wings located at opposed mesial and distal sides of the body **7222** and includes a central body portion **7322** encompassed by a locking spring **7324**. The mesial and distal edges of the shutter body **7322** are received within grooves **7326** so that the shutter **7224** may slide between open and closed positions. The grooves **7326** have undercuts **7328** that terminate at steps **7330** in the occlusal and gingival tie wings **7234** and **7236** respectively. The steps **7330** receive one end of a spring **7324**. The opposite ends are formed as an occlusal tail. A spring member in the form of a resilient shim **760** is secured to the tail **7332** so as to be spaced from the retaining spring **7324**. A lingual step **7235** accommodates the shim **760** from a lingual aspect. The shim **760** thus engages an archwire **7242** in the archwire slot **7240** when the shutter **7224** is in the closed position in a resilient manner to provide a continuous biasing action against the archwire as shown in **FIG. 6***b*. The step **7330** retains the shutter **7224** in the closed position with the resilient shim **760** biased against the archwire **7242**. As shown in **FIG. 67**, the shim **760** may be secured to the tail **7332** as a separate structure. Alternatively, as shown in **FIG. 69**, the shim **760** may be formed on the tail **7332** of a liner layer **7334** that encompasses the body **7322**. The spring **7324** extends over the upper edge of the body **7322** and terminates above the upper edge of the shim **760**. The shim **760** is thus free to flex to accommodate different sizes and dispositions of archwires while providing a continuous action on the archwire.

[0196] Similarly, as shown in **FIG. 70**, the shim **760** may be secured at its upper edge to the spring **7324** with the lower edge free of the tong to slide relative to the shutter upon flexure of the shim **760**.

[0197] An alternative arrangement for the shim **760** is shown in **FIGS. 72 and 73**. In this embodiment, the resilient shim **760** is defined in the lingual aspect of the outer layer of the spring **7324**. Three sides of the shim **760** are defined by slots **764** cut into the lingual aspect of the outer layer of the spring to define the periphery of the shim **760**. The resultant shim defines an inwardly convex surface **762** that resiliently engages the archwire. Naturally, such a shim **760** may be formed integrally with the springs **7324** to facilitate manufacture.

[0198] A further modification of an existing orthodontic bracket **7220'** is shown in FIGS. **74** to **78** in which the orthodontic bracket known as the Damon bracket and shown in U.S. Pat. No. 5,439,378, the contents of which are incorporated herein by reference, is modified to provide a spring member in the form of a resilient shim **770** on the lingual surface of the shutter **7224'**. Shutter **7224'** may be extended occlusally to accommodate the shim **770** which in this embodiment is formed by folding a continuous extension of the shutter **7224'** back upon itself. The shim **770** presents a convex surface **772** which enters the archwire slot **7240'** when the shutter **7224'** is in a closed position. One end **744** of shim **770** is free to slide relative to the shutter **7224'**. In this manner, the shim **770** may flex to accommodate different sizes and shapes of archwires **7242'** accommodated in the archwire slot **7240'** to provide a continuous action on the archwire.

[0199] As those of skill in the art will appreciate, in the embodiments illustrated in FIGS. **38** to **78**, the spring member may be formed as a separate member and attached to the shutter adjacent either its gingival or occlusal ends in a manner so that it extends into the archwire slot to bias the archwire. Alternatively, the spring member may be integrally formed with the shutter by a folding portion of the shutter about an edge. If the spring member is to be integrally formed with the shutter, a continuous extension of the shutter is typically folded about either a gingival or occlusal edge of the shutter and is configured so that it extends into the archwire slot to bias the archwire.

[0200] Referring now to FIGS. **79** to **82**, still yet another embodiment of an orthodontic bracket **8220** is shown similar to that shown in **FIGS. 16***a* to **17***a*. In this embodiment, like reference numerals will be used to denote like components of the embodiment of **FIGS. 16***a* to **17***b* with a "**8000**" added for clarity. As can be seen, the resilient locking shutter **8224***a* is pivotally secured to a boss **8290** that extends between the gingival tie wings **8236***a* by way of a centrally located pivot pin **8268***a*. The boss **8290** is located on a lingually bevelled labial surface of the body **822***a*. Thus, the shutter **8224***a* is inclined. One edge **8292** of the locking shutter **8224***a* is arcuate to give the shutter a generally semi-circular appearance. Deflection notches **8248***a* are formed in the archwire slot **8240***a* adjacent the occlusal tie wings **8234***a*.

[0201] Dimples (not shown) are formed on each of the gingival tie wings **8236***a* and corresponding indentations **8272***a* are formed on the locking shutter **8224***a*. The dimples and indentations **8272***a* cooperate when the locking shutter **8224***a* is either in the open or closed positions to retain the locking shutter in that position. An aperture **8267***a* is provided in the shutter **8224***a* to receive a tool and facilitate movement of the shutter **8224***a*. The locking shutter **8224***a* can be pivoted about pivot pin **8268***a* so as to bring the shutter **8224***a* into engagement with the archwire **8242***a* in the archwire slot **8240***a* as shown in **FIG. 81** by overcoming the detent provided by the indentations **8272***a* and dimples. In this position, the locking shutter **8224***a* is effective to inhibit removal of an archwire **8242** from the archwire slot **8240***a* and provides a continuous action on the archwire. The locking shutter **8224***a* can be readily moved to the open position by rotating the locking shutter about the pivot pin **8268***a* to allow access to the archwire slot **8240***a*. As can be seen in **FIG. 82**, when a larger archwire **8242** is accommodated by the archwire slot **8240***a*, the shutter **8224***a* flexes to accommodate the archwire yet provide a continuous action on the archwire. The deflection notches **8248***a* and the angulated orientation of the shutter **8224***a* inhibit the shutter **8224***a* from moving labially out of the archwire slot **8240***a*.

[0202] Another embodiment of an orthodontic bracket **9220** utilizing an alternative shutter structure is shown in FIGS. **83** to **87**. In this embodiment, like reference numerals will be used to denote like components of the embodiment of FIGS. **12** to **15** with a suffix '**9000**' added for clarity. As shown in FIGS. **83** to **87**, the shutter **9224** is pivotal and is formed from a wire **9001** bent into a generally cruciform outline. The wire **9001** has opposite ends that are turned over to provide oppositely-directed tails **9003** and **9005**. The tails **9003**, **9005** extend parallel to a common axis but are offset from one another.

[0203] Each of the tails **9003**, **9005** is received in a respective bore **9007** formed in each of the occlusal tie wings **9234**. The tails **9003**, **9005** are free to rotate within the respective bores to permit pivotal movement of the shutter **9224**.

[0204] The wire **9001** defines a pair of oppositely-directed arms **9009**, **9011** which extend across the archwire slot **9240**. A horizontal recess **9013** is formed in each of the gingival tie wings **9236** adjacent the archwire slot **9240** to provide an abutment surface to limit pivotal movement of the shutter **9224** towards the archwire slot **9240**.

[0205] The wire **9001** between the arms **9009**, **9011** is formed into a rearwardly-projecting hook **9015** as can best be seen in **FIG. 84** and is received within groove **9017**. An extension **9019** is formed on the gingival surface of the body **9222** and passes through the hook **9015** when the shutter **9224** is in a closed position to provide a frictional fit between the hook **9015** and body **9222** and retain the shutter in the closed position.

[0206] As shown in **FIG. 84**, the hook **9015** retains the shutter **9224** against the archwire **9242** and inhibits relative movement between the archwire and the body **9222** of the orthodontic bracket **9220**. To release the archwire **9242**, the shutter **9224** is caused to pivot about the offset tails **9003**, **9005** to release the hook **9015** from the extension **9109**. As the shutter **9224** is rotated, the eccentricity of the axes of rotation of the tails **9003**, **9005** causes a torsional resistance due to flexure of the wire **9001** tending to return the shutter **9224** to the closed position. This movement is opposed until such time as the shutter **9224** goes over center, at which point the shutter **9224** becomes biased to the open position as shown in **FIG. 87**. In this way, the shutter **9224** is

resiliently biased toward the body **9222** as it is moved towards the closed position but remains in a stable, open position at other times.

[**0207**] A further embodiment of an orthodontic bracket **9220'** utilizing a wire for a shutter **9224'** is shown in **FIGS. 88 and 89**, where like components of the previous embodiment will be described using like reference numerals with a suffix "'" added for clarity. In this embodiment, the shutter **9224'** is formed from a wire **9001'** having oppositely directed tails **9003'**, **9005'**. Each of the tails **9003'**, **9005'** is pivotally received within bores **9007'** which are aligned on a common axis to allow free pivotal movement of the shutter **9224'**. The bores may also be offset as shown in **FIG. 83**.

[**0208**] The wire **9001'** between the arms **9009'**, **9011'** is formed as an elongate U-shaped projection **9020** and is received within a locking clip **9022**. As can best be seen in **FIG. 89**, locking clip **9022** is generally U-shaped with serpentine limbs terminating in outwardly-flared ends **9024**. The projection **9020** may be received between the flared ends **9024** to force the limbs apart but is then resiliently retained between the limbs in a stable manner. The locking clip **9022** may alternatively have a generally circular section as shown in **FIG. 90** but it is believed the clip **9022** shown in **FIG. 89** facilitates insertion of the projection **9020**. Again, the shutter **9224'** retains the archwire **9242'** within the archwire slot **9240'** when the locking clip **9022** retains the shutter **9224'** in a closed position.

[**0209**] Referring now to **FIGS. 91***a* and **91***b*, orthodontic tools **900** are shown which are suitable to open and close the shutters of the orthodontic brackets. As can be seen, each orthodontic tool **900** comprises a central body portion **902**, a nose-shaped portion **904** at one end of the body portion for opening the shutter and a generally square corrugated fork-shaped portion **906** at the opposite end of the body portion **902** for gripping and guiding archwires lingually into the archwire slots to facilitate closure of the shutters. The fork-shaped portion straddles the outside of the bracket mesially and distally. In use, the nose-shaped portion **904** is inserted into the aperture in the shutter and a force is applied to the shutter using the tool **900** to move the shutter in the desired manned. In the embodiment of **FIG. 91** a, the fork-shaped portion **906** is aligned with the body portion **902** while in the embodiment of **FIG. 91***b*, the fork-shaped portion **906** is at right angles to the body portion. Other angles between the body portion **902** and the fork-shaped portion **906** are of course suitable. Also, the shape of the nose-shaped portion **904** can vary to complement the aperture in the shutter.

[**0210**] Referring now to **FIGS. 92***a* to **92***c* still yet another embodiment of an orthodontic bracket is shown and is generally indicated to by reference numeral **10010**. The orthodontic bracket **10010** includes a body **10012** and a lingual mounting pad **10014** attached to the body. The mounting pad **10014** has a lingual surface **10015** to be attached to a tooth. A pair of gingival tie wings **10016** and a pair of occlusal tie wings **10018** extend from a labial surface of the body **10012**. The gingival tie wings **10016** and the occlusal tie wings **10018** curve lingually. Both the gingival tie wings **10016** and the occlusal tie wings **10018** at opposed mesial and distal sides of the body are separated by an interwing region **10019** of the body **10012**. An archwire slot **10020** extends mesiodistally across the body between the gingival and occlusal tie wings at opposed mesial and distal sides of the body and opens labially to receive an archwire **10022**. The archwire slot **10020** is interrupted mesiodistally in the interwing region **10019**. A locking shutter **10024** is accommodated by recesses **10026** in the gingival and occlusal tie wings and is moveable between a closed position where the archwire is locked into the archwire slot and access to and the release of the archwire slot **10020** is inhibited, and an open position where access to the archwire slot is permitted.

[**0211**] Within the archwire slot **10020** is a slot activator in the form of a generally rectangular, resilient spring member **10032** formed of suitable material such as for example Nickel-Titanium or spring stainless steel. The spring member **10032** extends mesiodistally along the archwire slot. The spring member **10032** has a central portion **10034** secured to the lingual wall of the archwire slot **10020** such as for example by way of a weld **10036** or a sleeve (not shown). Opposed ends of the spring member **10032** curve labially towards the locking shutter **10024** to define protrusive mesial and distal wings **10038** and **10040**. The mesial and distal wings **10038** and **10040** of the spring member **10032** extend into the archwire slot **10020** starting from the lingual wall of the archwire slot a distance equal to approximately one third to one half of the depth of the archwire slot. The archwire slot **10020** formed in the body **10012** is mildly deeper than in conventional orthodontic brackets to accommodate the thickness of the central portion **10034** of the spring member **10034**.

[**0212**] In use, when an archwire **10022** is placed into the archwire slot **10020** and the locking shutter **10024** is closed, the mesial and distal wings **10038** and **10040** of the spring member **10032** contact the archwire **10022** to bias it towards the locking shutter **10024**. As shown in **FIGS. 92***b* and **92***c*, when a small round archwire is used, the archwire **10022** is biased by the spring member **10032** to control and seat the archwire towards the locking shutter. During initial treatment, biasing of the archwire **10022** in this manner provides initial tooth movements to produce accurate rotation corrections and in-out (horizontal plane) movements of teeth. During the middle of treatment, biasing of the archwire in this manner controls and supports bodily tooth movement preventing rotation of teeth as they slide along a straight archwire by a pull force.

[**0213**] **FIG. 92***d* shows the orthodontic bracket **10010** accommodating a large rectangular archwire **10022** in the archwire slot **10020** which is used at the end of treatment. In this case, the labially curved mesial and distal wings **10038** and **10040** of the spring member **10032** are partially flattened by the archwire but continue to act on the archwire to bias it towards the locking shutter **10024**. Biasing the archwire **10022** in this manner applies a labial force on the archwire against the locking shutter **10024** to produce desired root torque in the tooth root and crown.

[**0214**] Referring now to **FIG. 93**, still yet another embodiment of an orthodontic bracket is shown and is generally indicated to by reference numeral **10110**. In this embodiment, the slot activator is in the form of a generally rectangular, convex resilient spring member **10132** formed of spring stainless steel. The mesial and distal ends **10138** and **10140** of the spring member **10132** are flattened. Distal end **10140** of the spring member **10132** is secured to the

lingual wall of the archwire slot **10120** by way of a weld **10136** while the mesial end **10138** of the spring member **10132** is free.

[**0215**] Although the distal end of the spring member **10132** is shown attached to the body, it should be apparent to those of skill in the art that the mesial end of the spring member **10132** may be secured to the body with the distal end of the spring member **10132** being free. The length of the spring member **10132** is less than the length of the archwire slot **10120** so that the free end of the spring member remains in the archwire slot when the spring member **10132** is partially flattened by a large rectangular archwire accommodated by the archwire slot.

[**0216**] The orthodontic bracket **10110** functions in a similar manner to the previous embodiment. When a small round archwire is placed in the archwire slot **10120** and the locking shutter (not shown) is closed, the convex spring member **10132** biases the archwire **10122** towards the locking shutter. When a large rectangular archwire **10122** is placed in the archwire slot **10120**, the spring member is only partially flattened and biases the archwire towards the locking shutter.

[**0217**] Referring now to **FIG. 94**, still yet another embodiment of an orthodontic bracket is shown and is generally indicated to by reference numeral **10210**. In this embodiment, the slot activator is similar to that shown in the previous embodiment except that the spring member **10232** is oriented to extend occlusiogingivally in the interwing region **10219** between the occlusal and gingival tie wings **10218** and **10216** respectively. The occlusal end **10250** of the spring member **10232** is secured to the body by way of a weld **10236** while the gingival end **10252** of the spring member **10232** is free. Although the occlusal end of the spring member **10232** is shown attached to the body, it should be apparent to those of skill in the art that the gingival end of the spring member **10232** may be secured to the body with the occlusal end of the spring member being free.

[**0218**] **FIG. 95** illustrates still yet another embodiment of an orthodontic bracket in accordance with the present invention. In this embodiment, the orthodontic bracket **10310** includes magnetized bars **10360** and **10362** inserted into recesses **10364** formed in the lingual and gingival walls of the body **10312** defining the archwire slot **10320**. The magnetized bars **10360** and **10362** are oriented so that they present a magnetic field of the same polarity into the archwire slot **10320**. The archwire **10322** to be accommodated in the archwire slot is magnetized to the same polarity as the magnetized bars **10360** and **10362** so that the archwire is repelled and biased labially and occlusally in the archwire slot towards the locking shutter **10324**. If desired, the locking shutter can be magnetized to the opposite polarity as the archwire to attract it.

[**0219**] Referring now to **FIGS. 96***a* and **96***b*, still yet another embodiment of an orthodontic bracket is shown and is generally indicated to by reference numeral **10410**. In this embodiment, the slot activator **10430** is in the form of a pair of spring loaded pistons **10470** extending into the archwire slot **10420** and positioned at opposed mesial and distal ends of the archwire slot between the occlusal and gingival tie wings **10418** and **10416** respectively. Each spring loaded piston **10470** includes a labially extending piston head **10472** to contact an archwire **10422** in the archwire slot. A coil spring **10474** is accommodated in a bore **10476** formed through the body **10412** and acts between the mounting pad **10414** and the back of the piston head **10472** to bias the piston head in a direction towards the locking shutter **10424**. The piston heads **10472** are dimensioned to fill approximately one-third to one-half of the vertical dimension of the archwire slot to inhibit the archwire from sliding up or down and behind the piston head.

[**0220**] Referring now to **FIGS. 97***a* to **97***c* still yet another embodiment of an orthodontic bracket is shown and is generally indicated to by reference numeral **10510**. In this embodiment, the slot activator is in the form of a generally rectangular, stainless steel spring member **10532** and is located external to the archwire slot **10520**. The spring member **10532** includes a central portion **10534** which runs mesiodistally along the lingual wall of the body **10512** and is trapped between the body **10512** and the lingual mounting pad **10514**. Labially extending wings **10538** and **10540** are provided at the mesial and distal ends of the spring member **10532** and contact an archwire **10522** extending along the archwire slot **10520** exterior to the archwire slot near the mesial and distal sides of the body **10512**. Thus, the spring member **10532** in this embodiment is external to the archwire slot **10520** but still biases an archwire **10522** in the archwire slot labially towards the locking shutter **10524**. The labial extending wings **10538** and **10540** contact the archwire at a lateral angle greater than 90° to facilitate flattening of the labial wings when a large rectangular archwire is accommodated by the archwire slot **10520**.

[**0221**] In this embodiment, the locking shutter **10524** includes a single loop adjacent one end to surround a pivot pin **10580** extending between the occlusal tie wings **10518**. A hole **10582** is provided in the locking shutter **10524** and co-operates with a pair of spaced projections **10584** extending upwardly from the gingival surface of the body in the interwing region of the orthodontic bracket. Each projection **10584** includes a head **10586** and an undercut stem **10588** supporting the head above the gingival surface of the body. The projections **10584** are spaced a distance slightly greater than the diameter of the hole **10582** so that the heads **10586** must be compressed towards one another to fit into the hole. The undercut stems **10588** allow the projections **10584** to snap back to their original positions once the heads have passed through the hole **10582** thereby to lock the shutter **10524** in place in a closed position.

[**0222**] Referring now to **FIGS. 98***a* and **98***b*, still yet another embodiment of an orthodontic bracket is shown and is generally indicated to by reference numeral **10610**. Orthodontic bracket **10610** is similar to that shown in **FIGS. 92***a* to **92***d* except that the ends **10638** and **10640** of the spring member **10632** extend mesiodistally beyond the archwire slot **10620** and contact the archwire **10622** exterior to the archwire slot but near the mesial and distal sides of the body **10612**.

[**0223**] **FIGS. 98***c* and **98***d* illustrate another embodiment of an orthodontic bracket **10610'** similar to that shown in **FIGS. 98***a* and **98***b*. In this embodiment, one of the gingival tie wings **10616'** has a pair of grooves **10625** formed in its opposed sides to obviate the need for an upwardly extending hook on the tie wing.

[**0224**] **FIGS. 99***a* and **99***b* show still yet another embodiment of an orthodontic bracket **10710**. As can be seen, orthodontic bracket **10710** is similar to that illustrated in

FIG. 94 and includes an occlusiogingivally extending slot activator positioned in the interwing region **10719** between the occlusal and gingival tie wings **10718** and **10716** respectively. The slot activator is in the form of a curved spring member **10732**. The spring member passes through a vertical slot **1074***i* formed in the body **10712** of the orthodontic bracket lingual to the archwire slot **10720** and which opens up at the archwire slot. The occlusal end **10738** of the spring member **10732** is secured to the occlusal surface of the body such as for example by a weld. The gingival end **10740** of the spring member **10732** is free allowing the free end of the spring member to move when the spring member is flattened by an archwire **10722** in the archwire slot **10720** as indicated by the dotted lines **10745**.

[**0225**] Referring now to **FIGS. 100***a* to **100***c* still yet another embodiment of an orthodontic bracket is shown and is generally indicated to by reference numeral **10810**. Orthodontic bracket **10810** is similar to that shown in **FIGS. 97***a* to **97***c* and includes a pivotal locking shutter **10824** having a single loop at one end surrounding a pivot pin **10880** extending between the occlusal tie wings **10818**. The gingival end of the locking shutter curves occlusally and snaps over a bulbous lip **10875** formed on the gingival surface of the body **10812** in the interwing region **10819** to maintain the locking shutter in the closed condition. An opening **10877** is provided through the locking shutter to accommodate a tool to facilitate opening of the locking shutter. A marker **10879** is also provided on the labial surface of the locking shutter below the opening. The marker identifies the center of the archwire slot **10820** to facilitate proper placement of the orthodontic bracket on the center of the long axis of a tooth. The marker **10879** can of course be provided on the locking shutter **10824** at any suitable location so as to identify the position of the archwire slot. In this particular embodiment, the marker is in the form of a coloured circle on the labial surface of the locking shutter. It should however be apparent that the marker can be of any other suitable form such as for example an embossed or depressed region or a laser marking on the locking shutter.

[**0226**] The slot activator in the embodiment is in the form of a pair of spring members **10832**. The spring members extend labially along the mesial and distal sides of the body **10812** and contact an archwire **10822** accommodated by the archwire slot **10820** exterior to the archwire slot but near the mesial and distal sides of the body **10812**. The spring members **10832** are secured to the body by welds and contact the archwire at a lateral angle greater than 90° to facilitate flattening of the spring members **10832** when a large rectangular archwire is accommodated by the archwire slot.

[**0227**] In the embodiment illustrated in **FIG. 10***d*, the configuration of the locking shutter **10824'** and the lip **10875'** on the gingival surface of the body **10812'** in the interwing region is modified slightly from that shown in **FIGS. 100***a* to **100***c*. In this particular arrangement, the gingival end of the locking shutter **10824'** and the lip **10875'** are configured as wedges which snap over one another to maintain the locking shutter in the closed condition. The opening **10877'** in the locking shutter **10824'** accommodates a tool to facilitate pivoting of the locking shutter over the lip **10875** to allow the locking shutter to be pivoted to the open condition.

[**0228**] Referring now to **FIGS. 110***a* to **110***d* still yet another embodiment of an orthodontic bracket is shown and is generally indicated to by reference numeral **10910**. In this embodiment, the orthodontic bracket includes a slot activator in the form of a spring member **10932** similar to that shown in **FIGS. 98***a* and **98***b*. The locking shutter **10924** is however of a different configuration. In particular, the locking shutter **10924** is generally T-shaped in front plan and is constituted by a pair of shutter elements **10981** generally overlying one another and retained in proximity by flaps **10983** integrally formed on one of the shutter elements and which have been folded over the other of the shutter elements. The locking shutter is pivotal about a pivot pin **10980** extending between the occlusal tie wings **10918** and accommodated by recesses **10997** therein. A spring **10985** is welded to the pivot pin **10980** and is also trapped between the shutter elements **10981**.

[**0229**] In the closed condition, the locking shutter **10924** is biased by the spring **10985**, which acts on the pivot pin **10980**, into notches **10987** formed in the occlusal surfaces of the gingival tie wings **10916**. When it is desired to release the locking shutter **10924** and move it to an open condition, it is necessary to apply an occlusally directed force on the locking shutter to compress the spring **10985** and move the locking shutter occlusally allowing the gingival end of the locking shutter to clear the notches **10987** and pivot to the open condition. Closing the locking shutter is achieved by performing the above steps in reverse.

[**0230**] Referring now to **FIGS. 102 and 103**, still yet another embodiment of an orthodontic bracket is shown and is generally indicated to by reference numeral **20010**. The orthodontic bracket includes a locking shutter **20024** having a single loop at one end surrounding a pivot pin **20080** extending between the occlusal tie wings **20018**. The locking shutter **20024** is pivotal about the pivot pin **20080** between open and closed positions. A locking mechanism is provided on the orthodontic bracket to retain the locking shutter **20024** in the closed condition. The locking mechanism includes an L-shaped arm **20025** extending from the free end of the locking shutter. A wedge **20027** is provided on the locking shutter adjacent the free end. The L-shaped arm and wedge define a channel **20029**. >An inverted U-shaped stop **20031** is provided on the body **20012** in the interwing region. The stop **20031** is accommodated by the channel **20029** when the locking shutter **20024** is in the closed condition. In this condition, the resilient nature of the locking shutter brings the wedge **20027** into abutment with the stop **20031** to maintain the locking shutter in the closed condition. To open the locking shutter, an occlusially directed force is applied to the L-shaped arm to flex the locking shutter and slide the wedge **20027** beyond the stop **20031** allowing the locking shutter to pivot to the open condition.

[**0231**] Referring now to **FIG. 104**, still yet another embodiment of a body for an orthodontic bracket is shown and is generally indicated to by reference numeral **20112**. In this embodiment, the body **20112** and mounting pad (not shown) are shaped to deflect food debris and plaque mesially and distally away from the orthodontic bracket in the direction of arrows **20113**. Specifically, the gingival surface of the body is rounded and is generally egg-shaped. The occlusal surface of the body **20112** is undulated and has a central formation **20115** thereon defining a pair of curved lateral faces **20117**. This body design can be used with any of the described orthodontic brackets.

[0232] Referring now to **FIGS. 105 and 106**, still yet another embodiment of an orthodontic bracket is shown and is generally indicated to by reference numeral **20210**. In this embodiment, each gingival tie wing **20216** has a spring-loaded piston **20291** therein. The piston heads **20293** extend outwardly of the gingival tie wings into the interwing region **20219** and constitute a retainer for the locking shutter **20224** to maintain the locking shutter in the closed condition. The spring is sealed by a stop **20225** located on the lateral side of the bracket. The pistons **20291** must be biased into the gingival tie wings in order to pivot the locking shutter **20224** to the open condition. As will be appreciated, similar to the embodiments shown in FIGS. **38** to **47**, **97***a* to **97***c*, and **100***a* to **103**, the locking shutter **20224** includes a single loop surrounding a pivot pin extending between the occlusal tie wings. Although, the pivot pins are illustrated as extending between the occlusal tie wings, those of skill in the art will appreciate that the pivot pin can extend between the gingival tie wings. It should also be appreciated that the locking shutter may include laterally spaced, single loops to surround the pivot pin or pivot pins at laterally spaced mesial and distal locations.

[0233] If desired, a lubricating or sealing agent can be applied to the body, locking shutter and/or archwire of the previously described orthodontic brackets.

[0234] The orthodontic brackets described above can be formed of any suitable material such as ceramic, plastic or other cosmetic material. If appropriate, the archwire slot may be constituted by a metallic insert accommodated by the body of the orthodontic bracket. Likewise in the case of the embodiment shown in **FIGS. 99***a* and **99***b*, the vertical slots accommodating the spring member **10732** may also be defined by a metallic inset accommodated by the ceramic body of the orthodontic bracket.

[0235] When the orthodontic brackets are to be used to form braces, it is preferred that pre-engaging twin orthodontic brackets of one of the types illustrated herein be used and attached to the central and lateral teeth and first and second molars and that single orthodontic brackets without wings (not shown) be used and applied to the cuspid and premolar teeth. This system of orthodontic brackets provides advantages in that the nature of the single orthodontic brackets are easier to bond to the posterior crowns of the cuspid and premolar teeth. Also, the single orthodontic brackets provide greater interbracket distances allowing for greater archwire flexibility in the posterior middle regions, cuspids and premolars. Better rotational control is however maintained with the use of the twin preengaging orthodontic brackets on the central and lateral teeth and first and second molars.

[0236] Although a number of embodiments of orthodontic brackets have been disclosed, those of skill in the art will appreciate that other variations and/or modifications may be made to the present invention without departing from the scope thereof as defined by the appended claims.

4. An orthodontic bracket as defined in claim **3** wherein said locking shutter is pivotally connected to said body.

5. An orthodontic bracket as defined in claim **2** wherein said leaf spring is located on said locking shutter between said gingival and occlusal tie wings.

6. An orthodontic bracket as defined in claim **2** wherein said leaf spring extends mesiodistally and is secured to said locking shutter intermediate its ends, said leaf spring having respective mesial and distal formations thereon extending into said archwire slot when said shutter is in a closed position.

7. An orthodontic bracket as defined in claim **2** wherein said biasing means is in the from of a resilient spring member secured to said locking shutter, said spring member extending occlusiogingivally.

8. An orthodontic bracket as defined in claim 7 wherein said spring member includes an outwardly convex portion intermediate its length extending lingually into said archwire slot when said locking shutter is in said closed position.

9. An orthodontic bracket as defined in claim **1** wherein said locking shutter is formed of resilient material and is engageable with an archwire in said archwire slot when in said closed position thereby to constitute said biasing means.

10. An orthodontic bracket for attaching an archwire to a tooth comprising:

a body having a lingual surface for attachment to a tooth, a pair of laterally spaced gingival tie wings and a pair of laterally spaced occlusal tie wings, said gingival and occlusal tie wings projecting from a labial surface of said body, both said gingival tie wings and occlusal tie wings at opposed mesial and distal sides of said body being separated by an interwing region of said body;

an archwire slot extending mesiodistally across said body and between the gingival and occlusal tie wings at opposed mesial and distal sides of said body to accommodate an archwire, said archwire slot being interrupted by said interwing region;

a locking shutter movable relative to said body between an open position in which placement and removal of said archwire in said archwire slot is facilitated and a closed position in which placement and removal of said archwire from said archwire slot is inhibited; and

biasing means engageable with an archwire in said archwire slot when said locking shutter is in said closed position to urge said archwire towards said locking shutter to provide a continuous corrective force thereon.

11. An orthodontic bracket as defined in claim 10 wherein said biasing means is in the form of a resilient spring member extending mesiodistally along said archwire slot, said spring member being secured to said body and having at least one free end.

12. An orthodontic bracket as defined in claim 11 wherein said spring member has a central portion secured to said body and labially curved wings at opposed ends of said central portion to contact said archwire and urge resiliently said archwire toward said locking shutter.

13. An orthodontic bracket as defined in claim 12 wherein the length of said spring member is less than or equal to the length of said archwire slot so that said curved wings contact said archwire within said archwire slot.

14. An orthodontic bracket as defined in claim 12 wherein the length of said spring member is greater than the length of said archwire slot, said labially curved wings contacting said archwire exterior to said archwire slot.

15. An orthodontic bracket as defined in claim 11 wherein said spring member is generally convex and is secured to said body adjacent one end thereof.

16. An orthodontic bracket as defined in claim 15 wherein the length of said spring member is less than or equal to the length of said archwire slot so that said spring member remains in said archwire slot when partially flattened by an archwire in said archwire slot.

17. An orthodontic bracket as defined in claim 10 wherein said biasing means is in the form of a generally convex resilient spring member secured to said body adjacent one end thereof, said spring member extending occlusiogingivally in said interwing region.

18. An orthodontic bracket as defined in claim 10 wherein said biasing means includes magnetized elements within said body adjacent to at least a lingual wall of said archwire slot to present a magnetic field in said archwire slot, said archwire being magnetized to the same polarity as said magnetic field so that said magnetic field urges said archwire toward said locking shutter when placed in said archwire slot.

19. An orthodontic bracket as defined in claim 10 wherein said biasing means is in the form of a pair of spring loaded pistons accommodated by said body adjacent opposed mesial and distal ends of said archwire slot, said spring loaded pistons acting on said archwire to urge said archwire toward said locking shutter.

20. An orthodontic bracket as defined in claim 19 wherein each of said pistons includes a piston head sized to inhibit said archwire from moving behind said piston head.

21. An orthodontic bracket as defined in claim 10 wherein said biasing means is in the form of resilient spring members secured to said body and engageable with an archwire passing through said archwire slot at mesial and distal locations exterior to said archwire slot.

22. An orthodontic bracket as defined in claim 21 wherein said resilient spring members are in the form of labial wings extending from opposed ends of a central strap secured to said body.

23. An orthodontic bracket as defined in claim 21 wherein each of said spring member is secured to an opposed side of said body and contacts said archwire at a lateral angle greater that.

24. An orthodontic bracket as defined in claim 17 wherein said spring member is accommodated by a generally vertical slot in said body lingual to said archwire slot, said vertical slot opening up into said archwire slot in said interwing region.

25. A pre-engaging orthodontic bracket for attaching an archwire to a tooth comprising:

a body having a lingual surface for attachment to a tooth, a pair of laterally spaced gingival tie wings and a pair of laterally spaced occlusal tie wings, said gingival and occlusal tie wings projecting from a labial surface of said body, both said gingival tie wings and occlusal tie wings at opposed mesial and distal sides of said body being separated by an interwing region of said body;

an archwire slot extending mesiodistally across said body and between the gingival and occlusal tie wings at opposed mesial and distal sides of said body to accommodate an archwire, said archwire slot being interrupted by said interwing region; and

a locking shutter pivotal about at least one pivot pin between an open position in which placement and removal of said archwire in said archwire slot is facilitated and a closed position in which placement of said archwire in said archwire slot is inhibited.

26. An orthodontic bracket as defined in claim 25 wherein said pivot pin extends between the tie wings of one of said pair and wherein said locking shutter includes a single loop at one end thereof to surround said pivot pin.

27. An orthodontic bracket as defined in claim 25 wherein said locking shutter includes a pair of laterally spaced, single loops surrounding said pivot pin.

28. An orthodontic bracket as defined in claim 25 wherein said locking shutter further includes a marker thereon to identify generally the center of said archwire slot when said locking shutter is in said closed position.

29. An orthodontic bracket as defined in claim 25 further including a lubricating or sealing agent carried by one or more of said body, locking shutter and archwire.

30. An orthodontic bracket as defined in claim 25 wherein at least one of said gingival tie wings has at least one groove formed therein.

31. An orthodontic bracket as defined in claim 25 further including a locking mechanism acting between said body and said locking shutter to maintain said locking shutter in said closed position.

32. An orthodontic bracket as defined in claim 31 wherein said locking mechanism includes a pair o f sp aced projections extending from said body and an opening in said locking shutter, said projections being flexed together when accommodated by said opening.

33. An orthodontic bracket as defined in claim 31 wherein said locking mechanism includes a bulbous lip formed on said body, said locking shutter curving lingually and occlusially at its free end to engage said lip when said locking shutter is in said closed position.

34. An orthodontic bracket as defined in claim 33 wherein said locking shutter curves lingually and occlusially at its free end and wherein said locking mechanism is constituted by co-operating wedge shaped formations on said body and said free end.

35. An orthodontic bracket as defined in claim 31 wherein said locking mechanism includes a spring member carried by said locking shutter, said spring member acting between said locking shutter and pivot pin to bias said locking shutter into retaining notches formed in the tie wings of one of said pair.

36. An orthodontic bracket as defined in claim 31 wherein said locking mechanism includes a stop on said body and a wedge on said locking shutter to abut said stop when said locking shutter is compressed and moved to said closed position.

37. An orthodontic bracket as defined in claim 31 wherein said locking mechanism includes a spring-loaded piston accommodated by a tie wing and extending into said interwing region.

38. A body for an orthodontic bracket having a mesiodistally extending archwire slot formed therein and gingival and occlusal surfaces shaped to deflect food debris and plaque mesially and distally therefrom when secured to a tooth.

39. A body as defined in claim 38 wherein said gingival surface is generally egg-shaped and wherein said occlusal surface is undulated to present a pair of oppositely directed curved lateral faces.

40. A set of braces including a plurality of orthodontic brackets to be attached to an individual's teeth, said braces including self-engaging twin orthodontic brackets to be attached to the central and lateral teeth and first and second molars of said individual and single orthodontic brackets to be attached to the cuspid and premolar teeth of said individual.

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