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(54) Title: EDGE WISE WINGLESS SELF LIGATION ORTHODONTIC BRACKET SYSTEM

(57) Abstract: Pre fabricated Wingless Orthodontic Brackets are manufactured in such a way that it has no tie wings. It has all other parts of a bracket other than the tie- wings. The brackets can be made up of any single material or a combination of any material. The bracket is Capital D shaped or apex of a parabola shaped. The Brackets are ligated by self ligation and Brackets which has a press lock latch. Vertical Slide Ligation Brackets which the base is bonded on the tooth surface and the incise part forming a vertical slide mechanism. Direct Press Ligation Brackets, Vertical Press Ligation Bracket, Elastic Hook Ligation Bracket are all variations of a single design.



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FIELD OF INVENTION

The invention generally relates to Orthodontics and in particular to all Edge wise,
5 Straight wire and all its modification and custom fabricated Brackets or tubes for
orthodontic correction using virtual dental model and Cad Cam technology and Begg
Brackets and tubes.

10 BACK GROUND AND PRIOR ART

In conventional Orthodontic braces Brackets and tubes are bonded on all the teeth that
are required for support or that need correction of irregularities. An Alternative
method is to weld Orthodontic brackets and tubes on Bands which are prefabricated
15 according to the contour of the teeth or adapted to the contour of the teeth. These
bands with the brackets and tubes welded on them are cemented to the teeth using
Dental Luting Cements. Orthodontic Brackets are used to deliver forces to various
teeth in a scientific manner so that the teeth can be arranged for better appearance and
function. In conventional Orthodontics the Orthodontic brackets and tubes are
20 bonded or Bands with welded Brackets and tubes are cemented to the teeth using
various resins or luting cements. Forces are then applied using a wire that pass
through the slots on these Brackets. These wires are tied securely to the brackets with
the help of thin wire called Ligature wire or with the help of thin plastic rings called
“lig a rings”. More recently the tie wings are used to engage the wire in the Bracket
25 using various self ligating cover like designs. The slots of theses brackets are at
specific locations and do have pre planned alignments to the Bracket bases. The
position and alignment of these slots define the various treatment prescriptions in
orthodontics. The arch wire is tied to the bracket taking advantage of the undercuts
designs present in the Brackets called Tie wings.

30 DESCRIPTION OF THE INVENTION

The present Invention is an over all design variation where the tie wings are entirely
avoided and the outer surface of the bracket is made smooth and polished. The surface
35 can also be made of different materials for the reasons of appearance. The new
invention does not have any thing to do with the location of the bracket slots. But the
difference is in the overall design variation of the Bracket itself. That means any

system of treatment is possible in this design variation. The earlier Brackets were
 40 bulky and had wing like structures called Tie wings "more like Thorns" for the
 purpose of putting ligature wire to keep the force applying wire in place.

The systems of treatment "referred" to includes any design variations in the slot
 position that is in practice today like Begg System with tubes or Edgewise systems
 45 with tubes or any of its modifications or The Begg & Straight wire (PEA)
 Combinations like Tip edge Systems with tubes or any Cad Cam system with tubes
 systems yet to develop. Any bracket designs like twin brackets or mono brackets can
 be fabricated in the **Edge wise Wingless Self Ligation Orthodontic Bracket
 System**. Any kind of bracket bases can be used in these systems. Here onwards
 50 Orthodontic Brackets of any system of treatment, made of any material or virtual or
 with any Bracket base and any type of attachments like Brackets and tubes will be
 referred to as Brackets for the purpose of convenience.

The Main advantages of the new system of Brackets are that we eliminate the Tie
 55 wings entirely from the bracket design.

- 10) It further reduce Fabrication cost
- 11) This change improves the Patient comfort.
- 12) Improves patient esthetics
- 60 13) Reduce incidence of Lip and Cheek injury.
- 14) Improves the ability to brush
- 15) Automatically improve Oral hygiene because it allows self cleansing by lips
 and Tongue.
- 65 16) The design permits food particle to easily slide over the Brackets there by
 reduce food particles from getting stuck between the tie wings.
- 17) Increase the bonding area and hence improve Bond strength
- 18) Since the tie wings are absent Bracket breakage is almost nil.
- 70 19) The Slot dimension is not interfered by ligatures or "lig a rings".

DESCRIPTION OF THE DRAWINGS

Figure 1. The normal Edge Wise Bracket: The normal Edge Wise Bracket is a piece
 75 of metal with a surface either contoured to adhere to the tooth surface and a slot for

the wire to pass. The surface that adheres to the tooth is called the base of the Bracket. The sides of the slots curve away from the slot and forms what is known as the tie wings. The slot and the base are connected to each other by the bracket stem. Through ages the Orthodontic bracket has gone through many phases of evolution.

80 Almost all the designs were either winged but there were quit a few un- winged Brackets as well. But till now no bracket system that is round shaped and having a contour of Capital D to the apex of a Parabola are invented. These brackets come as fully fabricated and only need to be bonded on teeth no bracket base fabrication in the dental clinic is needed. The entire bracket can be manufactured in the factory.

85 Andrews bracket and Roth brackets from many companies available now are examples of different prescriptions of Winged Brackets.

Figure 2. The different line angles seen from the Facial/ Buccal view : The different terms used in the article are dependant on the various nomenclature systems in dentistry. But for convenience sake they are explained once again here using a picture. The various line angles of our interest, seen from the facial surface of an anterior tooth are the Cervical Margin, The Incisal or Occlusal Margin, the Mesio-buccal, Disto-buccal line angles. The various line angles of our interest, seen from the facial surface of a posterior tooth are the Cervical Margin, Occlusal Margin, the

90 Mesio-buccal, Disto-buccal line angles. These terms help us to determine each edge of a tooth and help us to define the appliance better in relation to the tooth.

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Figure 3. The different point angles seen from the Labial/Buccal view : The different terms used in the article are dependant on the various nomenclature systems in dentistry. But for convenience sake they are explained once again here using a picture. The various point angles of our interest, seen from the facial surface of an anterior tooth are the Mesio-Cervical, the Disto-cervical, mesio incisal, and disto incisal point angles. The various point angles of our interest, seen from the facial surface of a posterior tooth are the Mesio-Cervical, the Disto-cervical, mesio occlusal, and disto-occlusal point angles. These terms help us to determine each corner of a tooth and help us to define the appliance better in relation to the tooth.

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Figure 4. How Bracket is altered : Here in the new invention the tie wings are entirely avoided and the space occupied by the tie wings are either included in the brackets itself or that part of the tie wing is that is not with in the limits of the bracket design is removed and the under cuts are blocked with any material with which the

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brackets is fabricated or with any other material. The new invention is also an altered design of Orthodontic Bracket were all the under cuts in the design of the bracket were filled with the material of fabrication of the bracket or a different material. Thus all the under cuts and food retention areas are eliminated. The basic idea of bracket Ligation was to secure the force applying Arch wire to be in place. Thin wires called ligatures wires pass around the tie wings and keep the arch wire against the bracket Base. This will generate the necessary force to move the tooth to the desired position.

Figure 5. Bracket profile transitions : These Tie wings and the ligature wire together often cause patients great discomfort and injury to the soft gums and cheek around the bracket. Often because these areas of food lodgment cause caries and Bad breath occurs. So by excluding these tie wings a lot of problems associated with the tooth itself and the adjoining tissues can be avoided. But this also calls for many challenges for securing the Arch wire to the bracket by some means other than ligation with a ligature wire. The arch wire locking is made effective by self ligation philosophy and a number of designs have been developed for the same. The center of the face of the Bracket or the center of the parabola or Capital D has a slot for engaging the Arch wire. Since the Arch wire slot in the bracket is a part of the bracket itself, the bracket design does not show the slot specifically but the design shows the overall shape of the Bracket including the Slot. The design can have any shape that progress from a Capital D Shape to a parabola as shown in the Figure 5

Figure 6. Parts of the new bracket system : In the new design all the under cuts in the design of the bracket were filled with the material of fabrication of the bracket itself or a different material. Thus all the under cuts and food retention areas are eliminated. The basic design from the mesial or distal side is "a Capital D Shape to an apex of a parabola". The design also has all the parts of the normal Edge wise bracket namely Bracket Base, Bracket Slot, and Bracket stem except the Ligature tie wings.

The Facial Press Ligation Brackets

Figure 7. Facial view of Facial Press Ligation Brackets and Lock Opening incisally : The Bracket is essentially a solid block of the material with which the Bracket is manufactured. The block has a horizontal slot in the middle of its face according to the Bracket prescription in mind of the manufacturer. The base of the Bracket slot

joins with the face of the Bracket Base by the Stem of the Bracket. The Bracket has a latch to lock the arch wire in place it can be opened either incisally or occlusally.

150 In a bracket with the latch opening Incisally or occlusal, the inciso-facial or the occluso-facial edge of the Bracket is thoroughly rounded so that the surface resembles the surface of capital D or the apex of a parabola or any shape that happens in between these two shapes as shown in the Figure5. The Mesial and distal incisal portions of the slot has a depression to allow the hinge of the latch.

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Figure 8. Facial view of Facial Press Ligation Brackets and Lock Opening incisally : The bracket on the Mesial side and the distal side except in the incisal area where the depression for the hinge is present and the gingival area is hollowed out into a concavity that allows the latch to occupy space. The latch at the gingival part has a

160 lock that locks with the Bracket base

Figure 9. Facial Press Ligation Brackets and Lock Opening cervically : The Bracket is essentially a solid block of the material with which the Bracket is manufactured. The block has a horizontal slot some where in the middle according to the Bracket prescription in mind of the manufacturer. The bracket can also have a vertical slit that goes along with the Long axis of the Tooth to help bracket orientation. The base of the Bracket slot joins with the face of the Bracket Base. The Bracket has a latch to lock the arch wire in place it can be opened cervically. In a bracket with the latch opening gingival, the gingivo-facial aspect of the Bracket is thoroughly rounded to a capital D or the apex of a parabola or any shape that happens in between these two shapes as shown in the Figure5. The Mesial and distal incisal portion of the slot has a depression to allow the hinge of the latch. The bracket on the Mesial side and the distal side except in the incisal area where the depression for the hinge is present and the gingival area is hollowed out into a concavity that allows the latch to occupy space.

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Figure10. Facial Press Ligation Brackets and Lock Opening cervically : The latch at the gingival part has a lock that locks with the Bracket base. In case of a Bracket with the latch opening gingival the depression for the hinge of the latch is in the incisal portion of the Mesial and distal surface of the Bracket. In this situation the lock is at the gingival portion and the Mesial side and the distal side except in the incisal area

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where the depression for the hinge is present and the incisal / occlusal area are hollowed out into a concavity that allows the latch to occupy space.

185 Figure 11. Close up view of the self lock Facial Press Ligation Brackets : The descriptions of the lock is given along with that of the Figures 8 and 10.

Vertical Slide Ligation Brackets

Figure 12. Vertical Slide Ligation Brackets : A new vertical Slide design for arch
190 wire ligation in the parabola design and the Capital D profile Brackets. A sliding jig with spring loaded locking systems is fixed at four opposing areas at a distance to which the vertical Sliding is required. The incisal arch wire boundary of the bracket along with the anterior wall (The arch wire ligation part) is fixed to this jig and this forms the movable part in the Bracket design. But once firmly locked into place it
195 along with the cervical member acts like a firm bounding box for the arch wire

Figure 13. Vertical Slide Ligation Brackets. Non sliding part : The Bracket Base along with the stem forms a system that allows the vertical sliding jig to slide along the vertical axis. The system has the female part that fits exactly with the Spring
200 loaded locking systems in the Vertical Sliding jig. The cervical arch wire boundary of the bracket is fixed to this block. The cervical arch wire boundary is that part of the earlier edge wise bracket that used to have the cervical tie wings. This part along with the bracket stem is bonded to the tooth surface by the bracket base and will not move during arch wire engagement.

205 Figure 14. Vertical Slide Ligation Brackets. Assembled appearance : The assembly in the figure shows the various parts of the vertical slide lock brackets in the assembled form.

210 Figure 15. The Spring loaded locking system used in Vertical Slide Ligation Brackets: The Male part or the movable part of the Bracket is fixed with a spring loaded locking system to engage the immovable part of the bracket once the bracket is closed. The vertical sliding part passes through a slider on either side.

215 Direct Press Ligation brackets

Figure 16. Direct Press Ligation Brackets : A simple press lock system to lock the arch wire in place. The bracket face is fixed with a hinged latch with a spring loaded lock at the locking end. The lock is pressed against an inclined locking surface

Bracket face. Unlocking requires a sharp explorer with goes into the lock and
 220 disengages the lock.

Figure 17. The press lock locking system used in Direct Press Ligation Brackets.

Vertical Press Ligation Bracket

225 Figure 18. Vertical Press Ligation Bracket. Profile and Facial views : The bracket
 face is fixed with a hinged latch with a spring loaded lock at the locking end. The
 lock is pressed against an inclined locking surface Bracket face. Unlocking requires a
 sharp explorer with goes onto the spring loaded lock through a hole in the cervical /
 incisal part to the bracket face and disengages the lock.

230 Figure 19. Vertical Press Ligation Bracket showing the press locking system.

Figure 20. Elastic Hook Ligation Bracket. Profile and Facial views : The bracket
 face is fixed with a hinged latch with a spring loaded lock at the locking end. The
 235 elastic hook is fixed on to the spring hook and pressing the hook disengages the latch
 and the bracket slot is opened. When locked the middle expanded part of the hook
 engages an under cut on the face of the bracket and keeps the latch locked.

Figure 21. Examples of spring loaded locks that can be used in the locking systems
 240

Bracket Face Ligation system

Figure 22. The bracket face is cut into a triangle longitudinal section. On the other
 side of the hinge on the ligation part is a self locking system as shown in the figure
 23. The Figure 22 shows the Profile and facial view of the Bracket Face Lock system.
 245 The cervical / incisal margin is fixed with a hinge for the face cover to open.

The figure 23 shows the ligation system used in Bracket face lock System.

Figure 24 shows the view from the Incisal/ Cervical aspect. In addition to all the other
 250 veiws 3 other views also introducing regarding the Bracket design. One from the
 Incisal and another from the facial aspect and the design of the base all related to the
 wingless bracket design.

Figure 25 shows the Various facial views possible in the Wingless Bracket design
 255 The view from the facial aspect varies from

- f) Round to rectangle with or with out rounded corners
- g) Round to square with or with out rounded corners
- h) Square or Rectangle to Parallelogram with or with out rounded corners

- 260 i) Square or Parallelogram to a rhombus with or with out round corners
- j) Or any combination of the above
- all with a wingless design as described earlier.

Figure 26 shows various Bracket bases that are possible with Wingless Brackets. Now
 265 the base of the bracket also shows the transition. It starts from a straight line to a
 smooth or sharp curve as shown in the figure 26. Any combination of the base with
 any combination of the Bracket facial appearance all with the wingless Bracket design
 described earlier.

270 **Vertical Slide Side Lock Brackets**

Figure 27 shows the facial and proximal view of Vertical Slide Side Lock Brackets
 The bracket assembly is separated into 2 pieces. One attached to the tooth this bears
 the Bracket slot and have the female portion for occupying the 2 side locks on the
 275 Slide Cover. The second part is the Sliding cover with the attached side locks. The
 cover is used to keep the arch wire in place. Note that the cover portion in the closed
 position completely covers the arch wire slot.

Figure 28.shows Facial View of Vertical Slide Side Lock Bracket's Base assembly
 280 and cover separate

Figure 29 shows t he Proximal view of the bracket assembly

Figure30shows the view from the cervical aspect with out the side cover. In this view
 285 the arch wire slot, the side lock slot and the ligature path are visible. The ligature path
 is a shallow groove on the Cervical and Occlusal. Incisal aspect of the Bracket base to
 accommodate a ligature wire if needed.

Rotating cover lock Bracket

290 Figure 31 shows aRotating cover lock Bracket. It is a simple hinge and lock design
 for bracket opening and closing. The hinge can be either cervical or incisal and the

lock on the opposite side respectively. The bracket base assembly and the Cover together defines the Bracket Slot.

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Vertical Slide lock Brackets modified

Figure 32 shows the Various facial views of Vertical Slide lock bracket modified bases
300 One additional shape transition of bracket from round to oval apart from the shapes previously mentioned . That means, with a wingless design as described earlier, the view from the facial aspect varies from round to rectangle with rounded corners. The present modification is from round to oval as shown in the figure 32 with all wingless bracket design.

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Figure 33 shows Vertical Slide lock Brackets modified. The locking system is modified to and is restricted to the facial surface only.

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I CLAIM,

1. A method of manufacturing of Pre fabricated Wingless Orthodontic Brackets, manufactured in such a way that it has no tie wings. It has all other parts of a bracket other than the tie wings. The brackets can be made up of any single material or a combination of any material.
2. A Pre fabricated Wingless Orthodontic Brackets as claimed in claim 1 wherein the bracket is Capital D shaped or apex of a parabola shaped. All combination of shapes from a low profile Capital D to that of apex of the parabola. All under cuts in the outer aspect of the Brackets are avoided by the design. The tie wings are removed and the under cuts are blocked with the material of manufacture of the bracket itself or a different material. Elastic hooks can be fixed if needed by the Operator.
3. A Pre fabricated Wingless Orthodontic Brackets as claimed in claim 1 wherein the Brackets are ligated by self ligation philosophy. But if necessary normal ligation can be employed.
4. A method of manufacturing of The Facial Press Ligation Brackets which has a press lock latch as shown in Figure 11.
5. A method of manufacturing of Vertical Slide Ligation Brackets which the base is bonded on the tooth surface and the incise part forming a vertical slide mechanism. Together the face of the bonded part and the face of the vertical sliding hold the arch wire in place. The slot dimension will be according to the manufacture's prescription to the slot fabricated in the bracket.
6. Direct Press Ligation Brackets, Vertical Press Ligation Bracket, Elastic Hook Ligation Bracket are all variations of a single design. These brackets ligate the arch wire in place by the help of a Direct Press Ligation Bracket system as shown in figures, 16, 17. Direct pressure is applied on the spring loaded locks vertically so that it engages a locking system in the face of the bracket. Vertical Press Ligation Bracket is a variation of Direct Press Ligation Brackets except the fact that the pressure is applied to open the latch through a hole in the face of the bracket. The system is shown in the Figures 18, 19. Many times elastics are engaged to the Brackets for the purpose of tooth movement. In such situations the press lock device is connected to the Elastic hook and

the elastic hook engages a minor under cut in the face of the Bracket. The brackets are shown Figures 20. Various locking systems are also developed for the 3 bracket variations as shown in Figure 21.

7. The bracket face is cut into a triangle. And the cover is contoured in such a way that the cover is contoured to the desired convexity as claimed in claims 1&2. A self locking system is designed to lock the cover in place as shown in figure 23.
8. A method of manufacturing of Vertical Slide Side Lock Brackets which the 2 pieces bracket assembly, one attached to the tooth. This bears the Bracket slot and have the female portion for occupying the 2 side locks on the Slide Cover. The second part is the Sliding cover with the attached side locks to keep the arch wire in place and completely covers the arch wire slot.
9. A method of manufacturing of Rotating cover Lock Brackets which is a simple hinge and lock design for bracket opening and closing. The hinge can be either cervical or incisal and the lock on the opposite side respectively. The bracket base assembly and the Cover together define the Bracket Slot.
10. A method of manufacturing of Vertical Slide lock bracket modified bases one additional shape transition of bracket from round to oval appart from the other shapes . That means, a wingless design as described earlier, the view from the facial aspect varies from round to rectangle with rounded corners. The present modification is from round to oval as shown in the figure 32 with all wingless bracket design.

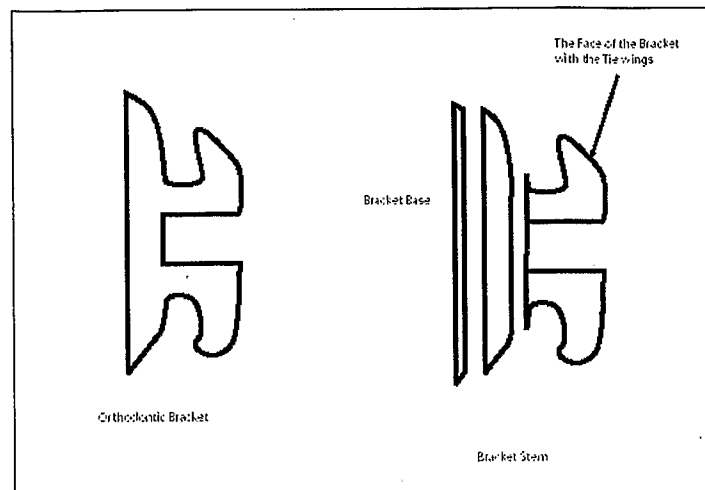


Figure 1. The normal Edge Wise Bracket

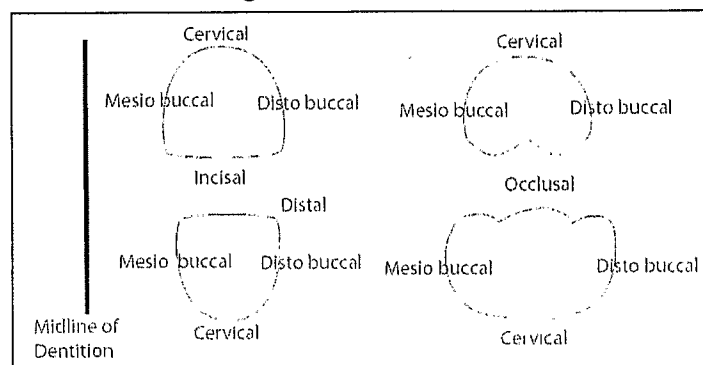


Figure 2 The different line angles seen from the Facial/ Buccal view

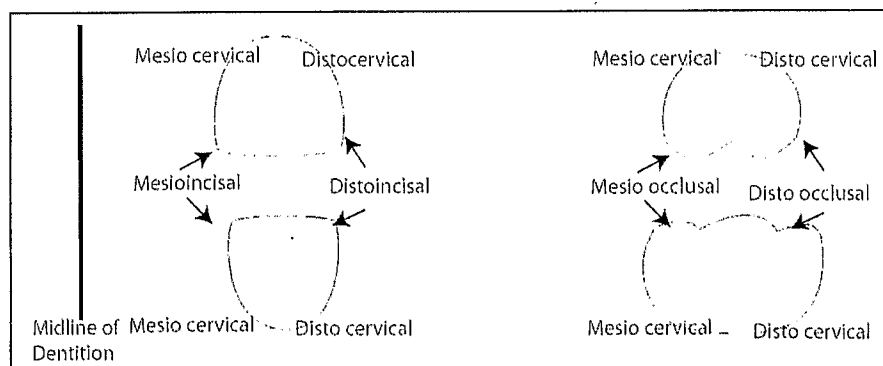


Figure 3. The different point angles seen from the Labial/ Buccal view

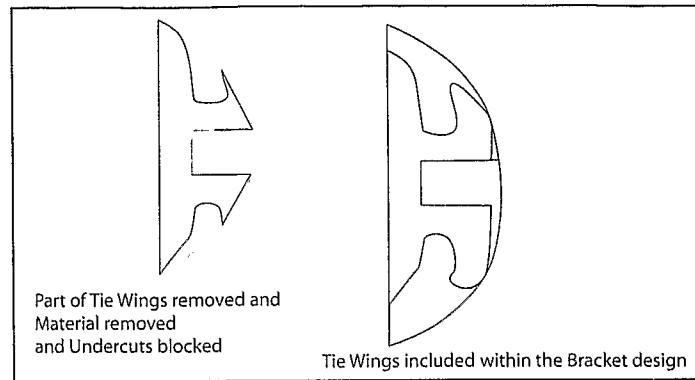


Figure 4. How Bracket is altered

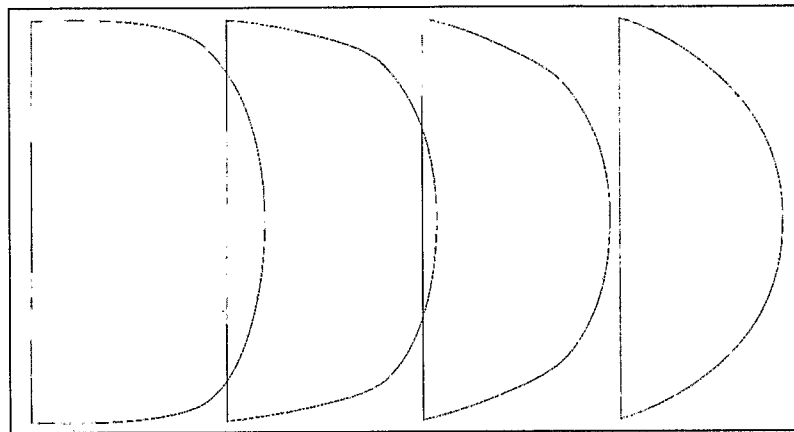


Figure 5. Bracket profile transitions

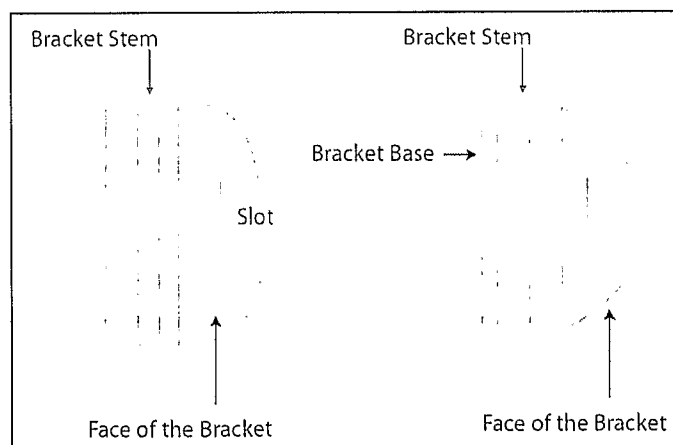


Figure 6. Parts of the new bracket system

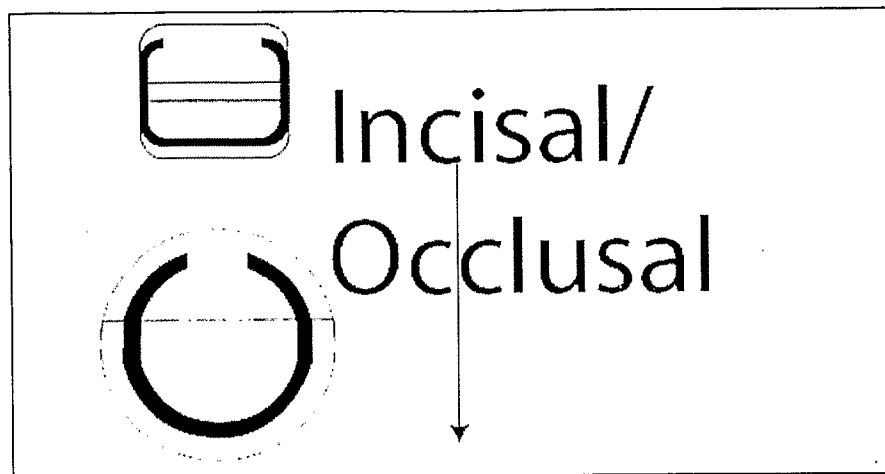
The Facial Press Ligation Brackets

Figure 7. Facial view of Facial Press Ligation Brackets and Lock Opening incisally

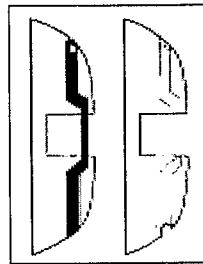


Figure 8. Profile view of Facial Press Ligation Brackets and Lock Opening incisally

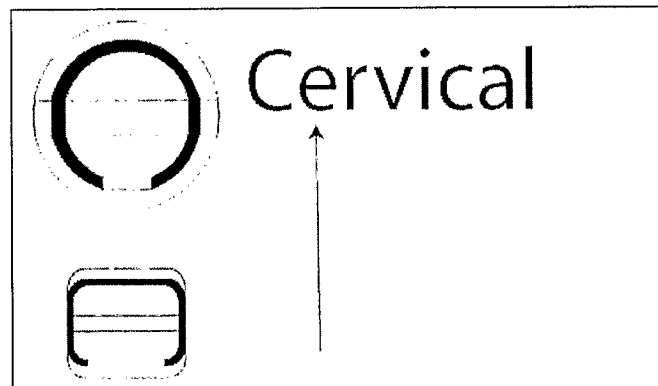


Figure 9. Facial view of Facial Press Ligation Brackets and Lock Opening cervically

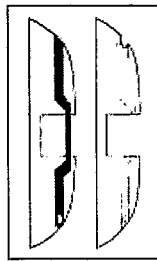


Figure 10. Profile view of Facial Press Ligation Brackets and Lock Opening cervically

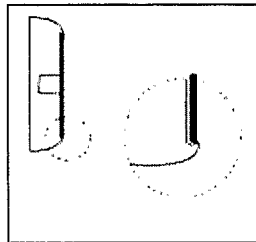


Figure 11. Close up view of the self lock Facial Press Ligation Brackets

Vertical Slide Ligation Brackets

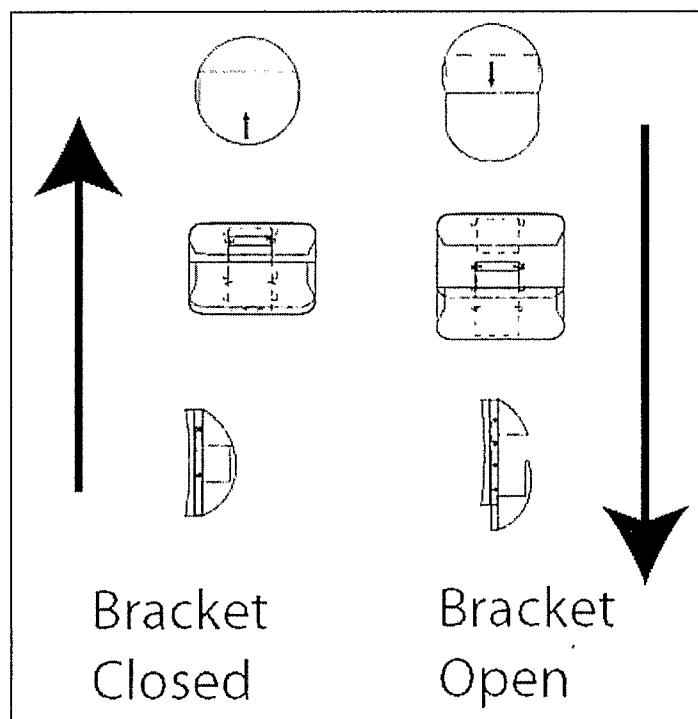


Figure 12 Vertical Slide Ligation Brackets. Facial view and Profile views

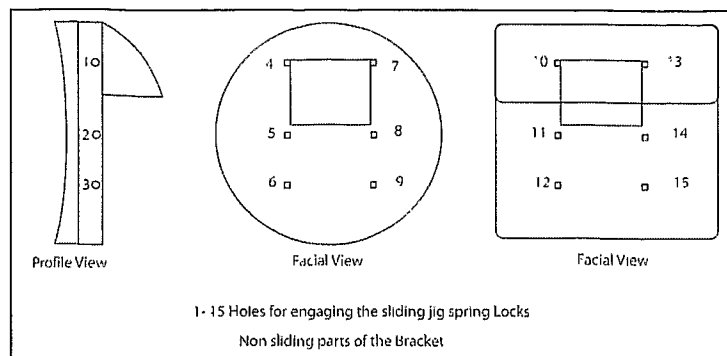


Figure 13 Vertical Slide Ligation Brackets. Non sliding part. Profile and Facial views

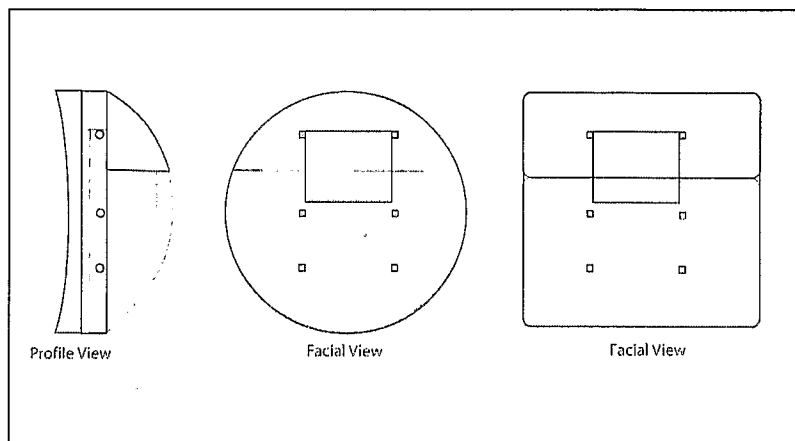


Figure 14 Vertical Slide Ligation Brackets. Assembled appearance. Profile and Facial views

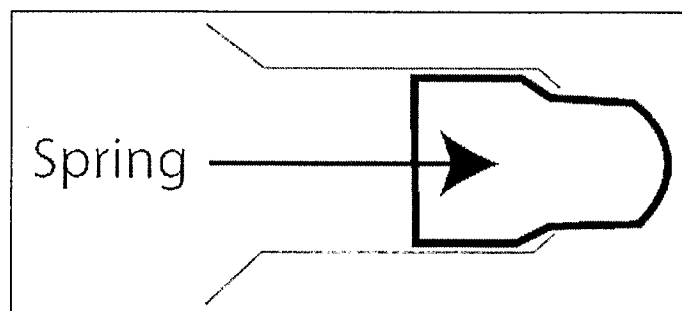


Figure 15 The Spring loaded locking system used in Vertical Slide Ligation Brackets.

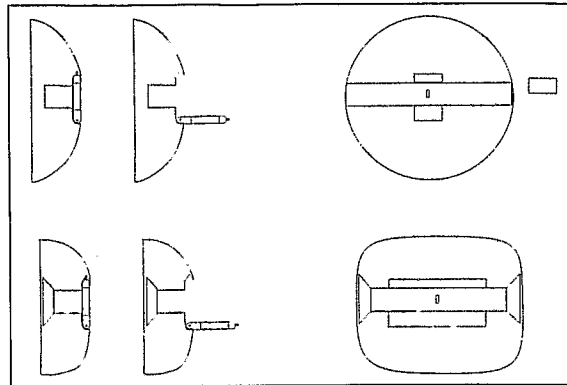
Direct Press Ligation brackets

Figure 16 Direct Press Ligation Brackets. Profile and Facial views

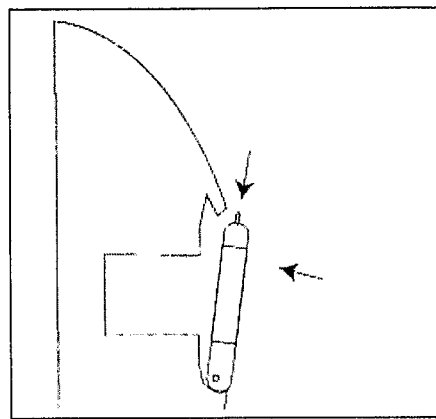


Figure 17 The press lock locking system used in Direct Press Ligation Brackets.

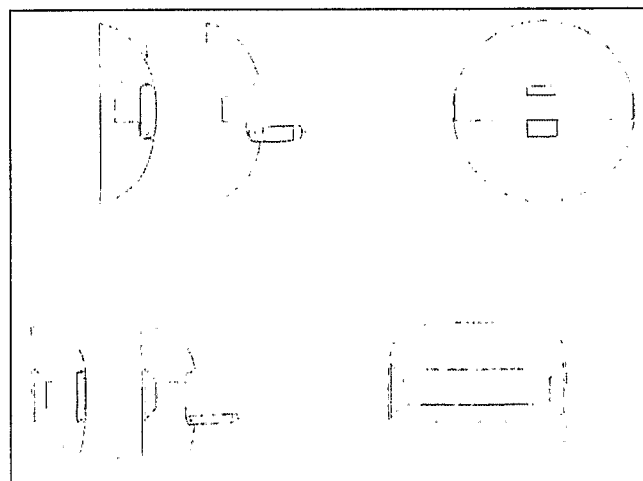
Vertical Press Ligation Bracket

Figure 18 Vertical Press Ligation Bracket. Profile and Facial views

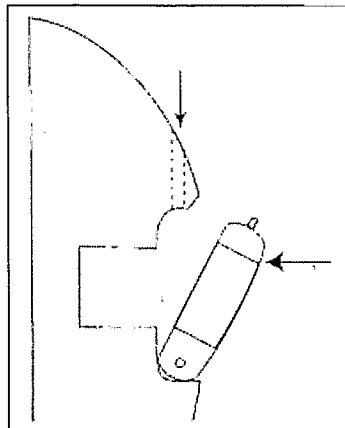


Figure 19 Vertical Press Ligation Bracket showing the press locking system.

Elastic Hook Ligation Bracket.

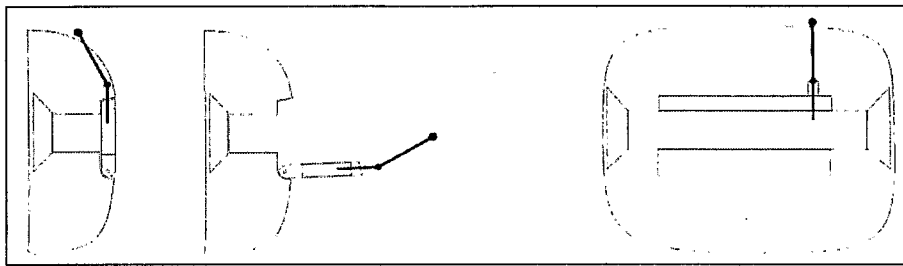


Figure 20 Elastic Hook Ligation Bracket. Profile and Facial views

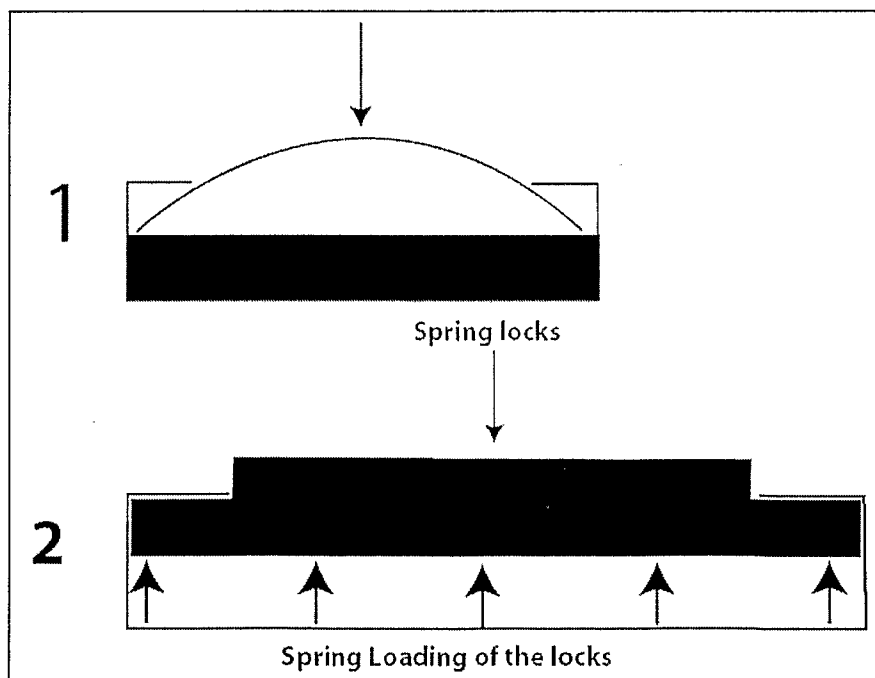


Figure 21 Examples of spring loaded locks that can be used in the locking systems

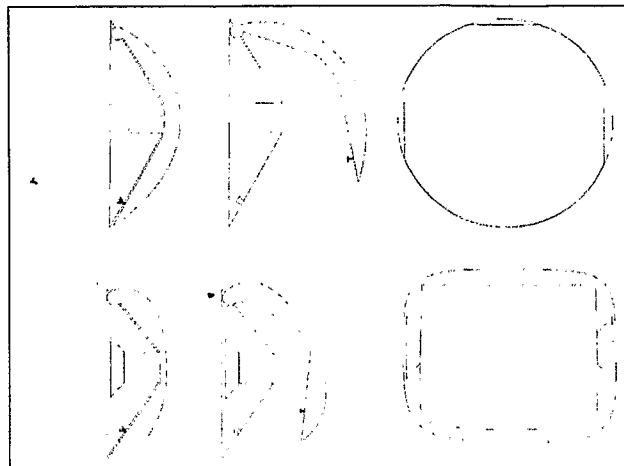
Bracket Face Ligation system

Figure 22. The Bracket Face Ligation System. Profile and Facial views

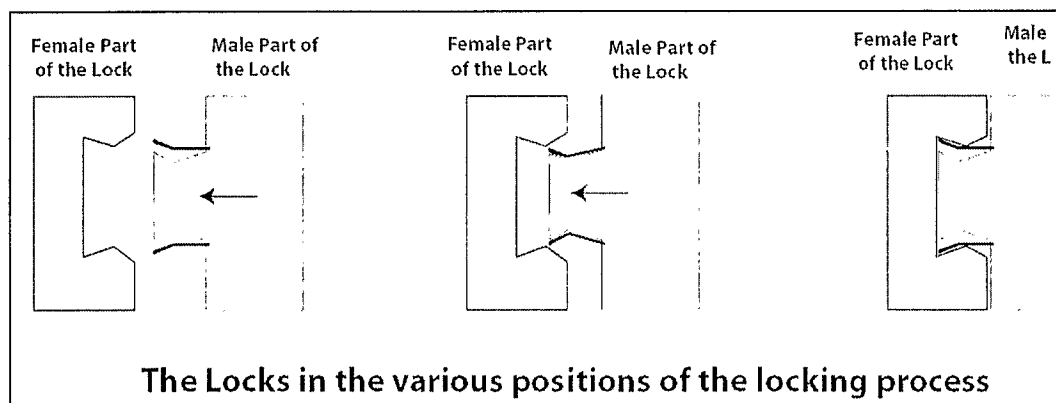


Figure 23. A locking system for the Bracket Face Ligation System

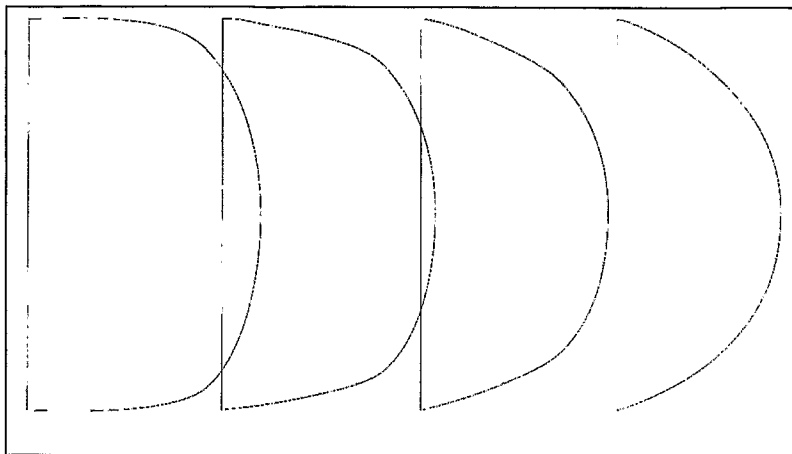


Figure 24 View from the Incisal and Cervical aspects.

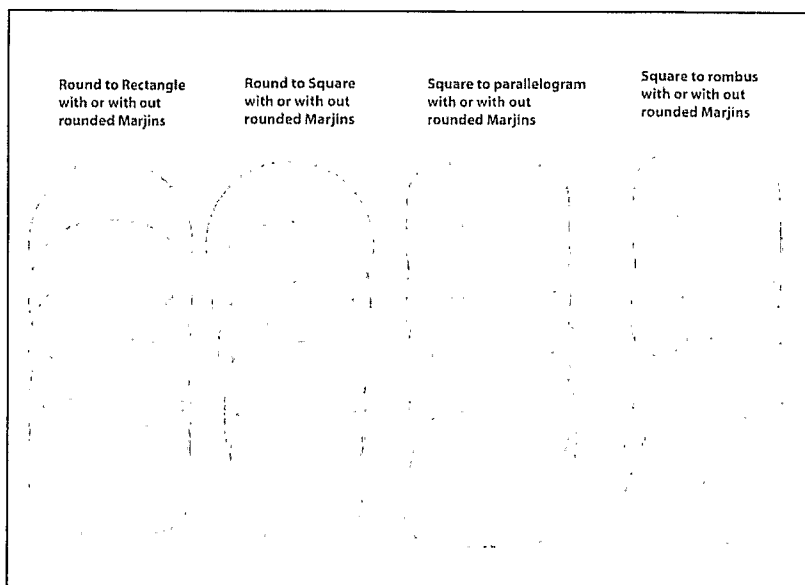


Figure 25 The Various facial views possible in the Wingless Bracket design

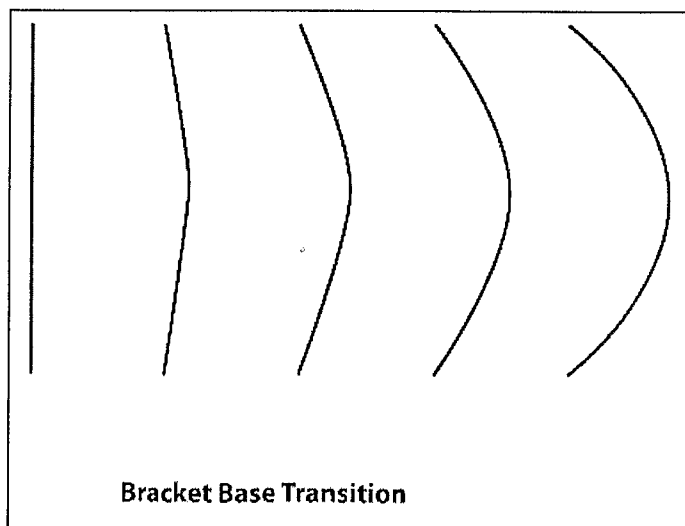


Figure 26 Various Bracket bases that are possible with Wingless Brackets

Vertical Slide Side Lock Brackets

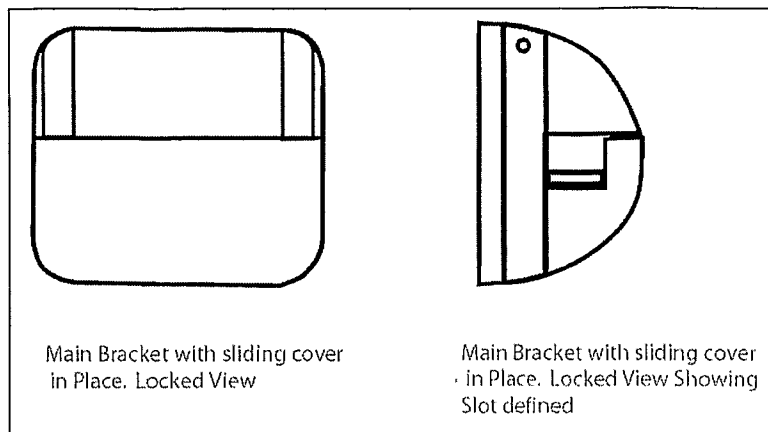


Figure 27. Vertical Slide Side Lock Brackets Assembled Facial and Proximal view.

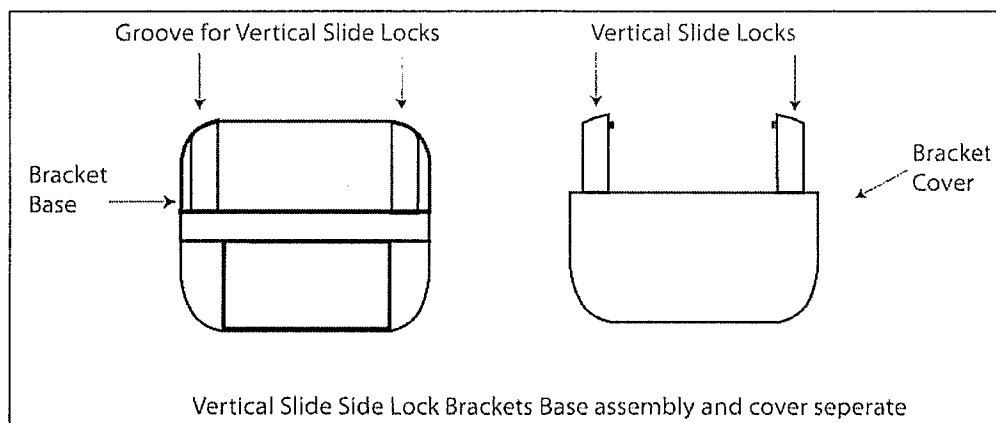


Figure 28. Base assembly and cover separate Facial View.

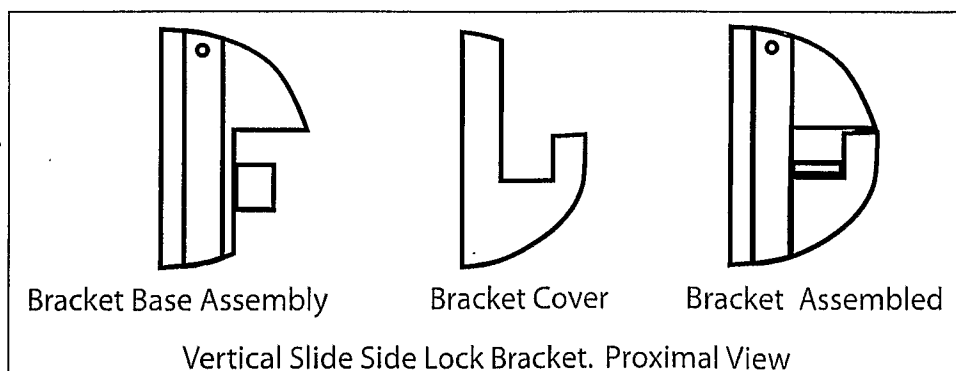


Figure 29 The Proximal view of the bracket assembly

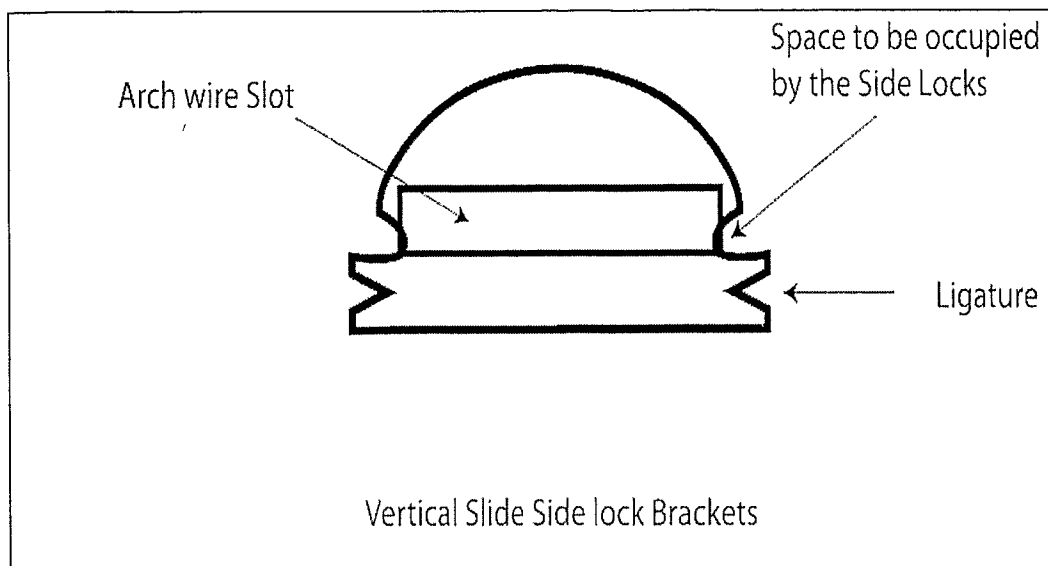


Figure30. View from the cervical aspect with out the side cover.

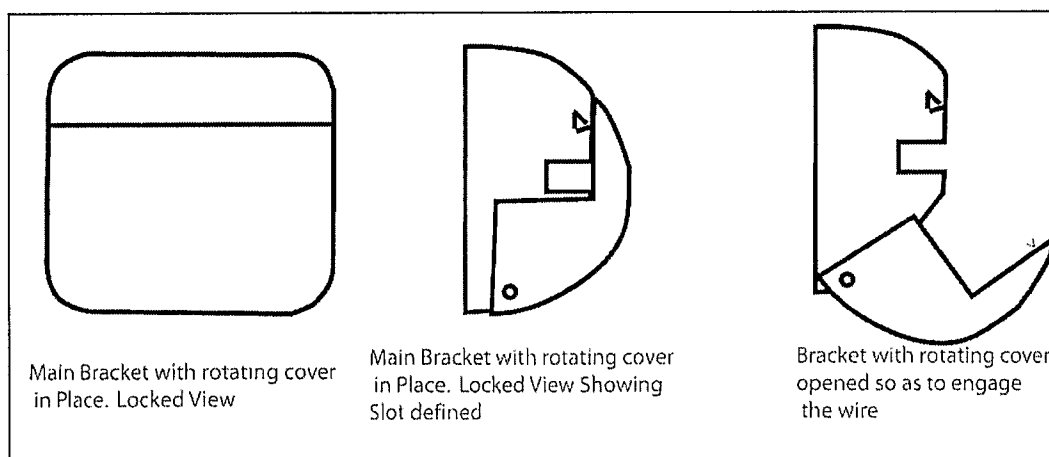


Figure 31 Rotating cover lock Bracket

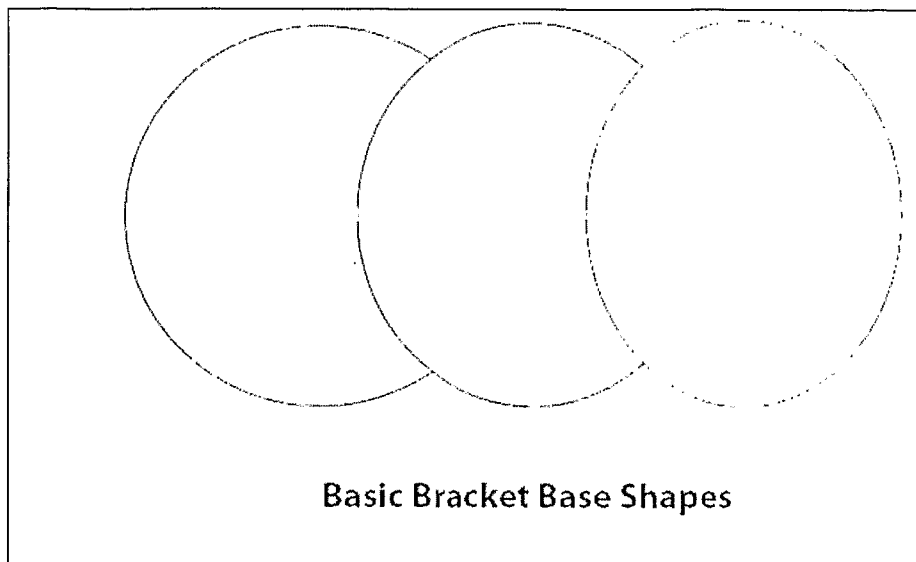


Figure32 shows the Various facial views of Vertical Slide lock bracket modified

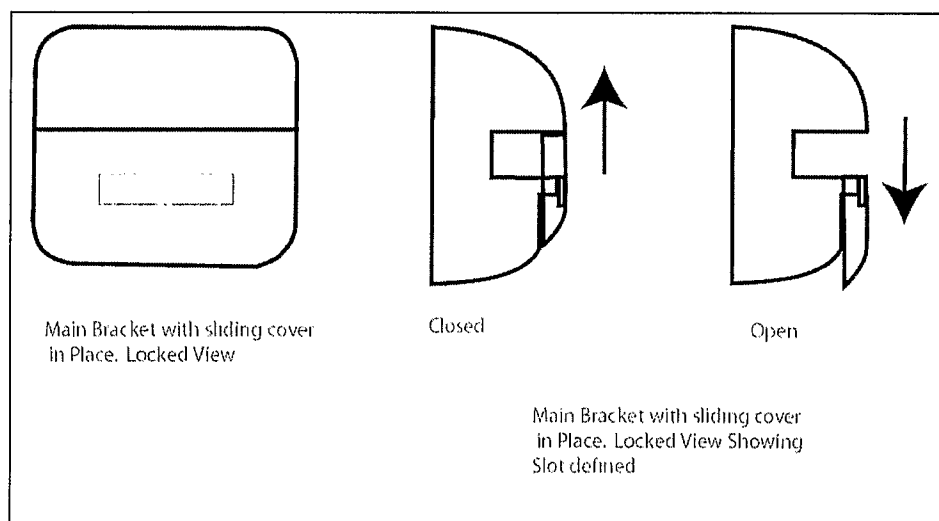


Figure 33 Vertical Slide lock Brackets modified