A self-ligating orthodontic bracket has a sliding archwire cover that has a top surface congruent with the top surface of an upper body portion having an archwire slot. The cover has a resilient locking tab that slides across the slot, bending upward as it encounters a ridge on the other side of the slot, and latching to the ridge to secure the cover in a closed position. The cover has a modified dovetail shape with flared bottom portions that slideably engage guides for reciprocating opening and closing sliding motion. A groove in the slide support track engages the locking tab in the open position preventing it from disengaging from the upper body portion.

FIG. 1
— as to the applicant’s entitlement to claim the priority of the earlier application (Rule 4.17(Hi))

Published:
— with international search report (Art. 21(3))

— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))
SELF-LIGATING ORTHODONTIC APPLIANCE WITH SLIDING COVER

CROSS-REFERENCE TO RELATED APPLICATIONS

[oooi] This application is a continuation-in-part application of pending U.S. patent application serial no. 13/679,019 filed November 16, 2012. This application also claims priority based upon U.S. provisional application serial no. 61/779,630 filed March 13, 2013.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not applicable.

NAMES OF PARTIES TO A JOINT RESEARCH AGREEMENT

[0003] Not applicable.

REFERENCE TO SEQUENCE LISTING, A TABLE, OR A COMPUTER PROGRAM LISTING COMPACT DISC APPENDIX

[0004] Not applicable.

BACKGROUND OF THE INVENTION

Field of the Invention

[0005] This disclosure relates to improved self-locking or ligatureless orthodontic brackets.

Description of Related Art Including Information Disclosed Under 37 CFR 1.97 and 1.98.

[0006] Several self-locking or self-ligating (ligatureless) orthodontic brackets have been designed. However, most of those have complex designs, incorporating features requiring prohibitively expensive machining operations or comprising multiple separate parts, which in turn increases the number of failure modes for such brackets. Other designs have been rejected in the marketplace due to poor quality or poor design, a lack of available features, difficulty of use, or other factors.

[0007] One such bracket is disclosed in U.S. Patent No. 7,621,743 entitled Orthodontic Bracket. That device is a self-ligating bracket that includes a locking slide cover that entrains an archwire. However, like many sliding covers, the top surface is not smooth, which is important for patient comfort. Moreover, this device is difficult to manufacturer requiring small interlocking extensions mating in the plane of the slide and guide members on either side having sharp edges that protrude outwardly which have a tendency to irritate the mouth of the user.

[0008] Another construction is shown in U.S. Patent No. 8,414,292. In this patent, a keyhole-shaped clip slides across an archwire slot and two wings on the clip engage stops to lock the clip in place. The locking clip is tiny, and because it is flat, it is rather flimsy and prone to failure.
BRIEF SUMMARY OF THE INVENTION

[0009] A self-ligating orthodontic bracket has an archwire cover that slides in a guide channel across an archwire slot. A flexible locking tab at the cover’s leading edge engages a ridge on the other side of the archwire slot. It flexes up and over a ridge and a spring restoring force locks it in place once it has cleared the ridge.

[0010] The foregoing and other objectives, features, and advantages of the invention will be more readily understood upon consideration of the following detailed description of the invention taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE SEVERAL DRAWINGS

[0011] Figure 1 is a perspective view of a self-ligating orthodontic bracket with a sliding archwire slot cover in a closed position.

[0012] Figure 2 is a perspective view of the orthodontic bracket of Figure 1 with the sliding cover in the open position.

[0013] Figure 3 is a top view of the orthodontic bracket of Figure 1.

[0014] Figure 4 is a sectional view taken along line 4-4 of Figure 3.

[0015] Figure 5 is a sectional view taken along line 5-5 of Figure 3.

[0016] Figure 6 is a top view of the orthodontic bracket of Figure 2.

[0017] Figure 7 is a sectional view taken along line 7-7 of Figure 6.

[0018] Figure 8 is a side elevation view of another embodiment of a self-ligating orthodontic bracket in an open position.

[0019] Figure 8A is a side elevation view of the bracket of Figure 8 in the closed position.

[0020] Figure 9 is a top view of an alternate embodiment of an orthodontic bracket in the open position.

[0021] Figure 10 is a top view of the bracket of Figure 9 in the closed position.

[0022] Figure 11 is a side cutaway view taken along line 11-11 in Figure 9.

[0023] Figure 12 is a side cutaway view taken along line 12-12 in Figure 10.

[0024] Figure 13 is a side cutaway view taken along line 13-13 in Figure 9.

[0025] Figure 14 is a cutaway view taken along line 14-14 in Figure 10.

[0026] Figure 15 is a top view of an alternate construction of a sliding archwire cover used in the embodiment of Figure 9.

[0027] Figure 16 is a cutaway view taken along line 16-16 in Figure 15.
[0028] Figure 17 is a cutaway view taken along line 17-17 in Figure 15.
[0029] Figure 18 is a side cutaway view taken along line 18-18 in Figure 15.
[0030] Figure 19 is a top view of another embodiment of a self ligating bracket with a sliding cover in an open position.

5 [0031] Figure 20 is a top view of the embodiment of the self ligating bracket of Figure 19 with the sliding cover in a closed position.
[0032] Figure 21 is a cutaway view taken along line 21-21 in Figure 19.
[0033] Figure 22 is a cutaway view taken along line 22-22 in Figure 20.
[0034] Figure 23 is a top view of a sliding cover used in the embodiment of Figure 19.

10 [0035] Figure 24 is a cutaway view taken along line 24-24 in Figure 23.
[0036] Figure 25 is a cutaway view taken along line 25-25 in Figure 23.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0037] Orthodontic treatment generally comprises dental work to correct irregularities of the teeth or of the relation of the teeth to surrounding anatomy. The irregularities may involve malocclusions with varying degrees of severity. Class 1 malocclusions, for example, may involve spacing irregularities such as excessive crowding or diastema (a gap between two adjacent teeth). Class 2 malocclusions may involve overbite conditions where the upper anterior teeth project labially over the lower anterior teeth. Class 3 malocclusions, in contrast, may involve underbite conditions where the upper anterior teeth close within the lingual side of the lower anterior teeth. For these and other observed irregularities, treatment typically involves installation of braces or mechanical aids for repositioning the teeth into correct orthodontic alignment.

[0038] Braces generally include orthodontic brackets configured for attachment to the labial or lingual surfaces of the teeth or for attachment to metallic bands secured around the teeth. The brackets typically include archwire slots within which a flexible yet resilient archwire may be engaged. Typically, each bracket is bonded to the tooth surface so that the bracket's archwire slot is oriented for engagement with the archwire. Various techniques are used for orienting the brackets. For example, an edgewise appliance comprises braces whereby each bracket is oriented and bonded to the tooth so that the archwire slot is perpendicular to the long axis of the root of the tooth. Alternatively, a straight-wire appliance includes braces whereby each bracket is oriented and bonded to the tooth so that the archwire slot is parallel to the occlusal plane (the biting surfaces of the teeth).
The archwire is typically a curved metallic wire having a rectangular or circular cross section that is bent or twisted prior to engagement with the brackets. The memory or restoring force exerted by the archwire upon the brackets serves to move the teeth into the desired alignment. Throughout the duration of orthodontic treatment, the orthodontist periodically adjusts the shape of the archwire (as well as the configuration of other attachments such as elastic bands and so forth) to achieve the correct orthodontic alignment.

Most brackets in current use incorporate tie wings or extensions that project upwardly and downwardly in a gingival-occlusal orientation and require the use of ligatures or ligating modules to hold the archwire within the archwire slots. The ligatures or ligating modules are typically donut-shaped elastomeric rings or wires that are stretched around or twisted around the tie wings.

The use of such ligatures or ligating modules presents a number of inherent disadvantages, some of which are mentioned herein. The small size of the ligatures or ligating modules requires substantial time for installation of the archwire. Because the orthodontist will typically make numerous adjustments to the archwire throughout orthodontic treatment, the orthodontist will likely remove and replace the ligatures or ligating modules numerous times. Hygiene is another problem since the use of ligatures or ligating modules increases the areas where food particles may be trapped. Further, with movement due to chewing or other activities, the ligatures or ligating modules may become detached altogether, allowing the archwire to disengage from the archwire slots.

Ligatures or ligating modules also present other limitations in terms of the forces exerted upon the brackets. For example, the labial or outward force that may be applied to a tooth having a bracket bonded to its labial surface is limited to the strength of the ligature or ligating module in the labial direction. On the same tooth, the force that may be applied in the lingual direction is not so constrained (because the force is applied against the bracket structure rather than the ligature or ligation module). Similarly, the longitudinal (or mesial-distal) forces, which may be applied along the direction of the archwire, may be limited or defined by the friction between the ligature or ligation module and the archwire. By contrast, a means for locking the archwire within the archwire slot would enhance the forces that may be exerted along the direction of the archwire. Likewise, a means for slideably retaining the archwire within the archwire slot would allow greater flexibility than available from brackets requiring the use of ligatures or ligation modules.

A self-ligating orthodontic bracket includes two separate parts, which together comprise a bracket assembly. A bracket body includes a base portion that is secured to a patient's tooth (not shown) with an adhesive or the like. The base portion supports an
upper body 16 that includes a pair of tie wing portions 17, 18, one portion extending in the
gingival direction and the other portion oriented in the occlusal direction. It is to be
understood that these directions may be reversed depending upon the bracket’s position and
the preference of the designer. The upper body 16 has an archwire slot 20 that extends in a
mesial-distal direction when the bracket 10 is installed on a patient’s tooth. The archwire slot
20 has a first sidewall 19 and a second sidewall 23. The second part is a sliding cover 22 that
engages the upper body 16 and is selectively opened and closed over the archwire slot 20 so
as to retain the archwire (not shown) or to provide access to the archwire slot 20 for
installation, removal, and/or adjustment.

[0044] The sliding cover 22 has a lower portion 24 that resembles a semi-dovetail shape.
Rounded lower side portions 25, 28 flare outwardly beyond the width of the top surface
portion. These side portions engage a guide channel 27 in the upper tie wing portion 16 of the
bracket 20. The guide channel 27 overlaps the side portions of the cover 25, 28 and retains
the cover 22 as it slides forward. A depression 21 in the top surface of the cover permits an
orthodontist to use a tool to manipulate the sliding cover from a locked to an unlocked position.
On the opposite side of the archwire slot is a receiving space 29 into which a locking tab nests
when the slide cover is in a fully closed position.

[0045] The sliding cover 22 has a flexible locking tab 24 on its forward end. The locking tab
is joined to the main body of the sliding cover by a narrow neck 26 of reduced height and
width. The neck 26 provides elasticity so that the locking tab 24 can flex in an upward (labial)
direction relative to the base 14 and spring back into a locked position under the restoring
force of the flexible neck 26. No particular shape is necessary for providing enough flex for the
locking tab 24, and other shapes such as a relief channel or merely making the tab out of a
material that permits it to act like a leaf spring are also contemplated. The locking tab 24 has
a rounded leading edge 30 in front and a straight undercut surface 32 behind the leading edge
so that the front part of the locking tab 24 forms a hook.

[0046] The leading edge of the tab 24 slides across a ridge 34 as the cover 22 is urged across
the archwire slot 20. The ridge 34 is curved or angled so that the rounded leading edge 30
easily slides up and over it. This forces the tab 24 to flex upwardly. Once the leading edge 30
clears the ridge 34, it snaps back onto the latch effectively latching the cover 22 in a closed
position. The sliding cover 22 has a length dimension such that when the cover is closed, the
forward ends 40, 42 of the flared side portions 25, 28 abut a wall 37 of the tie wing portion 17,
and the back end 39 of the sliding cover 22 is flush with the upper body portion 16 forming
essentially a smooth and continuous surface. Thus, there are no sharp protruding parts to
irritate the patient’s mouth.
To open the archwire slot 20, a tool (not shown) is inserted into the depression 21 in the top of the cover 22 and the cover is pulled back. The locking tab 24 flexes upward as the cover 22 retracts, clearing the ridge 34. The neck 26 is formed so that the spring action of the tab is not too stiff to resist the ramping action of the tab 24 over the ridge 34 as the cover is retracted.

In its retracted position, the locking tab 24 rests in a groove 44 on the opposite side of the archwire slot. This prevents the sliding cover from becoming separated from the body of the bracket. It also defines the amount of travel of the sliding cover from open position to closed position.

Figures 8 and 8A show an alternate version of the sliding cover of Figures 1-7. The lingual front edges 47a and 47b of the two side portions 26, 28 of the cover 22 each have a chamfered edge 46. With a chamfered edge as an underside surface, the cover more easily engages the archwire 50 and acts like a sliding inclined plane, pushing the archwire 50 into the slot 20 so that it contacts the bottom surface of the slot. This makes for better coupling of torquing forces to be transferred to the teeth.

An alternate bracket construction is shown in Figure 9. Bracket 100 has a base 102 and a body portion 104. The base 102 and body 104 are a single piece, preferably formed through the process of metal injection molding. A single piece molded bracket is much stronger than a conventional two piece unit in which the base and the upper body are formed separately then attached to each other. A sliding archwire slot cover 106 provides self ligation. The body portion 104 comprises two parts, a gingival portion 108 housing the cover 106 and an occlusal portion 110 which receives the cover when it closes. Labeling these parts as gingival and occlusal portions is for convenience in description only, and in actual practice the orientation of the bracket could be reversed, if desired.

In the embodiment of Figures 9-12, the cover 106 includes a pair of side wing portions 126 and 124. These portions fit within guide channels similar to those shown in Figure 4 and slide all the way across the archwire slot 112 to a ledge 120 on the gingival side of the upper bracket body, thus firmly locking the archwire in the slot.

The sliding cover 106 is similar to the cover of Figure 1. A flexible locking tab portion 114 is joined to the main body of the cover 106 by a narrow neck 116. As Figure 11 shows, the neck 116 is thin in the lingual-labial plane as well as narrow in the mesial-distal plane. This permits the tab portion 114 to flex upward (in a labial direction) when the tab encounters a ridge 118 as the cover moves from an open to a closed position. The nose 117 of the locking tab 114 has an inclined planar surface 115 that engages a curved portion 119 of the ridge 118 that is adjacent the archwire slot as the sliding cover 106 is moved from an open toward a
closed position. The inclined planar surface 115 meets the curved ridge surface 119, and as the cover 106 slides over the slot, the locking tab 114 flexes in a labial direction until it clears the ridge 118. Once this occurs, the tab portion 114, under the restoring force action of the thin neck 116, which acts as a spring, snaps down, and locks onto the ridge. A hook portion 111 of the locking tab 114 effectively latches the sliding cover shut by engaging the back surface 121 of the ridge 118. At the same time the nose 117 of the tab portion 114 contacts a stop 122 thus preventing further forward movement. The interaction of the inclined plane 115 with the curved ridge surface 119 under the force of the forward movement of the sliding cover efficiently latches the sliding cover without requiring an undue amount of force to move the locking tab up and over the ridge. It will be understood that the front of the ridge may assume other shapes that could work equally well such as a slanted or inclined surface. Similarly the nose portion of the locking tab need not be an inclined plane, but could be merely curved. What is important is not the specific form of these surfaces, but that they are formed to slide smoothly against each other and provide some mechanical advantage to overcome the stiffness of the spring effect of the neck 116.

[0053] When the cover 106 is to be retracted to an open position the process is reversed, and the cover is slid back until the hook 111 is caught by a groove 113 in the slide track 125 of the occlusal portion 108 thus preventing any further rearward movement.

[0054] Figures 13-18 show an embodiment of the sliding cover that may be used as an alternative to the sliding cover of Figures 8 and 8A. The cover 106 is in all other respects the same as that illustrated in Figures 9-12, but instead of using chamfered undersurfaces on the sliding cover, it employs insertable leaf springs to push the archwire into the archwire slot. The side wing portions 126 and 124 of the sliding cover 106 have underside (lingual) pockets that are fitted with insertable leaf springs 128 and 130. When the cover 106 moves from an open to a closed position, entraining the archwire 50 in the slot 112, the leaf springs 128, 130 apply pressure to the top of the archwire and press it down into the slot.

[0055] Figures 19-25 illustrate another alternative embodiment of a self ligating bracket. This bracket is of single piece construction as well and may be made of a clear or translucent material such as a plastic co-polymer. A bracket 200 includes a base 202 and an upper body portion 204 with an occlusal side 206 and a gingival side 208 separated by an archwire slot 210. Preferably the bracket 200 is of single piece construction formed by a three dimensional printing process.

[0056] A sliding cover 212 slides across the archwire slot 210 to close over and entrain an archwire (not shown) therein. The cover 212 has a leading edge 211 that slides across the slot 210 and in the closed position engages a ledge 214 formed in the gingival side 208 of the
upper body portion 204. The cover’s top surface includes a small depression 209 which may be
engaged by a manipulator tool (not shown) to open the cover 212. A groove 207 in the top
surface provides a means for engaging the cover with the tool to slide it into a closed position.

[0057] Referring to Figures 21 and 22, the sliding cover 212 has a recess 216 formed in its
lingual underside. A downwardly (lingually) depending leaf spring 218 is adapted to flex within
the recess 216 and engages a rear stop groove 220 in the occlusal side 206 of the bracket
when the sliding cover is in an open position. This limits rearward movement of the sliding
cover and prevents its dislodging from the upper bracket body 204. When the cover is moved
forward to a closed position, the spring 218 flexes upwardly within the recess as it slides over a
curved surface 217 that extends between the rear stop groove 220 and a forward locking
groove 222, and then snaps downwardly into the groove 222 to lock the cover in place over the
archwire slot 210. As in the embodiment of Figures 8 and 8A, the leading edge 211 of the
cover 212 may have a chamfered undersurface 224 that aids in pushing the archwire into the
slot.

[0058] The terms and expressions which have been employed in the foregoing specification
are used therein as terms of description and not of limitation, and there is no intention in the
use of such terms and expressions of excluding equivalents of the features shown and
described or portions thereof, it being recognized that the scope of the invention is defined and
limited only by the claims which follow.
CLAIM(S)
I claim:

1. A self ligating orthodontic bracket comprising:
   a body having a base surface adapted to be affixed to a tooth, said body having
   a first upper portion and a second upper portion, said first upper portion
   being separated from said second upper portion by an archwire slot
   extending through the body in a mesial-distal direction;
   said second upper portion having a ridge, said ridge having a front surface
   adjacent said archwire slot and a back surface;
   a ligating archwire cover slidably mounted on said first upper portion, said
   archwire cover having a centrally disposed, forwardly extending locking
   member comprising a flexible locking tab, wherein said locking tab is
   adapted to flex in a labial direction when said cover is moved from an open
   position toward a closed position and said locking tab engages said ridge,
   and is adapted to flex in a lingual direction to latch said sliding cover in a
   closed position thereby covering said archwire slot when said locking tab
   clears said ridge.

2. The self ligating orthodontic bracket of claim 1 wherein said locking tab comprises
   a slanted nose portion for engaging said front surface of said ridge.

3. The self ligating orthodontic bracket of claim 1 wherein said front surface of said
   ridge is slanted or curved.

4. The self ligating orthodontic bracket of claim 2 wherein said locking tab further
   comprises a hook portion for latching said cover to said back surface of said ridge.

5. The self ligating orthodontic bracket of claim 4 wherein said first upper portion
   includes a groove for engaging said hook when said archwire cover is moved from a closed to
   an open position.

6. The self ligating bracket of claim 1 wherein said ligating archwire cover further
   includes a pair of side wing portions on either side of said locking member, said side wing
   portions each having a chamfered lingual surface adjacent leading edges thereof.

7. The self ligating bracket of claim 1 wherein said ligating archwire cover further
   includes a pair of side wing portions on either side of said locking member, said side wing
portions each having a lingually flexing leaf spring for engaging an archwire when said sliding cover is moved from an open position toward a closed position.

8. The self ligating bracket of claim 1 wherein said ligating archwire cover further includes a pair of side wing portions on either side of said locking member, said side wing portions each having a length that spans said archwire slot to thereby sidewardly engage a ledge on said second upper portion when said archwire cover is moved to a closed position.

9. A self ligating orthodontic bracket comprising:
   a body having a base surface adapted to be affixed to a tooth, said body having a first upper portion and a second upper portion, said first upper portion being separated from said second upper portion by an archwire slot extending through the body in a mesial-distal direction; said first upper portion having a latching groove extending in a mesial-distal direction
   a ligating archwire cover slidably mounted on said first upper portion, said archwire cover having a recess in a lingual side thereof and a leaf spring member disposed in said recess, said leaf spring member being adapted to flex lingually and engage said latching groove when said archwire cover is moved from an open position to a closed position.

10. The self ligating orthodontic bracket of claim 9 wherein said archwire cover includes a leading edge, said leading edge having a chamfered lingual surface.

11. The self ligating orthodontic bracket of claim 9 wherein said first upper portion includes a second groove displaced from said latching groove, said leaf spring engaging said second groove when said archwire cover is moved from a closed to an open position.

12. The self ligating orthodontic bracket of claim 11 wherein said first upper portion includes a curved labial surface connecting said latching groove with said second groove.
FIG. 15

FIG. 16

FIG. 17

FIG. 18
**INTERNATIONAL SEARCH REPORT**

**INTERNATIONAL APPLICATION**

International application No. PCT/US 13/70140

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(8) - A61 C 3/00 (2013.01)

USPC - 433/1 0

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

**B. MINIMUM DOCUMENTATION SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

USPC: 433/16, 10

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

USPC: 433/8, 11, 14, 16, 17 (keyword limited; terms below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PatBase: Google Patents; Google

Search Terms Used: latch, "clip", "lock", slide*, tab, cover, cap, closure, archwire, leafspring, leaf spring, chamfer*, "bevel", orthodontic, ligature, bracket, two, dual, second, groove%, sloth%, mov%, spring

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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</thead>
<tbody>
<tr>
<td>X</td>
<td>US 5,275,557 A (DAMON) 04 January 1994 (04.01.1994) fig 1-3, 5-6, col 3, In 63-65, col 5, In 28-41</td>
<td>1-4, 8</td>
</tr>
<tr>
<td>Y</td>
<td>US 8,029,276 B1 (LOKAR) 04 October 2011 (04.10.2011) 1 fig 7, 8</td>
<td>5-7</td>
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<tr>
<td>Y</td>
<td>US 5,322,435 A (PLETCHER) 21 June 1994 (21.06.1994) fig 9, 10, 11</td>
<td>9</td>
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Further documents are listed in the continuation of Box C.

- Special categories of cited documents:
  - A: document defining the general state of the art which is not considered to be of particular relevance
  - E: earlier application or patent but published on or after the international filing date
  - L: document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
  - O: document referring to an oral disclosure, use, exhibition or other means
  - P: document published prior to the international filing date but later than the priority date claimed
  - T: later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
  - X: document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
  - Y: document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
  - S: document member of the same patent family

Date of actual completion of the international search: 05 March 2014 (05.03.2014)

Date of mailing of the international search report: 17 APR 2014

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450
Facsimile No. 571-273-3201

Authorized officer: Lee W. Young

PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774

Form PCT/ISA/2 10 (second sheet) (July 2009)
INTERNATIONAL SEARCH REPORT

<table>
<thead>
<tr>
<th>Box No. II</th>
<th>Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)</th>
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<td></td>
<td>This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:</td>
</tr>
<tr>
<td></td>
<td>1. ☑ Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:</td>
</tr>
<tr>
<td></td>
<td>2. ☑ Claims Nos.: because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:</td>
</tr>
<tr>
<td></td>
<td>3. ☑ Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).</td>
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</table>

<table>
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<tr>
<th>Box No. III</th>
<th>Observations where unity of invention is lacking (Continuation of item 3 of first sheet)</th>
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<tbody>
<tr>
<td></td>
<td>This International Searching Authority found multiple inventions in this international application, as follows:</td>
</tr>
<tr>
<td></td>
<td>This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid:</td>
</tr>
<tr>
<td></td>
<td>Group I (Claims 1-8) is drawn to a self ligating orthodontic bracket.</td>
</tr>
<tr>
<td></td>
<td>Group II (Claims 9-12) is drawn to a self ligating orthodontic bracket.</td>
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<tr>
<td></td>
<td>---------Continued on Supplemental Page---------</td>
</tr>
</tbody>
</table>

|            | 1. ☑ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims. |
|            | 2. ☑ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees. |
|            | 3. ☑ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.: |
|            | 4. ☑ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.: |

| Remark on Protest | ☑ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee. |
|--------------------| The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation. |
|                    | ☑ No protest accompanied the payment of additional search fees. |
The inventions listed as Groups I and II do not relate to a single general inventive concept under PCT Rule 13.1 because under PCT Rule 13.2 they lack the same or corresponding technical features for the following reasons:

The special technical features of Group I are said second upper portion having a ridge, said ridge having a front surface adjacent said archwire slot and a back surface; and said archwire cover having a centrally disposed, forwardly extending locking member comprising a flexible locking tab, which are not required by Group II.

The special technical features of Group II are said first upper portion having a latching groove extending in a mesial-distal direction; and said archwire cover having a recess in a lingual side thereof and a leaf spring member disposed in said recess, which are not required by Group I.

Groups I and II share the technical features of a self ligating orthodontic bracket having a body having a base surface adapted to be affixed to a tooth, said body having a first upper portion and a second upper portion, said first upper portion being separated from said second upper portion by an archwire slot extending through the body in a mesial-distal direction; and a ligating archwire cover slidably mounted on said first upper portion. However, this shared technical feature does not represent a contribution over prior art, specifically US 2012/0028206 A1 (LOPES). Lopes teaches a self ligating orthodontic bracket having a body (10) having a base surface (bottom of 10, fig 3) adapted to be affixed to a tooth (para [0019]), said body having a first upper portion (6) and a second upper portion (5), said first upper portion being separated from said second upper portion by an archwire slot (2) extending through the body in a mesial-distal direction; and a ligating archwire cover (3) slidably mounted on said first upper portion (fig 1, 3, para [0059]).

As the common technical features were known in the art at the time of the invention, these cannot be considered special technical feature that would otherwise unify the groups.

Therefore, Groups I and II lack unity under PCT Rule 13 because they do not share the same or corresponding special technical feature.