

[54] **ORTHODONTIC BRACKET**

[75] Inventor: **Alexander J. Wildman**, Eugene, Oreg.

[73] Assignee: **Consyne Corporation**, Glendora, Calif.

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[52] U.S. Cl. **32/14 A**

[51] Int. Cl. **A61c 7/00**

[58] Field of Search **32/14 A**

[56] **References Cited**

UNITED STATES PATENTS

3,578,744 5/1971 Wildman 32/14 A

Primary Examiner—Louis G. Mancene

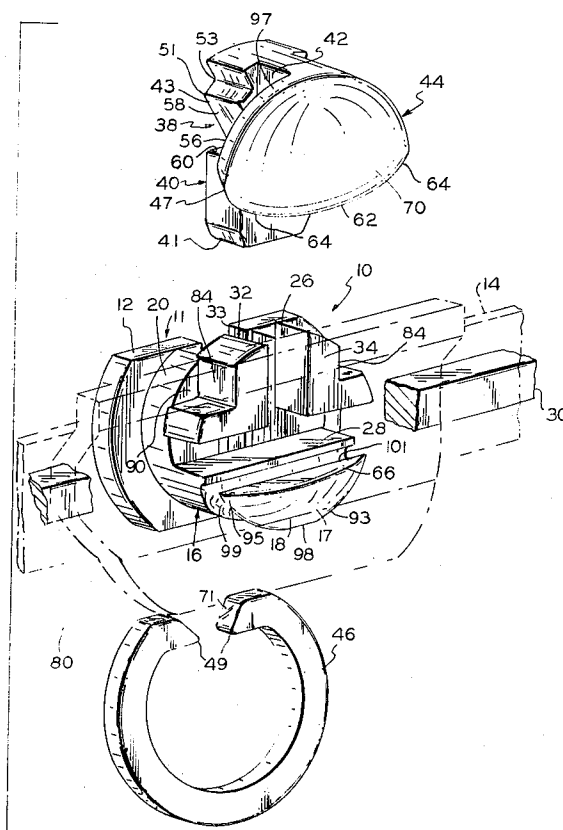
Assistant Examiner—J. Q. Lever

Attorney—Stephen W. Blore et al.

[57] **ABSTRACT**

An arch wire is held in a slot in a bracket body by a finger of a hook-like follower having a camming portion adapted to push the arch wire into the slot. The finger has a rounded labial surface blending with a labial portion of a head of the body and has wedging surfaces adapted to move the follower to its open position. A snap ring engages somewhat abrupt shoulders on the follower to strongly hold the follower in its closed position, and engages less abrupt shoulders on the follower to weakly hold the follower in its open position. The body has a saddle horn portion to connect elastics to the body, and has notches for receiving auxiliary equipment.

13 Claims, 9 Drawing Figures



SHEET 1 OF 2

FIG. 1

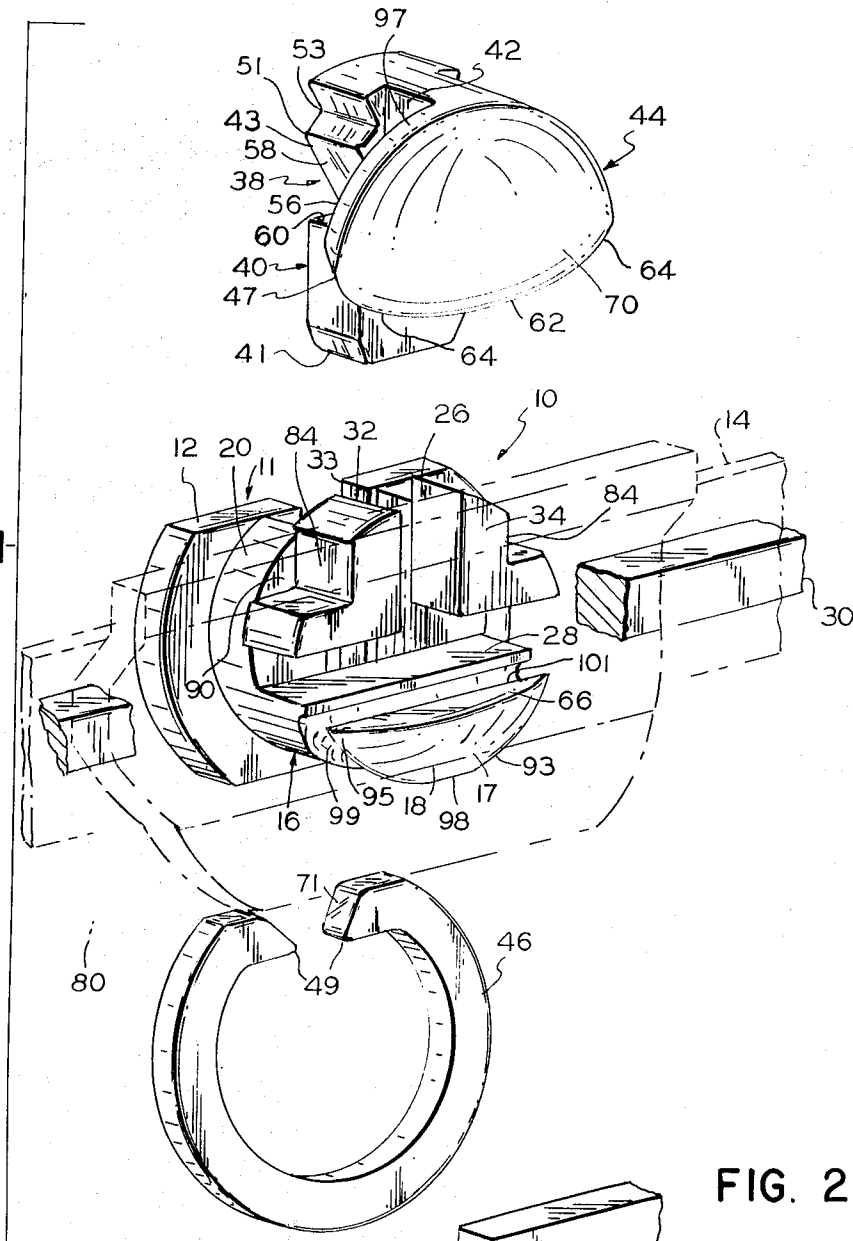


FIG. 2

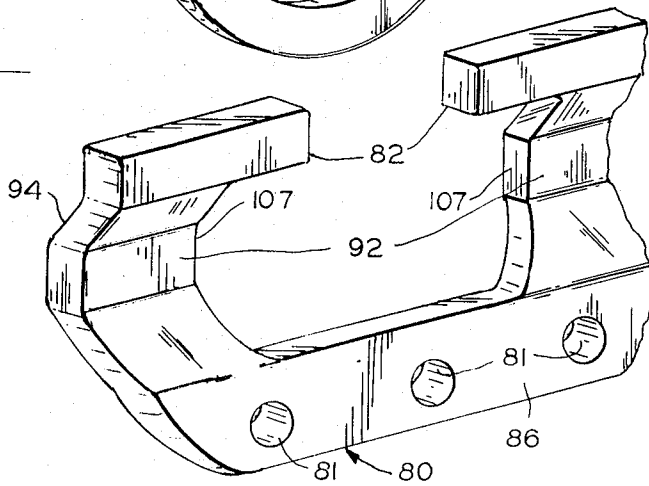


FIG. 3

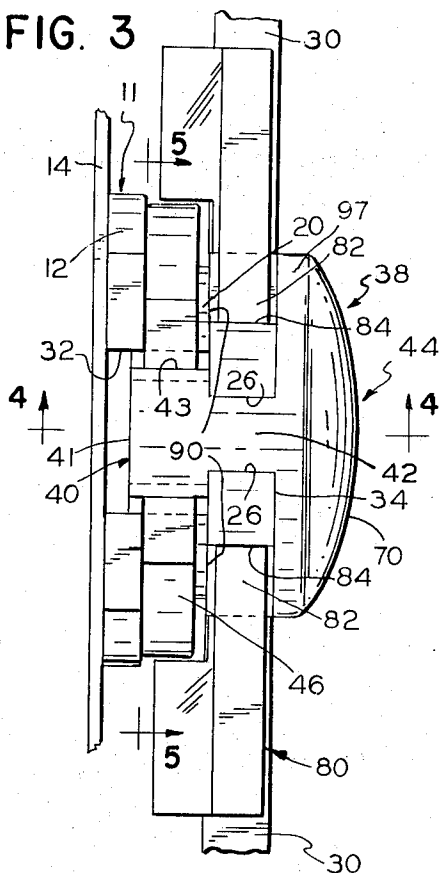


FIG. 5

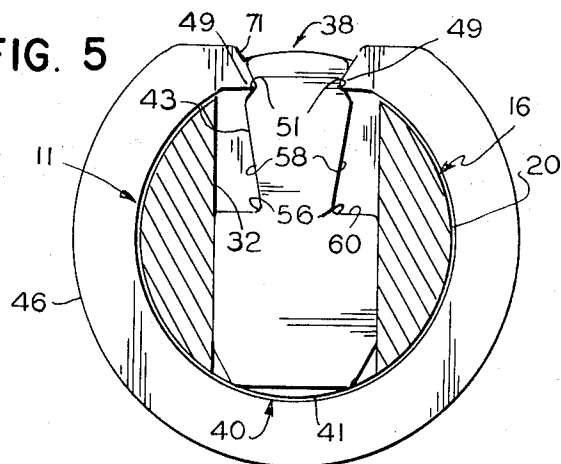


FIG. 6

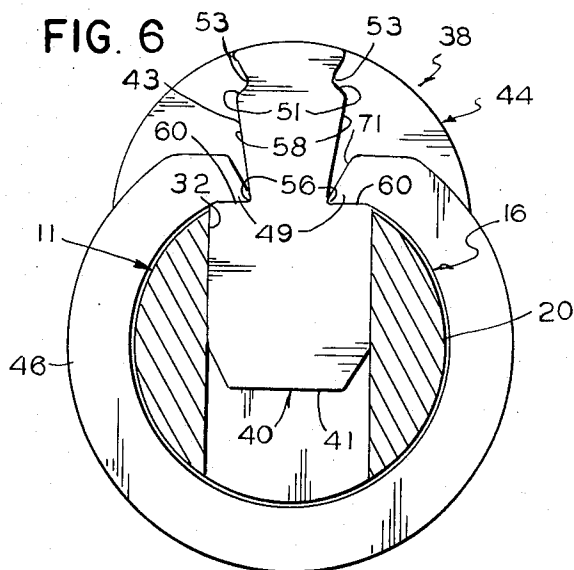


FIG. 4

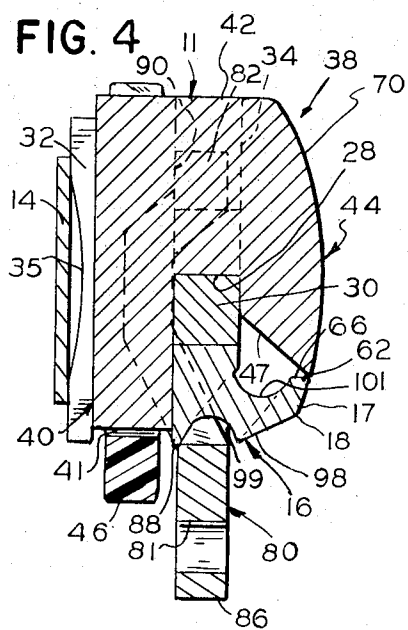


FIG. 7

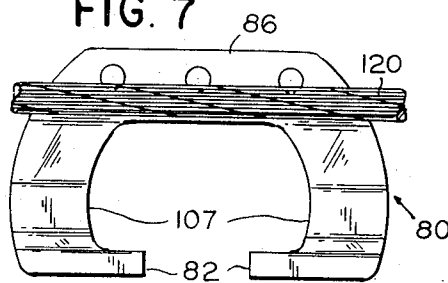


FIG. 8

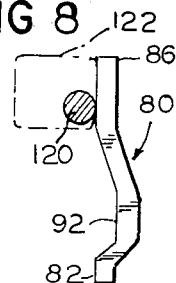
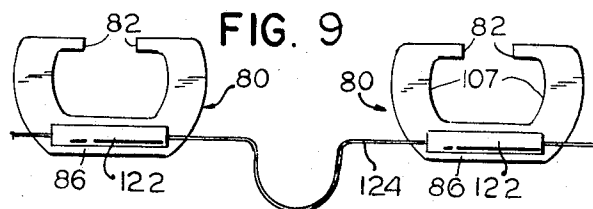


FIG. 9



ORTHODONTIC BRACKET

BACKGROUND OF THE INVENTION

In accordance with what is known as the direct method of orthodontic work, bands are positioned around the individual teeth of a patient with brackets to permit connection of the band to the arch wire and various spring wires as are ordinarily utilized. This technique requires considerable skill and judgment on the part of an orthodontist in manipulating and forming the various force applying wires so as to attain the desired movement of teeth.

In accordance with the so-called "indirect" method utilized heretofore, bands and arch wires are formed in an ideal model and then transferred to the patient. However, it is virtually impossible to secure the bands on the patient's teeth in the same location as on the model.

SUMMARY OF INVENTION

By utilizing the apparatus of the invention an orthodontist is enabled to perform the difficult and intricate task of forming an arch wire so as to obtain the desired tooth movement on an ideal model of the teeth of the patient while the arch wire is out of the mouth. Thereafter, the arch wire can be transferred to the patient's mouth and easily and quickly secured to the individual teeth by the novel brackets of the invention.

More particularly, in accordance with the invention, arch wire brackets are secured by bands to the teeth of a patient after which an impression is made of the patient's mouth. After removal of the impression, replicas of the brackets are inserted in a corresponding position in the impression and a casting made of the teeth in the course of which the brackets will become rigidly attached to the tooth castings. Thereafter, the individual tooth castings are separated and reset in an ideal model of the patient's mouth whereupon an arch wire can be formed so as to conform to the bracket locations of the teeth in the ideal model. After formation of such wire, it is transferred to the patient's mouth, whereupon the memory of the wire will apply corrective force to the teeth causing them to move towards their ideal location.

The invention includes an improved orthodontic bracket in which a snap ring engages first interlocking portions of a follower with a strong detenting force for holding the follower in a closed position on a body, and engages second interlocking portions on the follower for holding the follower in an open position with a weaker detenting force. The bracket may have a cleat for attachment of elastics, and may have connections for an auxiliary collar for engaging the arch wire outboard of the bracket to increase leverage on the bracket.

THE DRAWINGS

FIG. 1 is an exploded perspective view of an improved orthodontic bracket forming one embodiment of the invention;

FIG. 2 is a perspective view of an auxiliary collar of the bracket of FIG. 1;

FIG. 3 is a top plan view of the bracket of FIG. 1;

FIG. 4 is a vertical sectional view taken along line 4-4 of FIG. 3;

FIG. 5 is a vertical sectional view taken along line 5-5 of FIG. 3;

FIG. 6 is a vertical sectional view similar to FIG. 5 but with parts of the bracket in different positions; FIG. 7 is a fragmentary, inverted, elevation view of the auxiliary collar with an attachment;

FIG. 8 is a partially sectional, inverted, elevation view of the auxiliary collar and attachment; and

FIG. 9 is a fragmentary, elevation view of two auxiliary collars and a wire interconnecting the collars.

Referring now in detail to the drawings, there is shown therein a bracket 10 forming one embodiment of the invention and including a body 11 having a base 12 adapted to be secured as by brazing or other suitable means to a tooth band 14 which is mounted upon the patient's tooth in any conventional manner. The bracket also includes a head portion 16 having a saddle horn or cleat 17 having a labial surface 18. As indicated, the base and head portions are preferably of circular configuration, but need not be so, and extending between them is a shank 20 which is of reduced diameter with respect to both the base portion 12 and the head portion 16. The head portion 16 is formed with a horizontal groove 28 therein for receiving an arch wire 30. Preferably, but not necessarily, both the groove 28 and the arch wire 30 are of rectangular configuration. The head portion 16 is also provided with a vertical slot or notch 26. A vertical groove or guideway 32 extends through the base and shank portions and preferably being of rectangular cross section. The slot 26 extends between the groove 32 and outer, planar face 34 of the head. The base 12 has a planar, annular surface 33 and a concave, frustospherical portion 35 to accommodate the convex portion of a tooth.

A generally U-shaped locking member or follower 38 includes a base 40 having a slide 41 of rectangular cross section adapted to be slidably received within the groove 32 and a latching portion 43. Extending forwardly from the base 40 is an arm or bridge 42 fitting closely and slidably in the slot 26. At the end of the arm 42 is a button-like locking finger or head 44 adapted to extend across the open side of the groove 28 and hold the arch wire 30 when the same is in the groove 28, compound inclined wedging or camming face 47 of the finger 44 serving to force the arch wire into the groove when the follower is moved to its closed position if the arch wire is initially only half way in the groove. The finger covers the entire length of the groove to give good leverage from the arch wire to the bracket. The finger has no rough edges or sharp corners.

The follower 38 is adapted to be locked in place by a snap ring 46 (FIGS. 4 and 5) which, in turn, is adapted to be engaged about the shank 20, pointed, slightly hooked end portions 49 of the snap ring extending over sloping, rounded, shoulders 51 of strongly detenting notches 53 of the latching portion 43 when the follower is in its closed position as shown in FIG. 5. This locking action prevents popping open of the follower. The latching portion has less strongly detenting notches 56 having gently tapering or inclined surfaces 58 providing a weak detenting action to move the follower to and hold the follower in its open position as shown in FIG. 6. Abrupt shoulders 60 prevent upward movement of the follower beyond its open position. The snap ring 46 holds the follower in its closed position with a strong detenting action, and holds the follower in its open position with a less strong, somewhat soft detenting action. To move the follower to its closed position, the orthodontist merely presses, with a finger

or tool, the follower down until the snap ring engages the rounded shoulders, and then the snap ring pulls the follower down until end 62 (FIG. 4) of the finger 44 engages the saddle horn 17. To move the follower to its open position, the finger 44 has inclined or wedging edge portions 64 opposite planar edge 66 of the saddle horn, and jaws of a plier-like tool may be forced between the portions 64 and the edge 66 to wedge the follower slightly away from its closed position until the pointed end portions 49 of the snap ring are in engagement with the inclined surfaces 58. Then the snap ring forces the follower to its open position in which the finger 44 clears the groove 28. The snap ring acts as an overcenter spring to either snap the follower closed or to move the follower to a fully open position. The follower opens with a click and closes with a click.

Labial surface 70 of the finger and labial surface 18 of the saddle horn 17 form a button-like or frusto-spherical surface so as to not irritate adjacent portions of the mouth. It should be noted that biting action of the user always tends to move the follower toward its closed position.

The snap ring 46 (FIGS. 5 and 6) is provided with inclined end surfaces 71. To assemble the follower 38 with the body, the lower end of the follower is pushed against the end surfaces 71 to spread the ends of the snap ring apart, and the follower is pushed on into the slot 32 at least to its open position. The follower keeps the snap ring from rotating on the bracket.

An elongated, rigid, C-shaped auxiliary collar 80 (FIGS. 1 and 2) may be mounted on the bracket when, for example, there is desired greater leverage for rotation of the tooth than is provided by engagement of the bar-like arch wire 30 with the outer ends of the bottom of the groove 28. Before the arch wire 30 is inserted, aligned pintle portions 82 of the collar are inserted into notches 84 in the head 16 and the connecting bar 86 of the collar is snapped over the saddle horn 17. Next the arch wire 30 is inserted into the groove 28 and pressed into engagement with the bottom surfaces of the aligned, outboard grooves 92 formed in the opposite wings 94 of the collar. The follower 38 is then moved downwardly into its locked, operative position whereupon the arch wire 30 is relatively rigidly engaged within the groove 28, the arch wire in turn pressing against the auxiliary collar 80 so that the pintle portions 82 bear against the sidewalls or stop portions 90 defining in part the notches 84 and the connecting bar 86 of the collar bears against the inclined surface 88 which also acts as a stop portion. As will be apparent, the arch wire 30 may be removed from the bracket for adjustment and replacement without requiring removal of the collar 80.

The saddle horn 17 has a bar-like cleat 93 having end surfaces 95 forming portions of the same cylinder as the head 16 and radially external surface 97 of the follower 38. The saddle horn also has a reduced shank 99. The cleat 93 is relieved at 98 to permit the auxiliary collar 80 to be snapped over it during assembly or disassembly. The saddle horn serves as a connector for an arch wire, elastics or other auxiliary devices, a groove 101 being provided for a round arch wire, the finger 44 holding the round arch wire in the groove.

The bar 86 (FIG. 2) of the auxiliary collar 80 may have holes 81 therein for attaching wires or other auxiliary equipment to the collar. Also, auxiliary equipment may be brazed or welded to the bar 86. For example,

a wire, a spring or a buccal tube, either round or rectangular, may be brazed to the bar 86 for attachment of springs, arch wires, retraction devices or other auxiliaries. Inner edge portions 107 also provide areas for attachment of auxiliary devices. If desired, the collar may be provided with fulcrum projections projecting from the bottom of the groove 92 at the end portions of the groove 92 to increase the rotation leverage.

The bracket, collar and follower are preferably formed of stainless steel, scandium or other suitable corrosion resistant, high strength metal and can obviously also be formed of high strength plastic or other material. The groove 28 and arch wire 30 are preferably of such dimension as to form a close fit, but they should, at the same time, permit some longitudinal movement of the arch wire 30 through the groove 28. Such movement is necessary, of course, to permit adjustment of the position of the bracket on the arch wire as a tooth rotates under pressure applied to it through the arch wire. Likewise, the clearance between the finger 44 and an arch wire 30 must be such as to permit sliding movement of the wire.

To attach the arch wire 30 to the bracket 10, the follower 38 is mounted on the body 11 with the snap ring 46 engaged in the notches 56 so that the groove 28 is clear. The arch wire 30 is then inserted within the groove 28 and positioned against the rear wall of such groove and pressure then applied to the follower 38 to cause it to move downwardly, thereby moving the finger 44 over the arch wire 30 to hold it in position. When the shoulders 51 of the follower 38 clear the ends of the snap ring 46, the snap ring closes over the tops of the shoulders 51 to retain the follower in its closed position with a strong detenting force.

To remove an arch wire, the process is reversed, that is, the orthodontist pushes the follower to its open position with a suitable plier-like tool if desired to move the follower 38 upwardly until the ends of the snap ring 46 engage in the notches 56. At this point the finger 44 will have cleared the groove 28 so that the arch wire 30 can be moved sideways and out of the groove 28. While the bracket of this embodiment has been illustrated in connection with a rectangular arch wire 30, it will be obvious that round arch wires or bundles or two or more arch wires can be suitably utilized.

In FIGS. 7 and 8, the auxiliary collar 80 (shown in an inverted position) is shown with an arch wire 120 welded thereto. Also, in FIG. 8, a tube 122 may be welded to the collar. In FIG. 9, two auxiliary collars 80 are shown with a wire 124 passing through tubes 122. The constructions shown are merely illustrative of the many attachments that may be made to the auxiliary collars.

I claim:

1. In an improved orthodontic bracket, a rigid auxiliary collar of a predetermined length having an opening therethrough and having a shallow groove, a body having a base and head portion having an arch wire receiving groove open at the side thereof more remote from the base, the collar being adapted to be passed over the head portion and engage the side of an arch wire in the groove adjacent the base at points spaced substantially beyond the ends of the groove, the body having stop portions holding the collar in a position in which the portions of the collar beyond

the ends of the groove are substantially flush with the bottom of the groove,

and means for retaining the arch wire in the groove.

2. The improved orthodontic bracket of claim 1 wherein the collar is C-shaped.

3. In combination,

a body having a guideway and a retaining opening open at one side,

a locking member having a slide portion slidable in the guideway, a locking portion for covering said one side of the opening and a latching portion, and a snap ring detenting spring mounted on the body,

the locking member having shoulder portions engaged by the detenting spring for holding the locking member against movement relative to the body with a predetermined force when the locking member is in a closed position relative to the body, the locking member also being provided with sloping camming portions engagable by the detenting spring to hold the locking member in an open position with a force substantially less than said predetermined force.

4. In combination,

a body having a guideway and a retaining opening open at one side,

a locking member having a slide portion slidable in the guideway, a locking portion for covering said one side of the opening and a latching portion, and a snap ring detenting spring mounted on the body,

the locking member and the detenting spring having first interlocking portions for holding the locking member against movement relative to the body with a predetermined force when the locking member is in a closed position relative to the body, the locking member and the detenting spring also being provided with second interlocking portions for holding the locking member in an open position with a force substantially less than said predetermined force,

the locking member having a first pair of notches defining the first interlocking portions and a second pair of notches defining the second interlocking portions,

the first pair of notches having sides with a predetermined slope and the second pair of notches having sides with a slope substantially less than said predetermined slope.

5. In combination,

a body having a guideway and a retaining opening open at one side,

a locking member having a slide portion slidable in the guideway, a locking portion for covering said one side of the opening and a latching portion,

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and a snap ring detenting spring mounted on the body,

the locking member and the detenting spring having first interlocking shoulder portions for holding the locking member against movement relative to the body with a predetermined force when the locking member is in a closed position relative to the body, the locking member and the detenting spring also being provided with second interlocking cam portions for holding the locking member in an open position with a force substantially less than said predetermined force,

the end portions of the spring extending over one end of the guideway and being bevelled to facilitate insertion of the locking member into the guideway.

6. In combination,

an orthodontic arch wire receiving bracket including a body having a guideway and an arch wire receiving groove open at one side,

a locking member having a slide portion slidable in the guideway, a locking portion for covering said one side of the groove and a latching portion, and a detenting spring mounted on the body,

the locking member and the detenting spring having interlocking shoulder and detent portions for holding the locking member against movement relative to the body with a predetermined force when the locking member is in a closed position relative to the body,

the locking member and the detenting spring also being provided with interlocking sloping cam and detent portions for holding the locking member in an open position with a force substantially less than said predetermined force.

7. The combination of claim 6 wherein the locking member is generally U-shaped with one arm forming the slide portion and the other arm forming the locking portion.

8. The combination of claim 7 wherein said other arm has a camming end portion adapted to push the arch wire fully into the groove.

9. The combination of claim 7 wherein said other arm covers at least the major portion of the end of the body when the locking member is in its closed position.

10. The combination of claim 9 wherein said other arm is button-like in shape.

11. The combination of claim 5 including an auxiliary collar on the body and engaging the arch wire outboard of the body.

12. The combination of claim 11 wherein the collar is C-shaped and the body has notches receiving the end portions of the collar.

13. The combination of claim 11 wherein the collar is retained on the body by the arch wire.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,780,437 Dated December 25, 1973

Inventor(s) Alexander J. Wildman

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 7, change "band" to --bands--

Column 6, claim 11, line 1, change "5" to --6--

Signed and sealed this 16th day of April 1974.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents