United States Patent

[11] 3,597,845

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Division of Ser. No. 614,654, Feb. 8, 1967, Pat. No. 3,469,315.
[45] Patented **Aug. 10, 1971**

[54] **ORTHODONTIC APPLIANCE**
7 Claims, 20 Drawing Figs.

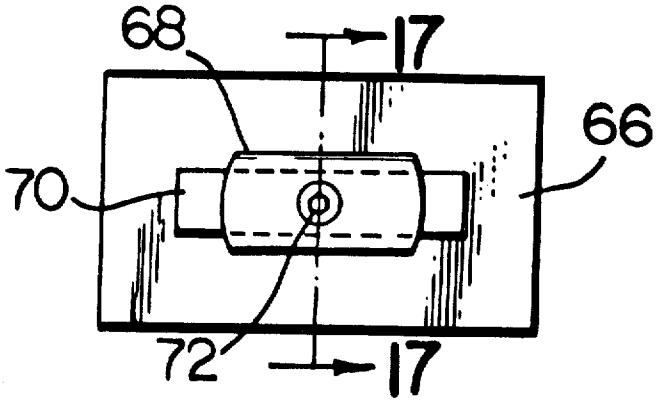
[52] **U.S. Cl.** ..... **32/14 A**
[51] **Int. Cl.** **A61c 7/00**
[50] **Field of Search** 32/14

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Attorney—Hood, Gust, Irish & Lundy

ABSTRACT: An orthodontic appliance comprising means for securing detachably an arch wire to a tooth, including a retainer which slidably receives an elongated hollow receptacle, an arch wire received by said receptacle, and means securing said retainer, said receptacle and said arch wire together.



Patented Aug. 10, 1971 3,597,845

3 Sheets-Sheet 1

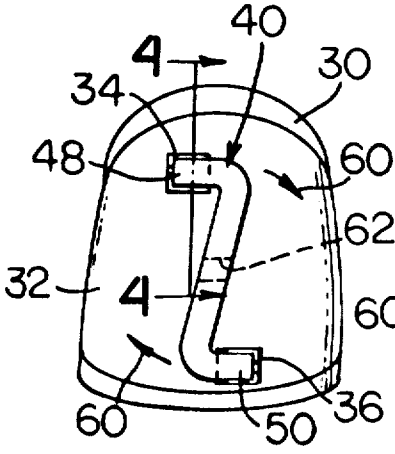


FIG. 1

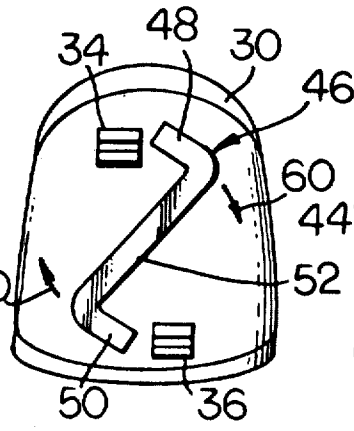


FIG. 2

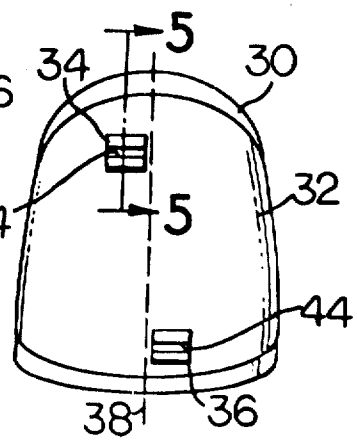


FIG. 3

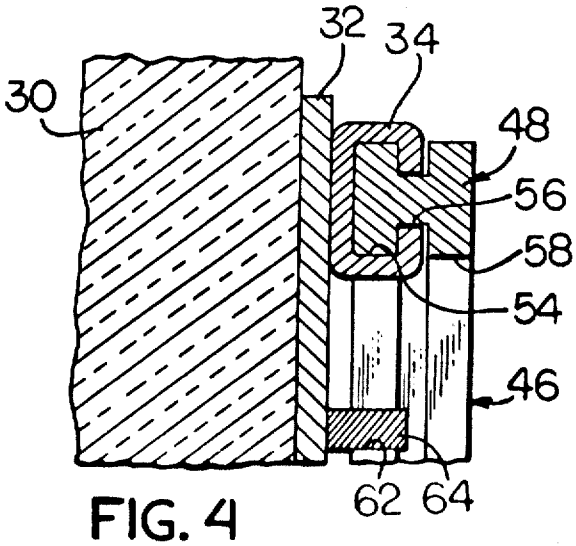


FIG. 4

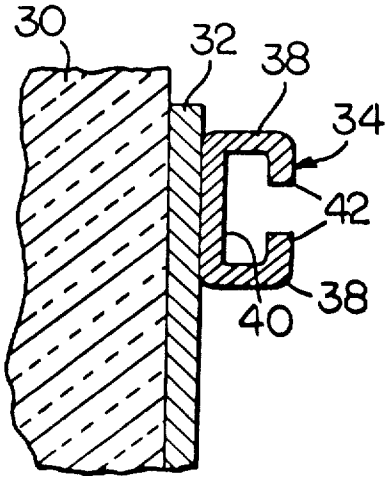


FIG. 5

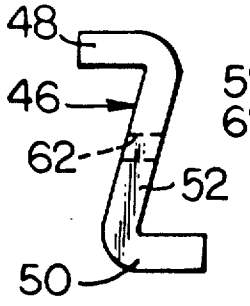


FIG. 6

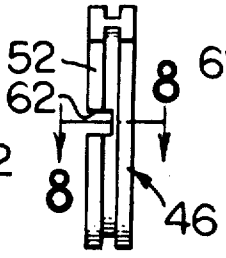


FIG. 7

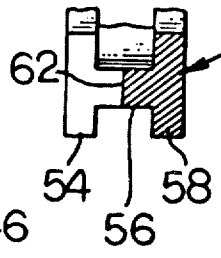


FIG. 8

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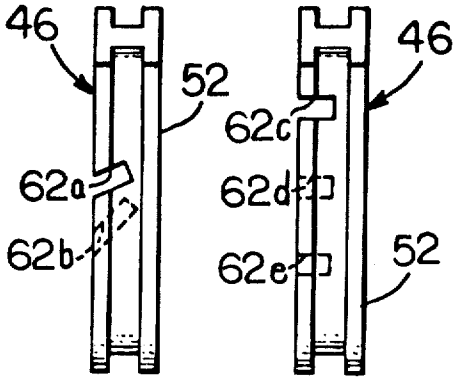


FIG. 9

FIG. 10

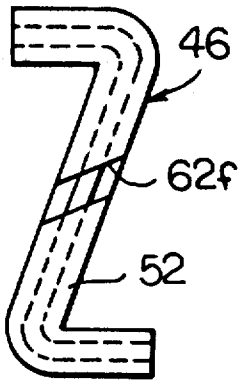


FIG. 11

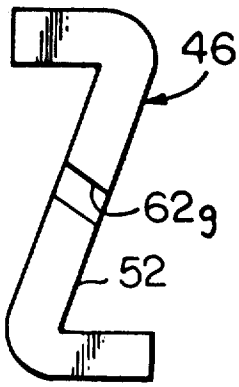


FIG. 12

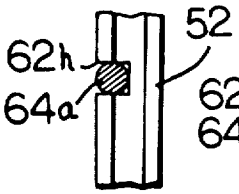


FIG. 13

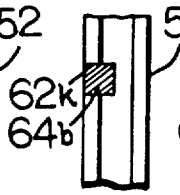


FIG. 15

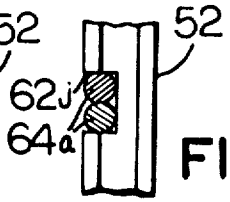


FIG. 14

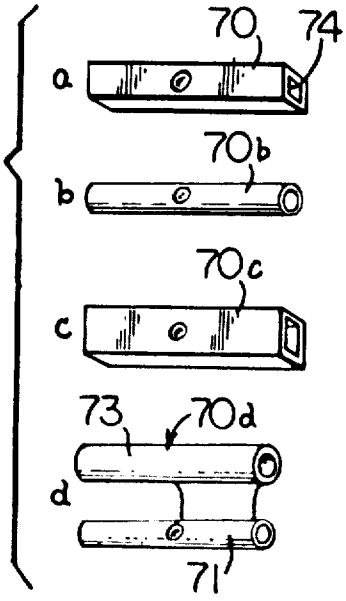


FIG. 19

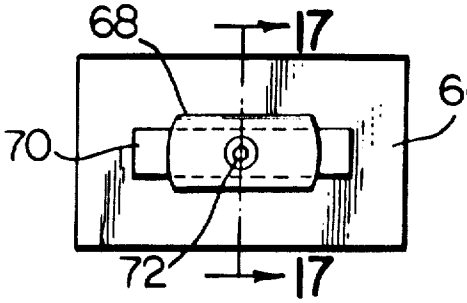


FIG. 16

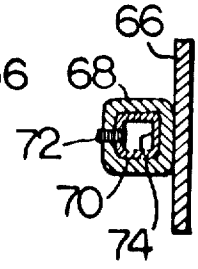


FIG. 17

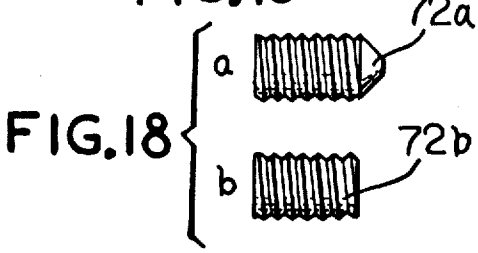


FIG. 18

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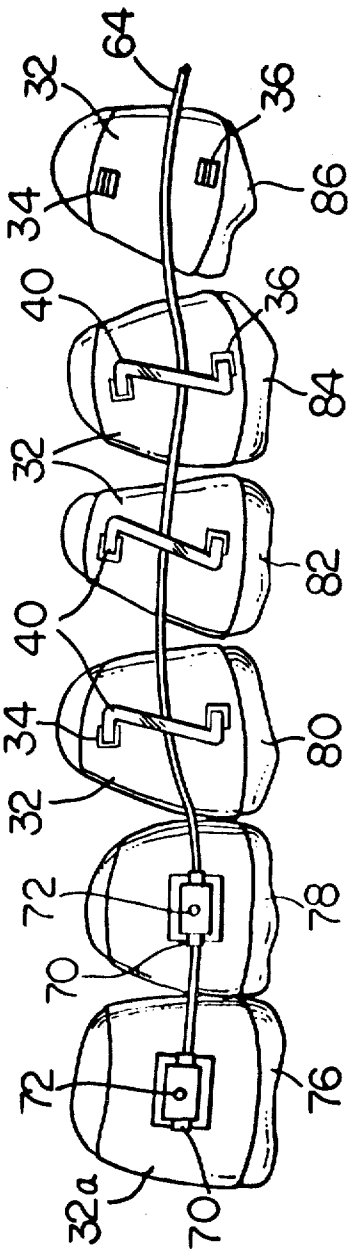


FIG. 20

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ORTHODONTIC APPLIANCE

This is a divisional application of application Ser. No. 614,654, filed Feb. 8, 1967 and now U.S. Pat. No. 3,469,315 issued Sept. 30, 1969.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to apparatus employed in orthodontics, and more particularly to an orthodontic attachment for use in attaching the arch wire of an orthodontic appliance to a tooth which is to be repositioned.

2. Description of the Prior Art

In the practice of orthodontics, it is common to straighten teeth by means of an arch wire secured to certain teeth of a dental arch. The arch wire commonly is secured to the teeth by means of an attachment, there having been developed up to the present time a multiplicity of different designs for such attachments which are variously preferred within the practice. In common installations, the opposite ends of the arch wire normally are secured to anchor teeth, which usually are molars near the back of the dental arch. The wires are passed over the labial surfaces of the teeth constituting the dental arch at preselected angles and are usually tensioned so as to apply forces to the teeth which tend to move them in directions which will effect straightening.

In the use of these prior art apparatuses, practitioners have developed a variety of techniques for installing and adjusting the same in treating a patient. In many instances, certain techniques require particularly designed apparatuses, and techniques in many instances are dictated by particular apparatus design. Certain of these techniques and designs require the use of ligatures which are tedious and time consuming to install and adjust. In almost all of these certain difficulties are encountered in connection with installation and adjustment by the orthodontist.

SUMMARY OF THE INVENTION

The present invention constitutes an improvement over prior art apparatuses in the respect of facilitating installation and adjustment. In this connection, ligatures are eliminated and installation and adjustment are facilitated by the use of brackets detachably secured in place.

It is an object of the present invention to provide an orthodontic appliance which may be installed and adjusted with facility and can be used in connection with a variety of different techniques employed in the profession.

It is still another object of the invention to provide an orthodontic appliance which includes a molar attachment conveniently operable to secure detachably an arch wire to a molar tooth.

The above-mentioned and other features and objects of this invention and the manner of attaining them will become more apparent and the invention itself will be best understood by reference to the following description of an embodiment of the invention taken in conjunction with the accompanying drawings: wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a labial side view of the crown portion of a tooth on which an orthodontic appliance relating to this invention is mounted;

FIG. 2 is a similar view illustrating one operational step involved in the detachable mounting of a bracket portion;

FIG. 3 is another similar view with the bracket removed;

FIG. 4 is a fragmentary sectional view of the tooth and appliance taken substantially along section line 4–4 of FIG. 1;

FIG. 5 is a similar sectional view taken substantially along section line 5–5 of FIG. 3;

FIG. 6 is a side view of the bracket of this invention;

FIG. 7 is an edge view thereof;

FIG. 8 is a cross section taken substantially along section line 8–8 of FIG. 7;

FIGS. 9, 10, 11 and 12 are edge and side views, respectively, illustrating the bracket provided with different wire-receiving notches;

FIGS. 13, 14 and 15 are fragmentary side views, partially sectioned for clarity, of different notch and wire configurations which may be employed;

FIG. 16 is a side view of a molar attachment;

FIG. 17 is a cross section taken substantially along section line 17–17 of FIG. 16;

FIG. 18 shows two different setscrew designs which may be employed in the arrangement of FIGS. 16 and 17;

FIG. 19 shows a series of differently shaped tubes, in perspective, which may be used in the arrangement of FIGS. 16 and 17; and

FIG. 20 is a diagram of a partial dental arch showing the use of the attachments of this invention.

DESCRIPTION OF PREFERRED EMBODIMENT

Referring to the drawings, and more particularly to FIGS. 1 through 8, a typical tooth 30 has applied to the crown thereof a conventional metal band 32 which completely surrounds the tooth in tight-fitting relation. As shown more clearly in FIGS. 3 and 5, secured to the labial side of the band 32 are two retaining sockets or anchoring devices 34 and 36 formed of a suitable metal which is to some degree resilient, these anchors 34 and 36 being vertically spaced as far as possible on the band 32 and positioned adjacent to and on opposite sides of the longitudinal center line 38 of the tooth as shown. Preferably, the band 32 covers substantially the entire labial side of the crown so that the two anchors 34 and 36 can be spaced relatively far apart.

The two anchors 34 and 36 are constructed identically, such that a description of one will suffice for both. Referring more particularly to FIGS. 3 and 5, each anchor is channel shaped, being provided with upstanding sides 38, a bottom 40 and two inturned flanges 42 as shown. The ends of the flanges 42 are spaced slightly apart so as to provide a slotlike gap 44 therebetween as more clearly shown in FIG. 3.

These anchors 34 and 36 may be fastened to the band 32 by any of the usual means, such as by welding, soldering or the like.

The bracket which detachably fits the anchors 34 and 36 is indicated by numeral 40 and is shown in detail in FIGS. 6, 7 and 8. This particular bracket 40 in cross section is H-shaped as shown more clearly in FIG. 8; however, as will become more apparent from the following description, other cross-sectional shapes may be used without departing from the spirit and scope of this invention. This bracket 40 in side view, as shown in FIG. 6, is Z-shaped, having opposite, parallel-extending end attachments as indicated by the numerals 48 and 50, respectively. The stem or midportion 52 of the bracket 46 is straight and elongated as shown and is joined at the opposite ends thereof in relatively smooth curves to the barlike attachments or ends 48 and 50, respectively.

As shown more clearly in FIGS. 1, 2 and 4, the ends 48 and 50 of the bracket snugly fit into the channels 34 and 36, respectively, the flange portion 54 of the bracket end 48 fitting into the cavity or channel portion of the anchor 34 as shown more clearly in FIG. 4 so as to be gripped frictionally thereby. The bar portion 56 of the bracket as viewed in FIG. 4 extends outwardly through the slot 44 and preferably is frictionally engaged by the anchor flanges 42. This positions the outermost flange 58 in overlying relation with respect to the anchor 34.

The bracket end 48 is insertable into the anchor 34 and frictionally interfits therewith. The bracket end 50 similarly frictionally interfits into the respective bracket 36.

As shown more clearly in FIG. 2, by rotating the bracket 46 in the direction of the two arrows 60, the bracket 46 may be easily and quickly removed from the anchors 34 and 36.

Reverse rotation of the bracket **46** results in insertion of the bracket ends **48** and **50** into the respective anchors **34** and **36**.

As shown more clearly in FIG. **4**, when the bracket end is inserted into its respective anchor, the anchor flanges **42** are engageable with the bracket flange **54** to prevent outward or labial movement of the bracket **46** with respect to the anchor **34**, **36**. Counterclockwise rotation of the bracket **46** is limited, as viewed in FIG. **1**, by engagement of the bracket ends **48** and **50** with the respective anchors **34** and **36**. The significance of this will become apparent from the description later on.

As shown clearly in FIGS. **6**, **7** and **8**, at some point along the stem **52** of the bracket **46** there is provided in the lingual side thereof a notch **62** of rectangular shape. While this particular notch **62** is shown rectangular, as will appear from the description that follows, the shape may vary to fit the cross section of any given arch wire or an assemblage of such wires. Of importance is the fact, as clearly shown in FIG. **1**, that the notch **62** opens immediately adjacent to band **32** which provides a closure therefor, thereby locking or trapping the arch wires in place as will be explained more fully later on. This is more clearly shown in FIG. **4**, wherein an arch wire **64** of rectangular cross section is shown fitted into the notch **62** and as abutting against the band **32**. When the bracket **46** is locked into the anchors **34** and **36**, the arch wire **64** is firmly secured in place by engagement by the notch sides and bottom.

The shape and the position of notch **62** in the stem **52** constitute a variable which especially adapts this invention for exerting proper forces for either uprighting or torquing a tooth. This is best explained by reference to FIGS. **9** through **12** wherein notches of different shapes and positions are illustrated. In FIG. **9**, two different notches in two different positions are shown, one shown in full line and the other dashed, these being indicated by numerals **62***a* and **62***b*, respectively. The notch **62***a* is located about midway between the ends of the bracket stem **52** but is at an angle to the axis thereof. The notch **62***b* is farther removed from the center and is at a sharper angle. FIG. **10** serves to illustrate the condition in which the notches **62***c*, **62***d* and **62***e* may extend at substantially right angles to the stem axis but be located at different positions along the length of the stem. FIGS. **11** and **12** serve to illustrate that the notches **62***f* and **62***g* may extend at different transverse angles with respect to the length of the stem **52**. As will now appear obvious, the notches (there being only one notch per bracket) may be of any size or shape and may be positioned at any desired angle in the stem **52** of the bracket **46**. This, of course, permits the orthodontist to make adjustments and use various techniques in order to secure the results desired.

Different sizes, designs and shapes of arch wires may be used in the various notches, as in graphically illustrated in FIGS. **13** through **15**. In FIG. **13** is illustrated a square notch **62***h* having a circular arch wire **64***a* snugly fitted therein. In FIG. **14**, the notch **62***j* is wider so as to receive two such arch wires **64***a* in side-by-side relation. In FIG. **15**, the notch **62***k* is rectangular so as to receive snugly an arch wire **64***b* in ribbon form. Thus it is demonstrated in these FIGS. **13** through **15** that the notches may be varied in size and shape so as to accommodate different sizes and shapes of arch wires.

In using molar teeth as anchors, it is desirable to apply the molar attachment of FIGS. **16** through **19** thereto for accommodating the ends of the arch wires. This molar attachment is securely mounted on a molar band **32***a*, substantially like the previously described band **32**, and includes a mounting plate **66**, a tubular retainer **68** of square cross section and a variety of different arch wire receptacles, all as shown in FIG. **19**. If the receptacle **70** of FIG. **19** is used, this is telescopically fitted into the retainer **68** and is secured in place by means of a setscrew **72**. In FIG. **16**, the receptacle **70** is shown to be longer than the retainer **68** so as to project beyond the opposite ends thereof. The receptacle **70** has a central passage **74** for receiving the end of an arch wire. The setscrew **72** may have a pointed end as indicated by the numeral **72***a* of FIG. **18** or a flat end as indicated by the numeral **72***b*, the screw **72***a* being used when it is desired to clamp tightly the arch wire in place and the screw **72***b* when it is desired to permit the arch wire to slide within the passageway **74**. The pointed end on the setscrew **78** is adapted to dig into the arch wire and hold the same against movement, whereas the flat end on the screw **72***b* is adapted to either only lightly engage the arch wire or not at all. Since arch wire sizes and shapes vary, it is necessary to use a variety of differently shaped receptacles **70** as indicated in FIG. **19**. A round wire may be accommodated by a receptacle **70***b* which telescopically fits into the retainer **68** the same as the previously described receptacle **70**. This receptacle **70***b* is of circular cross section and is therefore adapted to receive a circular wire.

In the claims, the term "arch wire device" is intended to include all of the arch wire structures disclosed herein and equivalents thereof.

The receptacle **70***c* is rectangular and adapted to receive a ribbon wire. The receptacle **70***d* of FIG. **19** consists of two different tubes, one a round wire tube **71** rigidly fastened to a laterally offset headcap tube **70***d*, both tubes being of circular cross section. The tube part **71** is adapted to be received by the retainer **68**, this retainer also being adapted to receive all of the receptacles shown in FIG. **19** and there secured in place by means of the setscrews previously described.

The present invention is utilized as will now be explained in connection with FIG. **20**. The molar attachments are attached to two molar teeth **76** and **78** as shown, while the attachments which include the brackets **40** are applied to the teeth **80**, **82**, **84** and **86**. With all of the bands **32** and anchors **34** and **36** in place on the labial sides of the teeth, the orthodontist determines the magnitude and direction of the forces which he desires to apply for uprighting, torquing or altering the longitudinal position of the teeth as may be necessary. In this connection, the orthodontist selects particular brackets **40** having notches at the positions and at the angles desired in the brackets **40**.

In the initial application, all the brackets **40** are removed from the respective anchors **34** and **36** and the arch wire **64** is extended across the labial surfaces of the bands **32** as shown with one end thereof passed through the receptacles **70** in the two molar attachments. In this example, let it be assumed that the setscrews are those indicated in FIG. **18** by the numeral **72***a* and are tightened securely against the wire **64** to prevent the same from moving. Depending upon whether it is desired to apply a torquing, uprighting, intruding or elongating force on the tooth, brackets **40** having appropriately positioned and shaped notches are selected. With respect to the tooth **80**, the bracket **40** to be applied thereto is first applied to the wire **64** with the notch **62** straddling the same. The opposite ends of the bracket **40** are then rotated in a direction to insert them into the respective anchors **34** and **36**. The bracket **40** for the tooth **82** is applied in the same way first to the wire **64** and then fastened to the respective anchors **34** and **36**. This process is repeated for each successive tooth **84**, **86**, etc., until the project has been completed. The wire **64** is tensioned, as is conventional, so the particular angles and positions of the notches in the bracket **40** will exert the desired forces on the respective teeth.

If it is desired to make an adjustment, it is only necessary to rotate the particular bracket **40** until the ends thereof are withdrawn from the anchors **34** and **36** and then merely lift the bracket off the wire **64**. A new bracket having a slightly different positioned or shaped notch is then fitted over the wire and the ends of the bracket are inserted into the anchors **34** and **36** to apply a slightly different force to the tooth. It is thus seen that both installation and adjustment are greatly facilitated by the mere fact that the brackets **40** may be simply and easily changed until the desired force action is obtained.

As will now be obvious, no ligating wires are necessary in order to secure the arch wire **64** in place. This is for the reason that the notches **62** in the brackets **40** are located on the sides of the bracket adjacent to the teeth, such that once the brackets are installed, the wire **64** is locked in place. This further simplifies and facilitates installation and adjustment.

Recapitulating, from the foregoing description it will appear as obvious to persons skilled in the art that the present invention is adapted to be employed even though the techniques may vary. The particular shapes, sizes and positions of the notches on the brackets can result in obtaining the corrective action desired such as rotation, elongation, intrusion, torquing and the like.

Of particular importance in this invention is the fact that the anchoring devices **34** and **36** are located as far apart as possible in a direction longitudinally of the tooth. This permits the application of maximum force moments to the teeth without requiring excessive stresses on the arch wire and brackets themselves. The anchoring devices on the various bands will be positioned such that a series of brackets of the same size will fit, the only difference in the brackets being the locations, positions and sizes of the notches therein. Thus, different series of brackets will be provided for different bands, respectively.

What I claim is:

1. An orthodontic appliance comprising a hollow tubelike retainer, a supporting band carrying said retainer, an elongated receptacle having a passageway therein slidably received by said retainer, a fastening device penetrating both said receptacle and said retainer for securing them against movement with respect to each other and for alternatively securing an arch wire device in said receptacle either for reciprocal sliding movement or in fixed position relative thereto, and an arch wire device received by said receptacle in said passageway.

2. The appliance of claim **1** in which said fastening device includes a setscrew threadedly received by said retainer and engaging said receptacle to hold the latter against movement with respect thereto.

3. The appliance of claim **1** including a headcap tube secured to and being laterally offset from said receptacle and extending in a direction parallel to said receptacle.

4. The appliance of claim **2** in which said setscrew threadedly engages both said retainer and said receptacle and fixedly engages said wire device holding the latter against movement with respect to said receptacle.

5. The appliance of claim **1** in which said retainer is of orthogonal cross section and said receptacle having one of the cross sections of orthogonal and round.

6. The appliance of claim **2** in which the receptacle and said retainer threadedly receive said setscrew therethrough such that one end of the setscrew penetrates to the interior of said receptacle.

7. The appliance of claim **6** including a mounting plate which carries said retainer.