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F. W. JOHNSON  
ORTHODONTIC BRACKET

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3 Sheets-Sheet 2

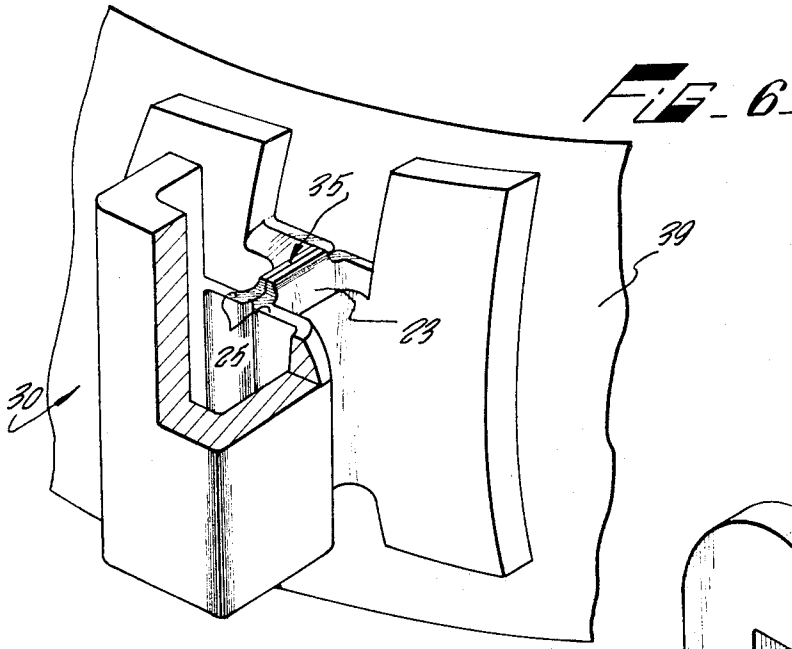
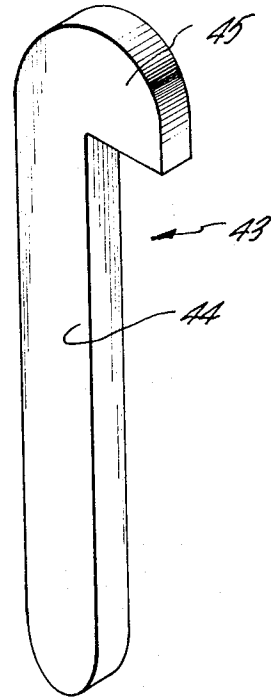
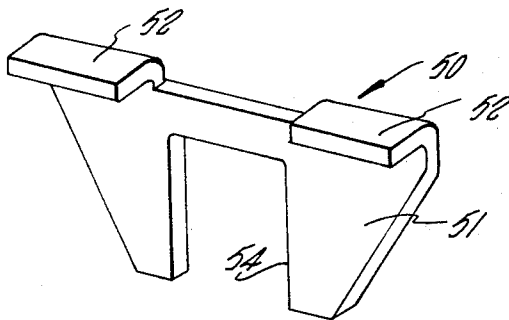


FIG. 1



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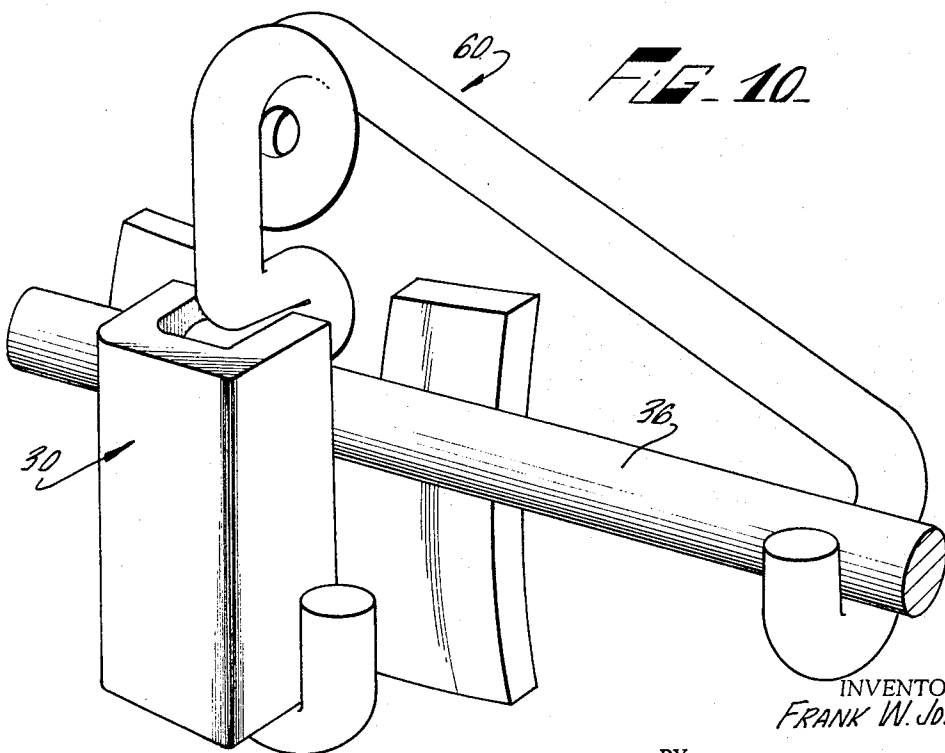
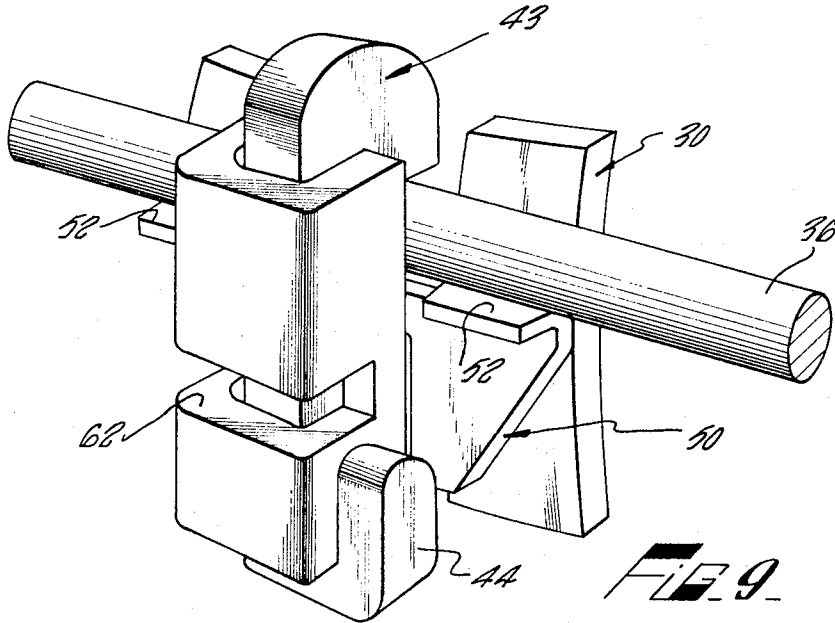
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## ORTHODONTIC BRACKET

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9 Claims. (Cl. 32—14)

This invention relates to an orthodontic bracket, and specifically to an integral, unitary bracket having a relatively sharp pivotal edge for supporting an arch wire whereby a tooth on which the bracket is mounted is free to tip in a mesiodistal direction (i.e., toward and away from the midpoint and endpoints of the dental arch).

An orthodontic method of considerable importance is known as the Begg light-wire technique. This method is described in the "American Journal of Orthodontics," volume 42, No. 7, July 1956, at page 48, in an article entitled "Differential Force in Orthodontic Treatment," by Dr. P. R. Begg. The light-wire technique employs a round arch wire of relatively small diameter which is secured to orthodontic brackets mounted on the patient's teeth. Corrective forces, typically generated by various forms of springs, are applied through the wire and brackets to urge malpositioned teeth into a desired alignment.

Certain forms of orthodontic light-wire treatment require that the malpositioned tooth or teeth be free to tip in a mesiodistal direction. When this form of treatment is required, the light arch wire should rest on a pivotal edge in the bracket, the bracket being free to rock or pivot on the arch wire whereby the tooth to which the bracket is secured is free to tip mesiodistally.

It has been proposed in the past that a pivot pin having an arrow-head shaped upper portion be fabricated as a separate component, and then installed in an orthodontic bracket to provide the desired pivotal edge along the point of the arrowhead. Such bracket assemblies, however, are expensive to manufacture, and are awkward and time consuming to use as the separate pivot pin is very small and consequently difficult to install.

The orthodontic bracket of this invention overcomes these difficulties, and includes an integral pivotal edge to support a light arch wire. The bracket is economical to manufacture as it is formed by bending a single piece of sheet metal, and is quick and easy for an orthodontist to manipulate as no separate pivot pins are required. The bracket includes an occlusalgingivally extending channel to receive a lock pin for securing the light arch wire against the pivotal edge. Auxiliary appliances, such as up-righting springs and torquing springs, may be mounted on the bracket in this channel. The bracket is also adapted to receive a stabilizing bar when the pivotal-edge feature of the bracket is no longer needed in the orthodontic treatment program.

Briefly stated, the orthodontic bracket of this invention is formed from an initially flat, unitary, elongated strip of sheet metal having front and rear sides, a top surface, and a bottom surface. A pair of longitudinally spaced-apart notches are formed on opposite sides of the center of the strip, and extend from the top surface toward the bottom surface. The strip includes a center section between the notches, a pair of flange sections on opposite ends of the strip extending away from the notches, and a pair of spaced-apart web sections extending between the center section and the flange sections. The web sections have upper surfaces, and at least a portion of the surfaces slope up from the front side toward the rear side and away from the bottom surface.

The center section of the strip is bent in a generally U-shaped configuration, whereby the rear side of the center section curves concavely to define a lock-pin chan-

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nel transverse the length of the strip. The web sections are first bent toward each other across the open end of the U-shaped configuration and are then bent to extend away from the channel with upper portions of the rear sides of the web sections in juxtaposition. The upper surfaces of the juxtaposed web sections form a relatively narrow pivotal edge to support an arch wire, the pivotal edge having a width less than two times the thickness of the strip before the strip is bent and formed.

The flange sections extend away from each other and approximately perpendicularly away from the pivotal edge, and the rear sides of the flange sections are adapted to be secured to a tooth band. The top surfaces of the flange sections are approximately level with the top surface of the center section, whereby an arch-wire channel is defined by the front sides of the flange sections, the pivotal edge, and the ends of the center section. The arch-wire channel extends approximately parallel to the flange sections and approximately perpendicular to the pivotal edge and the lock-pin channel.

Preferably, the sloped portions of the upper surfaces of the juxtaposed web sections are swaged together to raise the pivotal edge away from the bottom surfaces of the web sections. In another form of the bracket, the strip includes a pair of spaced-apart notches extending from the bottom surface toward the upper surfaces of the web sections to define a ligature notch. To facilitate attachment of the bracket to a tooth band, the rear sides of the flange sections are preferably concavely curved to conform to an average surface curvature of the tooth band.

The invention will be described with reference to the attached drawings, in which:

FIG. 1 is an elevation of a sheet metal blank from which the orthodontic bracket of this invention is formed;

FIG. 2 is a view along line 2—2 of FIG. 1;

FIG. 3 is a top view of an orthodontic bracket formed according to the invention;

FIG. 4 is a side view of the bracket;

FIG. 5 is a bottom view of the bracket;

FIG. 6 is a perspective view of the bracket, partly broken away to show a swaged pivotal edge to support a light arch wire;

FIG. 7 is a perspective view of a lock pin;

FIG. 8 is a perspective view of a stabilizing bar;

FIG. 9 is a perspective view of the stabilizing bar mounted on the bracket and supporting a light arch wire; and

FIG. 10 is a perspective view of the bracket and a combination lock pin and uprighing spring.

Referring to FIGS. 1 and 2, the first step in forming the orthodontic bracket of this invention is to cut a flat, elongated strip 10 of a suitable sheet-metal material such as stainless steel. The bracket may of course be formed in various sizes, but the strip is typically about one-quarter inch long, slightly under one-eighth inch high, and about 0.012 inch thick. The strip has a rear side 11, a front side 12, a top surface 13, and a bottom surface 14.

A pair of spaced-apart, rectangular notches 16 are cut on opposite sides of a vertical (as viewed in FIG. 1) center line of the strip to extend from top surface 13 toward bottom surface 14. A second pair of spaced-apart notches 17 are cut in vertical alignment with notches 16 to extend upwardly from bottom surface 14. A center section 19 of the strip extends between the notches, and the ends of the strip adjacent the notches form a pair of spaced-apart flange sections 20. A pair of web sections 21 join the center section to the flange sections.

As best seen in FIG. 2, the upper surface of web sections 21 includes a sloping or beveled portion 23 which slopes upwardly from front side 12 toward rear side 11.

Although the entire top surface of the web sections may be so beveled, preferably sloping portion 23 terminates short of rear side 11 to form a horizontal (as viewed in FIG. 2) portion 25. The horizontal portion of the upper surface of the web section adds rigidity and structural strength to the web section, simplifying bending of this portion of the strip to form the orthodontic bracket.

FIGS. 3-5 show the blank after a series of bending steps to form an orthodontic bracket 30 according to the invention. Center section 19 is bent in a U-shaped configuration with rear side 11 curving concavely to define a lock-pin channel 31 extending transverse the length of the strip. Web sections 21 are bent toward each other across the open end of the U-shaped center section to close the lock-pin channel, and are then bent to extend away from the channel with at least the upper portions of juxtaposed rear sides 11 of the web sections in immediate contact as shown in FIG. 3. The outer parts of the web sections are then bent away from each other to merge into outwardly extending flange sections 20. The juxtaposed upper surfaces of the web portions extending between the U-shaped center section and flange sections form a pivotal edge 35 on which an arch wire 36 is supported.

After the bracket has been formed as just described, the juxtaposed upper portions of the web sections are preferably stamped or swaged together, slightly raising pivotal edge 35 as shown in FIG. 6, and narrowing the width of the pivotal edge to a few thousandths of an inch or less. This slight raising of the pivotal edge eliminates any possibility of the light arch wire contacting or hanging up on the upper surfaces of the web sections which extend toward each other across the open end of the U-shaped center section. As seen in FIGS. 3 and 4, the arch wire is received in a channel defined by front sides 12 of the flange sections, pivotal edge 35, and the ends of the center section, the arch-wire channel extending approximately parallel to the flange sections and approximately perpendicular to the pivotal edge and the lock-pin channel.

As seen in FIG. 6, the bracket is attached to a conventional tooth band 39 by securing rear sides 11 of the flange sections to the surface of the tooth band by any convenient method such as spot welding. The rear sides of the flange sections are preferably slightly concavely contoured to match the general contour of the tooth band, simplifying mounting of the bracket on the tooth band. The arch-wire channel is defined entirely by the bracket, avoiding any reliance on exact curvature of the tooth band to control the dimensions of the arch-wire channel.

A conventional lock pin 43, suitable for use with the orthodontic bracket of this invention, is shown in FIG. 7. The lock pin includes an elongated body 44 dimensioned to fit into lock-pin channel 31 of the bracket. An enlarged head 45 is formed at the upper end of the body. As shown in phantom view in FIG. 4, head 45 extends over arch wire 36 as supported on the pivotal edge of the bracket, confining the arch wire against the pivotal edge. The lock pin is secured in place by bending the lower end of body 44 around the bottom surface of the center section of the bracket as shown in FIG. 9. The arch wire is thus confined within the arch-wire channel by the lock pin, but a tooth to which the bracket and tooth band are secured is free to tip in a mesiodistal direction as the bracket can rock freely about the arch wire.

Upon completion of the portion of the orthodontic treatment program which requires the freedom of tipping as described above, the bracket of this invention may be converted to a conventional bracket by installing a stabilizing bar 50 as shown in FIGS. 8 and 9. The stabilizing bar includes a body 51 and a pair of arch wire supporting tabs 52 bent to extend perpendicularly from the top of the body. The body includes a notch 54 whereby the stabilizing bar may be slipped over the web sections of the bracket to fit in grooves 55 (see FIG. 5) formed by the concavely bent front sides of the web

sections. As seen in FIG. 9, arch wire 36 is firmly supported on tabs 52 of the stabilizing bar, and is confined in the bracket by a lock pin 43. Of course, the arch wire may also be secured to the bracket with a conventional ligature (not shown) and the slot formed by notches 17 (see FIG. 4) provides a convenient anchor slot for securing such a ligature.

The closed lock-pin channel provided in the orthodontic bracket of this invention is advantageous in that it may receive various auxiliary appliances as commonly used in the light-wire technique. For example, a combination lock pin and uprighting spring 60 is shown installed in the bracket in FIG. 10. Corrective forces are generated by the uprighting spring, which also serves to secure the arch wire against the pivotal edge of the bracket.

FIG. 9 also illustrates an alternative form of the bracket which includes a labially opening, rectangular, auxiliary notch 62 in U-shaped center section 19 to receive a conventional rectangular-section arch wire as used in an edgewise-technique orthodontic treatment plan. The provision of the auxiliary notch allows the orthodontist to select either the light-wire or edgewise technique for various phases of a treatment program, without any need for changing brackets. The positioning of auxiliary notch 62 in the sheet-metal blank from which the bracket is formed is shown in phantom in FIG. 1.

There has been described a novel orthodontic bracket useful in the light-wire technique where mesiodistal tipping of a malpositioned tooth is desired. The bracket is of integral construction, and is inexpensive to manufacture and easily installed by the orthodontist.

I claim:

1. An orthodontic bracket for use with light-wire corrective techniques, and formed from an initially flat, unitary, elongated strip of sheet metal having front and rear sides, a top surface and a bottom surface, and having a pair of longitudinally spaced-apart notches on opposite sides of the center of the strip and extending from the top surface toward the bottom surface, the strip having a center section between the notches, a pair of flange sections on opposite ends of the strip extending away from the notches, and a pair of spaced-apart web sections extending between the center section and the flange sections, the web sections having upper surfaces, at least a portion of the upper surfaces sloping upwardly from the front side toward the rear side and away from the bottom surface;

- the center section of the strip being bent in a generally U-shaped configuration whereby the rear side of the center section curves concavely to define a lock-pin channel extending transversely the length of the strip; the web sections being bent toward each other across the open end of the U-shaped configuration and then bent to extend away from the channel with upper portions of the rear sides of the web sections in abutment, the upper surfaces of the abutted web sections forming a relatively narrow pivotal edge to support an arch wire; and
- the flange sections extending away from each other and approximately perpendicularly away from the pivotal edge, the rear sides of the flange sections being adapted to be secured to a tooth band, the top surfaces of the flange sections being approximately level with the top surface of the center section whereby an arch-wire channel is defined by the front sides of the flange sections, the pivotal edge, and the ends of the center section, the arch-wire channel extending approximately parallel to the flange sections and approximately perpendicular to the pivotal edge and the lock-pin channel.

2. The orthodontic bracket defined in claim 1 in which the sloped portions of the upper surfaces of the web sections are swaged together to raise the pivotal edge away from the bottom surfaces of the web sections.

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3. The orthodontic bracket defined in claim 2 in which the rear sides of the flange sections are concavely curved to conform to an average surface curvature of a tooth band.

4. The orthodontic bracket defined in claim 1 in which the strip has a pair of longitudinally spaced-apart notches on opposite sides of the center of the strip and extending from the bottom surface toward the upper surfaces of the web sections to define a ligature notch between the ends of the center section and the front sides of the flange sections.

5. The orthodontic bracket defined in claim 1, and further comprising a separate, unitary stabilizing bar fitted over the web sections and having a supporting tab extending across the arch-wire channel for non-pivotally supporting an arch wire.

6. The orthodontic bracket defined in claim 1, in which the U-shaped center section of the strip includes a labially opening auxiliary notch to receive a rectangular-section arch wire.

7. An orthodontic bracket for use with light-wire corrective techniques, and formed from an initially flat, unitary, elongated strip of sheet metal having front and rear sides, a top surface and a bottom surface, and having a pair of longitudinally spaced-apart notches on opposite sides of the center of the strip and extending from the top surface toward the bottom surface, the strip having a center section between the notches, a pair of flange sections on opposite ends of the strip extending away from the notches, and a pair of spaced-apart web sections extending between the center section and the flange sections, the web sections having upper surfaces, at least a portion of the upper surfaces sloping upwardly from the front side toward the rear side and away from the bottom surface;

the center section of the strip being bent in a generally U-shaped configuration whereby the rear side of the center section curves concavely to define a lock-pin channel extending transversely the length of the strip;

the web sections being bent toward each other across

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the open end of the U-shaped configuration and then bent to extend away from the channel with upper portions of the rear sides of the web sections in juxtaposition, the upper surfaces of the juxtaposed web sections forming a relatively narrow pivotal edge to support an arch wire, the pivotal edge having a width less than twice the thickness of the strip; and the flange sections extending away from each other and approximately perpendicularly away from the pivotal edge, the rear sides of the flange sections being adapted to be secured to a tooth band, the top surfaces of the flange sections being approximately level with the top surface of the center section whereby an arch-wire channel is defined by the front sides of the flange sections, the pivotal edge, and the ends of the center section, the arch-wire channel extending approximately parallel to the flange sections and approximately perpendicular to the pivotal edge and the lock-pin channel.

8. The orthodontic bracket defined in claim 7 in which the sloped portions of the upper surfaces of the juxtaposed web sections are swaged together to raise the pivotal edge away from the bottom surfaces of the web sections.

9. The orthodontic bracket defined in claim 7 in which the strip has a pair of longitudinally spaced-apart notches on opposite sides of the center of the strip and extending from the bottom surface toward the upper surfaces of the web sections to define a ligature notch between the ends of the center section and the front sides of the flange sections.

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