United States Patent

[11] **3,574,940**

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[54] **LOCKPIN FOR ORTHODONTIC BRACKET**
5 Claims, 4 Drawing Figs.

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

[56] **References Cited**

UNITED STATES PATENTS

3,093,903	6/1963	Kesling	32/14
3,163,933	1/1965	Begg et al.	32/14
3,408,739	11/1968	Johnson	32/14
3,262,207	7/1966	Kesling	32/14
3,435,527	2/1968	Kesling	32/14

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ABSTRACT: A lockpin for confining an arch wire in a light-wire orthodontic bracket. The pin has a shank which is received in a vertically extending channel in the bracket. A head extends lingually from the shank over an arch-wire channel in the bracket. The shank has a shoulder which rests on a bracket surface defining the bottom or floor of the arch-wire channel, and the shoulder serves to space the head a predetermined distance above the floor of the arch-wire channel. A portion of the pin between the shoulder and head is configured to extend lingually into the arch-wire channel to adapt the bracket for use with an arch wire having a diameter smaller than the width of the arch-wire channel.

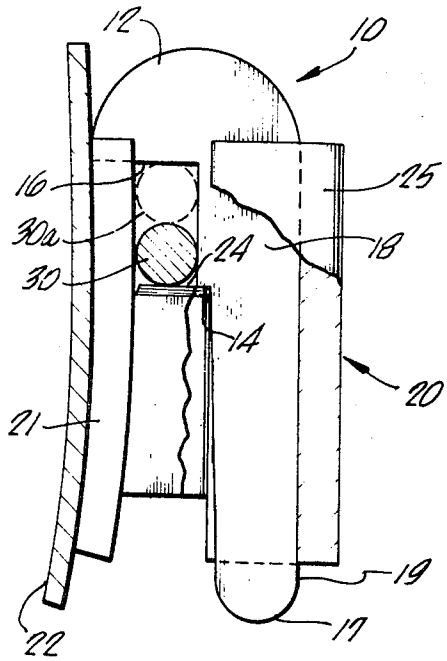


FIG. 1

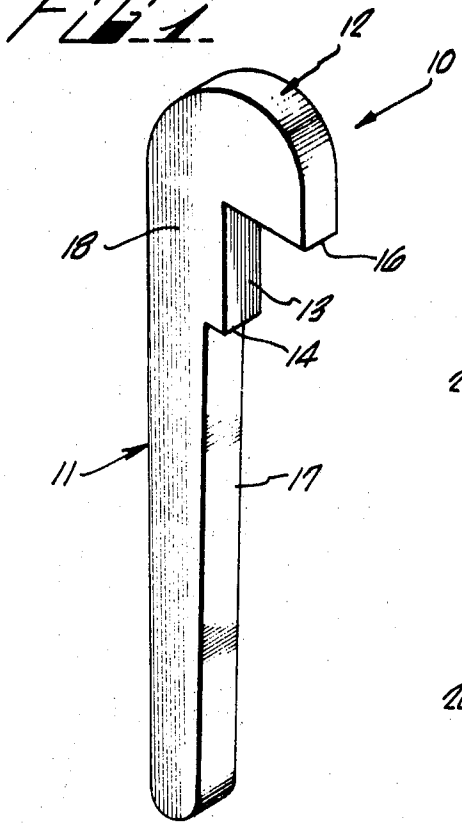
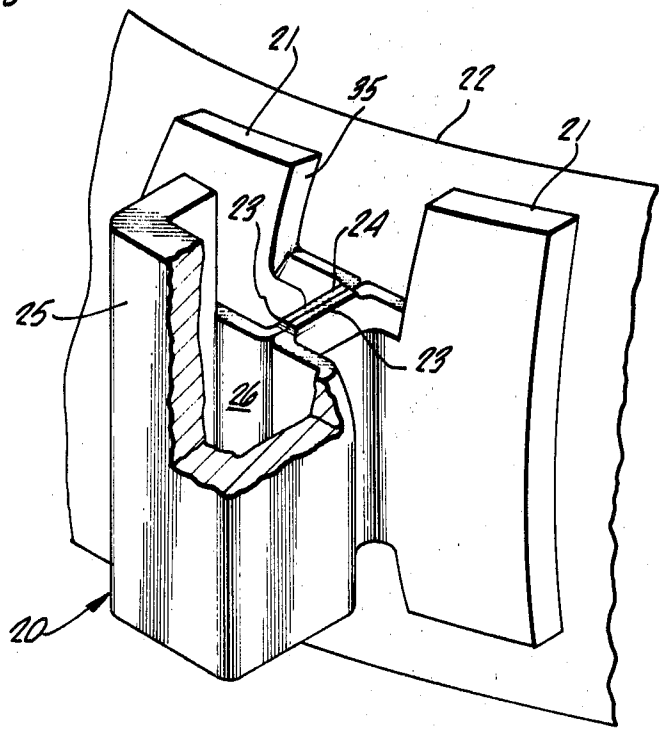


FIG. 2



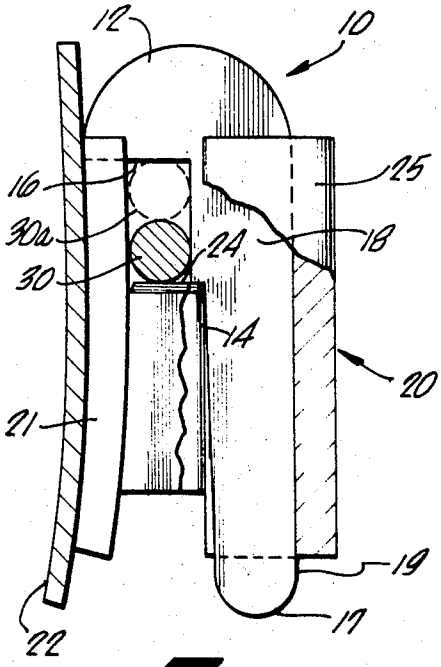


FIG. 3

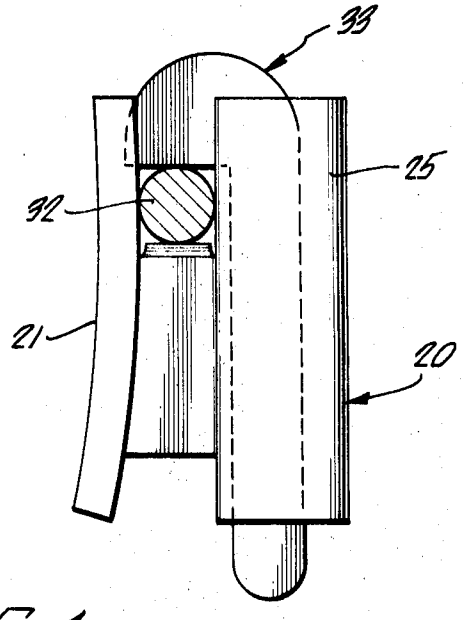


FIG. 4

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LOCKPIN FOR ORTHODONTIC BRACKET

BACKGROUND OF THE INVENTION

An important treatment method in the field of orthodontics involves movement of malpositioned teeth by light-wire techniques. These techniques involve the use of one or more round arch wires of relatively small diameter which are secured to orthodontic brackets mounted on the patient's teeth. Corrective forces, typically generated by various forms of springs or other auxiliary appliances, are applied through the wire and brackets to urge malpositioned teeth into proper 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 or floor surface 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 in response to the applied corrective forces. A bracket of this type is disclosed in U.S. Pat. Ser. No. 543,165 filed Apr. 18, 1966, now U.S. Pat. No. 3,408,739.

The Bracket described in the aforementioned patent has a mesiodistally extending arch-wire channel defined by a floor surface and a pair of labiolingually spaced-apart side surfaces of the bracket. The floor surface of the channel is very narrow to permit an arch wire resting thereon to pivot freely as an associated tooth on which the bracket is secured is tipped mesiodistally. A vertically or occlusogingivally extending lockpin channel is defined by the bracket immediately adjacent the arch-wire channel to receive a lockpin. The function of the pin is to confine the arch wire in the channel during the application of orthodontic corrective forces.

The aforementioned patent discloses a lockpin which is useful with the light-wire bracket in certain treatment stages. The lockpin has a straight elongated shank configured to extend through the lockpin channel of the bracket, and an enlarged head extends lingually from the upper end of the shank over the top of the arch wire. The lockpin is secured in place by bending around the bottom of the bracket an end of the shank which extends from the end of the lockpin channel remote from the lockpin head.

Some forms of light-wire treatment involve several stages during which the relationship of the arch wire and bracket is changed, or the arch wire itself may be replaced by another wire of larger diameter. For example, one type of treatment involves a first stage in which the arch wire should have a limited amount of vertical or occlusogingival freedom in the bracket channel. It is difficult to achieve this configuration with a conventional lockpin because the desired vertical clearance must be maintained while the shank of the pin is bent around the bottom of the bracket. This is an awkward operation, in view of the small size of the pin, and it is difficult to maintain an accurate clearance spacing as desired in orthodontic work.

In a later treatment stage, it is often desirable to replace the original arch wire with a new wire of larger diameter. For example, a circular cross section wire of about 0.016 inch diameter may be used in an initial stage, and be replaced in a later stage by a wire of about 0.020 inch diameter. The replacement of the original wire poses a problem in bracket design in that it is normally desirable to confine the wire labiolingually in the bracket channel even though the wire is free to move occlusogingivally within a limited range. That is, the width of the arch-wire channel should usually be substantially equal to the diameter of the arch wire such that the wire is confined buccolingually even though free to move occlusogingivally. While it is possible to bend a bracket installed in the patient's mouth to widen the arch-wire channel prior to replacement of the arch wire, this is a very time consuming and painstaking operation which is very difficult to perform with the measure of precision normally desired.

The lockpin of this invention provides an economical and convenient solution to the aforementioned problems. The pin has an elongated shank which extends through the lockpin channel in the bracket, and an enlarged head extends from the upper end of the shank to confine the arch wire in the bracket channel. The pin shank has a labial side surface which is smooth and unbroken, but a lingual side surface of the shank defines a lower shoulder which is spaced occlusogingivally from the head. The shoulder is configured to abut the bracket surface which defines the floor of the arch-wire channel, and thereby serves to "stop" the lockpin with the head positioned a predetermined distance above the floor of the arch-wire channel. The body of the shank between the head and shoulder is arranged to extend into the arch-wire channel to narrow this channel and thereby provide a snug labiolingual fit for an arch wire having a diameter somewhat smaller than the width of the full arch-wire channel defined by the bracket.

The shoulder on the lockpin shank is positioned to space the head above the floor of the arch-wire channel about twice the diameter of the small arch wire to be used in the initial treatment stage. Ample occlusogingival freedom is thereby provided for the arch wire during the early treatment stages involving considerable mesiodistal tipping of the tooth. The pin is also useful with techniques involving dual arch wires which are to be closely confined on all sides within the bracket channel. When the initial stage of the treatment is complete, the lockpin is removed and discarded, and can be replaced by a conventional pin if it is desired to clamp the original arch wire in the bracket channel without occlusogingival freedom. If the original arch wire is replaced by a new wire of larger diameter, an enlarged width of the bracket channel is automatically obtained simply by removing the original lockpin, and the desired fit of the wire in the channel is thereby assured.

SUMMARY OF THE INVENTION

The lockpin of this invention is used in combination with an orthodontic bracket and arch-wire assembly, the bracket having an arch-wire channel defined by a floor surface and a pair of labiolingually spaced side surfaces of the bracket. The bracket has a lockpin channel adjacent the arch-wire channel, and the arch wire is received in the channel. The lockpin comprises a member having a head portion extending over the arch wire to confine it in the channel. An elongated shank portion extends from the head into the lockpin channel, the shank portion defining a shoulder which abuts the lower surface of the arch-wire channel to position the head at a predetermined spacing from the lower surface.

The lockpin is a unitary member with a head portion secured to and extending laterally from one end of the shank portion to overhang one side of the shank and thereby define an upper shoulder configured to extend over the arch wire when the pin is secured to the bracket. The shank portion includes an elongated bendable tab member and an arch-wire control member integrally secured between the head portion and the tab member. The control member is of constant width and has an end remote from the head defining the lower shoulder which abuts the floor of the arch-wire channel. Preferably, the tab member is tapered to decrease in width as it extends away from the control member. The shank portion preferably has a straight and unbroken side surface opposite the surface in which the shoulders are formed, and the shoulders extend perpendicularly to this straight side.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a lockpin formed according to the invention;

FIG. 2 is a perspective view, partly broken away, of an orthodontic bracket suitable for use with the lockpin;

FIG. 3 is a side view, partly broken away, of an assembled bracket, lockpin and arch wire; and

FIG. 4 is a side view of the bracket and arch wire shown in FIG. 3 in combination with a conventional lockpin.

DESCRIPTION OF THE PREFERRED EMBODIMENT

An improved lockpin **10** according to the invention is shown in FIG. **1**, and is a unitary member having an elongated shank portion **11** and an enlarged head portion **12**. The pin is made of a strip of half-hard brass, stainless steel, or a similar material which is suitable for use in the mouth. The head portion is generally semicircular to avoid sharp tissue-irritating edges, and extends lingually from the upper end of the shank portion. A lingual side or face **13** of the shank portion defines a labiolingually extending step or lower shoulder **14** which is spaced occlusogingivally from an upper labiolingually extending shoulder **16** defined by the lockpin head where it overhangs the shank portion.

The shank portion of the pin includes a bendable tab member **17** and an arch-wire control member **18** which is that portion of the shank extending between the two shoulders. The control member is of constant width, but the tab member tapers slightly to be readily insertable in a lockpin channel of an orthodontic bracket in which the pin is to be secured. A labial side or face **19** of the shank portion is straight and unbroken to fit securely in the lockpin channel, and tapering of the tab member is provided by inclining the lingual side of the tab toward labial side **19** as seen in FIG. **3**.

The lockpin is intended for use with an orthodontic bracket **20** of the type shown in FIG. **2**, and as fully described in the aforementioned U.S. Pat. No. 3,408,739. The bracket includes a pair of flanges **21** adapted to be secured to a conventional tooth band **22**. Extending labially from the flanges are a pair of juxtaposed web sections **23**, the upper surfaces of which have been swaged together to define a pivotal floor surface **24** forming the lower surface of an arch-wire channel. The web sections merge in a boxlike body **25** which is hollow to define an occlusogingivally extending lockpin channel **26**. This style of bracket is formed from a stamped strip of sheet metal which is bent into the configuration shown in FIG. **2**. The construction of the bracket is fully disclosed in the aforementioned patent, and, for brevity, will not be here described in further detail.

In FIG. **3**, lockpin **10** is installed in bracket **20** to secure an arch wire **30** in an arch-wire channel of the bracket. The arch-wire channel is defined by floor surface **24** of the web sections, and by the labiolingually spaced-apart side surfaces of flanges **21** and the lingual surfaces of boxlike body **25**, these surfaces extending upwardly or occlusogingivally from floor surface **24**. Shank portion **11** of the lockpin makes a snug fit in lockpin channel **26** of the bracket, and the end of tab member **17** is bent laterally over the bottom of body **25** of the bracket to secure the pin in place.

Shoulder **14** of the lockpin rests on floor surface **24** of the bracket which also supports an arch wire **30**. Upper shoulder **16** defined by head **12** of the lockpin is therefore spaced a predetermined amount above the floor of the arch-wire channel and above the arch wire to provide the desired vertical freedom for the arch wire during preliminary treatment stages. The lockpin is also useful when twin-wire techniques are used and two wires are to be secured in the bracket without vertical play or freedom. A second arch wire **30***a* is shown in phantom line in FIG. **3** as it would be oriented in this technique.

As mentioned above, the arch wire used in early treatment stages may be replaced with a larger diameter wire for the final phases of treatment. The arch-wire channel in bracket **20** is dimensioned to accept the largest diameter wire which will be used in the treatment program. As shown in FIG. **3**, laterally enlarged control member **18** above shoulder **14** projects lingually into the arch-wire channel and abuts the small diameter arch wire to secure it against labiolingual movement. That is, the shouldered lockpin has the effect of narrowing the arch-wire channel in the bracket without modification of the bracket itself.

Head portion **12** of the lockpin is configured to extend lingually through a notch **35** in bracket flanges **21** to abut tooth band **22**. This configuration increases the structural rigidity of the bracket, and prevents labiolingual narrowing of the arch-wire channel which might otherwise arise from lingual bending of the upper part of bracket body **25** caused by relatively heavy masticatory forces. The portion of the tooth band contacted by head portion **12** is herein considered as part of the bracket flanges, and portion **12** would of course be slightly smaller in diameter to abut the flange surface if notch **35** is omitted from the bracket.

FIG. **4** shows the bracket after arch wire **30** has been removed and replaced by a larger diameter arch wire **32**. Lockpin **10** has been removed and replaced by a conventional unshouldered lockpin **33** installed in the same fashion as described above. The full width of the bracket arch-wire channel is now available to receive the larger arch wire as shown in the drawing.

There has been described a shouldered lockpin useful in orthodontic treatment stages in which small diameter arch wires are used. The pin adapts the bracket for use with arch wires of several different sizes, and at the same time insures that a desired amount of occlusogingival spacing or freedom is available for the arch wire. The lockpin is quickly and easily installed or removed, and provides a considerable saving in chair time for both dentist and patient. The head portion of the pin is small and extends only slightly from the bracket to minimize entrapment of food particles which could cause decay.

While the lockpin of this invention has been described with reference to its use with a specific bracket, it is to be understood that the pin can be installed on other types of brackets which define an appropriate lockpin channel and which have a reference surface against which the pin shoulder can rest to position the pin head a predetermined amount above the arch wire.

I claim:

1. In combination with an orthodontic bracket and arch-wire assembly, the bracket having an arch-wire channel defined by a floor surface of the bracket and a pair of labiolingually spaced-apart side surfaces of the bracket extending occlusogingivally from the floor surface, the bracket further having an occlusogingivally extending lockpin channel adjacent the arch-wire channel, the arch wire being received in the channel, an improved lockpin comprising a member having a head portion extending over the arch wire to confine the arch wire in the channel, and an elongated shank portion extending from the head into the lockpin channel, the shank portion defining a shoulder which abuts the floor surface of the arch-wire channel to position the head at a predetermined spacing from the floor surface, the shank portion being configured to extend into and thereby narrow the arch-wire channel.

2. The combination defined in claim **1** in which the head portion extends lingually over the arch wire into contact with the bracket whereby the bracket is stiffened against forces tending to narrow the arch-wire channel.

3. The combination defined in **1** in which the shank-portion shoulder extends laterally in a side of the shank portion adjacent the arch wire, the shoulder being parallel to the floor surface of the arch-wire channel.

4. The combination defined in claim **3** in which the head portion is spaced from the shoulder substantially twice the effective width of the arch-wire channel when the lockpin is installed, whereby two arch wires are receivable in the arch-wire channel.

5. The combination defined in claim **4** in which the lockpin is a unitary member, the head portion is arcuately formed, and the shank portion is tapered to decrease in width as it extends away from the shoulder.