Sept. 21, 1971 E. SCHWARTZ 3,606,685

ORTHODONTIC APPLIANCE

Filed Oct. 13, 1969

FIG. 1

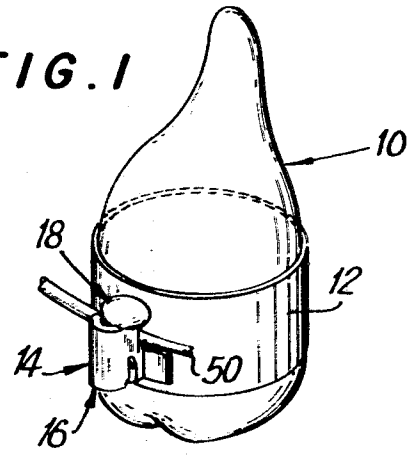


FIG. 2

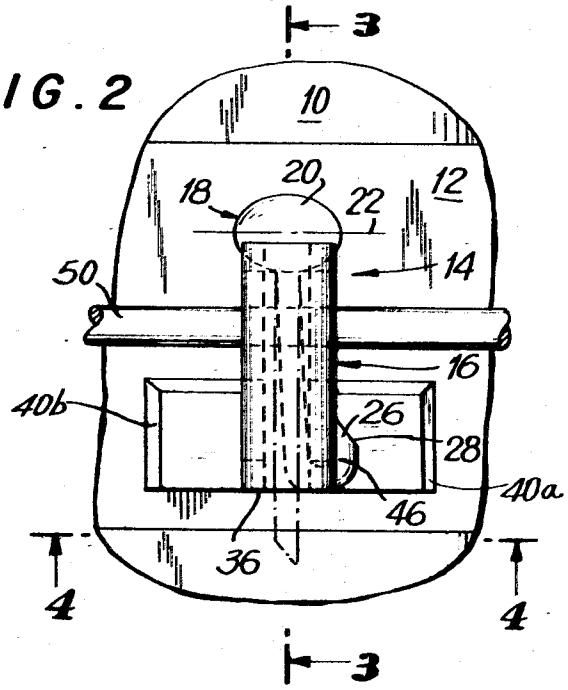


FIG. 3

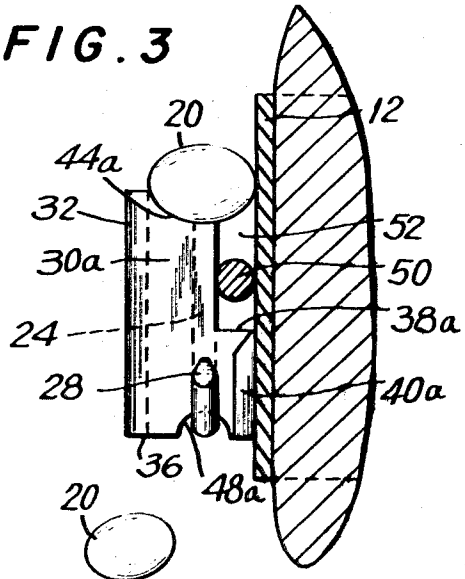


FIG. 4

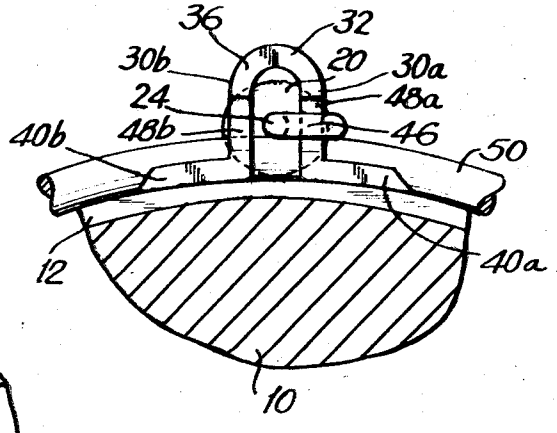
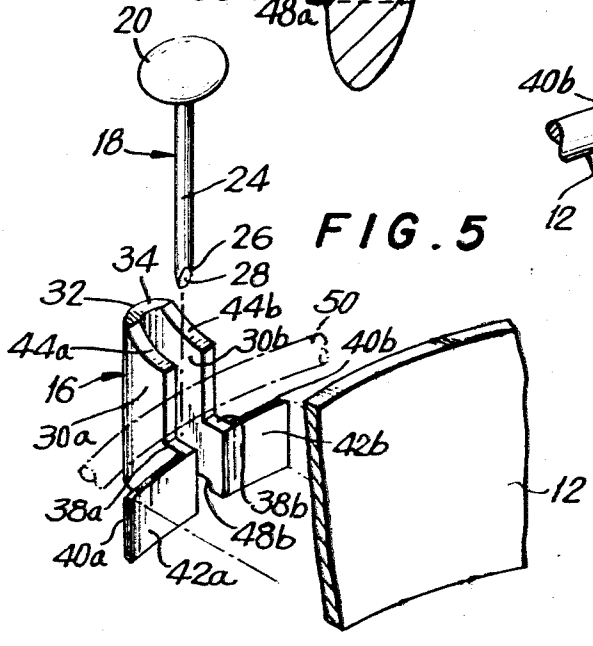


FIG. 5



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ORTHODONTIC APPLIANCE

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ABSTRACT OF THE DISCLOSURE

An orthodontic appliance for maintaining an arch wire properly positioned with respect to a tooth. The appliance includes a symmetrically constructed guidance pin having an oval head and an elongated tail extending perpendicularly with respect to the major axis of the oval head. This pin is received in a bracket, with the tail extending between side walls of the bracket. The side walls extend substantially vertically and terminate in upper surfaces respectively formed with recesses extending around the major axis of the oval head and receiving the latter to form a seat therefor. The bracket side walls are formed at inner edges with upwardly directed shoulders which with the oval head and the outer surface of a band which carries the bracket define an enclosure through which the arch wire extends. When the pin is initially placed in the bracket the tail extends substantially parallel to an axis of a cylinder of which the band forms a part, with this tail being situated forwardly of the band without being inclined toward the latter.

BACKGROUND OF THE INVENTION

The present invention relates to orthodontic appliances. In particular, the present invention relates to a combination pin and bracket assembly used to retain an arch wire.

Orthodontic appliances of this general type are well known and widely used. However, such appliances suffer from serious drawbacks. For example, at the present time when a safety pin is inserted into a bracket, the tail of the pin is inclined toward the band so as to engage either the band, or a part of the tooth. As a result it is inconvenient to grasp the lower end of the tail which must be bent around the lower edge of the bracket.

Furthermore, with known safety pins, which generally are stamped from a metal sheet so that they are of a flat configuration, great care must be taken in inserting the safety pin into the bracket. The reason for this is that the upper end of the safety pin, where the head is located, provides the safety pin with a non-symmetrical construction. Because of this lack of symmetry it is very easy to drop the pin into position in a reversed condition. Thus the operator must carefully check to see that such a conventional pin is properly oriented, and if it is not properly oriented the pin must be removed and reversed so as to become properly situated. These manipulations of course represent a great inconvenience and a source of possible error in the insertion of the pin.

Also, the head of the safety pin has sharp edges which often scratch the free gingival tissue during insertion and which easily scratch lip tissue during treatment.

Furthermore, when the lower end region of the tail of the safety pin is bent around the lower end surface of the bracket, the head of the pin is pressed against the band which surrounds the tooth, or against the tooth itself where no band is used and the bracket is mounted directly on the tooth. Such procedures are used in order to reliably provide an enclosure through which the arch wire can extend without any danger of escape of the arch wire from the enclosure. Thus, when bending the tail

of the pin, it is necessary to apply thereto not only the pressure required for the simple bending but also the pressure required to cam the head of the pin against the band or tooth. These operations may result in additional discomfort to teeth which have increased sensitivity due to orthodontic movement.

There are also known lock pins which retain the arch wire directly engaging the latter. Such lock pins are inserted into the interior of the bracket so as to directly engage the arch wire. However, these lock pins do not allow free tipping of the teeth, as is all important during the first two stages of the light wire differential force technique.

SUMMARY OF THE INVENTION

It is accordingly a primary object of the invention to provide an orthodontic appliance which will avoid the above drawbacks.

In particular, it is an object of the invention to provide an orthodontic appliance which does not require the tail of a pin to be inclined toward the band or tooth.

A further object of the invention is to provide an appliance where the pin has a head which may engage but does not press against the band or tooth.

In addition it is an object of the invention to provide an orthodontic appliance which can be very conveniently manipulated without risking any discomfort or injury to the patient.

The objects of the present invention also include the provision of a perfectly symmetrical guidance pin which will be properly positioned simply by being assembled with the bracket in either one of a pair of opposed positions.

Also, it an object of the invention to provide an orthodontic appliance of the above general type which is made up of simple relatively inexpensive components which coact very reliably to achieve the desired results, namely retaining of an arch wire in a proper position without the above drawbacks encountered in the present state of the art.

According to the invention a symmetrically consrtucted guidance pin is formed by a combination of elements which include an oval-shaped head having a major axis and a tail fixed to and extending from the head and being substantially perpendicular to the major axis thereof. A bracket which receives this pin is of substantially U-shaped configuration and has a pair of opposed side walls which extend between upper and lower end surfaces of the bracket. The upper surface of the bracket at the opposed side walls thereof is formed with a pair of curved recesses which extend around the major axis of the head of the guidance pin and form a seat for this head. At least one of the side walls is formed at the lower end surface of the bracket with a notch for receiving a bent-over end of the tail. Attaching flanges which project laterally from the side walls terminate in inner surfaces which substantially form part of a cylinder up to which the head of the guidance pin extends when seated in the recesses at the upper end surface of the bracket, and above the attaching flanges the side walls of the bracket are respectively formed with upwardly directed shoulders defining with the head of the guidance pin a space through which the arch wire extends to be retained in this space.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a perspective illustration showing in a partly diagrammatic manner an orthodontic appliance of the invention mounted on a tooth;

FIG. 2 is a front elevation of the bracket and guidance pin of FIG. 1 with the band and tooth fragmentarily illustrated, the structure of the tooth being shown at a scale larger than FIG. 1, and FIG. 2 illustrating the guidance

pin in dot-dash lines in its initial position when introduced into the bracket and in solid lines in its final position with respect to the bracket;

FIG. 3 is a fragmentary transverse section of the structure of FIG. 2 taken along line 3—3 of FIG. 2 in the direction of the arrows;

FIG. 4 is a fragmentary sectional upwardly directed plan view of the structure of FIG. 2 taken along line 4—4 of FIG. 2 in the direction of the arrows; and

FIG. 5 is an exploded perspective illustration of the orthodontic appliance of the invention, the band of FIG. 5 being fragmentarily illustrated, with the arch wire being indicated in dot-dash lines.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring now to the drawings, FIG. 1 illustrates the tooth **10** which has mounted thereon, in a known manner, a conventional band **12** which is of a substantially cylindrical configuration. This band **12** fixedly carries the orthodontic appliance **14** of the invention. This appliance **14** includes a bracket **16** and a symmetrically constructed guidance pin **18**.

The guidance pin **18** has a head **20** of oval-shaped configuration. This head **20** may be made of any suitable metal and has a major axis **22** which extends horizontally to the right and left, as viewed in FIG. 2. The minor axis of the head **20** extends vertically, as viewed in FIG. 4.

The head **20** of the pin **18** is fixed to and may be integrally formed with a tail **24** in the form of a simple wire of circular cross-section. The tail **24** extends perpendicularly with respect to the major axis **22**. In order to facilitate introduction of the guidance pin **18** into the bracket **16**, the tail **24** terminates in a tapered tip **26** of substantially pointed configuration. This tip **26**, which is distant from the head **20**, may be formed by providing the tail with an inclined end surface **28**.

The bracket **16** of the orthodontic appliance of the invention is of a substantially U-shaped configuration and includes a pair of opposed side walls **30***a* and **30***b*. These side walls are interconnected by a front curved transverse wall portion **32** of the bracket **16**. The bracket terminates in an upper end surface **34** and a lower end surface **36**. The side walls **30***a* and **30***b* terminate distant from the transverse wall **32** in edges respectively formed with upwardly directed shoulders **38***a* and **38***b*. Downwardly from the shoulders **38***a* and **38***b* the side walls **30***a* and **30***b* are respectively integrally connected with laterally extending attaching flanges **40***a* and **40***b* which respectively have inner surfaces **42***a* and **42***b* which substantially form part of a cylindrical surface and which have bevelled upper and outer end edges, as viewed in FIG. 2.

At its upper end surface **34**, the bracket **16** is formed at the side walls **30***a* and **30***b* with a pair of curved, concave recesses **44***a* and **44***b* which are in part curved around the major axis of the head **20**, as is particularly apparent from FIG. 3 which is in a plane normal to the major axis **22**. Thus, these recesses **44***a* and **44***b* form a seat for the head **20** whose major axis **22** extends across the recesses **44***a* and **44***b* with the outer opposed ends of the head **20** extending somewhat beyond the side walls **30***a* and **30***b* of the bracket **16**, as is particularly apparent from FIGS. 2 and 4.

The lower end surface **36** of the bracket **16** has a notched configuration, and at least at one of the side walls has a notch for receiving the bent-over end **46** of the tail **24** of the guidance pin **18**. In the illustrated example both of the side walls **30***a* and **30***b* are respectively formed with the substantially semicircular notches **48***a* and **48***b*, so that the lower end region of the tail can be bent into either one of these notches.

While it is possible to omit the band **12** and attach the flanges **40***a* and **40***b* directly to a tooth, in the illustrated example these flanges are fixed to the band **12**. Thus, the attaching flanges **40***a* and **40***b* may be spot welded or riveted to the band **12** so as to be fixedly carried thereby. Thus, the outer surface of the band **12** forms part of the cylinder along which the inner surfaces **42***a* and **42***b* extend.

The location of the recesses **44***a* and **44***b* is such that when the head **20** is received in and seated in these recesses, in the manner illustrated most clearly in FIG. 3, this head **20** extends in close proximity to and may even lightly engage the exterior surface of the band **12**. It does not, however, press with any substantial force against the band **12**.

When the guidance pin **18** is first introduced into the bracket, the tail **24** extends substantially vertically in the manner indicated in dot-dash lines in FIG. 2. In this initial position of the tail it is spaced from and situated forwardly of the band **12** extending substantially parallel to the cylinder axis surrounded by the band **12**, so that the lower end portion of the tail **24**, which is freely accessible beneath the bracket **16**, is initially spaced forwardly of the band **12** because the tail **24** is not initially inclined toward the band **12** so as to engage either the band **12** or the tooth **10**. Thus, because the lower end region of the tail **24** stands free of and is spaced forwardly from the band **12** and the tooth **10**, it is a simple matter to apply a tool to the free end of the tail **24** without any inconvenience or any possible injury to the patient, as would be the cause if it were necessary to grasp with the tool a free end of the tail located closely adjacent to and inclined toward the band **12** or the tooth **10**.

All that is required is to bend the lower end region of the tail **24** around the lower end surface **36** into one or the other of the notches **48***a* or **48***b*, so as to provide the tail with bent-over end **46** securing the guidance pin to the bracket. It will be noted that this operation does not in any way involve camming of the head **20** toward the the band **12**.

It is to be noted that the tail **24** is symmetrical with respect to the oval head **20**. In other words the axis of the tail **24** is situated midway between the outer ends of the head **20**. As a result it is possible to drop the tail **24** into the bracket **16** with the head **20** engaging the seating recesses in either of a pair of opposed positions. Thus, the head **20** may have the position shown in FIG. 2 or it may be turned through 180° with respect to the position shown in FIG. 2 without in any way changing the coaction between the guidance pin and the bracket. Because of this feature it is virtually impossible for the operator to assemble the guidance pin **18** in an improper manner with respect to the bracket **16**, and checking as to whether or not the pin must be reversed is completely eliminated with the structure of the invention.

The arch wire **50** is shown extending through the retaining space **52** (FIG. 3) defined between the shoulders **38***a*, **38***b* and the head **20** as well as between the outer surface of the band **12** and the inner edges of the side walls **30***a* and **30***b* above the shoulders **38***a* and **38***b*. Because the recesses **44***a* and **44***b* position the oval-shaped head with considerable precision in the manner shown in FIG. 3, the arch wire **50** will be reliably retained within the space **52**.

It is to be noted that it is not absolutely essential for the head **20** to have the configuration of a full oval. For example, the head **20** could have a flat surface so as to form the lower half of an oval. It is only essential that the downwardly directed lower surface of the head **20** form part of an oval so as to coact properly with the seats formed by the recesses **44***a* and **44***b*. As is apparent from FIG. 3, for example, if the head **20** should have an upwardly directed flat surface, for example, it still would coact properly with these seats, and most of the advantages of the invention would still be retained. However, it is preferred to provide a head **20** in the form of a complete full oval, because in this way the upper surface of the head is convexly curved to provide a far greater comfort and lack of possible injury or irritation to the

patient. Because of the smooth convexly curved upper surface of the head **20** it is capable of fending off any lip tissue which may come in engagement with the guidance pin, so that such tissue will not become scratched or otherwise irritated with the guidance pin of the invention. For these reasons the particular construction shown in the drawings and described above is preferred.

What is claimed is:

1. For use in an orthodontic appliance, a combination of elements forming a symmetrically constructed guidance pin, said elements including a head having at least a lower portion forming part of an oval having a major axis, and a tail fixed to and extending from said head, said tail being substantially perpendicular to said major axis, and a bracket coacting with said guidance pin for maintaining an arch wire positioned properly with respect to a tooth, said bracket having an elongated portion of substantially U-shaped configuration terminating in upper and lower end surfaces and having a pair of opposed side walls respectively extending substantially perpendicularly with respect to said end surfaces, the upper surface of said bracket at said opposed side walls thereof being formed with curved recesses extending in part around said major axis and forming a seat for said head, said tail extending freely between said side walls.

2. The combination of claim **1** and wherein the lower end surface of said bracket at at least one of said side walls has a notched configuration to receive a bent-over end of said tail distant from said head.

3. The combination of claim **2**, said side walls respectively terminating in inner edges respectively formed with upwardly directed shoulders which define with said head of said guidance pin a space for enclosing an arch wire, and said bracket having between said shoulders and said lower end surface attaching flanges provided respectively with inner surfaces directed away from said tail, said inner surfaces of said attaching flanges forming substantially, part of a cylinder and said recesses at said upper end surface of said bracket seating said head at a location where it extends up to the region of said cylinder while said tail extends downwardly and is spaced forwardly from said inner surfaces of said attaching flanges and is substantially parallel to the axis of said cylinder when said tail is initially introduced into said bracket, so that the lower end region of said tail need only be laterally bent around lower end surface of said bracket to be received in the notched side wall, without tilting said tail forwardly and without urging said head toward said cylinder.

4. The combination of claim **3** and wherein a tooth band carries said bracket and is fixed thereto at said inner surfaces of said attaching flanges thereof, said band having an exterior surface forming at least part of said cylinder and defining with said bracket side walls, above said shoulders thereof, and with said head of said guidance pin an enclosure through which an arch wire passes, said head of said guidance pin extending in close proximity to said band without pressing against the latter.

5. The combination of claim **2** and wherein a tooth band carries said bracket, said head contacting said band before the tail is bent in substantially the same way that said head contacts said band after the tail is bent around the lower surface of the bracket.

6. The combination of claim **3** and wherein said bracket has a forward transverse wall portion extending between said side walls thereof and located distant from said attaching flanges, said recesses at said upper surface of said bracket, at said side walls thereof, being situated rearwardly of said forward transverse wall portion of said bracket.

7. The combination of claim **2** and wherein both of said side walls are respectively formed with notches at the lower end surface of said bracket, so that the tail may be bent selectively into one or the other of said notches.

8. The combination of claim **2** and wherein said tail terminates distant from said head in a tapered substantially pointed tip facilitating introduction of said tail into said bracket.

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ROBERT PESHOCK, Primary Examiner