

[54] **SECURING MEANS FOR ORTHODONTIC APPLIANCE**

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[51] Int. Cl.² **A61C 7/00**

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

[56] **References Cited**

UNITED STATES PATENTS

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Attorney, Agent, or Firm—Jessup & Beecher

[57] **ABSTRACT**

A manually retractable locking means is provided on the end of the inner arch of an orthodontic appliance, which engages the buccal tube in which the end of the arch resides, thereby to prevent undesired or accidental removal of the arch from the buccal tube. In similar vein the face bow, to which the inner arch is secured, is provided with a stop means associated with the resilient retractive elastic customarily used with the face bow, which prevents the face bow from being completely separated from the neck strap or retaining head gear to which it is secured. In this way a double safety feature is provided to prevent harm to the wearer by the accidental pulling out and snapping back of the face bow and/or the inner arch.

10 Claims, 15 Drawing Figures

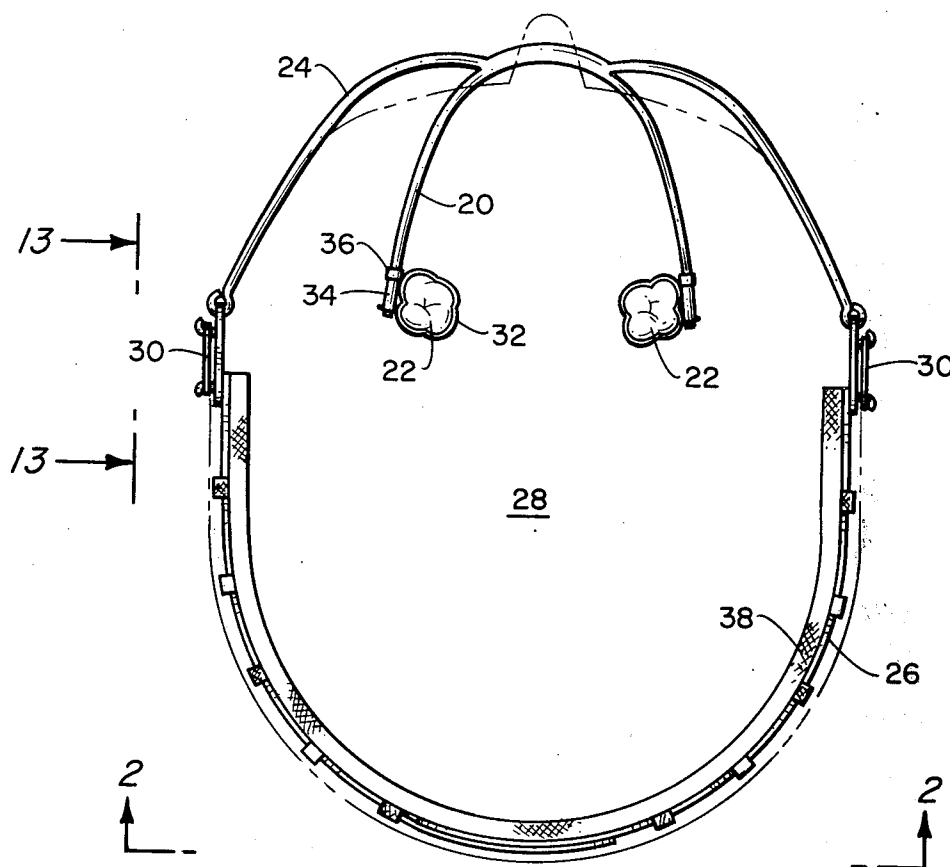


Fig. 1.

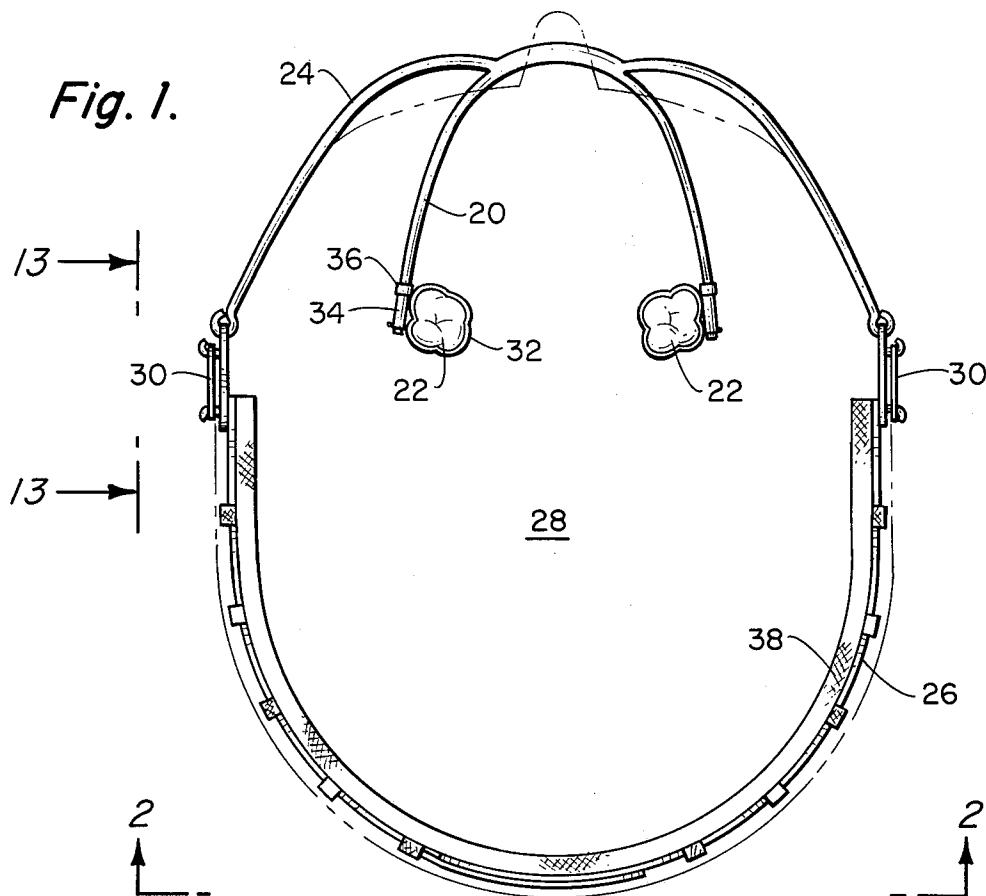


Fig. 2.

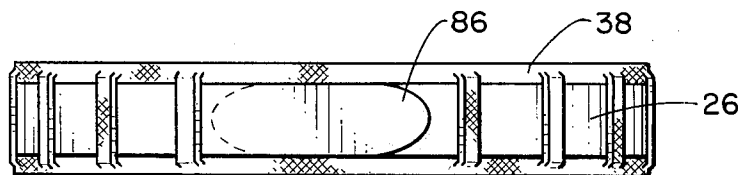


Fig. 3.

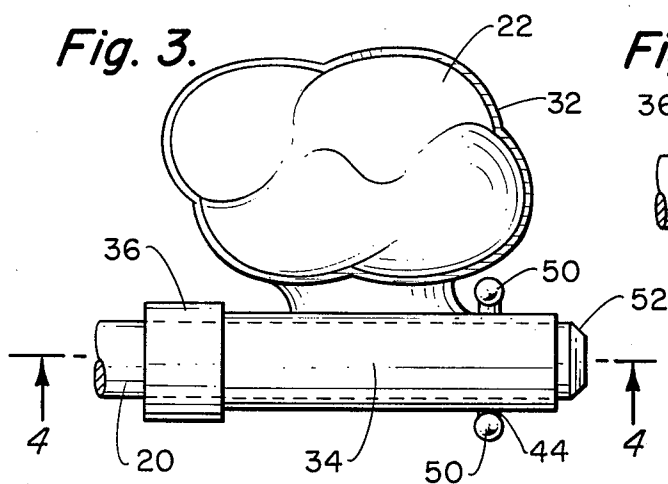


Fig. 4.

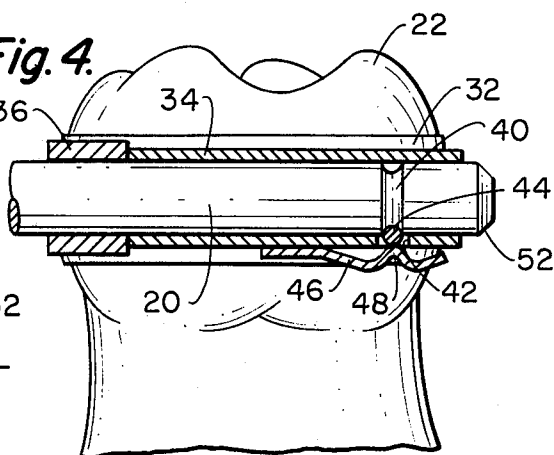


Fig. 6.

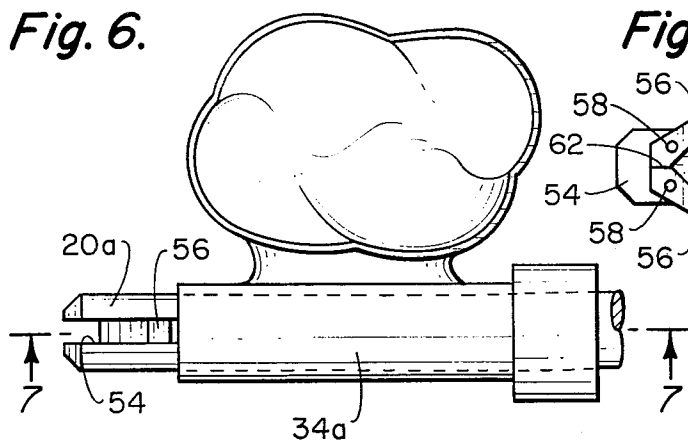


Fig. 7.

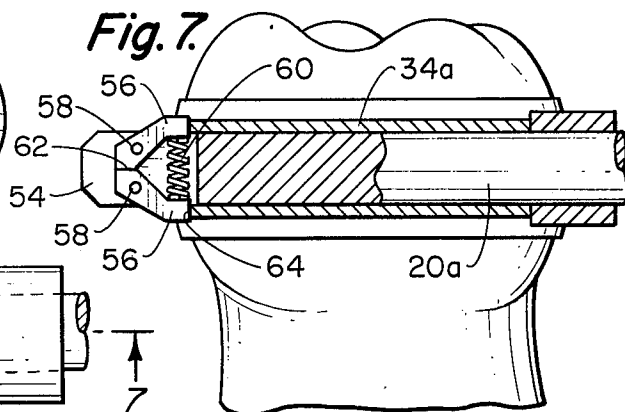


Fig. 5.

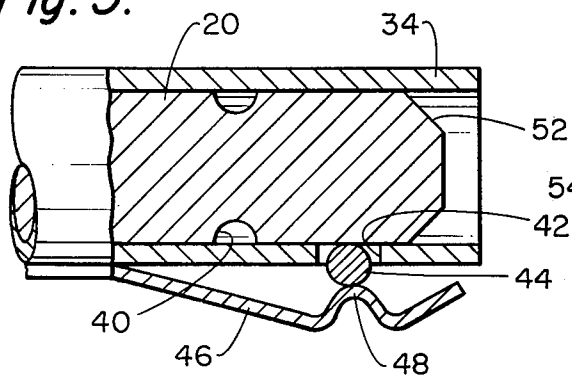


Fig. 8.

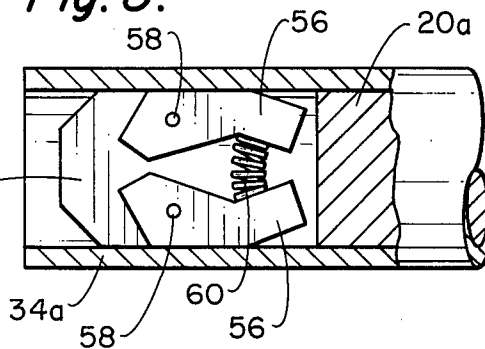


Fig. 9.

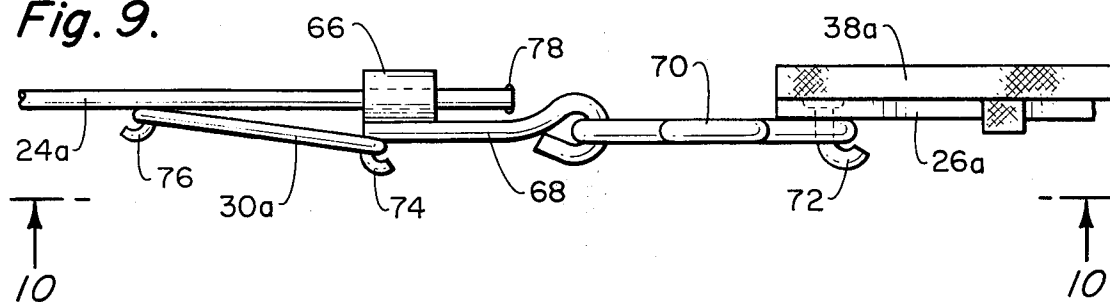


Fig. 10.

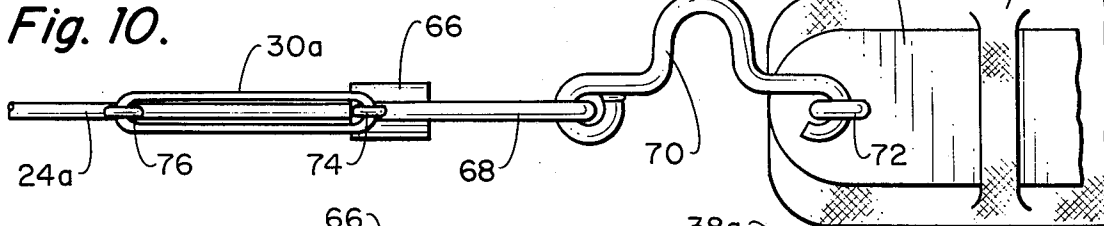


Fig. 11.

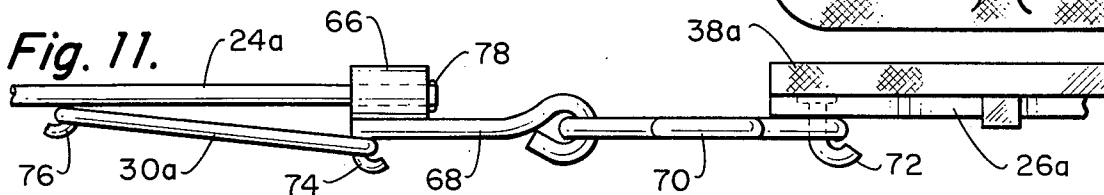


Fig. 12.

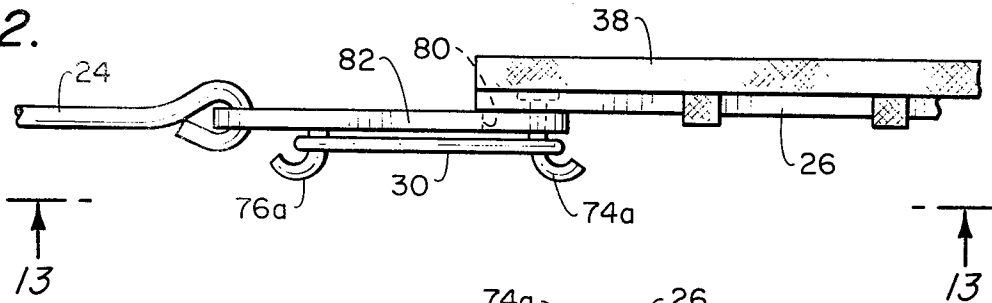


Fig. 13.

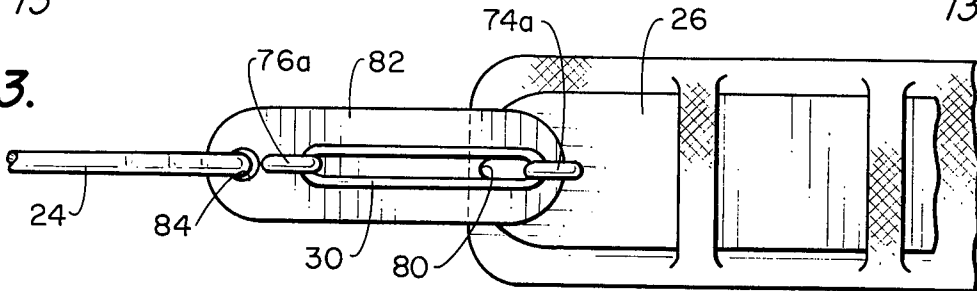


Fig. 14.

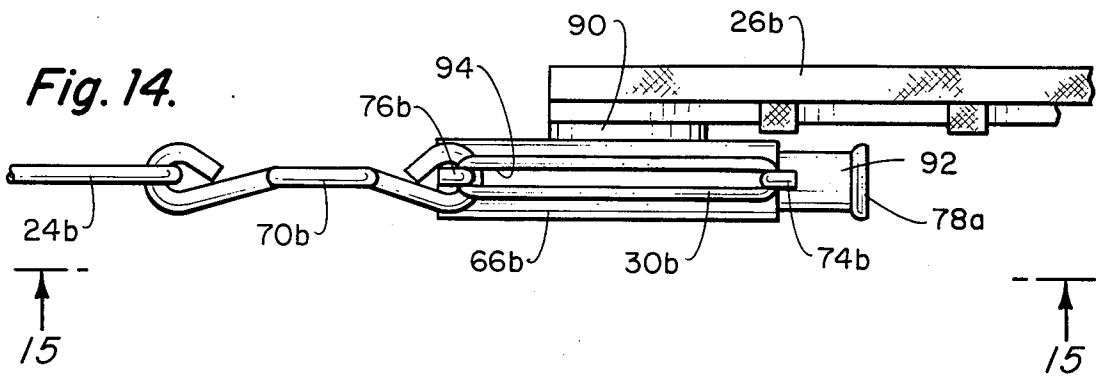
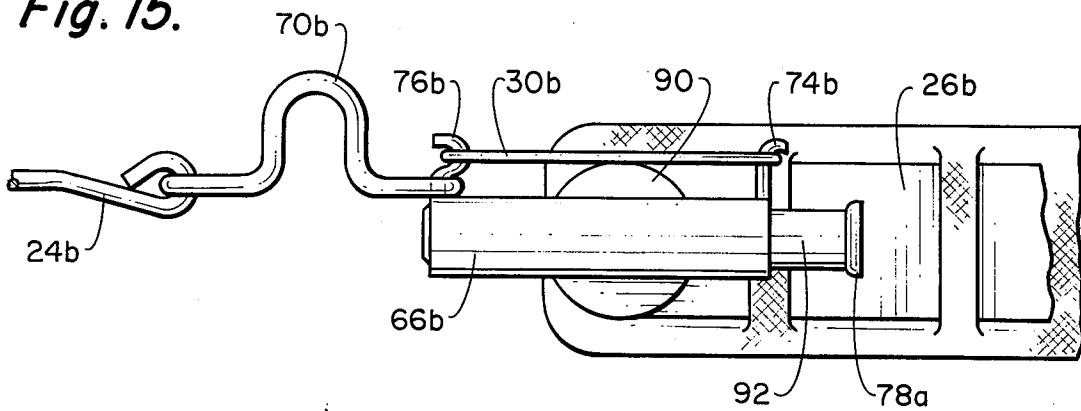


Fig. 15.



SECURING MEANS FOR ORTHODONTIC APPLIANCE

BACKGROUND OF THE INVENTION

In a typical orthodontic installation which requires a constant retractive force applied to teeth through buccal tubes, an inner arch is provided, the ends of which ride in a respective buccal tube inside the wearer's mouth. Stop members on the arch apply a rearward or retractive force to the tooth. This rearward force is derived from a face bow which is secured to the inner arch and extends across the face of the wearer and to the rear, where it is resiliently secured to a neck strap or other retaining head gear which runs around the back of the head or neck. The resilience of the connecting link between the face bow and the neck strap at each side provides a relatively constant force which biases the inner arch to the rear and hence applies a rearward retractive force to the teeth involved.

It has been found that there is some danger in this structure in that the face bow may be pulled forward against the resilience of the tensioning member, either accidentally or maliciously. This pulls the ends of the inner arch out of the buccal tubes and leaves them facing towards the wearer's face under the tension of the elastics at each side — an extremely dangerous condition. When the pulling force is removed, as for example if a malicious person pulls out and lets go, the two ends of the arch stab to the rear and may inflict critical and permanent injury, as for example by putting out an eye.

At times the orthodontist meets this problem, plus the other vexing problem of having a juvenile wearer simply remove the application and refuse to wear it — by tying the face bow in place using stainless steel wire. This, however, has a number of disadvantages, one of which is hygienic. If the bow is tied in place for approximately six weeks — a typical time between appointments — the patient will have a difficult time brushing his teeth, since the design of the typical inner arch is such that it covers most of the upper teeth, thereby making it difficult for proper brushing. Secondly, the continuous wearing of the appliance for such a long period gives the wearer no option which might otherwise be permitted by the orthodontist, as for example a willingness to wear the face bow during the day if it could be taken off at night, or vice versa. Another disadvantage is that the neck pad or retaining head gear becomes quite dirty, since there is no opportunity to clean the hair or the back of the neck.

SUMMARY OF THE INVENTION

The present invention solves the problem mentioned above by providing a lock at the buccal tube which prevents the inner arch from accidental removal therefrom and also by providing a limit stop in connection with the resilient connection between the face bow and the neck strap, which limits the amount by which the face bow can be pulled forward. Thus there is no danger that the appliance can be pulled so far away from the wearer's face as to constitute a serious hazard when it snaps back. In each case, however, the stop means is operable by the wearer, if he wants to go to the deliberate effort of actuating it, so that the appliance can without undo difficulty be removed for cleaning the teeth and the head and neck area.

DESCRIPTION OF THE DRAWINGS

In accordance with this invention several forms thereof will now be described in connection with the accompanying drawings wherein:

FIG. 1 is a plan view of the orthodontic device looking down upon the head of the wearer, which is shown in phantom;

FIG. 2 is a rear view along line 2—2 in FIG. 1;

FIG. 3 is a fragmentary enlarged view of one form of locking means for preventing undesired removal of the inner arch from the buccal tube on the tooth;

FIG. 4 is a cross-section taken on line 4—4 in FIG. 3;

FIG. 5 is an enlarged fragmentary section similar to FIG. 4 showing the parts in a different relative position;

FIG. 6 is a view similar to FIG. 3 showing an alternative form of locking means;

FIG. 7 is a sectional view taken on line 7—7 in FIG. 6;

FIG. 8 is an enlarged section similar to FIG. 7 showing the parts in another relative position;

FIG. 9 is a fragmentary view showing one form of tensioning link or mechanism for the orthodontic face bow and including the safety feature of a stop means which limits the extensibility of the tensioning means or rubber band;

FIG. 10 is a view taken on line 10—10 in FIG. 9;

FIG. 11 is a view similar to FIG. 9 showing the parts in another relative position, this being the position of maximum extensibility;

FIG. 12 shows another form of tensioning mechanism with associated stop means;

FIG. 13 is a view taken on line 13—13 in FIG. 12 and also represents a view which would be seen from line 13—13 in FIG. 1;

FIG. 14 shows a third form of tensioning mechanism and stop means; and

FIG. 15 is a view taken on line 15—15 in FIG. 14.

DETAILED DESCRIPTION OF THE EMBODIMENT OF THE INVENTION

Referring to the drawing, 20 represents an inner arch, the ends of which are adapted to extend rearwardly into the wearer's mouth and to be engaged with buccal tubes on a pair of teeth 22 to which an orthodontic retractive force is to be steadily applied. The inner arch has secured thereto a face bow 24 extending across the face of the wearer and rearwardly into resilient engagement with a neck strap 26 which extends around the back of the neck of the wearer. At each side of the head 28 of the wearer is an elongate tension member, shown here as a rubber band 30 forming a resilient tension connection between the face bow 24 and the neck strap 26, and thereby applying a steady retractive rearward force to the inner arch 20 and hence to the teeth 22.

The force on the teeth 22 is applied from the inner arch 20 by way of a tooth band 32 to which is affixed a buccal tube 34. The end of the inner arch 20 extends through the tube 34 and brings a stop member 36 on the arch 20 into engagement with the front facing end of the tube 34, thereby transferring the force from the rubber band 30 to the tube 34 and hence to the tooth 22. The customary neck pad 38 is secured to the neck strap 26 adjacent the neck of the wearer 28 to provide a softer bearing surface.

Referring to FIG. 3, the end of the arch 20 will be seen extending through the buccal tube 34 with the stop means 36 bearing against the tube to apply the rearward retractive force. In accordance with the present invention, a groove 40 is provided in the end of the inner arch 20 that resides within the buccal tube 34. A transverse slot 42 is provided in the tube 34 and riding in the slot is a transverse pin 44 biased inwardly into the groove 40 by a leaf spring 46 secured to the exterior of the tube 34 and having an inward corrugation 48 that bears against the pin 44. The pin 44 is thus resiliently detented into the groove 40 in the arch 20, providing a manually actuable locking means which prevents or inhibits the arch 20 from being withdrawn from the tube 34 except when the leaf spring 46 is deliberately lifted out, freeing the pin 44 from the groove 40. The pin 44 is maintained laterally in place by enlargements 50 on each end thereof which prevent it from sliding laterally out of the groove 40.

To simplify insertion of the arch 20 into the tube 34, the former is bevelled at the end as shown at 52 in FIG. 5. Thus it is merely necessary to insert the end of the arch 20 into the tube 34 until the bevel 52 engages the pin 44. Continued inward force will cam the pin 44 outwardly against the force of the spring 46, as shown in FIG. 5, until the end of the arch 20 has reached the position shown in FIG. 4, whereupon the pin 44 moves automatically into place in the groove 40 under the bias of the spring 46. Thereafter it is necessary to manually lift the spring 46 away from the tube 34 in order to remove the arch 20 from the mouth.

An alternate form of locking mechanism is illustrated in FIGS. 6-8. Here the arch 20a is provided at its extreme end with a longitudinal slot 54 within which is pivoted a pair of locking pawls 56 on respective pivot pins 58 spanning the slot 54. A single compression spring 60 biases the ends of each pawl 56 outwardly, the biasing action being halted by the engagement of the opposite ends of the pawls, as shown at 62. In this outwardly biased position, as best seen in FIG. 7, the pawls 56 are in position to engage the rear end 64 of the buccal tube 34a, and thereby prevent withdrawal of the arch 20a from the tube 34a.

The pawls 56 may be deliberately pushed inward so as to clear the end 64 of the tube, whereupon the arch 20a may be withdrawn, as shown in FIG. 8. FIG. 8 also illustrates the position of the parts as the arch is being inserted into the buccal tube 34a. The sloping angle at the outer surface of pawls 56 allows them to be cammed inwardly to the position shown in FIG. 8 as the arch 20a is pushed into the buccal tube 34; but as noted retraction of the arch is prevented once the pawls 56 snap outwardly into the position shown in FIG. 7.

In FIGS. 9-11 there is illustrated one form of safe tensioning mechanism by which the face bow 24a may be linked to the neck strap 26a.

The link consists of a first member and a second member slideably mounted with respect to each other. The first member in the case of FIG. 9 consists of a sleeve 66 bonded as by solder to a linkage rod 68 and connected through an adjustment or omega loop 70 to the neck strap 26a via a hook 72. This first member thus forms in effect a part of the end portion of the neck strap 26a. The second member in this instance is constituted by the end of the face bow 26a, which passes through and reciprocates within the sleeve 66. The left-hand end of the linkage rod 68 has a hook 74,

and the face bow 24a has another hook 76 thereon spaced a short distance forwardly of where the face bow 24a passes into sleeve 66. Linkage between the hooks 74 and 76 is provided by an elongate tension member 30a in the form of a rubber band as shown in FIG. 10. In order to limit the extensibility of the rubber band 30a and to prevent complete withdrawal of the face bow 24a from the sleeve 66, pin 78 is passed through the extreme end of the face bow 24a. The right-hand end of the sleeve 66 and the pin 78 thus constitute stop means engageable with each other to limit the extensibility of the rubber band 30a, as shown in FIG. 11. Alternatively the stop at 78 may be made by applying a protrusion of solder or by swaging the rod outward.

While the linkage rod 68 may, if desired, be directly hooked to the hook 72, it is preferred to provide an intermediate adjustment or omega loop 70, which may be manually adjusted by the orthodontist with a pair of pliers to set the initial tension in the rubber band 30a. Thus the loop 70 should be closed sufficiently to effect the proper tension in the rubber band 30a, while still maintaining a working clearance between the sleeve 66 and the stop in 78. The linkage may be deliberately disengaged, if desired, by retracting the omega loop 70 to the rear and then lifting it off from the hook 72.

A second form of safety tensioning mechanism is shown in FIGS. 12 and 13. In this embodiment the first member consists essentially of the hook 74a which extends through a slot 80 formed in an elongate linkage or slide plate 82, the other end of which is coupled by means of a hole 84 to the end of the face bow 24. Secured to the plate 82 adjacent the linkage hole 84 is a hook 76a, and tensioned between the hooks 74a and 76a is the rubber band 30.

In this embodiment the adjustment loop 70 is not employed, but instead the desired tension in the rubber band 30 is achieved at the back of the neck by adjusting the neck strap 26, as shown at 86 in FIG. 2.

The working span for the linkage is typically about 0.125 inch, and this is achieved in the embodiment shown in FIGS. 12 and 13 by making the slot 80 0.125 inch long. The initial adjustment of the apparatus is such as to position the hook 74a at the right-hand end of slot 80, as shown in FIGS. 12 and 13.

It will be readily evident that in this embodiment the stop means is constituted by the hook 74a on the first member which is engageable with the right-hand end of the slot 80 on the second member to limit the extensibility of the rubber band 30.

The embodiment shown in FIGS. 12 and 13 has the advantage that the wearer himself, or a companion, if he needs help, may readily completely disengage the face bow from the neck strap by removing the rubber band 30 from the hook 74a and then lifting the elongate slide plate 82 away from the neck strap 26.

A third variant of the face bow tensioning mechanism is shown in FIGS. 14 and 15, which constitute in some respects a modification of the form shown in FIGS. 9-11. Here the first member includes a tube or sleeve 66b secured as by soldering through the intermediacy of a spacing disk 90, to the neck strap 26b. Extended through and reciprocable in the sleeve 66b is a slider rod 92, to the forward end of which is secured a laterally extending hook 76b, that reciprocates back and forth in a longitudinal notch or slot 94 formed in the forward end of the tube 66b.

The face bow 24b is linked to the hook 76b through the intermediacy of an adjustment or omega loop 70b. Tensioned between the hook 76b and a hook 74b secured to the rearward end of the sleeve 66b is the rubber band 30b forming the retractive force for the apparatus. In this case the stop means is provided by an enlarged or swaged end 78a on the slide rod 92, which engages the rearward end of the sleeve 66b to limit the extensibility of the rubber band 30b. As in the case of the modification shown in FIGS. 12 and 13, the linkage may be deliberately disengaged simply by removing the rubber band 30b from the hooks 74b and 76b and then lifting the omega loop 70b off the hook 76b.

It will be noted that the embodiments of the invention shown in FIGS. 12, 13, 14 and 15 have the feature that the linkage at the rear of the face bow can be disengaged only by deliberately removing the tensioned rubber band 30b from at least the hook 76b (FIG. 15). The band 30b thus has the second function of insuring against disengagement of the face bow from the neck strap.

FIG. 1 shows safety devices at both the side of the head (at 30) and at the buccal tube 34, and at times it may be well to employ such at both positions. However, generally the safety features of the present invention will be needed only at one position or the other.

What is claimed is:

1. Orthodontic appliance comprising:

an inner arch;
a face bow secured to said inner arch;
each end of said arch being adapted to extend through a respective buccal tube secured to a tooth, and having stop means bearing against said tooth to apply a retractive force to the tooth;
manually actuable locking means forming an interengagement between each said end and its respective tube for preventing undesired removal of said arch from said tube;
a first member and a second member slideably mounted with respect to each other;
said first member being adapted to being secured to the end of a neck strap or retaining head gear;
said second member forming at least a part of the end portion of said face bow;
a first hook extending laterally from said first member;
a second hook extending laterally from said second member;
an elongate tension member tensioned between said hooks; and
stop means on said first and second members respectively, and engageable with each other to limit the extensibility of said tension member and to prevent undesired separation of said first and second members.

2. Orthodontic appliance comprising:

a buccal tube adapted to be secured to a tooth;
an inner arch having an end extended through said tube and having stop means bearing against said tube to apply a retractive force to the tooth;
characterized by
manually actuable locking means forming an interengagement between said end and said tube for preventing undesired removal of said end from said tube.

3. Appliance in accordance with claim 2 wherein said locking means comprises:

a groove in said arch;
detent means mounted on said tube and resiliently biased into said groove.

4. Appliance in accordance with claim 3 wherein said detent means comprises:

a pin residing in a slot in said tube; and
a leaf spring secured to said tube and bearing inwardly against said pin.

5. Appliance in accordance with claim 2 wherein said locking means comprises:

pawl means pivotally mounted to said arch end and engageable with the end of said tube;
spring means for biasing said pawl means into position to engage said tube end;
thereby to prevent removal of said arch from said tube except when said pawl means are deliberately retracted against the bias of said spring means.

6. Tensioning mechanism for an orthodontic face bow comprising:

a first and a second member slideably mounted with respect to each other;
said first member forming at least a part of the end portion of a retaining head gear or neck strap;
said second member forming at least a part of the end portion of a face bow;
a first hook extending laterally from said first member;
a second hook extending laterally from said second member;
an elongate tension member tensioned between said hooks; and
stop means on said first and second members respectively and engageable with each other to limit the extensibility of said tension member and to prevent undesired separation of said first and second members.

7. Tension mechanism in accordance with claim 6 wherein said tension member comprises an elastic band.

8. Tensioning mechanism adapted to link a first element comprising a face bow, to a second element comprising the end portion of a retaining head gear or neck strap, said mechanism comprising:

a first and a second member slideably mounted with respect to each other;
said first member being joined to one of said elements;
said second member comprising an elongate plate having a longitudinal slot, and attachment means adjacent one end for attachment to the other of said elements;
a first hook extending laterally from said first member through said slot;
a second hook extending laterally from said elongate plate adjacent said attachment means;
an elongate tension member tensioned between said hooks;
said first hook and an end of said slot constituting stop means engageable with each other to limit the extensibility of said tension member and to prevent undesired separation of said first and second members.

9. Tensioning mechanism for an orthodontic face bow comprising:

a first and second member slideably mounted with respect to each other;

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said first member comprising a sleeve and linkage rod
secured thereto, and means for connecting said rod
to the neck strap;
said second member comprising an end of the face
bow extending through said sleeve;
a first hook extending laterally from said first mem-
ber;
a second hook extending laterally from said second
member;
an elongate tension member tensioned between said 10
hooks;
a lateral extension at the end of said face bow en-
gageable with the end of said sleeve and serving as
a stop means to limit the extensibility of said exten-
sion member and to prevent undesired separation 15
of said first and second members.

10. Tensioning mechanism for an orthodontic face
bow comprising:

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a first and a second member slideably mounted with
respect to each other;
said first member comprising a sleeve secured to the
end of the neck strap and having a longitudinal
notch opening toward the face bow;
said second member comprising a rod slideable in
said sleeve, and means for connecting said rod to
the face bow;
a first hook extending laterally from said sleeve at the
end of said sleeve opposite said notch;
a second hook extending laterally from said rod and
positioned to slide back and forth in said notch;
a lateral extension on the end of said rod engageable
with the end of said sleeve to limit the extensibility
of said tension member and to prevent undesired
separation of said first and second members.

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