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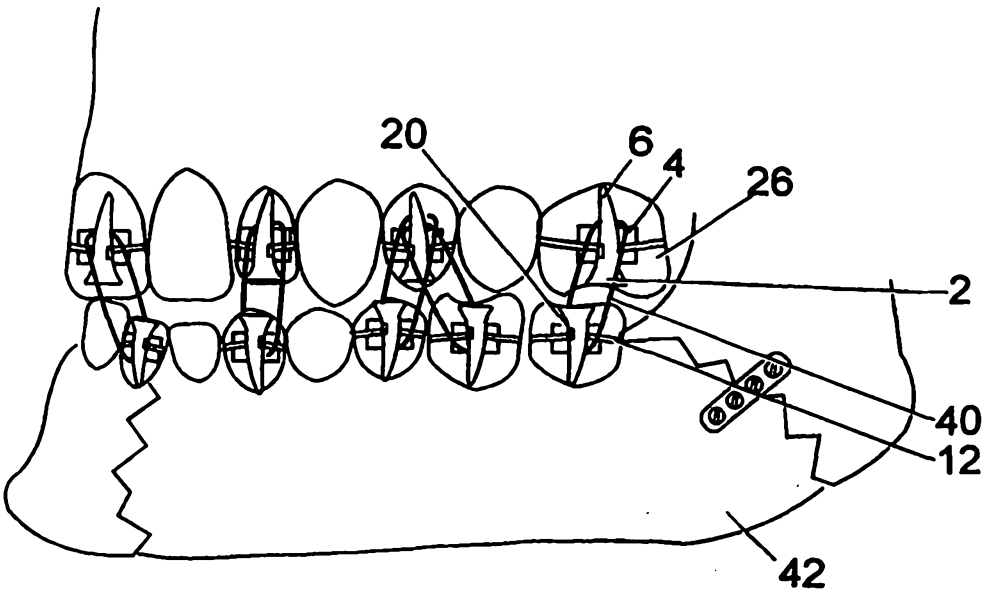

(57) Abstract

The present invention provides an intra–oral anchorage which comprises a flexible belt that extends around and between the teeth of a patient. The belt has locking means fixed thereon to receive a free end portion of the belt and lock said portion against retraction therefrom. The locking means is in the form of a buckle. The intra–oral anchorage of the present invention can be used to hold a jaw in a fixed position, in the case of a broken jaw for example. It offers ease of application and therefore a reduction in the cost of surgery as well as eliminating the risk of "needle stick" injury inherent with cutting and bending multiple ends of wire. It causes less gum damage in placement and removal, which is similarly easier, faster and less uncomfortable for the patient.

ORAL ANCHORAGE

This invention relates to a novel form of intra-oral anchorage, for use in oral surgical procedures.

Intra-oral anchorage refers to a stable point within the mouth, usually a tooth, such that traction may be applied to a less fixed or a moveable structure. Alternatively, two or more anchorage points may be used so that teeth may be held firmly together such that a fracture site may be aligned and/or that some other surgical procedure may be performed which would necessitate the occlusion being consistent throughout and after the procedure.

This intra-oral anchorage is usually achieved by use of metal wires twisted tightly around the teeth (see Figure 1A). Additionally, metal bars (arch bars) may be used to create multiple hooks as easy anchorage for traction or fixation (see Figures 1B and 1C). Once an anchorage point has been established, traction is usually achieved by means of elastic bands while fixation is by use of more metal wires.

This system of wiring is time consuming and requires

skill, dexterity and training. It is so uncomfortable for the patient that it is almost invariably done during a general anaesthesia. The removal of the wire several weeks later is usually under local anaesthesia and is generally distressing and destructive of delicate gingival (gum) structures.

As a result of the wire cutting, there are many sharp ends of wire which present hazards to the patient, operator and his assistant, as gloves and skin are often punctured by the wire. This results in a risk of transmission of blood borne infections particularly hepatitis and the AIDS virus which is a well know risk associated with current techniques.

Additionally, wire work hardens and fractures in placement and often stretches with functional load requiring readjustment.

Accordingly, the present invention provides anchorage for use in the treatment of oral fractures comprising a flexible and wholly or substantially plastic belt of a dimension to extend around and between the teeth of a patient to exert isotropic pressure thereon, the belt having integral locking means fixed thereon to receive a free end portion of the belt and lock said portion against retraction therefrom.

Preferably, the lock means is attached at one end to the belt, and may be generally in the form of a buckle.

Preferably, the locking means is in the form of a head having an aperture therethrough for receiving the end portion of the belt.

Preferably also the head has a one-way lock mechanism to allow advancement, but resist retraction of the belt

in the aperture.

The belt may comprise two sections, a first section including the free end of the belt and typically being curved; and a second section between the first section and the locking means.

The second section is preferably profiled to co-operate and lockingly engage with the locking head.

Preferably, the first section has a smooth surface to facilitate passing the belt through inter-dental spaces.

The locking head may have on its outer face means for retaining a fixing member, for example an elastic band, a plastic tie, a wire or a bar, for inter-connecting and fixing to other locking heads.

Advantageously, there are no sharp edges on the anchorage which may be hazardous to the patient or the operator.

The locking means may comprise a plurality of inclined teeth on both the second section of the belt and an inner face of the locking head whereby the teeth co-operate such that the belt can only pass through the aperture in one direction.

The locking means may include an external plate to ensure a coherent fitting of the anchorage to a tooth; the plate may be concave, although it can be varied to suit any given tooth.

In use, where more than one anchorage is used, traction may be applied between the anchorages by wrapping

elastic bands or other suitable means around retaining means such that the teeth or fracture points may be drawn into proper alignment and held in place.

The belt is typically between 10 and 14 centimetres in length and around 0.6 to 1.0 millimetres in width.

Said first section of the belt may be typically 1.5 to 3 centimetres long.

The locking head is preferably approximately 7 to 11 millimetres long and approximately 3 to 5 millimetres in width.

Further according to the invention there is provided a method of treating oral fracture including facial or jaw fractures, or facilitating facial or jaw bone surgery, comprising extending a flexible and wholly or substantially plastic belt of dimension able to fit between the intra-oral tooth spaces of a patient around one or more of a patient's teeth, passing one end portion of the belt through locking means carried on the belt and tensioning the belt around the teeth by drawing it through the locking means, said locking means preventing retraction of the belt therefrom.

The belt is preferably of plastics material.

More preferably the belt is of Nylon having a tensile yield strength of between 50 to 80 MN/m^2 and a Rockwell hardness of between 100 – 140.

Optionally the belt, is of polyketone, having a tensile yield strength of between 50 to 80 MN/m^2 and a Rockwell hardness of between 100 – 140.

Optionally a portion of the belt, especially the first section of the belt may be of steel, having a tensile

yield strength of between 175 to 2000 MN/m^2 and a modulus of elasticity of between 175 to 230 GN/m^2.

The plastic 'buckle' preferably faces outwards from the face of the tooth and incorporates a hook and location point for an arch bar. The entire device can be produced with no sharp edges and may have minor modifications of shape to facilitate placement.

Embodiments of the invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1A: Illustrates the prior art method of intra-oral wiring.

1B: Illustrates an arch bar of the prior art.

1C: Illustrates an arch bar of the prior art anchored by intra-oral wiring.

Figure 2A: Illustrates an anterior view of the first embodiment of the anchorage.

2B: Illustrates the first embodiment of the anchorage viewed from the right hand side.

2C: Illustrates the first embodiment of the anchorage viewed from the left hand side.

2D: Illustrates the posterior view of the first embodiment of the anchorage.

Figure 3A: Shows the first embodiment of the anchorage 'open'.

3B: Shows the first embodiment of the anchorage 'closed'.

3C: Shows the locking mechanism.

Figure 4A-D: Illustrates the device being fitted to a tooth.

Figure 5: Shows traction being applied using elastic bands wrapped around the hooks.

Figure 6A: Shows an arch bar fitted in place.

6B: Shows an arch bar secured in place by an elastic band.

Figure 7A: Shows a fracture at two positions.

7B: Shows the fracture sites realigned with a screw plate in place.

Figure 8A: Illustrates a top view of the second embodiment of the anchorage.

8B: Illustrates the second embodiment of the anchorage viewed from the right hand side.

8C: Illustrates the second embodiment of the anchorage viewed from the left hand side.

Figure 9: Illustrates the second embodiment of the

anchorage viewed from the left hand side.

Figure 10: Illustrates the pulling taut of the belt within the anchorage.

Figure 11A: Illustrates anchorages attached to teeth viewed from the front.

11B: Illustrates anchorages attached to teeth viewed from the side.

11C: Illustrates anchorages attached to teeth with an elastic band placed over the hooks, viewed from the side.

Figure 12A: Illustrates the second embodiment of the anchorage viewed from the right hand side.

12B: Illustrates the second embodiment of the anchorage viewed from the right hand side.

12C: Illustrates the second embodiment of the anchorage viewed from the right hand side.

Figure 13A: Illustrates the belt of the anchorage with teeth on its upper side viewed from the top, in cross section and from the side.

13B: Illustrates the belt of the anchorage viewed from the top and in cross section.

13C: Illustrates the belt of the anchorage with teeth on its side viewed from above and from the right hand side.

Figure 14A: Illustrates the first section of the belt of the anchorage viewed from the side and in cross section.

14B: Illustrates the curvature of the first section of the belt of the anchorage viewed from the side.

Figure 15A: Illustrates how the teeth of the belt cooperate with the teeth of the anchorage.

15B: Illustrates the metal member locking system.

15C: Illustrates the third embodiment of the anchorage with the flap open and also closed, viewed from the front.

15D: Illustrates the fourth embodiment of the anchorage and also when in use, viewed from the front.

15E: Illustrates the fifth embodiment of the anchorage and also when in use attached to a belt, viewed from the front.

Figure 16: Illustrates the belt of the anchorage viewed in cross section.

Figure 17A: Illustrates a perspective view of the second embodiment of the anchorage.

17B: Illustrates the second embodiment of the anchorage viewed from the left hand side.

17C: Illustrates the second embodiment of the anchorage viewed from the top side.

17D: Illustrates the second embodiment of the anchorage viewed from the right hand side.

Figure 18A: Illustrates the second embodiment of the anchorage viewed from above.

18B: Illustrates the second embodiment of the anchorage viewed from the right hand side.

Figures 1A-1C shows the prior use method of wiring an arch bar to teeth to provide a plurality of anchor points for traction to be applied.

The oral anchorage of the first embodiment of the invention is formed from a single piece of plastics material 2. The plastics material 2 is shaped to form a flat section 4 and a hook 6, which adjoins flat section 4. Between the flat section 4 and hook 6 there is a groove 8 for placement of arch bar 10. Hook 6 has a belt 12 which runs perpendicular from hook 6. Belt 12 may have teeth 14 on its upper and or side sections and is in sections 16 and 18; section 16 is linear and section 18 is curved. Hook 6 also has apertures 20 and 22 for entry and exit access for belt 12, and has teeth 24 between apertures 20 and 22, which cooperate with the teeth of belt 12, to produce a one-way locking mechanism. Aperture 20 is funnelled for ease of belt

entry.

In use the first embodiment of the oral anchorage of the invention is offered to outside face of tooth 26. Belt 12 is pushed through the gap between teeth 26 and 28, passed around the back of tooth 26 and through the gap between teeth 26 and 30. Belt 12 is then threaded into aperture 20, pulled through aperture 22 and pulled tight until taut around tooth 26. Belt 12 is held in position by virtue of the cooperation of its teeth 14 with teeth 24. The locking mechanism is of a one-way type such that once the belt 12 is passed through the apertures 20 and 22 it cannot be drawn back in the opposite direction. Any excess belt 12 which is left protruding from aperture 22 is cut away using any conventional technique.

The locking mechanism of the belt 12 between apertures 20 and 22 may vary. Teeth 14 on belt 12 may be on the longditudal side 32 or the vertical side 34 of belt 12.

Alternatively a metal member 36, positioned between the apertures 20 and 22 within the anchorage 2, and angled so that the belt may pass one way over the metal member 36 may comprise the locking mechanism.

Once attached to tooth 26 the oral anchorage may cooperate with another oral anchorage, which has been similarly attached to tooth 38. By virtue of an elastic band, plastic ties or ligature wires 40 traction can be provided between the two oral anchorages, fixing jaw 42 in position for healing to occur.

An arch bar 10 may be fixed into grooves 8. The arch bar is held in place by an elastic band 40 or by close

adoptation to facets in the buckle.

The oral anchorage of the second embodiment of the invention is formed from a single piece of plastics material 2. The plastics material 2 is shaped to form a hook 6 having a groove 8 for placement of elastic band 40. Hook 6 has a belt 12 which runs perpendicular from hook 6. Belt 12 has teeth 14 and is in sections 16 and 18; section 16 is linear and section 18 is curved. Hook 6 also has apertures 20 and 22 for entry and exit access for belt 12 with teeth 24 between apertures 20 and 22, which cooperate with the teeth of belt 12, to produce a one-way locking mechanism.

The oral anchorage of the third embodiment of the invention is formed from a single piece of plastics material 2. The plastics material 2 is shaped to form a hook 6 for placement of elastic band 40 and has a flap 42 hinged about the anterior end 44 of anchorage 2. Hook 6 has a belt 12 which runs perpendicular from hook 6. In use the anchorage is applied to a tooth 24 as in the first embodiment. The difference from the first embodiment is that belt 12 is restrained in anchorage 2 by closing flap 42 tight against anchorage 2.

The oral anchorage of the fourth embodiment of the invention is formed from a single piece of plastics material 2. The plastics material 2 is shaped to form a hook 6 for placement of elastic band 40 and has an incision 46 cut into the anchorage 2 toward its anterior end. Incision 46 is tapered from its point of incision. Hook 6 has a belt 12 which runs perpendicular from hook 6. In use the anchorage is applied to a tooth 24 as in the first embodiment. The difference from the first embodiment is that belt 12 is

restrained in anchorage 2 pulling the belt tight in incision 46.

The oral anchorage of the fifth embodiment of the invention is formed from a single piece of plastics material 2. The plastics material 2 is shaped to form a hook 6 for placement of elastic band 40 and has an incision 48 cut into the side of anchorage 2. Incision 48 is designed to cooperate with a belt 12, which has a bulbous end 50. The bulbous end 50 is restrained in incision 48 as the belt is pulled tight in its attachment to a another oral anchorage.

In the case of a fracture (see Figure 7A), once the teeth are brought into their correct relationship, the fracture sites will necessarily be correctly aligned. Using the hooks as anchorage points, ligature wires, strong elastic bands, or plastic ties would hold this stable for weeks to allow healing or briefly to allow placement of a rigid metal plate, fixed by screws (see Figure 7B).

The oral anchorage of embodiments of the present invention then provide anchorage points for the application of traction to teeth, particularly in the case of a broken jaw which is to be held in a fixed position. It offers a number of advantages over the conventional intra-oral anchorage method of metal wires as a result of its construction and ease of application. Particularly as there are no sharp ends of metal wires there is a much lower risk of "needle stick" injury to both patient and surgeon.

The present invention is easier to apply to a patient, resulting in lower operating time (and resultant lower costs) in applying and removing the anchorage and less

damage to the delicate gum tissue in placement and removal. The anchorages are also sterile packed, are biologically inert and are compatible with other prosthetic and surgical technology/equipment.

Throughout the specification, unless the context requires otherwise, the word "comprise" or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

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CLAIMS

1. An anchorage for use in treatment of oral fractures comprising a flexible and wholly or substantially plastic belt of dimension able to fit between the intra-oral tooth spaces of a patient and able to extend around a tooth to exert isotropic pressure thereon, the belt having integral locking means fixed thereon to receive a free end portion of the belt and lock said portion against retraction therefrom.

2. An anchorage as claimed in Claim 1, whereby the locking means thereof is attached at one end of the belt and is in the form of a buckle.

3. An anchorage as claimed in Claim 1 and 2, whereby the locking means thereof is in the form of a head having an aperture therethrough or therein for receiving the end portion of the belt.

4. An anchorage as claimed in Claim 3, whereby the head of the locking means has a one-way lock mechanism to allow advancement, but resist retraction of the belt in the aperture.

5. An anchorage as claimed in any preceding Claim having a belt which comprises two sections; a first curved section including the free end of the belt and a second section between the first section and the locking means.

6. An anchorage as claimed in Claim 5, whereby the second section of the belt thereof is profiled to co-operate and lockingly engage with the locking head.

7. An anchorage as claimed in any preceding Claim, whereby the first section of the belt thereof has a smooth surface to facilitate passing the belt through inter-dental spaces.

8. An anchorage as claimed in any one of Claims 3 to 7, whereby the locking head thereof has on its outer face means for retaining a fixing member, for example an elastic band, a plastic tie, a wire or a bar, for inter-connecting and fixing to other locking heads.

9. An anchorage as claimed in any preceding Claim, which has no sharp edges that may be hazardous to the patient or the operator.

10. An anchorage as claimed in any preceding Claim, whereby the locking means thereof comprises a plurality of inclined teeth on both the second section of the belt and an inner face of the locking head whereby the teeth co-operate such that the belt can only pass through the aperture in one direction.

11. An anchorage as claimed in any preceding Claim, whereby the locking means thereof includes an

external concave plate to ensure a coherent fitting of the anchorage to a tooth.

12. An anchorage as claimed in any preceding Claim, the belt thereof is 10 to 14 centimetres in length and around 0.6 to 1.0 millimetres in width.

13. An anchorage as claimed in any preceding Claim, the first section of the belt is 1.5 to 3 centimetres long.

14. An anchorage as claimed in any preceding Claim, the locking head is between 7 to 11 millimetres long and between 3 to 5 millimetres in width.

15. An anchorage as claimed in any preceding Claim, whereby the belt thereof is wholly made of plastics material.

16. An anchorage as claimed in any preceding claim whereby a portion of the belt thereof is made of steel, particularly the first section, having a tensile yield strength of 175 to 2000 MN/m^2 and a modulus of elasticity of 175 to 230 GN/m^2.

17. An anchorage as claimed in any one of Claims 2 to 16, whereby the plastic buckle provided on the belt thereof faces outwards from the face of the tooth and incorporates a hook and location point for an arch bar.

18. A method of treating an oral fracture, comprising extending a flexible and wholly or substantially plastic belt of dimension able to fit between the intra-oral tooth spaces of a patient around one or more of a patient's teeth, passing one end portion of the belt through locking means carried on the belt and tensioning the belt around the teeth by drawing it through the locking means, said locking means preventing the retraction of the belt therefrom.

19. A method of applying traction between two or more anchorages as claimed in any one of Claims 1 to 17 in use, wherein elastic bands or other suitable means are wrapped around the anchorages such that the teeth or fracture points may be drawn into proper alignment and held in place.

20. An anchorage according to any one of the preceding claims substantially as herein described with reference to the accompanying drawings.

21. A method of treating an oral fracture according to claim 18 substantially as herein described.

22. A method of applying traction according to claim 19 substantially as herein described.

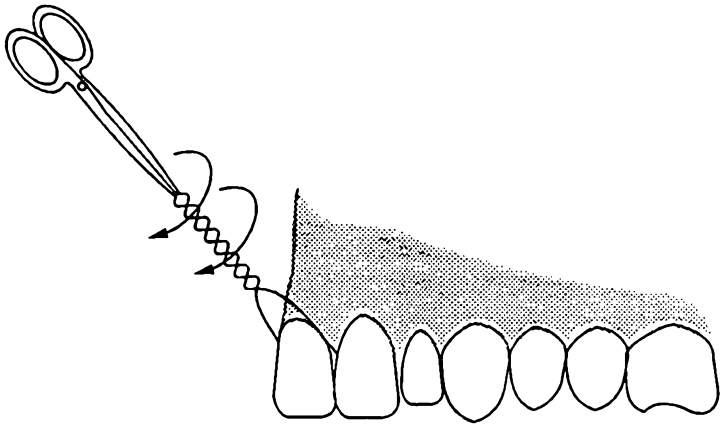


Fig. 1a

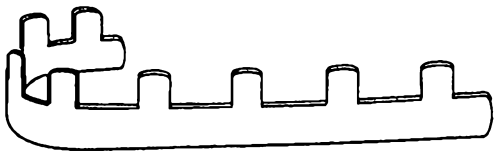


Fig. 1b

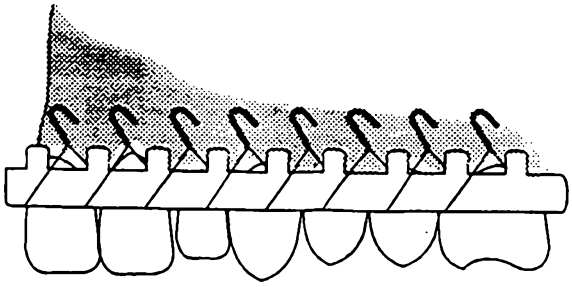


Fig. 1c

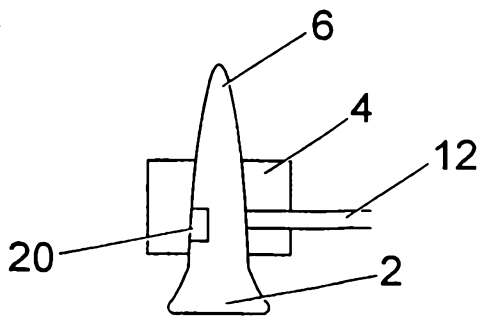


Fig. 2a

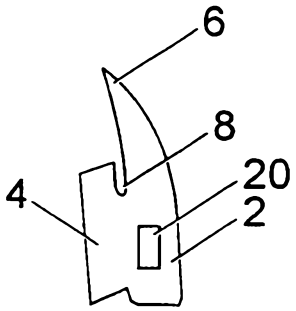


Fig. 2b

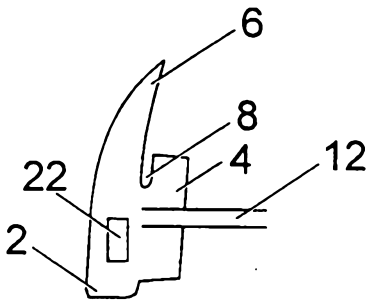


Fig. 2c

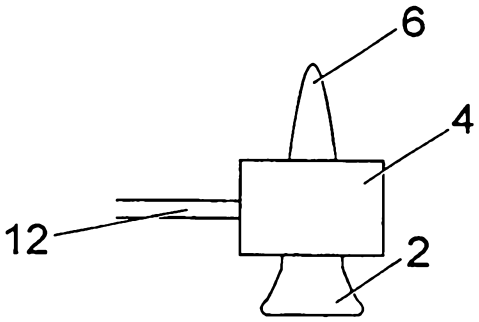


Fig. 2d

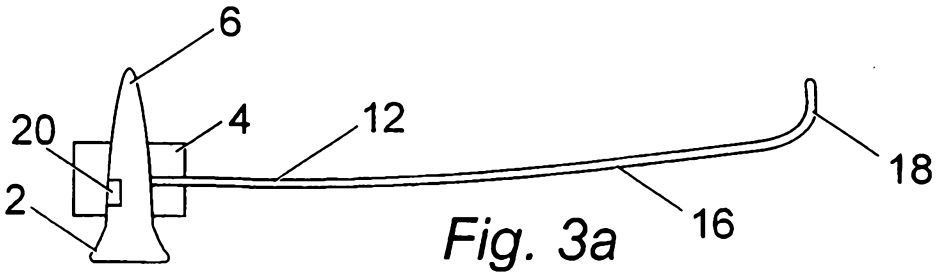


Fig. 3a

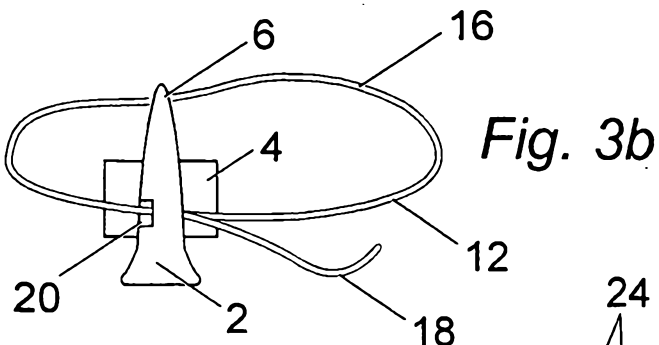
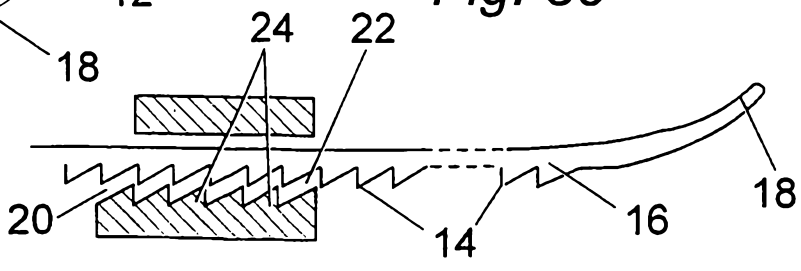


Fig. 3b

Fig. 3c



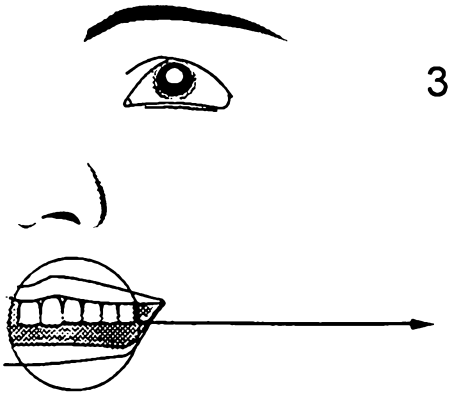


Fig. 4a

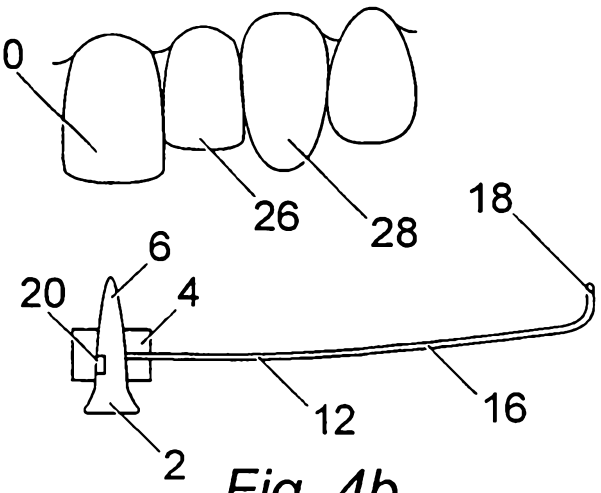


Fig. 4b

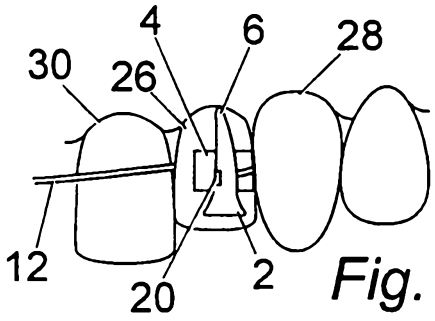


Fig. 4c

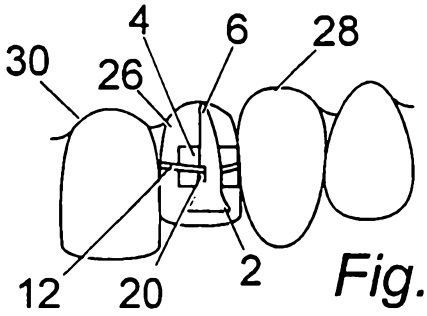


Fig. 4d

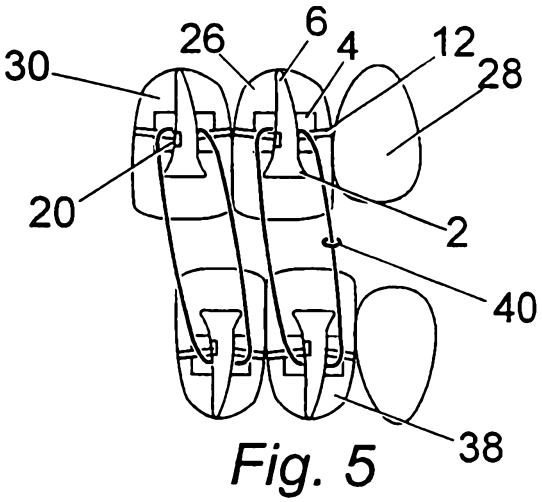


Fig. 5

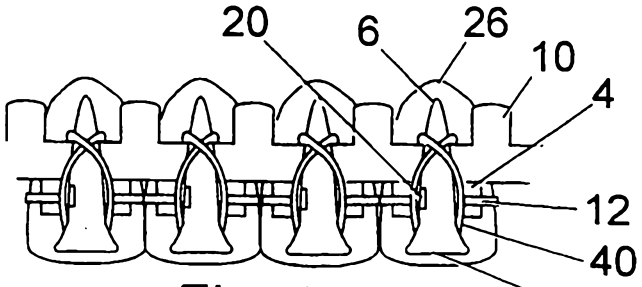


Fig. 6a

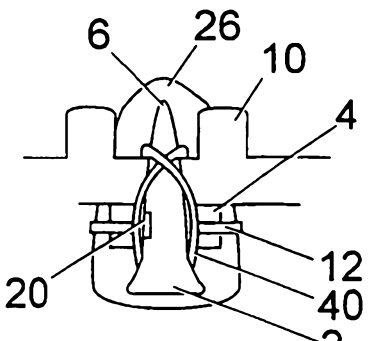


Fig. 6b

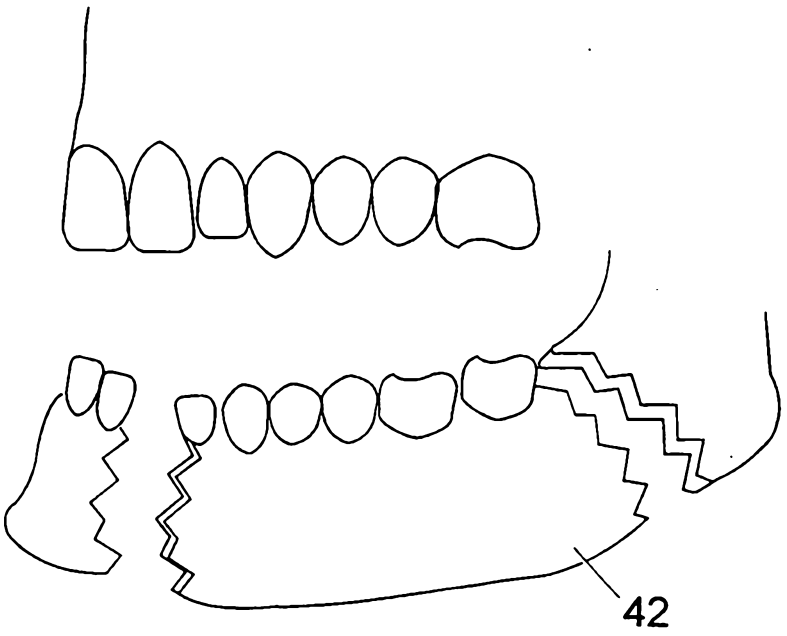


Fig. 7a

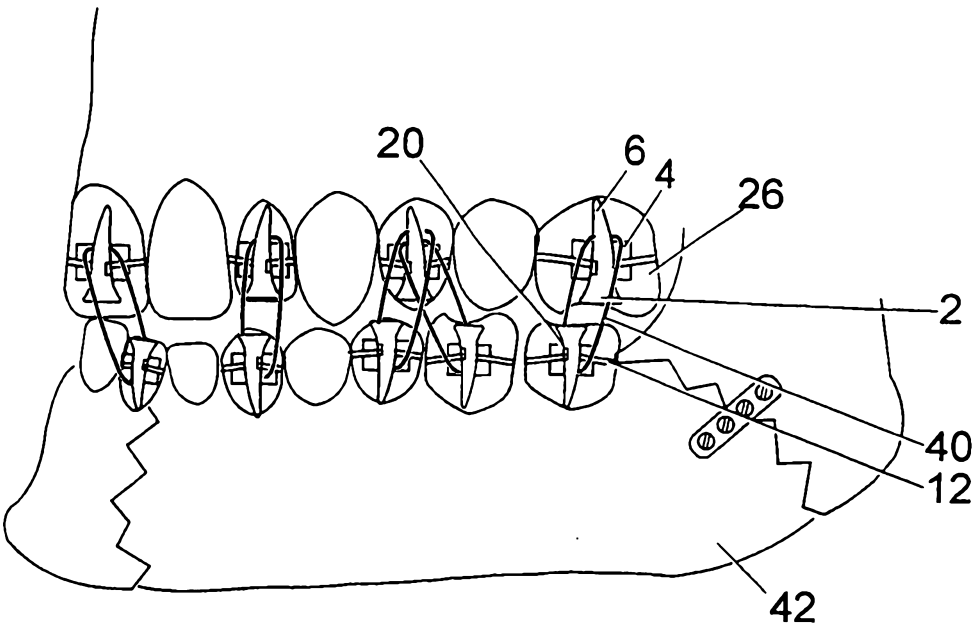


Fig. 7b

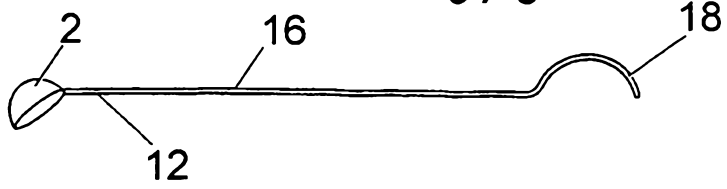


Fig. 8a

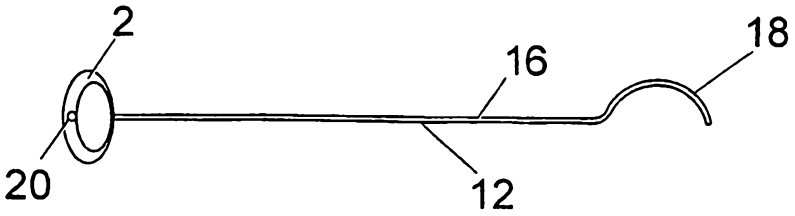


Fig. 8b

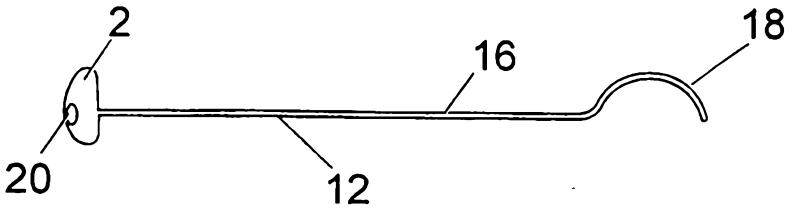


Fig. 8c

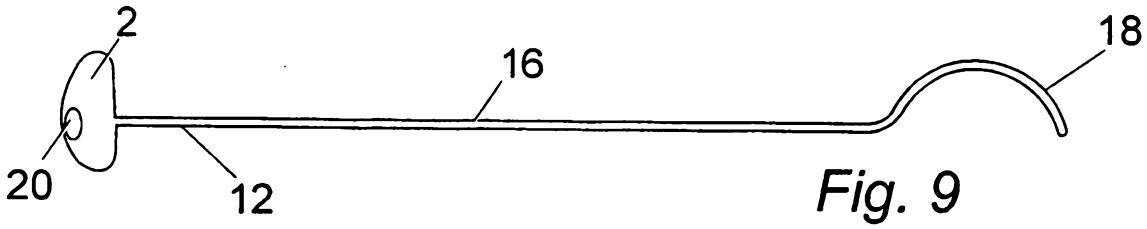


Fig. 9

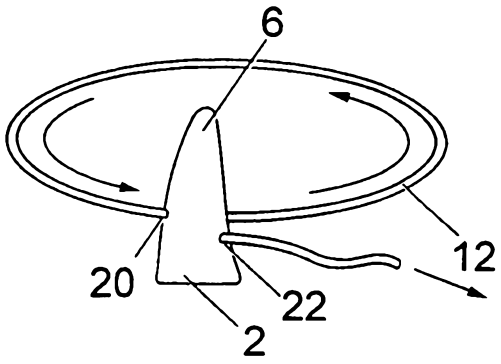


Fig. 10

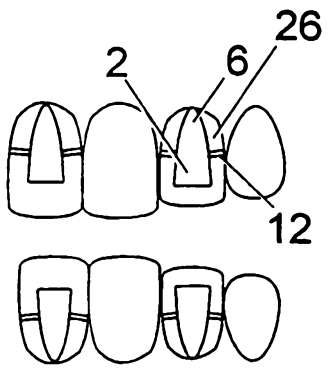


Fig. 11a

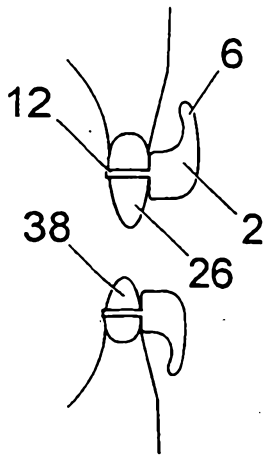


Fig. 11b

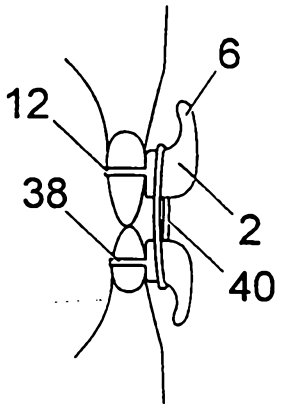


Fig. 11c

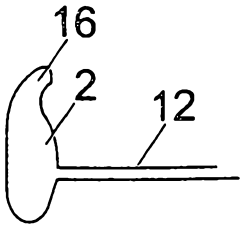


Fig. 12a

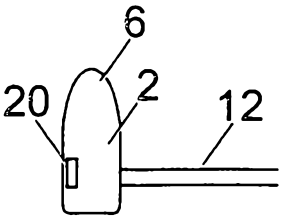


Fig. 12b

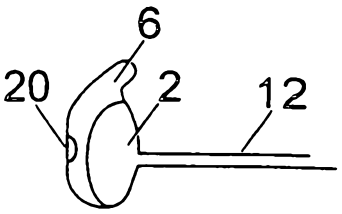


Fig. 12c

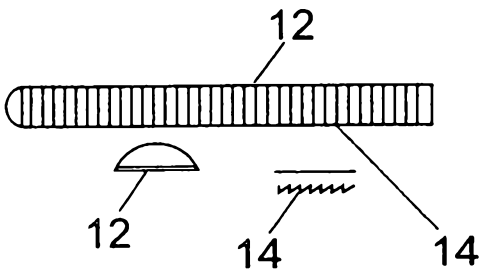


Fig. 13a

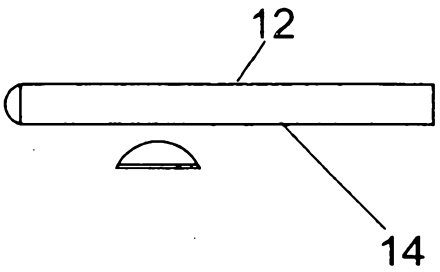


Fig. 13b

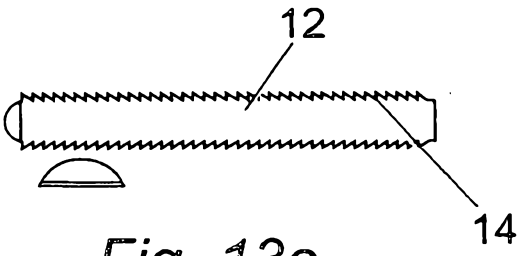


Fig. 13c

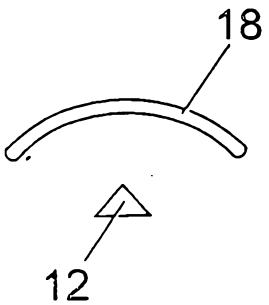


Fig. 14a

Fig. 14b

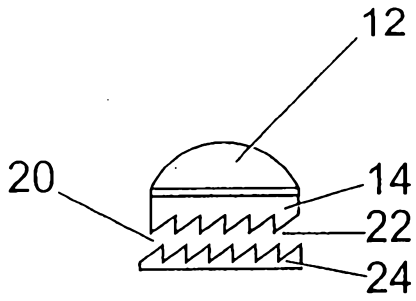
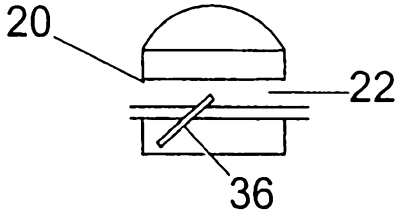


Fig. 15a



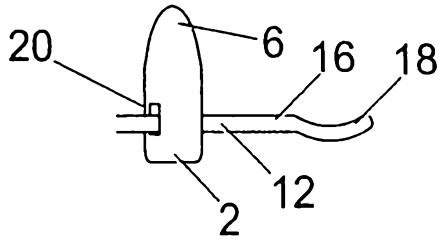
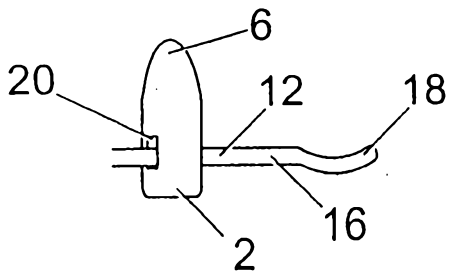
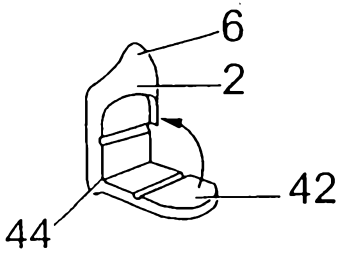
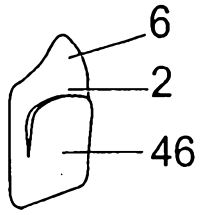


Fig. 15b







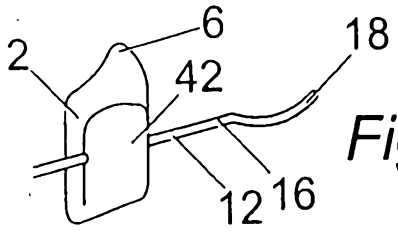


Fig. 15c

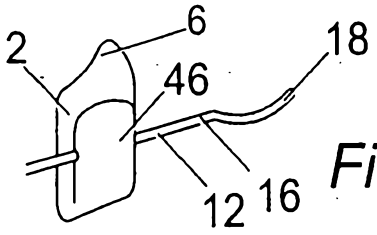


Fig. 15d

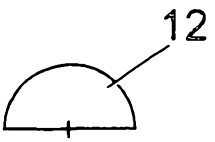


Fig. 16

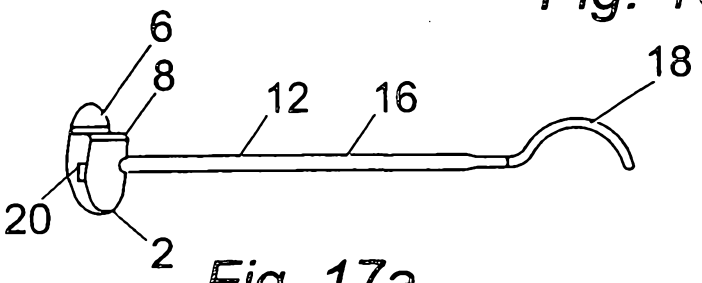


Fig. 17a

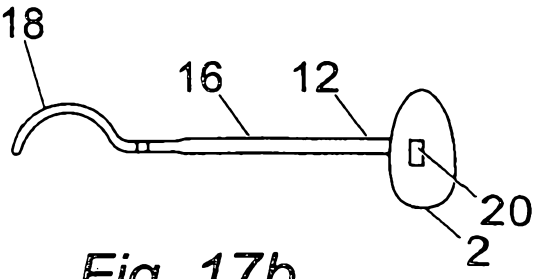


Fig. 17b

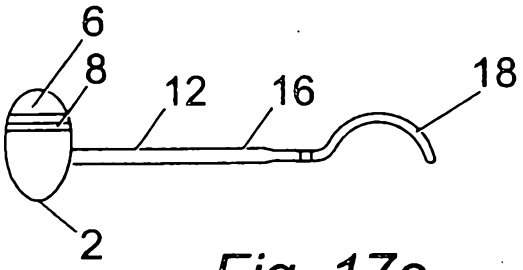


Fig. 17c

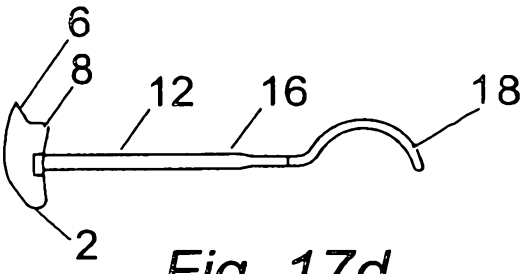


Fig. 17d

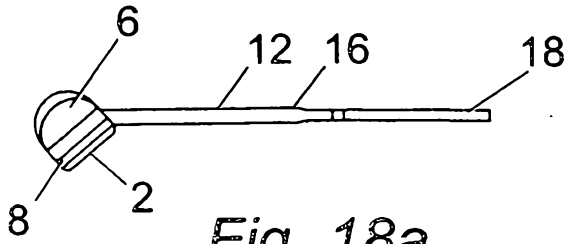


Fig. 18a

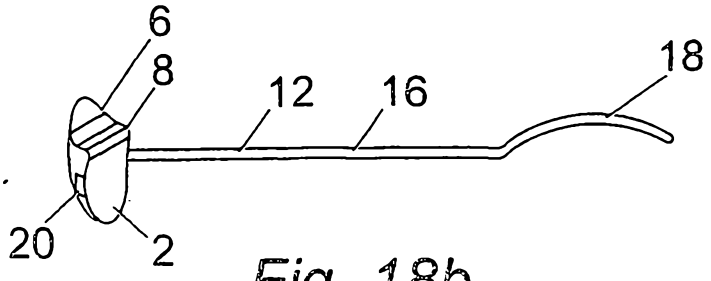


Fig. 18b