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(54) **FIXATION PIN**

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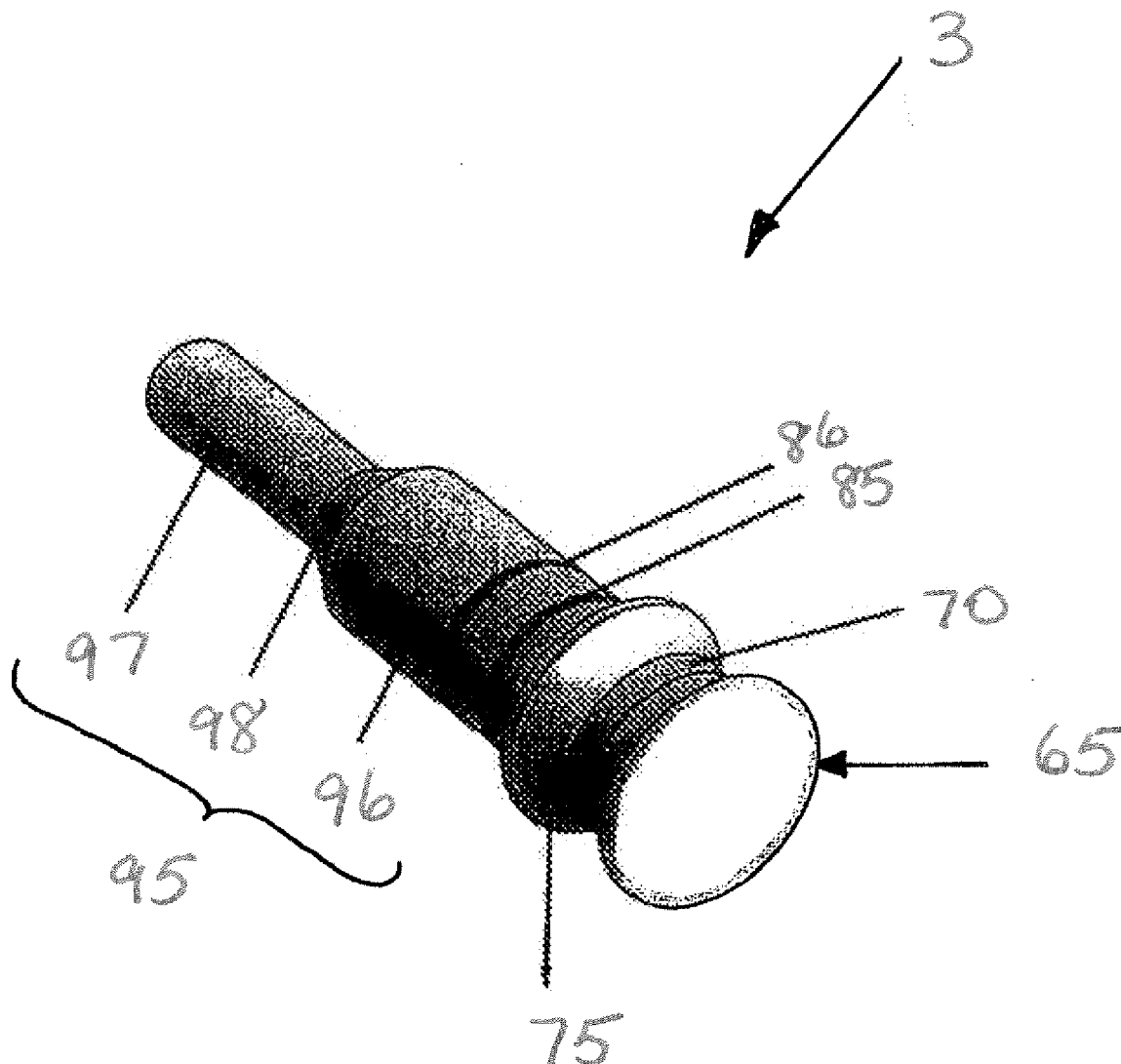
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(57) **ABSTRACT**

Fixation pin (1) for fixing a dental drill template. The fixation pin (1) has a head (5) having a bearing surface (10) that is intended to bear at least partially on the drill template, or a sleeve provided in the drill template. The fixation pin (1) has a rod (15) having a shape of an essentially circular cylinder and which extends from the bearing surface (10) at an essentially right angle. The rod (15) is intended to be inserted into the drill template or the sleeve provided in the drill template.



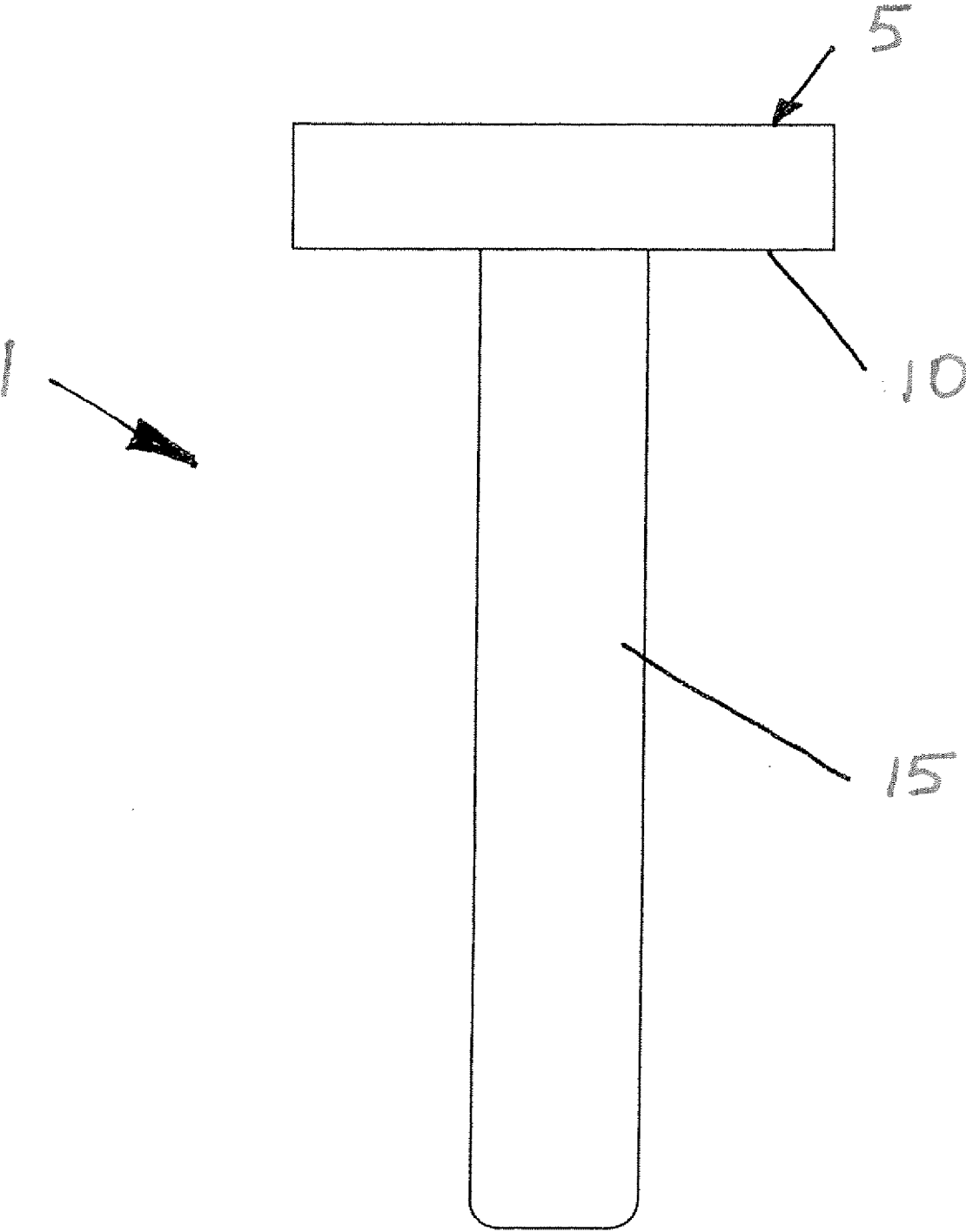


Fig. 1

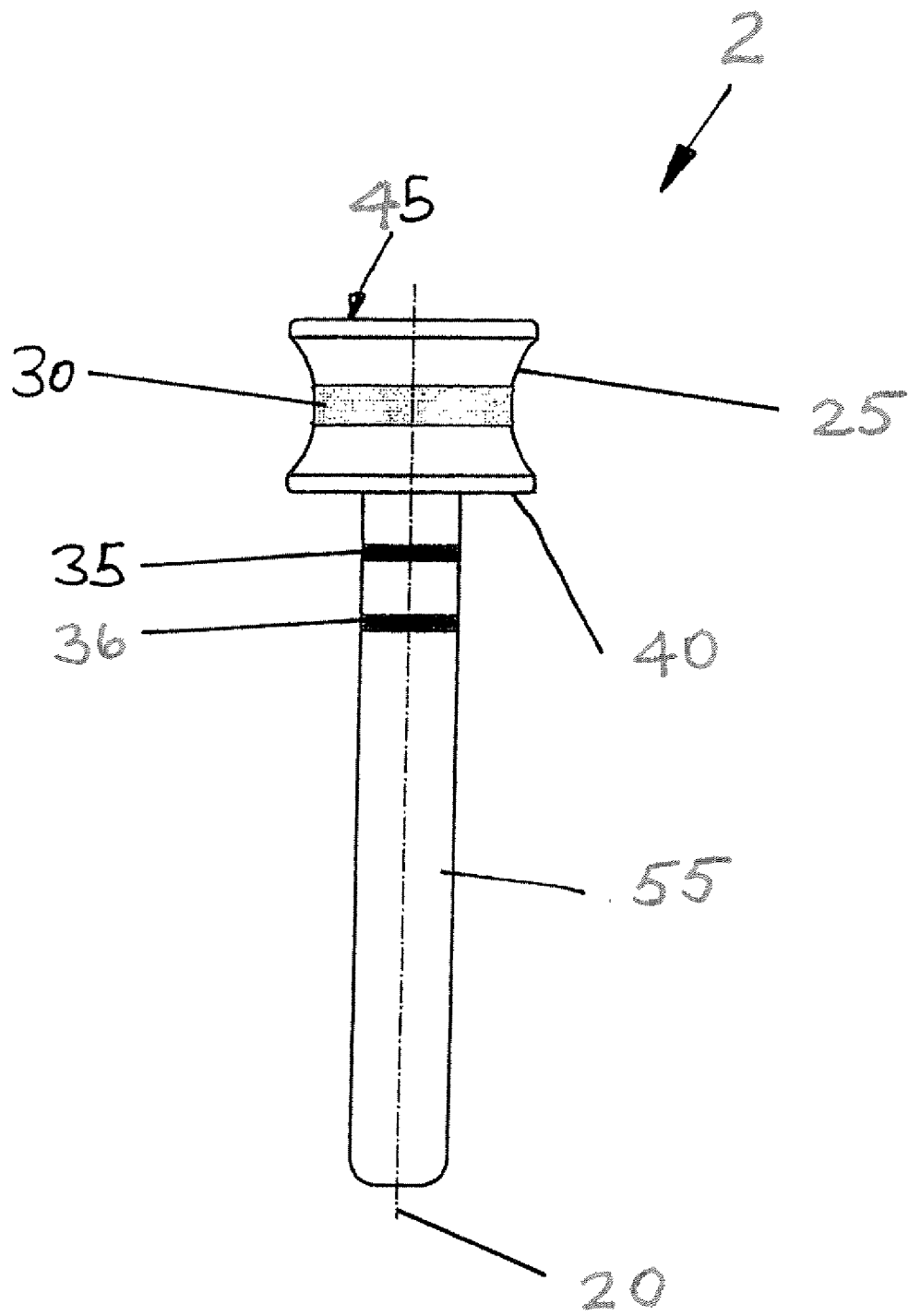


Fig. 2

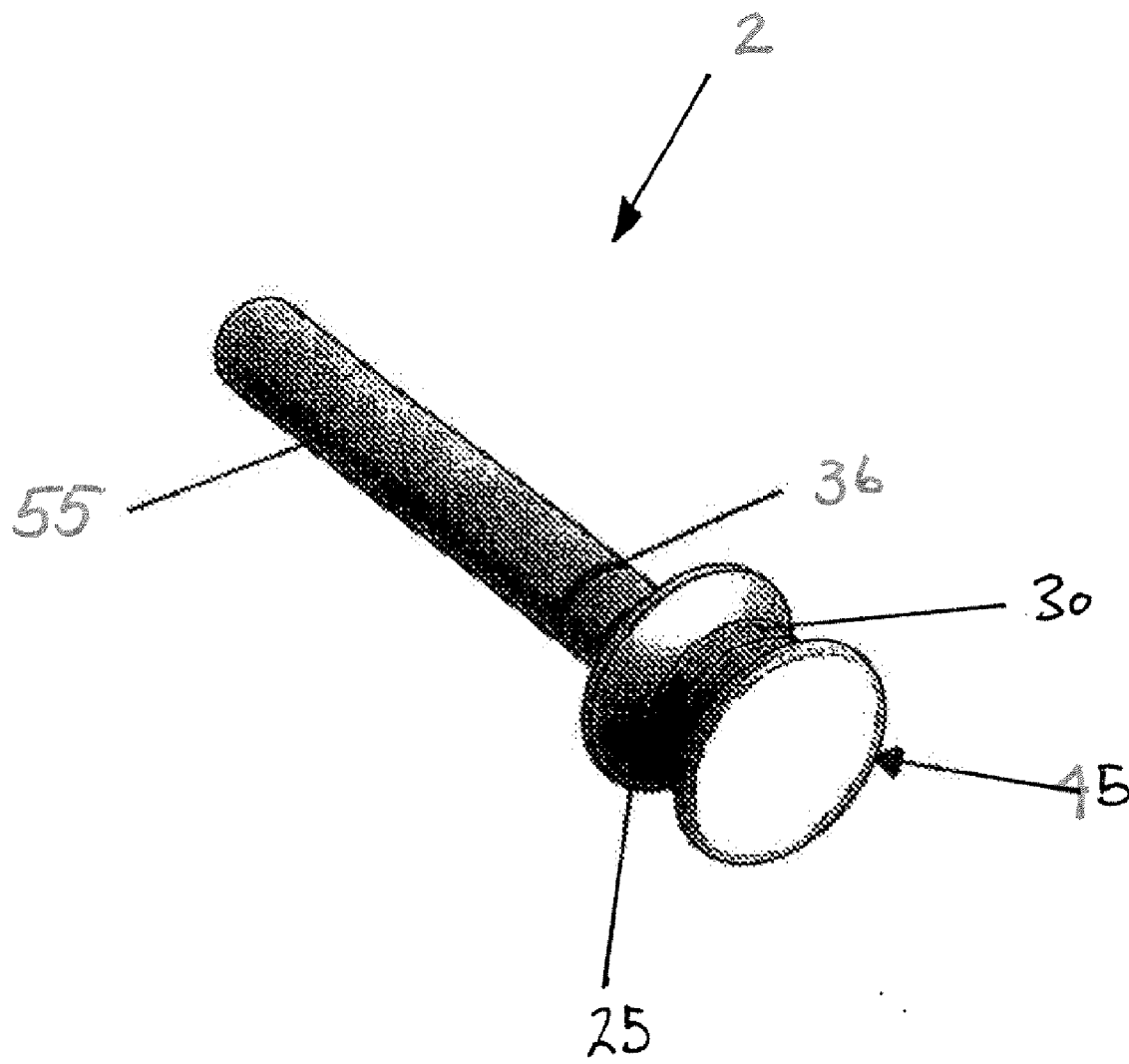


Fig. 3

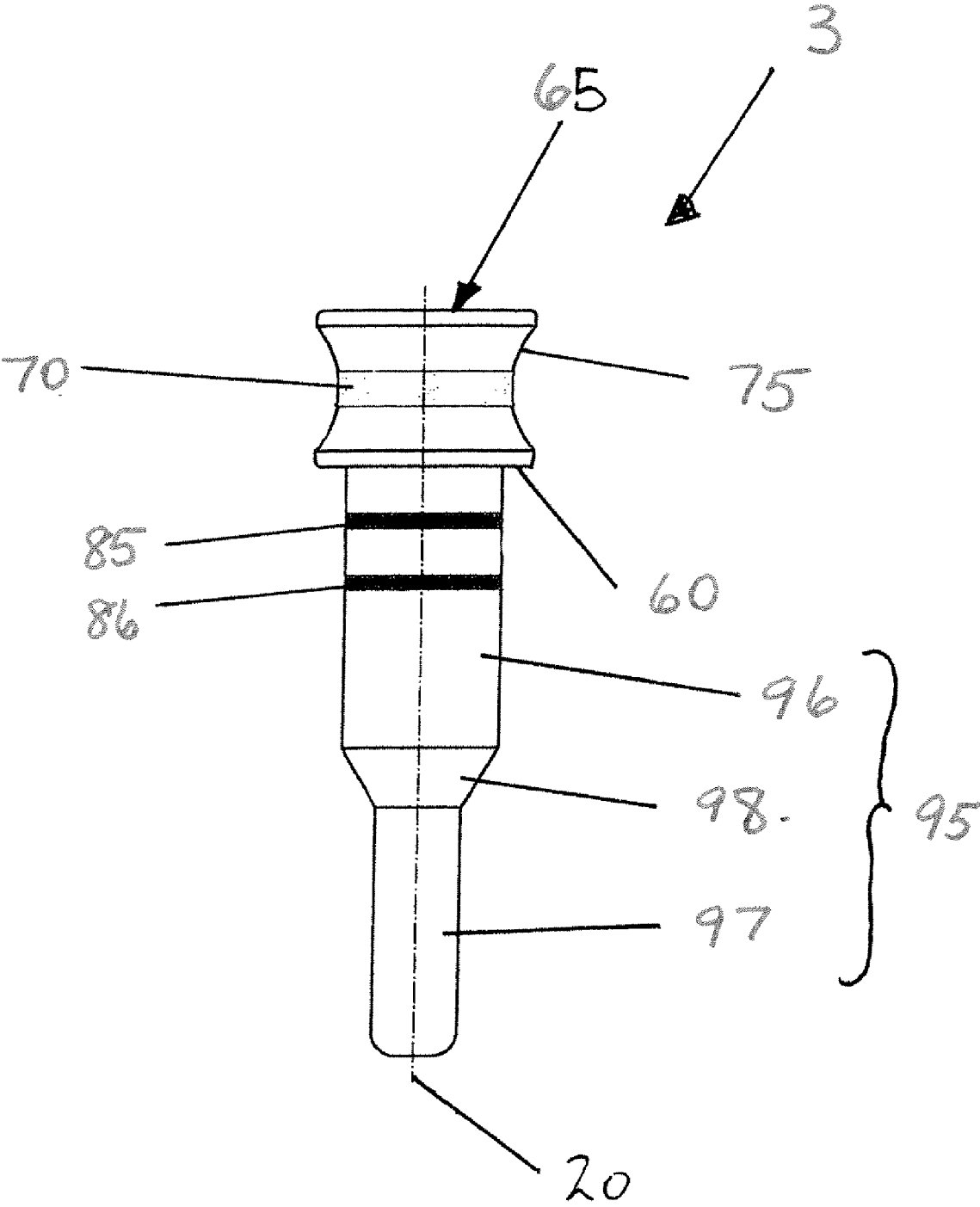


Fig. 4

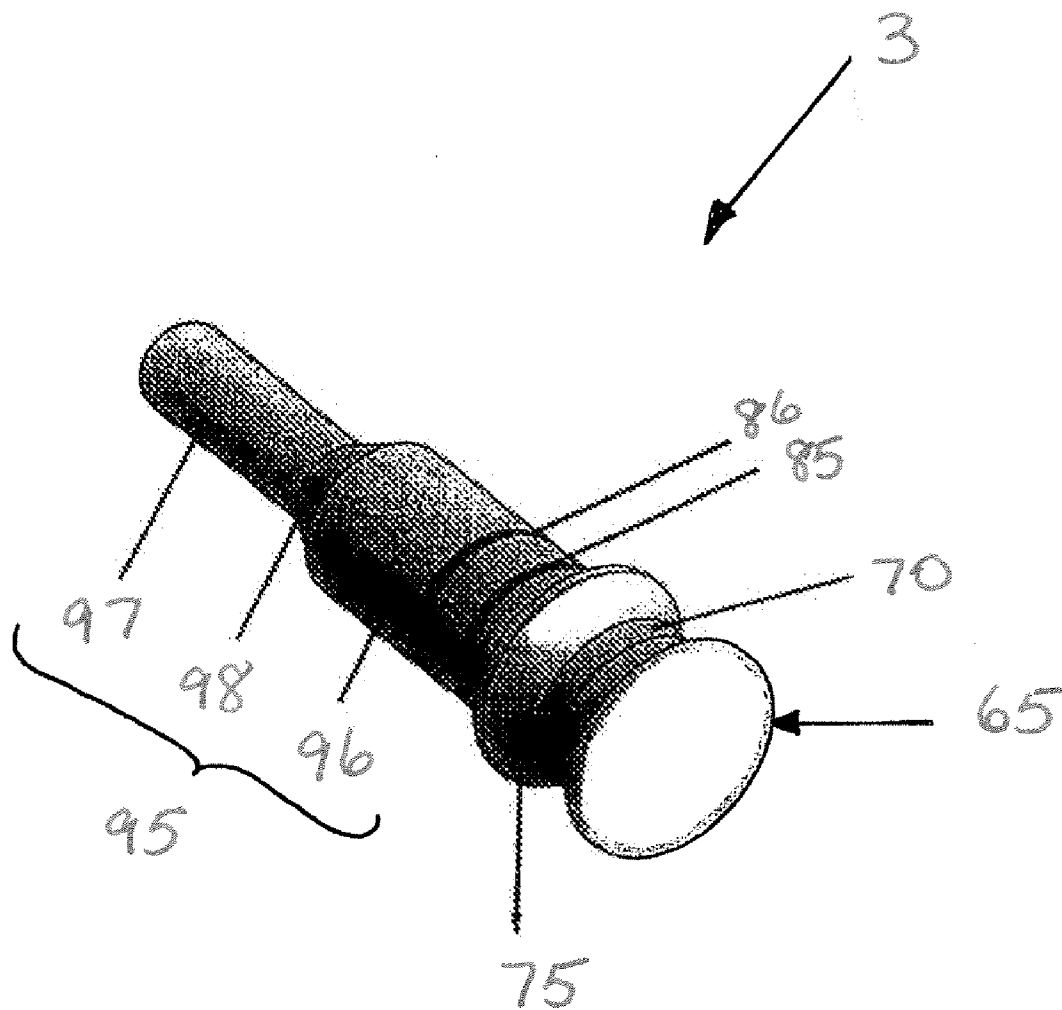


Fig. 5

FIXATION PIN

FIELD OF THE INVENTION

[0001] The present invention relates to a fixation pin for a dental template, to a set including the fixation pin and to its use for fixing a dental drill template.

BACKGROUND

[0002] In dentistry it is well known to replace either missing teeth or carious teeth where the progress of caries is such that they cannot be fixed in another, less invasive way. Said missing teeth are usually replaced by an endosseous implant with an artificial supra-structure. While quite a lot research has been done to improve the dental implants themselves, tools and devices which aid in planning the implantation and during the surgical intervention have long been neglected. However in recent years such aiding devices have become more and more important.

[0003] For instance, the drilling of the hole necessary for the endosseous part of the dental implant has been simplified. While at the beginning the drilling of the hole was purely dependent on the skill of the individual surgeon, there are now drill templates which are adapted to the anatomy of the individual patient and which serve to achieve a precise drilling of the hole. The drill template is manufactured after a prior check of the anatomy of the patient's jaw bone. Such a check helps to define the optimal position of the necessary bore hole(s). Once this positional information has been obtained and incorporated into the drill template by means of bore holes, the drill template is used by the surgeon to provide an optimal guiding of the drill thereby achieving the desired axis and dimensions of the hole(s). The drilling of the holes is a crucial step for a successful implantation, since it is hardly possible to correct wrongly positioned bore holes. Even slight corrections, e.g. of the drill axis, further diminish jaw bone mass and are thus difficult to correct. Although it is of utmost importance that drill templates are kept exactly in position once they have been placed on the jaw or the gum of a patient, there are no special means to keep the drill template in place during its use.

SUMMARY OF THE INVENTION

[0004] The problem addressed by the present invention is to provide an article and method for temporarily fixing a drill template in position while the drill template is used.

[0005] A fixation pin for fixing a dental drill template, according to one embodiment of the invention, has a head with a bearing surface that is intended to bear at least partially on a drill template, or a drill sleeve provided in a drill template. The fixation pin further has a rod having a shape of an essentially circular cylinder and which extends from the bearing surface of the head at an essentially right angle, whereby said rod is intended to be inserted into the drill template or the drill sleeve provided in the drill template.

[0006] The fixation pin provides for a fast and reliable fixation of a drill template and is easy to handle. Since the rod of the fixation pin does not have a screw thread, there is no screwing requirement. On the contrary, the essentially cylindrical shape of the rod can be easily inserted into the drill template, or the drill sleeve provided in the drill template, and

ensures a fast and detachable fixation of the drill template. In contrast, multiple insertions of a rod having a screw thread is likely to damage the bore hole and thus hamper the subsequent insertion of a dental implant such that the implantation is unsuccessful because of poor osseointegration of the implant. The fixation pin in various embodiments of the invention may also serve as a temporary cap of the bore hole and prevent the intrusion of blood, bone debris and other unwanted particles or liquids (e.g. saliva of the patient). This is particularly advantageous if several holes have to be drilled. Further, the bearing surface of the head of the fixation pin may provide a physical stop limiting the depth the fixation pin may be inserted into drill template (or drill sleeve provided in the drill template), thereby also limiting the depth by which the fixation pin extends into the bore hole that has been drilled into the jaw bone.

[0007] In a further embodiment, the head of the fixation pin has a shape of an essentially circular cylinder.

[0008] In another embodiment, the head has a circumventing indentation, which circumventing indentation preferably has a concave shape. The circumventing indentation provides for a good grip. The good grip avoids unintentional slipping and/or dropping of the fixation pin by the operator.

[0009] In a further embodiment of the fixation pin, the rod has a first portion which extends from the bearing surface of the head. The rod has, subsequent to the first portion, a second portion, said second portion having a diameter which is smaller than the diameter of the first portion. The second portion is attached to the first portion of the rod.

[0010] The axis of the first portion and the second portion of the rod are preferably coaxial.

[0011] In a further preferred embodiment, the first portion of the rod is connected to the second portion of the rod by an intervening third portion which has a conical shape.

[0012] In another embodiment, the fixation pin is made of one single piece. Being made of one piece the manufacturing of the fixation pin is simplified and its mechanical stability is further improved.

[0013] In a further embodiment, the fixation pin is made of a material which is selected from the group consisting of hard plastics, stainless steel, titanium and titanium alloys.

[0014] In a preferred embodiment, the fixation pin is made of titanium or a titanium alloy. Titanium has a very good stability and is biologically inert, that is to say, it has an excellent biocompatibility.

[0015] In a further embodiment, the fixation pin is made of stainless steel. Stainless steel shows a very good stability and is biologically inert. Stainless steel is readily available and is inexpensive.

[0016] In another embodiment, the fixation pin further includes an aspiration security. The aspiration security prevents unwanted aspiration of the fixation pin by the patient. Such an unwanted aspiration may be harmful for the patient and cause injury.

[0017] In a preferred embodiment, the aspiration security is a string that is attached to the head of the fixation pin. For instance, a dental floss may be bound around the head of the fixation pin, more precisely, around the circumventing indentation.

[0018] While the fixation pin is inserted in the drill template (or a sleeve provided in the drill template) in a patient's mouth, the end of the string which is opposite to the one attached to the fixation pin may be temporarily fixed outside the mouth of the patient. It may also be simply held by hand.

[0019] The present invention also relates to a set that includes at least one fixation pin. Preferably, the set comprises more than one fixation pin, whereby at least some of the fixation pins differ in their diameter. Differing in their diameter means that the fixation pins have either different diameters in the second portion of the rod and the same diameter in the first portion, or they differ in the diameter of the first portion and the diameter of the second portion is the same. In another alternative the fixation pins in the set differ both in the diameter of the first portion of the rod and in the second portion of the rod.

[0020] The present invention also relates to a method of using a fixation pin for fixing a drill template. The fixation pin provides for a simple and secure fixation of a drill template in the patient's mouth. Its use is particularly advantageous for fixing drill templates which have at least two bore holes.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] A fixation pin according to the present invention will be explained in more detail in the following text with reference to exemplary embodiments, which are illustrated in the drawings and in which, schematically:

[0022] FIG. 1 shows a first embodiment of a fixation pin in a longitudinal section;

[0023] FIG. 2 shows a second embodiment of a fixation pin in a profile view;

[0024] FIG. 3 shows the fixation pin according to FIG. 2 in a perspective view;

[0025] FIG. 4 shows a further embodiment of a fixation pin in a profile view; and

[0026] FIG. 5 shows the fixation pin according to FIG. 4 in a perspective view.

DETAILED DESCRIPTION

[0027] FIG. 1 shows a first embodiment of a fixation pin according to the present invention, in a longitudinal section. The fixation pin 1 has a head 5 which has a bearing surface 10. From the bearing surface 10 a rod 15 extends at an essentially right angle. The rod 15 has a shape of an essentially circular cylinder and its diameter is constant throughout the length of the rod. The rod 15 is arranged in the centre of the bearing surface 10.

[0028] FIG. 2 shows another preferred embodiment of a fixation pin according to the invention. The fixation pin 2 has a head 45 having a shape of an essentially circular cylinder. From the bearing surface 40 of the head 45 extends a rod 55 that also has a shape of an essentially circular cylinder. The head 45 and the rod 55 are coaxially arranged and have a common axis 20. Further, the head 45 has a circumventing indentation 25 having a concave shape. The head 45 also carries a mark in the form of a coloured, circumventing band 30. The coloured circumventing band serves as a colour code for distinguishing different sets of fixation pins. The colour code may, for instance, refer to the diameter of the bore hole. Since different dental implants require bore holes of different diameters, fixation pins with a portion intended to be inserted

into the bore hole that meet this diameter requirement, are also needed. The colour code allows for an easy distinction of the different fixation pins. In addition, the rod carries two height marks 35, 36 indicating different heights or distances. These marks provide visible stop marks that allow the surgeon to insert the fixation pin to a certain depth into the drill template (or the drill sleeve provided in the drill template) and into the bore hole. The maximum depth that a fixation pin can be inserted is limited by the bearing surface 40 of the head 45 of the fixation pin, thereby providing a physical stop.

[0029] FIG. 3 shows the fixation pin 2 of FIG. 2 in a perspective view. The fixation pin 2 has a head 45 having a circumventing indentation 25 of an essentially concave shape. In the concave indentation 25, the coloured circumventing band 30 is shown. A rod 55 extends in a coaxial direction from the head 45. The rod carries height marks 35, 36 of which only one 36 can be seen.

[0030] FIG. 4 shows a further embodiment of a fixation pin. The fixation pin 3 has a head 65 having a bearing surface 60 from which a rod 95 coaxially extends in a direction of the common axis 20. The head 65 has a circumventing indentation 75 with a coloured circumventing band 70. The rod 95 has a first portion 96 extending from the bearing surface 60 and a second portion 97 that has a smaller diameter than the diameter of the first portion 96. The first portion 96 of the rod 95 is connected to the second portion 97 by an intervening third portion 98, which third portion has a conical shape. The height marks 85, 86 are arranged on the first portion 96 of the rod 95.

[0031] FIG. 5 shows the fixation pin of FIG. 4 in a perspective view. The fixation pin 3 has head 65 having circumventing indentation 75 and coloured circumventing band 70. From bearing surface 60 (which cannot be seen in this view) of the head 65 a rod 95 extends at an essentially right angle. The rod 95 has three different portions 96, 97 and 98. While the first portion 96 extends from the bearing surface of the head 65, the second portion 97 of the rod 95 is connected to the first portion 96 by an intervening portion 98 having a conical shape. The second portion 97 has a diameter that is smaller than the diameter of the first portion 96. The intervening portion 98 has two end faces with different diameters. The end face of the intervening portion 98 with the smaller diameter adjoins the second portion 97 of the rod 95, whereas the end face of the intervening portion 98 having the greater diameter adjoins the first portion 96 of the rod 95.

1. Fixation pin for fixing a dental drill template, the fixation pin comprising a head having a bearing surface intended to bear at least partially on the drill template or a sleeve provided in the drill template, and a rod having a shape of an essentially circular cylinder and extending from the bearing surface of the head at an essentially right angle, the rod intended to be inserted into the drill template or the sleeve provided in the drill template.

2. Fixation pin according to claim 1, wherein the head has a shape of an essentially circular cylinder.

3. Fixation pin according to claim 1, wherein the head has a circumventing indentation.

4. Fixation pin according to claim 3, wherein the circumventing indentation has a concave shape.

5. Fixation pin according to claim 1, wherein the rod has a first portion extending from the bearing surface of the head, and a subsequent second portion, wherein the second portion has a diameter which is smaller than the diameter of the first portion.

6. Fixation pin according to claim 5, wherein the first portion of the rod is connected to the second portion by an intervening third portion, said third portion having a conical shape.

7. Fixation pin according to claim 1, wherein the fixation pin is made of one single piece.

8. Fixation pin according to claim 1, wherein the fixation pin is made of a material selected from the group consisting of hard plastics, stainless steel, titanium and titanium alloys.

9. Fixation pin according to claim 8, wherein the fixation pin is made of a material selected from the group consisting of titanium and titanium alloys.

10. Fixation pin according to claim 8, wherein the fixation pin is made of stainless steel.

11. Fixation pin according to claim 1, wherein the fixation pin further comprises an aspiration security.

12. Fixation pin according to claim 11, wherein the aspiration security is a string attached to the head of the fixation pin.

13. A set comprising at least one fixation pin according to claim 1.

14. A method comprising use of the fixation pin according to claim 1 for fixing a dental drill template while drilling a hole in a patient's jaw bone.

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