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(51) INT CL^6
A61F 2/46

(52) UK CL (Edition O)
A5R RAT

(56) Documents Cited
GB 2198647 A **GB 2181057 A** **GB 2153688 A**
GB 1373972 A **EP 0408109 A1** **EP 0269935 A2**
US 4364389 A

(58) Field of Search
UK CL (Edition O) **A5R RAT REYG**
INT CL^6 **A61B 17/28 , A61F 2/46**

(54) Prosthesis holding device

(57) An instrument for introducing a prosthesis or other component into a prepared cavity, wherein the instrument (10) comprises a plurality of projections (18,20) having a predetermined cross section and a predetermined spacing from one another, and means (30,34,36) for varying the relative orientation and/or spacing of the projections (18,20).

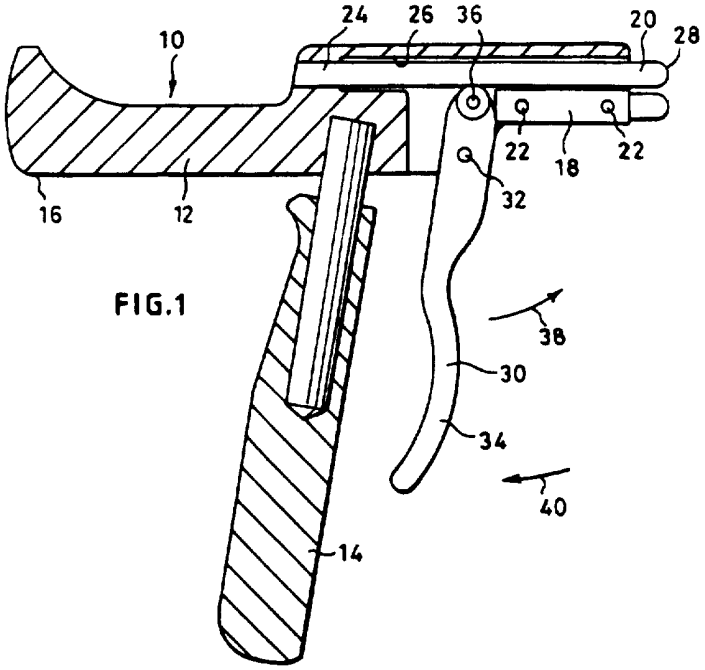

FIG.1

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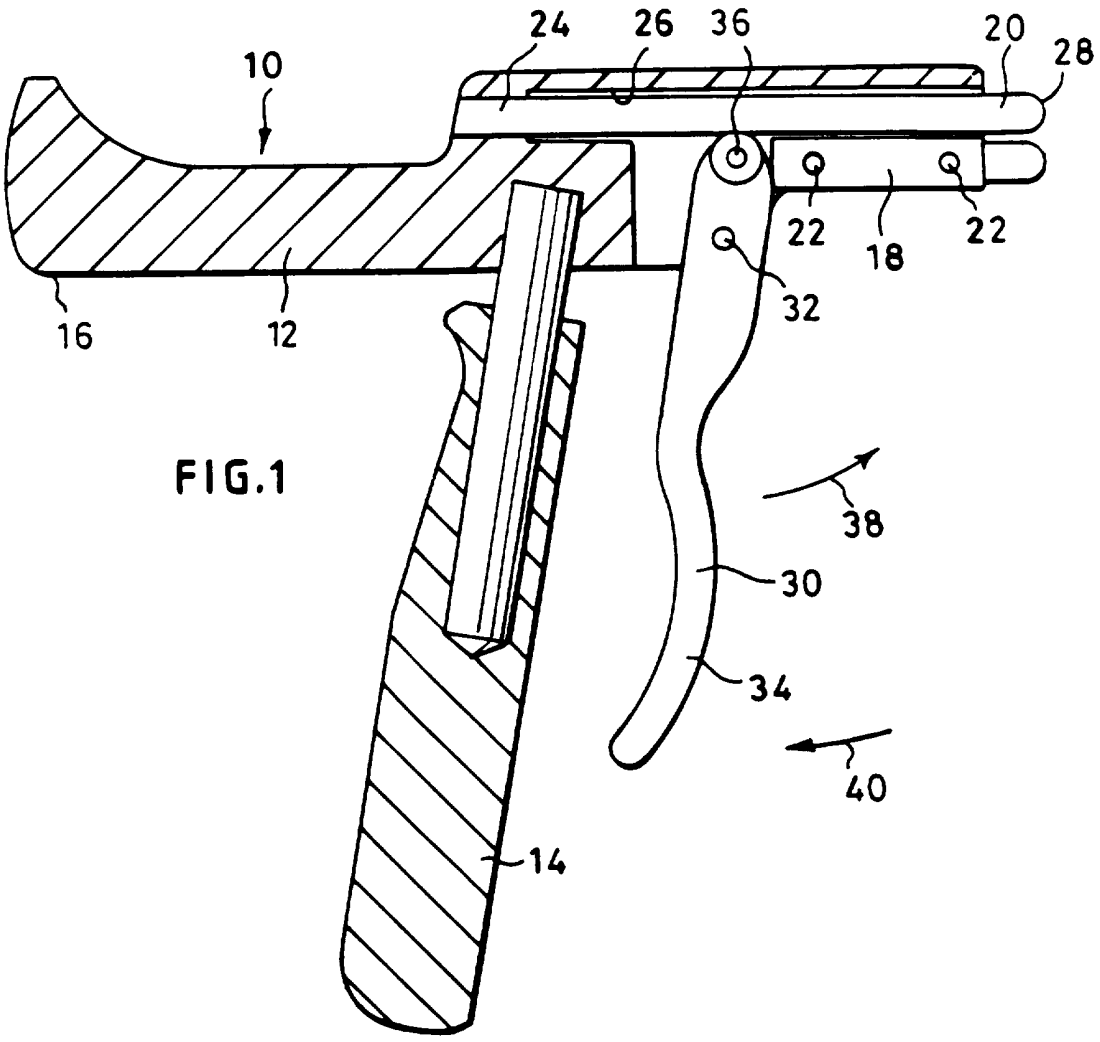

FIG.1

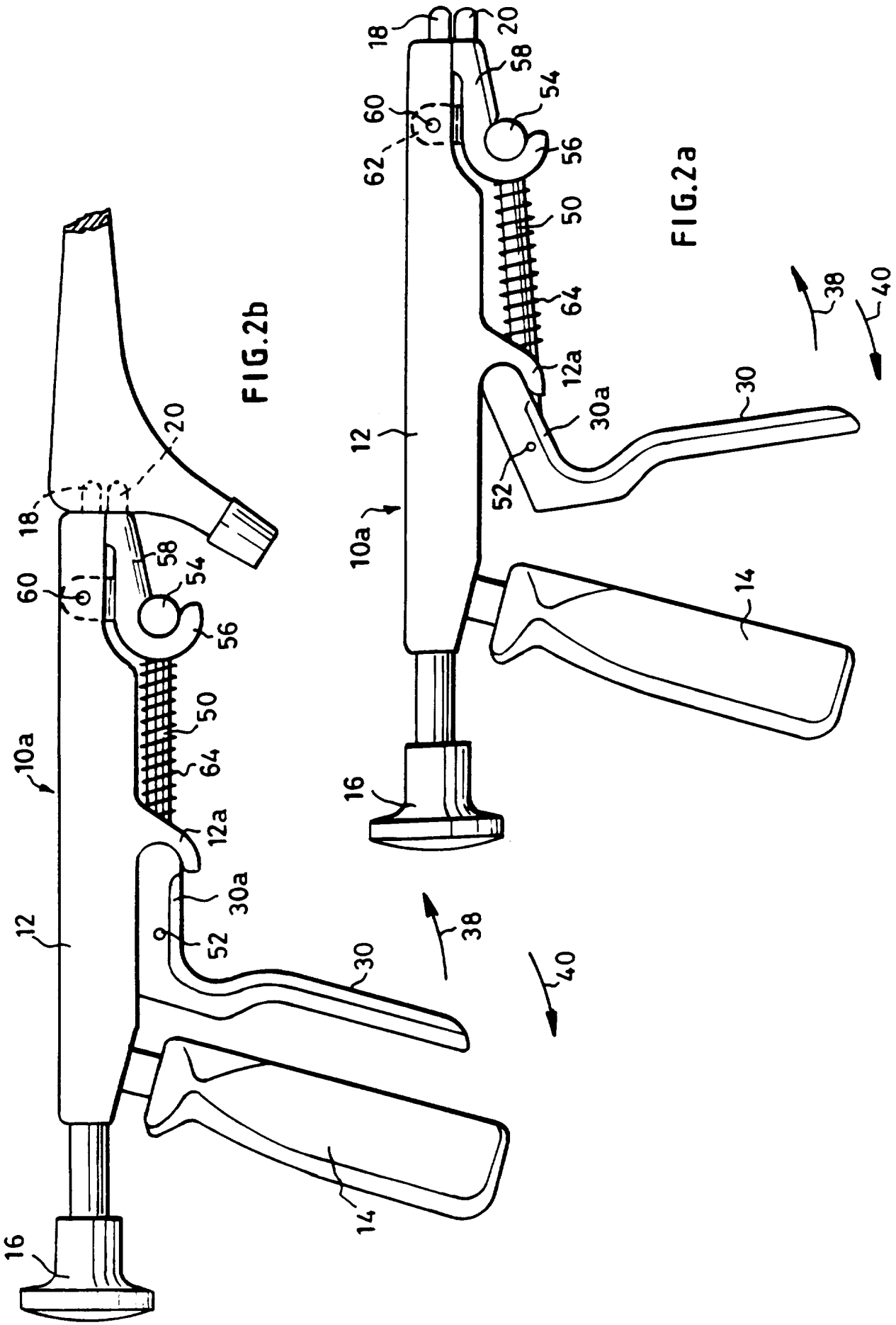
18
20
58
54
60
62
56
50
64
12a
30a
30
52
12
10a
14
16
38
40

FIG.2a

18
20
58
54
60
56
50
64
12a
30a
30
52
12
10a
14
16
38
40

FIG.2b

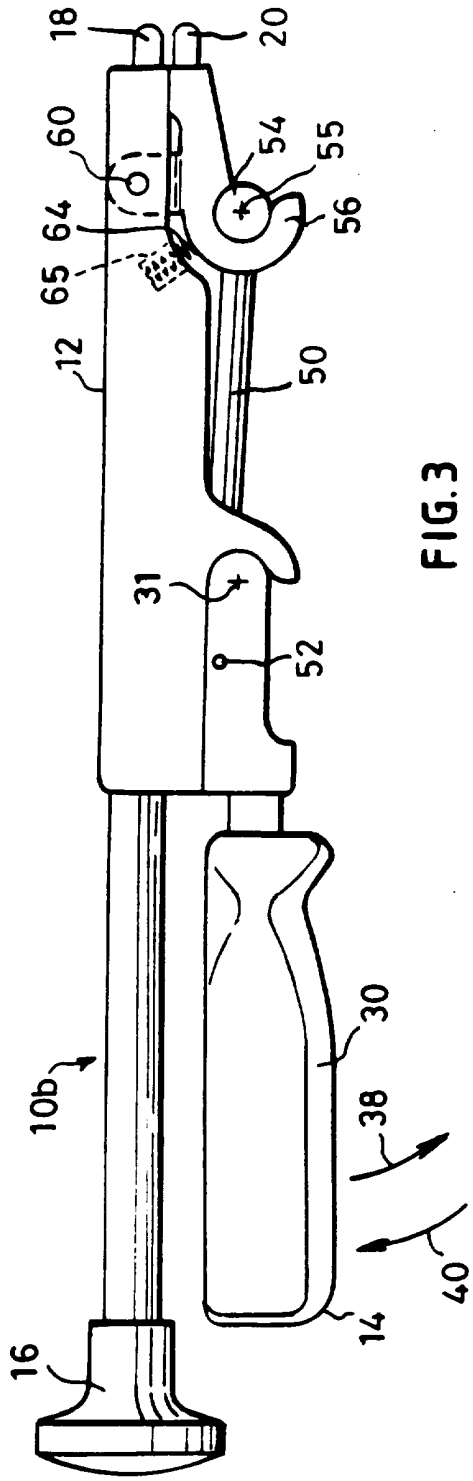

FIG.3

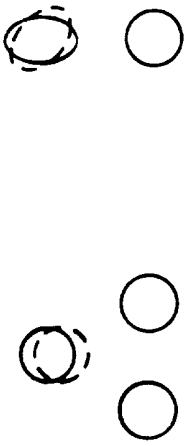

FIG.6

FIG.7

FIG.5

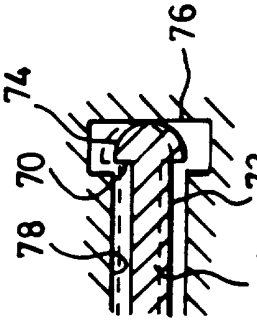

FIG.4

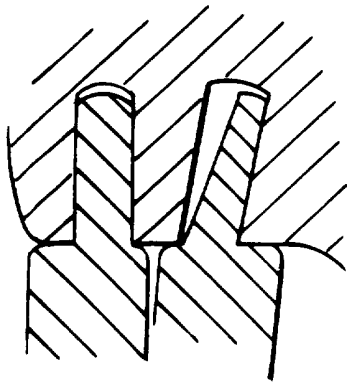

FIG.8b

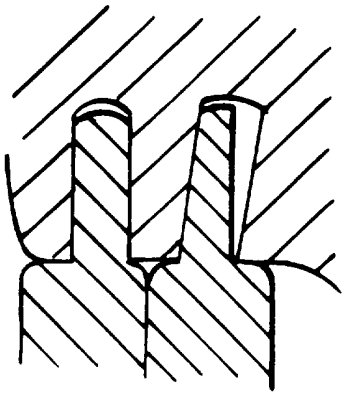

FIG.8a

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SURGICAL INSTRUMENT

The invention relates to a surgical instrument, particularly but not exclusively to a surgical instrument for introducing a prosthesis or other component into a cavity.

Surgical instruments of this type must be capable of being fixed securely to a prosthesis or other component without any substantial risk of the component becoming separated from the instrument. Inadvertent separation of the component from the instrument during the implant procedure may cause damage to the component or to the patient or can result in contamination of the previously sterile component. It is therefore essential that the component can be securely and reliably attached to the instrument. It is then equally important for the instrument to be quickly and easily releasable from the component once the component has been placed in position. Many instruments of this type have the disadvantage that, the more securely the component can be attached to the instrument, the more difficult the instrument is to release from the component when necessary.

It is therefore an object of the invention to provide a surgical instrument for introducing a prosthesis or other component into a prepared cavity which can be securely and reliably attached to the component and which can be quickly and easily released therefrom.

The invention provides an instrument as set out in claim 1. Advantageous features are also set out in the subsidiary claims.

The instrument of the invention is highly advantageous in that it requires only the addition of simple bore holes in the component with which the instrument is intended to cooperate. Also, the instrument itself is extremely simple to operate and the reliability of operation of the instrument is high. The connection formed between the instrument and the component is rigid so as to enable necessary pressure to be used to position the prosthesis or other component correctly. When the component is in place, the release of the instrument from the component is a simple procedure which requires no specialist training to carry out.

A further advantage is that the component can be fitted onto the instrument whilst the implant is in its packaging. Thus the component can be inserted into a cement bed or directly into a bone cavity without being touched or contaminated by operating theatre staff.

Embodiments of the invention will now be described with reference to the accompanying drawings wherein;

Figure 1 is a side sectional view of a first embodiment of a surgical instrument according to the invention;

Figures 2a and 2b are side views of a second embodiment of a surgical instrument according to the invention;

Figure 3 is a side view of a third embodiment of a surgical instrument according to the invention;

Figure 4 illustrates a modification applicable to any of the instruments of Figures 1, 2 or 3;

Figure 5 illustrates, in an exaggerated manner, the principle behind the operation of the instrument of any of Figures 1 to 3;

Figure 6 illustrates, in an exaggerated manner, a first alternative operation of the instrument of any of Figures 1 to 3;

Figure 7 illustrates, in an exaggerated manner, a second alternative operation of the instrument of any of Figures 1 to 3; and

Figures 8a and 8b show, on an enlarged scale, the connection between a third embodiment of a surgical instrument according to the invention and a prosthetic component.

The instrument 10 of Figure 1 consists generally of a body 12 and a handle 14. The handle 14 is rigidly

connected to the body 12 and extends generally downwardly therefrom. Rearwardly of the handle 14, the body 12 has a hand grip portion 16 which can be used by the surgeon to apply pressure in the direction of the longitudinal axis of the body 12.

Forwardly of the handle 14, the body 12 comprises two elongate projections 18,20 extending generally parallel to one another and to the longitudinal axis of the body 12. The first projection 18 is rigidly fixed to the body portion 12 by means of rivets 22, screws or other appropriate fastening means. The second projection 20 is connected to the body 12 at the proximal end 24 thereof such that the projection 20 is not axially moveable with respect to the body 12. However, the majority of the length of the second projection 20 lies within a bore 26 formed within the body 12. The distal end 28 of the second projection 20 extends out from the bore 26 and co-terminates with the first projection 18.

The distal ends of the projections 18,20 are domed so as to avoid mushrooming of the bores with which the projections 18,20 cooperate when the instrument is in use and allows safe impaction of the component.

A trigger 30 is pivotally connected to the body 12 at a pivot 32. The trigger 30 has a hand grip portion 34 on the lower side of the pivot 32 and an end portion 36 remote from the hand grip portion 34 which is shaped

in the manner of a cam. The cam 36 is located such that it abuts against the second projection 20 intermediate the fixed proximal end 24 and the free distal end 28 thereof.

When the hand grip portion 34 of the trigger 30 is moved in the direction of arrow 38 away from the handle 14, the cam 36 is rotated about the pivot 32 such that the second projection 20 is allowed to rest freely in the bore 26. However, when the hand grip portion 34 of the trigger 30 is pressed towards the handle 14 in the direction of arrow 40, the cam 36 abuts against the second projection 20 so as to cause the distal end 28 of the second projection 20 to move away from the distal end of the first projection 18. The movement is relatively small, in the order of one millimetre, but this is sufficient for the purposes of this instrument.

In order to secure a prosthesis component onto the instrument 10, the prosthesis component must be provided with at least one bore into which the distal ends of the first and second projections 18,20 can be introduced. The dimensions of the bore or bores in the prosthesis component must be selected so that the projections 18,20 fit into the bore or bores substantially without play. Ideally, two separate bores will be provided in the component, each bore having a diameter substantially identical to the diameter of the projections 18,20. However, it will be appreciated that the wall separating

these bores can be dispensed with if desired. The instrument 10 can be rigidly fixed to the component merely by introducing the distal ends of the first and second projections 18,20 into the bores and then operating the trigger 30 such that the distal end 28 of the second projection 20 is forced to move away from the first projection 18. The consequent gripping of the walls of the bore or bores in the component forms a rigid connection.

A second embodiment of an instrument according to the invention is illustrated in Figures 2a and 2b. Some components of the instrument 10a illustrated in Figures 2a and 2b correspond functionally to the equivalent components of the instrument 10 illustrated in Figure 1. They have therefore been given identical reference numerals.

A significant difference between the instrument 10a illustrated in Figures 2a and 2b and the instrument 10 illustrated in Figure 1 is the longitudinal distance between the distal ends of the projections 18,20 and the trigger 30. In some cases, use of the instrument 10 would be inappropriate because the component to be manipulated needs to be positioned at a depth greater than that accessible by this instrument. The instrument 10a allows a component to be positioned at a deeper level than the instrument 10.

In order to achieve satisfactory operation of the

instrument 10a, the trigger 30 is provided with a horizontally extending upper portion 30a so that the trigger 30 has a substantially inverted L shape. The distal end of the upper portion 30a is part-cylindrical or part-spherical in shape so that it can seat itself in a corresponding part-cylindrical or part-spherical portion 12a depending from the main body 12 of the instrument 10a. The handle 30 is capable of pivoting movement about an axis 31 formed by the said cooperating surfaces.

The upper portion 30a has a cross-section in the shape of an inverted U. Extending into the interior of the upper portion 30a is an elongate rod 50 which is pivotably connected to the upper portion 30a of the trigger 30 at a point 52 spaced from the distal end of the upper portion 30a. A channel is also provided in the depending portion 12a to allow the rod 50 to pass therethrough.

The end of the rod 50 remote from the trigger 30 is rigidly connected to a transverse pivoting arm 54. When viewed from above, the rod 50 and the pivoting arm 54 form a T-shape. The diameter of the pivot arm 54 corresponds to the inner surface of a hook portion 56 located on a mounting portion 58 which carries the movable projection 20. The pivoting arm 54 rotates about an axis 55 with respect to the hook portion 56. The mounting portion 58 is pivotably connected to the

main body 12 at a pivot point 60 by means of a lug 62. A compression spring 64 is seated in a recess 65 located in the main body 12 and acts directly on the mounting portion 58.

The operation of the instrument 10a will now be described. Figure 2a shows the instrument in its inoperative or open position. The rod 50 is allowed to rest in the inclined position illustrated in Figure 2a and the movable projection 20 is positioned so that its relative spacing to the fixed projection 18 will allow the projections 18,20 to be introduced easily into appropriate bores situated in the component to be manipulated. The component is illustrated in Figure 2b.

When the instrument 10a is to be fixedly connected to the component, the trigger 30 is pulled in the direction of arrow 40 towards the handle 14. The trigger 30 pivots about the axis 31 and the pivot point 52 is thereby raised towards the main body 12. This action brings the rod 50 into a position which is substantially parallel to the longitudinal axis of the main body 12 of the instrument 10a against the action of the spring 64. The pivot arm 54 is thereby also raised causing the mounting portion 58 to be raised on the side of the hook portions 56. This causes the mounting portion 58 to be rotated in a clockwise manner about the pivot point 60. The movable projection 20 is thereby moved downardly with respect to and drawn away from the

fixed projection 18. This movement is only slight but is sufficient to cause the projections 18,20 to jam against the walls of the bores in the component. The component is thereby fixedly attached to the projections 18,20 and the instrument 10a can then be used to manipulate and position the component in the relevant cavity. In order to release the instrument 10a from the component, the trigger 30 is merely rotated in the direction of arrow 38 so as to return the instrument 10a to the position shown in Figure 2a under the action of the spring 64. The projections 18,20 can then easily be withdrawn from the bores in the component.

By positioning the pivot point 52 slightly above a line joining the axes 31 and 54 when the trigger 30 is in the closed or operative position, an over-centre mechanism is used to retain the trigger 30 in the position shown in Figure 2b once the instrument 10a has been brought into the operative position. The surgeon or other operator need not then retain pressure on the trigger 30 in order to ensure that the component remains rigidly fixed to the instrument 10a.

The instrument 10a is also provided with a specifically manufactured impacting surface at the end of the hand grip 16 in order to allow impacting to take place in an effective manner.

A further alternative embodiment of an instrument according to the invention is illustrated in Figure 3.

The instrument 10b of Figure 3 is very similar indeed to the instrument 10a illustrated in Figures 2a and 2b. The instrument 10b shown in Figure 3 is designed to allow a component to be introduced even further into a prepared cavity since, in the operative position shown in Figure 3, there are no substantial projections extending transversely to the longitudinal axis of the main body 12. This is achieved by arranging for the trigger 30 to double as the handle 14. Movement of the trigger 30 to the operative position thus brings the trigger 30 into a position substantially parallel to the longitudinal axis of the main body 12. The hand grip 16 of the instrument 10b is also extended to allow the surgeon to position the component deeper into a cavity.

In all of the embodiments shown in Figures 1, 2a, 2b and 3, the projections 18,20 are illustrated with domed ends and cylindrical side walls. However, if the instrument in question is to be capable of connection to a previously implanted component so that extraction is possible, then a further modification is desirable. Referring now to Figure 4, it is proposed that the distal end of each projection 18,20 can be enlarged slightly with a step 70 being positioned between the cylindrical wall 72 and the domed head 74. The bore 76 in the relevant component will then have an undercut end although the diameter of the enlarged head 74 will be fractionally smaller than the main part 78 of the shaft

76. When one of the projections 18,20 is moved relative to the other projection, the step 70 will engage underneath the undercut portion of the bore 76. This provides additional fixing between the component and the instrument sufficient to allow a component to be extracted.

An instrument as described above can be used to insert a component into a cavity without any handling whatsoever. The instrument can be attached to the component whilst the component remains wholly or partially within its sterile packaging. The component can then be removed from its packaging and introduced into the appropriate cavity and the handle 14 and hand grip 16 can be used to orientate the component and to apply appropriate pressure. The component itself does not therefore need to be handled directly during the removal, orientation and introduction procedures, all orientation and application of pressure being carried out via the instrument. Any impaction which is required, for example when introducing a cementless implant, is applied via the instrument. Impaction surfaces can be provided at the distal end of the handle 14 if desired. The fact that the component does not need to be handled directly decreases the risk of the sterility of the component being impaired or destroyed.

Figure 5 illustrates the movement of the ends of the projections 18,20 in a greatly exaggerated manner. Of

course, there are very many variations of the instrument described above which fall within the scope of the present invention. Different numbers of projections can be provided and the direction of relative movement of the projections can, of course, be varied. Figure 6 illustrates the operation of a instrument comprising three projections, one of which is caused to move towards the other two in order to achieve the gripping action between the projections and corresponding bores in a prosthesis component.

As a further alternative, non-circular projections can be provided together with means for causing the relative orientation of these projections to be varied, as opposed to their spacing. Figure 7 illustrates the operation of a instrument having two projections, one of which is circular in cross-section and one of which is elliptical. The trigger of the instrument is configured to cause the elliptical projection to rotate about its longitudinal axis such that, when the elliptical projection is rotated within a correspondingly elliptical bore, a firm grip is established. Indeed, any appropriate configuration of pegs and bores can be provided together with appropriate means for varying the spacing and/or orientation of the pegs such that a jamming effect of one against the other is achieved.

In order to increase the coefficient of friction between the interior walls of the bore or bores of the

prosthesis component and the distal ends of the projections of the instrument, surface texturing or coating can be provided. One or more of the projections may also be inclined or tapered as illustrated in Figures 8a and 8b. This type of arrangement can assist with extraction of a component. Other modifications and variations will be apparent to a reader skilled in the art.

CLAIMS

1. An instrument for introducing a prosthesis or other component into a prepared cavity, wherein the instrument comprises a plurality of projections having a predetermined cross-section and a predetermined spacing from one another, and means for forcibly varying the relative orientation and/or spacing of the projections.

2. An instrument as claimed in claim 1, wherein two projections are provided.

3. An instrument as claimed in claim 1 or 2, wherein each projection is circular in cross section.

4. An instrument as claimed in any one of claims 1 to 3, wherein the varying means act so as to increase the spacing between the projections when actuated.

5. An instrument as claimed in any one of claims 1 to 4, wherein the varying means comprise a trigger or handle connected to a cam which acts on one of the projections so as to move it relative to the or each remaining projection.

6. An instrument as claimed in any one of claims 1 to

4, wherein the varying means comprise a trigger or handle connected to a rotatable portion via at least one linking portion, one of the projections being mounted on the rotatable portion, such that operation of the trigger or handle causes the rotatable portion to rotate thereby moving the said projection relative to the or each remaining projection.

7. An instrument as claimed in any one of the preceding claims, wherein the end of each projection is shaped or coated so as to increase the coefficient of friction between the respective end and a corresponding bore or recess in a prosthesis component.

8. An instrument as claimed in any one of the preceding claims, wherein at least one projection has a domed distal end.

9. An instrument as claimed in any one of the preceding claims, wherein each projection has an enlarged distal end with respect to the remainder of the respective projection.

10. An instrument as claimed in any one of the preceding claims, wherein locking means are provided for locking the varying means into an operative position.

11. An instrument as claimed in any one of the preceding

claims, wherein biassing means are provided for biassing the varying means into an inoperative position.

12. An instrument as claimed in claim 11, wherein the biassing means include an over-centre mechanism to allow biassing into the operative position.

13. An instrument for introducing a prosthesis or other component into a prepared cavity substantially as hereinbefore described with reference to any one of the embodiments shown in the accompanying drawings.

14. The combination of an instrument as claimed in any one of the preceding claims and a prosthesis component having at least one bore or recess adapted in cross-section and spacing to receive the projections of the instrument before the varying means are actuated.

15. The combination as claimed in claim 14, wherein the or each bore or recess is undercut at its inner end.

16. The combination as claimed in claim 14 or 15, wherein at least one of the projections and bores or recesses is tapered or inclined with respect to the longitudinal axes of the instrument and component.

The Patent Office

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Application No: GB 9525153.4 **Examiner:** John Jenkins
Claims searched: 1-16 **Date of search:** 19 February 1996

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): A5R (RAT,REYG)

Int Cl (Ed.6): A61F 2/46, A61B 17/28

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2198647 A	(R.JUNIPER) See page 4 line 1 to page 5 line 15, page 6 lines 3 to 5; Figures 1 & 4	1-4,6,8 & 10
X	GB 2181057 A	(BLAGOVESCHENSKY G. MED.INST.) See page 2 lines 54 to 70; Figures 1 & 2	1,3,4,6,8 &10
X	GB 2153688 A	(T.R.MAZZOCCO) See page 6 lines 18 to 48; Figure 35	1,2,4 &14
X	GB 1373972	(G.K.MCKEE) See page 2 lines 56 to 70; Figures 1,3 & 4	1,2,4,6 & 14
X	EP 0408109 A1	(BIOTECHNIC S.A.) See Figures 1,5 & 6	1,2 & 4
X	EP 0269935 A2	(S & G IMPLANTS GmbH) See Figure 1	1-4,6 & 10
X	US 4364389	(KELLER) See column 3 line 53 to column 4 line 22; Figure 2	1-4,8,10 & 14

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