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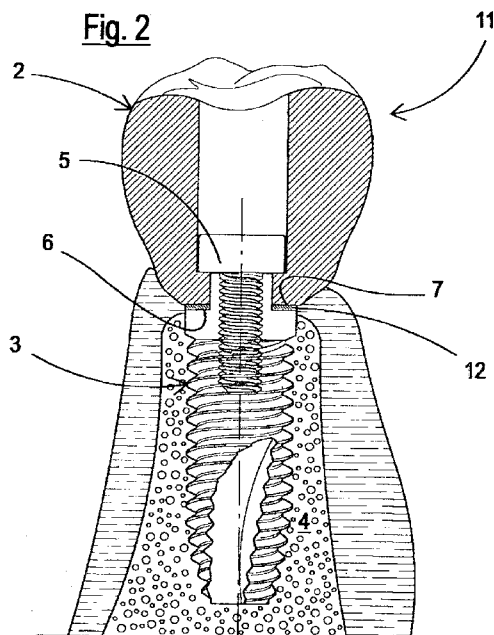
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[Continued on next page]

(54) Title: DAMPENING INSERT FOR DENTAL IMPLANTS



(57) Abstract: An insert for a dental prosthesis screwed onto an implant, in particular of the type comprising a superstructure (2) and an implant (3) integrated in the bone (4), which are reciprocally joined by means of a screw (5, 25). The insert of the invention consists, in particular, of an element made of a damping material interposed between the coupling surface (6, 7) of the superstructure (2) and implant (3). Thanks to the insert of the invention, a dental prosthesis screwed onto an implant is obtained, which reproduces the natural anchoring state of the tooth to the bone, so that the stress peaks on the superstructure are damped before being discharged onto the implant and consequently also onto the bone. The insert of the invention also offers the advantage of sealing the contact area between the superstructure and the implant, thus preventing dangerous bacterial infiltrations.



Published:

— with international search report (Art. 21(3))

— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

DAMPENING INSERT FOR DENTAL IMPLANTS

INSERT, IN PARTICULAR WITH A CUSHIONING EFFECT, FOR A DENTAL PROSTHESIS, SCREWED ONTO AN IMPLANT AND A DENTAL PROSTHESIS PROVIDED WITH SAID INSERT

Description

5 The present invention relates to an insert, in particular having a cushioning effect, for a dental prosthesis screwed onto an implant. The invention also relates to the dental prosthesis provided with this insert.

10 Field of the invention

The field of invention relates to dental prostheses screwed onto an implant, in which a superstructure is fixed, by means of a screw, onto the implant integrated in the bone.

15 Background of the invention

The fixing of a superstructure onto an implant is traditionally effected by direct contact between the parts, i.e. without any intermediate elements suitable for separating the respective contact surfaces. Any
20 stress on the superstructure, generated in particular by mastication, is consequently discharged directly onto the implant and therefore also onto the bone sustaining it. The stress peaks transmitted onto the contact surface between the bone and the implant are,
25 however, particularly detrimental as they can cause the

detachment of the implant from its seat and consequently instability of the prosthesis, with a possible loss of the implant.

Summary of the invention

5 An objective of the present invention is to provide a dental prosthesis which is similar to the natural state of the tooth, in which the stress peaks are damped before being discharged onto the bone.

10 A further objective of the present invention is to provide a prosthesis suitable for preventing the stress peaks received by the superstructures from reaching the bone unaltered.

15 Another objective of the invention is to provide a prosthesis suitable for preventing infiltrations of bacteria between the surfaces in reciprocal contact, of the implant and superstructure, respectively.

20 Yet another objective of the invention is to protect the surface of the dental superstructure in contact with the implant, thus avoiding possible damage due to the reciprocal fixing operations between these parts, and movements caused by mastication.

25 These and other objectives are achieved by means of the insert and prosthesis of claims 1 and 9 respectively. Some preferred embodiments of the invention are described in the remaining claims.

In particular, the insert of the invention comprises a superstructure and an implant integrated in the bone, which are reciprocally joined by means of a screw, wherein said insert consists of an element made
5 of a damping material interposed between the coupling surfaces of the superstructure and implant, respectively.

According to the invention, said insert consists of an element having an annular shape provided with a hole
10 for the passage of the above-mentioned screw.

In particular, the insert of the invention consists of an element containing a base suitable for being interposed between the above-mentioned coupling surfaces, said insert also having a profile which is
15 engaged with the coupling section between the superstructure and the implant.

The insert of the invention is also characterized in that it consists of an element having an annular base suitable for being interposed between the above-
20 mentioned coupling surfaces of the superstructure and implant, a profile which is engaged inside said superstructure and a threaded portion to be engaged with a cap, also threaded, for blocking said superstructure on the insert, said screw causing the
25 fixing of the insert on the implant.

According to a variant, the insert of the invention consists of an element having an annular base suitable for being interposed between the above-mentioned coupling surfaces and a profile which is engaged inside
5 said above-mentioned superstructure, said screw having a conical portion which, when engaged inside the hole of the insert, causes the expansion of said profile, thus blocking the superstructure on the insert and on the implant.

10 The insert of the invention is also characterized in that it comprises a protrusion suitable for being engaged with a corresponding housing of the superstructure, thus blocking its rotation on the same insert.

15 The latter is particularly made of an elastically deformable plastic material which, when subjected to a preload of 10-50 Nm by means of said screw 5, in the presence of additional loads as those performed by the masticatory apparatus, undergoes an elastic deformation
20 of 0,01-80 μ (micron) in the direction of the vertical axis.

Thanks to the insert of the invention, a dental prosthesis is obtained, which is screwed onto an implant which reproduces the natural anchoring state of
25 the tooth to the bone, so that the stress peaks on the

superstructure are damped before being discharged onto the implant and consequently also onto the bone.

The insert of the invention also offers the advantage of sealing the contact area between the superstructure and implant, thus preventing any dangerous infiltrations of bacteria.

Again, thanks to the cushioning effect generated by the insert of the invention, made of a material suitable for the purpose, damage to the superstructure is prevented, due to contact of the same with the implant during the fixing operations between the parts and also during mastication.

Brief description of the drawings

These and other objectives, advantages and characteristics are evident from the following description of some preferred embodiments of the insert and prosthesis of the invention, illustrated, as a non-limiting example, in the figures of the enclosed drawings. In which:

- 20 - figure 1 illustrates a sectional view of a dental prosthesis screwed according to the known art;
- figure 2 illustrates a sectional view of a first embodiment of the dental prosthesis screwed
- 25 according to the invention;

- figures 3 and 4 illustrate a plan and sectional view, respectively, of the insert assembled on the prosthesis of figure 2;
- figure 5 illustrates a variant of the
5 prosthesis and insert of figures 2 to 4;
- figure 6 illustrates a detail of an anchorage for an implant having an external connection with the insert positioned between the superstructure and the implant of the prosthesis of figure 5;
- 10 - figures 7, 7a and 8 illustrate a perspective, plan and sectional view, respectively, of the insert assembled on the prosthesis of figure 6;
- figure 9 illustrates a detail of an anchorage for an implant having an internal connection,
15 between the superstructure and the implant of the prosthesis of the invention;
- figure 10 illustrates a sectional view of a second embodiment of a screwed dental prosthesis of the invention, with an insert having a
20 floating anchorage and retention cap of the superstructure;
- figure 11 illustrates an exploded view of the prosthesis of figure 10;
- figure 12 illustrates a sectional view of a
25 third embodiment of a screwed dental prosthesis

according to the invention, with an insert having a floating anchorage and with retention of the superstructure with a conical coupling;

- figure 13 illustrates an exploded view of the prosthesis of figure 12; and
- figure 14 illustrates a plan view of the insert of the prosthesis of figures 10 to 13.

Detailed description of the drawings

The prosthesis of the known art illustrated in figure 1, indicated as a whole with 1, consists of a superstructure 2 fixed on the implant 3 anchored to the bone 4, by means of a screw 5, housed inside the hole 29 of the same superstructure 2. In this embodiment, the surface 6 of the superstructure and the surface 7 of the implant are in direct contact with each other at the interface between the superstructure 2 and the implant 3. The stress peaks on the superstructure are therefore discharged directly, first onto the side surface 9 of the implant 3 and from there onto the surface 8 of the bone 4. As a result, the mentioned surfaces 8 and 9 can be reciprocally detached, thus causing a loss in the hold of the implant in its seat and requiring the re-establishment or re-implantation of the implant itself.

From figure 1, it can also be observed that, at the

interface of the mentioned surfaces 6 of the superstructure 2 and 7 of the implant 3, there are inevitably interspaces 10, normally due to the mechanical production tolerances of these parts. These
5 interspaces have the disadvantage of representing seats for undesired and dangerous bacterial proliferation.

For the same reasons, the same surfaces 6 and 7, in direct contact with each other, can be damaged by the stress of mastication.

10 All of these drawbacks are solved by means of the prosthesis 11 of figure 2, in which an insert 12 is interposed between the facing surfaces 6 of the superstructure 2 and 7 of the implant 3. As better illustrated in figures 3 and 4, this insert 12
15 substantially consists of a circular washer, having a central hole 13 for the passage of the screw 5 which blocks the superstructure 2 to the implant 3.

As a result of its damping and protective cushioning functions between the surfaces 6 of the
20 superstructure 2 and 7 of implant 3, the material of the insert 12 must be less rigid than those forming the superstructure (for example ceramic, titanium and chromium/cobalt alloys) and those used for the production of the implant (for example titanium).

25 The formation material of the insert 12 is

preferably an elastically deformable plastic material which, when subjected to a preload of 10-50 Nm by means of said screw 5, in the presence of additional loads as those exercised by the masticatory apparatus (generally up to 400N), undergoes an elastic deformation of 0,01-80 μ (micron) in the direction of the vertical axis. To this purpose the material forming the insert 12 must exhibit an elastic modulus sufficient to restore its initial geometry in the absence of the masticatory load.

In the embodiment of figures 5 to 8, the insert 14 has an annular base 15 in a single piece, with a profile 16 which reproduces the form of the coupling section between the superstructure 2 and the implant 3. In this variant, the annular base 15 of the insert 14 has the protective cushioning and damping functions already described with reference to the washer 12 of figures 3 and 4, whereas the profile 16 acts as a damping and centering component between the implant 3 and the superstructure 2. As illustrated in figure 7, the outer section of the profile 16 of the insert 14, advantageously has the form of the corresponding coupling section of the implant, thus also obtaining an anti-rotational effect. As illustrated in figure 9, the insert 14 is positioned at the side of the inner

connection 17 of the implant, and no longer externally such as that represented in figure 6.

Unlike the prosthesis of figures 2 to 5, in which the screw 5 is used for reciprocally fixing the superstructure, implant and insert, in the variant of figures 10 and 11, the screw 5 joins the insert 18 to the implant 3, whereas, for the anchorage of the superstructure 2 to the insert 18 (and therefore also to the implant 3), a threaded cap 19 is used, which is screwed onto the corresponding threaded portion 20 of the insert 18. In this variant, as is better illustrated in figure 11, the insert 18 has an annular base 21, a profile 22 with the described threaded portion 20, and is also produced with the same material used for the inserts 12 and 14 previously described. The insert 18 of figure 14 advantageously has a protrusion 23 which, by engagement in a corresponding housing 24 inside the superstructure 2 of figure 11, has an anti-rotational function between the same structure and the insert.

In the variant of figures 12 and 13, a screw 25 is used for the reciprocal anchorage between the superstructure 2, the insert 27 and the implant 3, said screw having a conical portion 26, in turn suitable for being engaged inside the base 30, also having a

corresponding conical form, of the hole 13 of the insert 27. Therefore, when the screw 25 is engaged inside the hole 13 of the insert 27, its profile 26 compresses the base 30 of the hole 13, thus expanding
5 the outer profile 28 of the insert 27 against the corresponding inner surface of the hole 29 of the superstructure 2, thus blocking the superstructure without the necessity of the cap 19 of the version of figure 11.

10 Having thus described some preferred exemplary embodiments of the device of the present invention in accordance with the principles of the present invention, it should be apparent to those skilled in the art that various additional objects and advantages
15 have been attained by the invention and that a variety of modifications can be made within the scope of the present invention, being limited by the following appended claims only.

CLAIMS

1. An insert for a dental prosthesis screwed onto an implant, in particular of the type comprising a superstructure (2) and an implant (3) integrated in the bone (4), which are reciprocally joined by means of a screw (5,25), characterized in that it consists of an element made of a damping material, interposed between the coupling surfaces (6,7) of the superstructure (2) and implant (3), respectively.

2. The insert according to claim 1, characterized in that it consists of an element (12) having an annular form, provided with a hole (13) for the passage of said screw (5).

3. The insert according to claim 1, characterized in that it consists of an element (14) having a base (15) suitable for being interposed between the mentioned surfaces (6,7) said insert also having a profile (16) which is engaged on the coupling section between the superstructure (2) and the implant (3).

4. The insert according to claim 1, characterized in that it consists of an element (18) having an annular base (21) suitable for being interposed between the mentioned surfaces (6,7), a profile (22) which is engaged inside the superstructure (2) and a threaded portion (20) for engagement with a cap (19), also

threaded, for blocking the superstructure (2) on the insert (18), said screw (5) fixing the insert (18) onto the implant (3).

5 5. The insert according to claim 1, characterized in that it consists of an element (27) having an annular base suitable for being interposed between the mentioned surfaces (6,7) and a profile (28) which is engaged inside the superstructure (2), said screw (25) having a conical portion (26) which, when engaged
10 inside the hole (13) of the insert (27), causes the expansion of said profile (28), thus blocking the superstructure (2) on the insert (27) and on the implant (3).

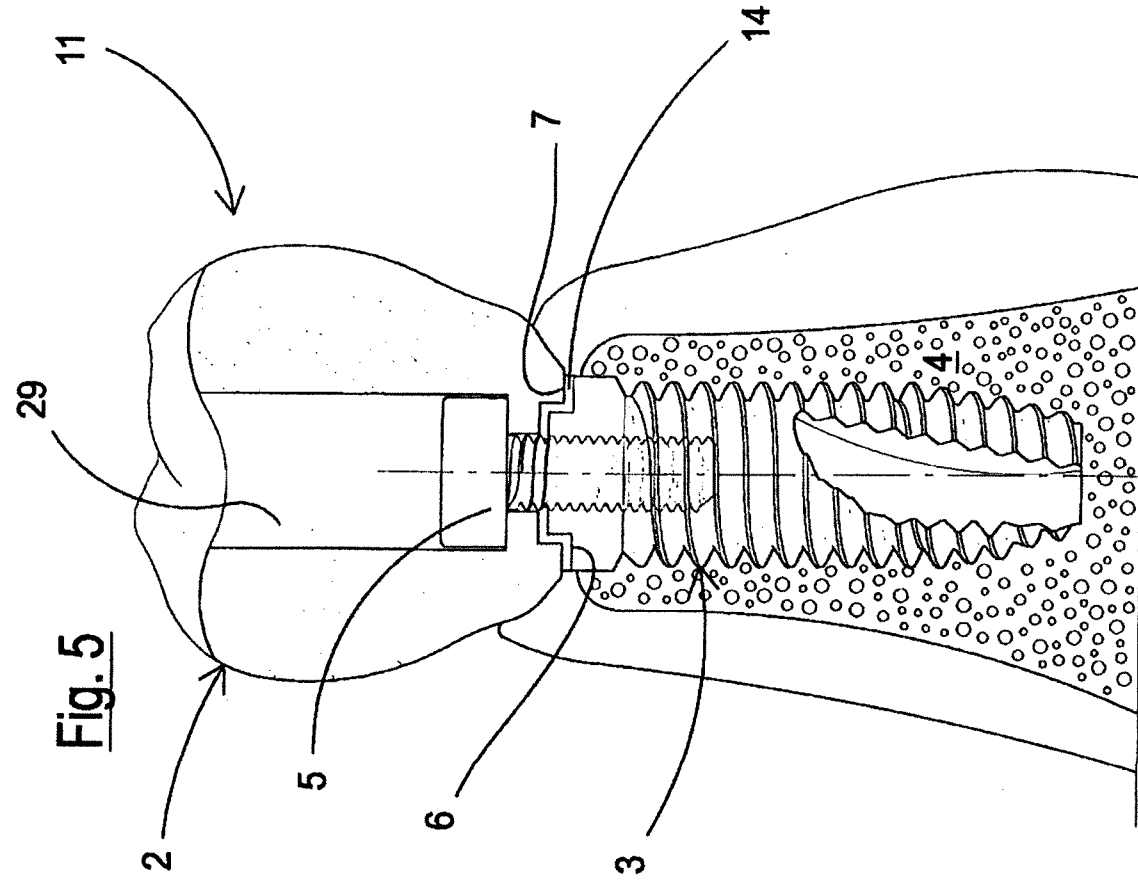
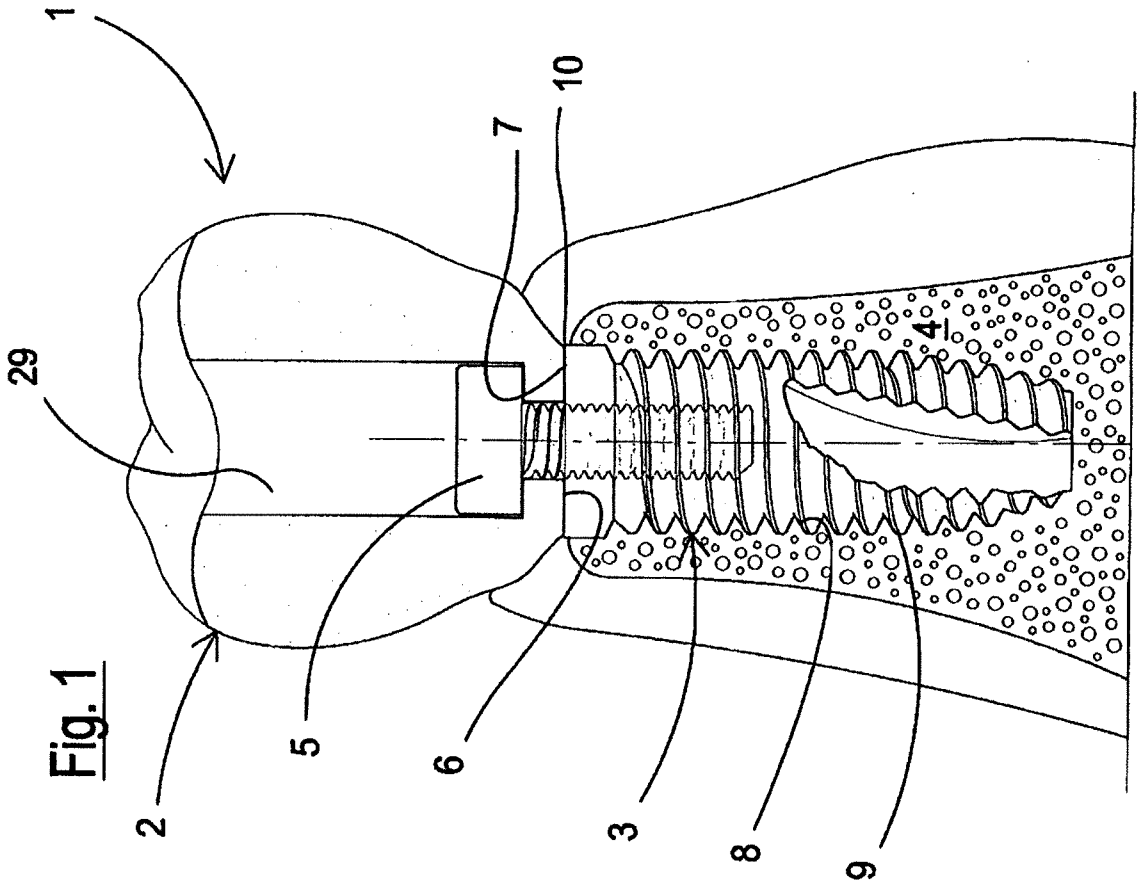
15 6. The insert according to one or more of the previous claims, characterized in that it also comprises a protrusion (23) suitable for being engaged with a corresponding housing (24) of the superstructure (2), blocking its rotation on the same insert.

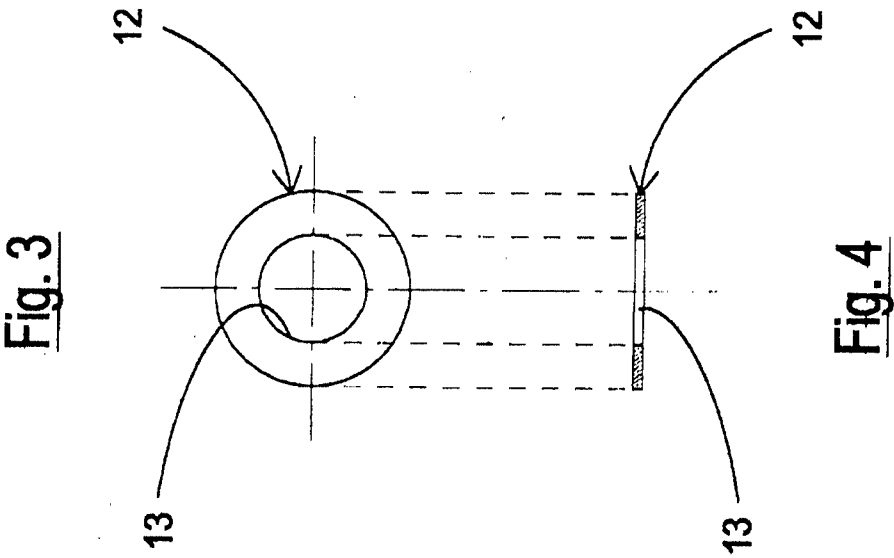
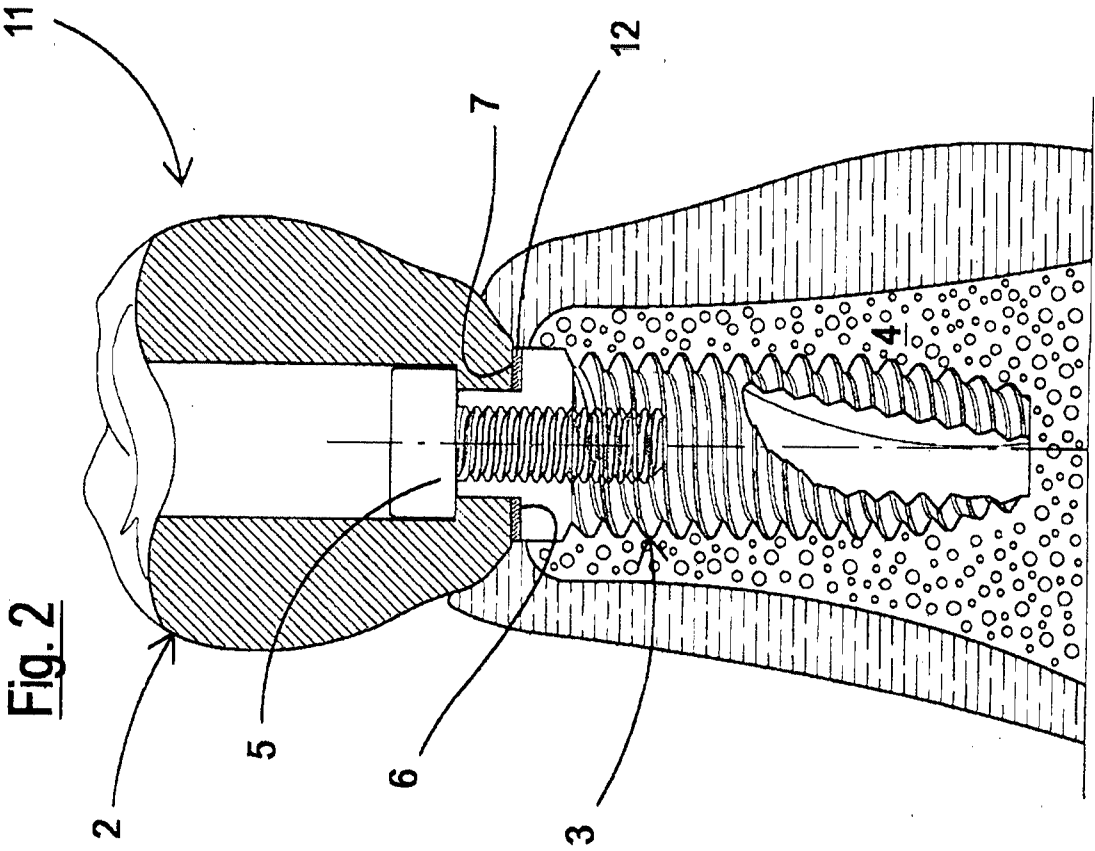
20 7. The insert according to one or more of the previous claims, characterized in that it is made of an elastically deformable plastic material which, when subjected to a preload of 10-50 Nm by means of said screw (5), in the presence of additional loads as those performed by the masticatory apparatus, undergoes an
25 elastic deformation in the direction of the vertical

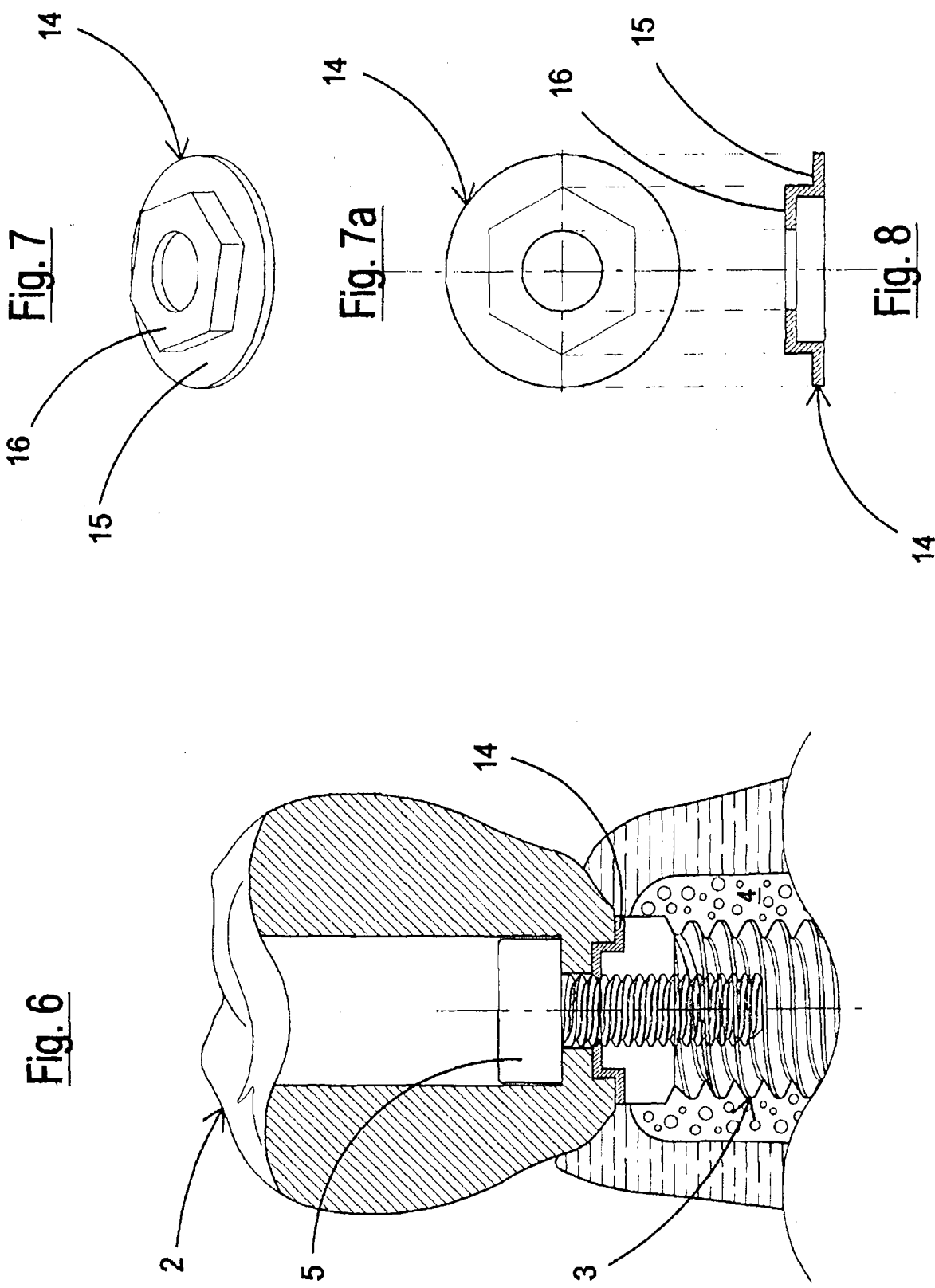
axis.

8. The insert according to one or more of the previous claims, characterized in that the elastic deformation of the elastically deformable plastic material is 0,01 to 80 μ (micron), in particular 0,05 to 40 μ , preferred 0,1 to 20 μ in the direction of the vertical axis.

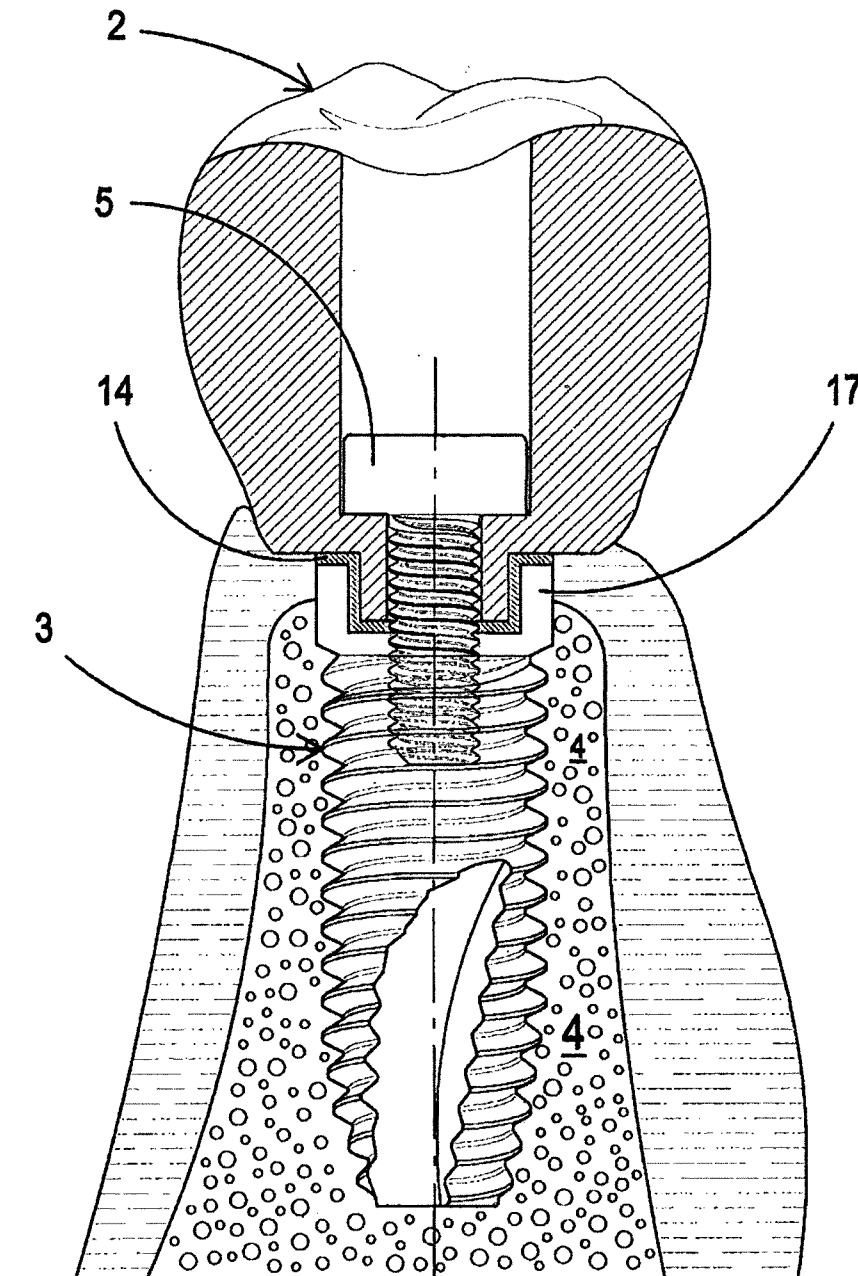
9. A dental prosthesis, characterized in that it is a dental prosthesis screwed onto an implant according to one or more of the previous claims.







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Fig. 9

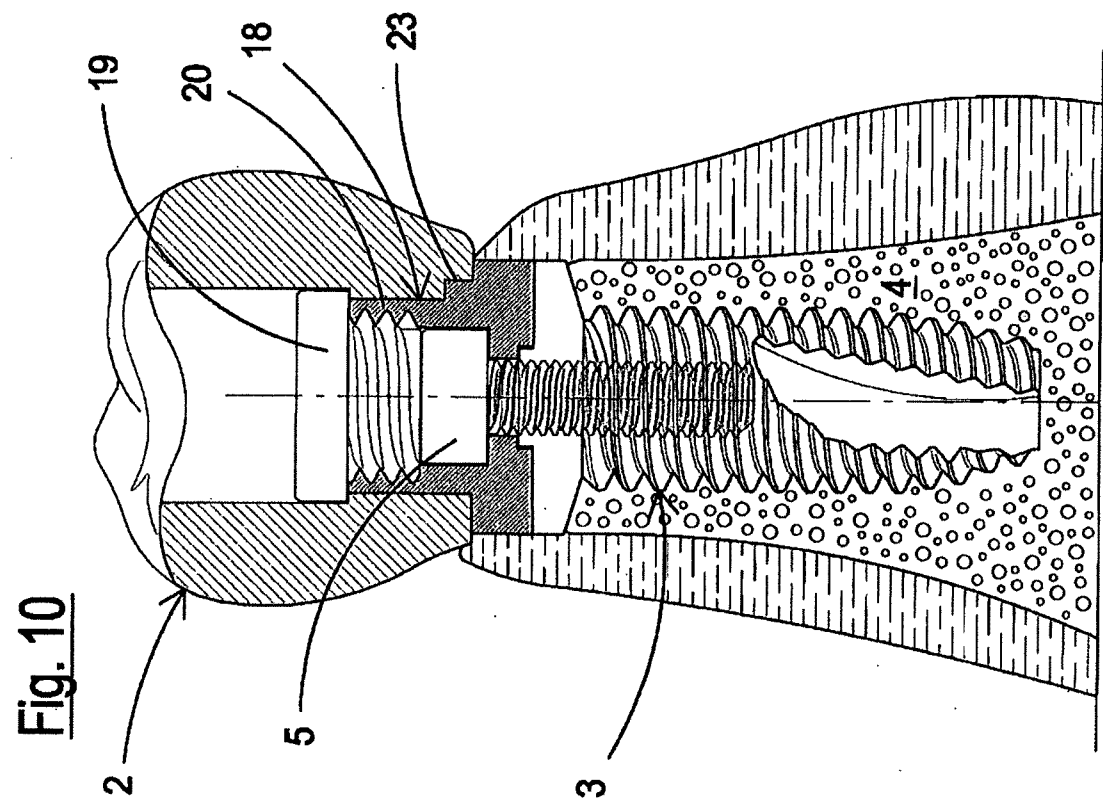
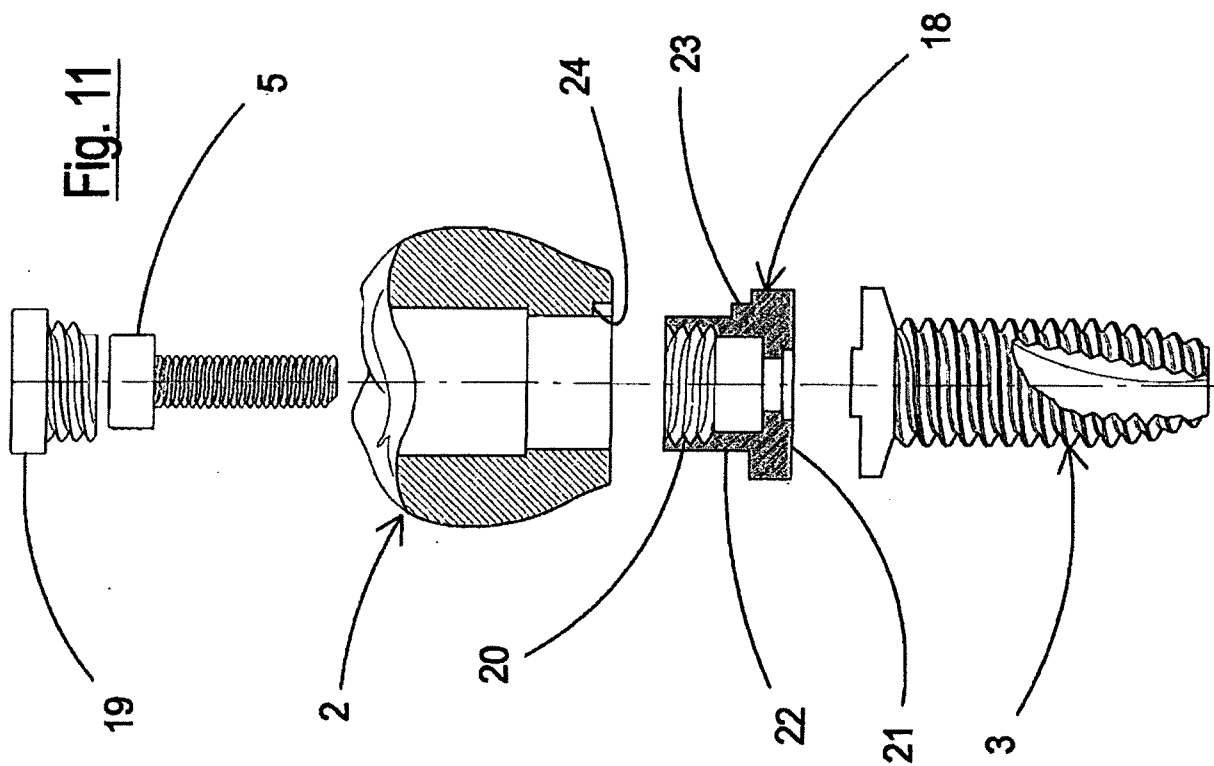


Fig. 12

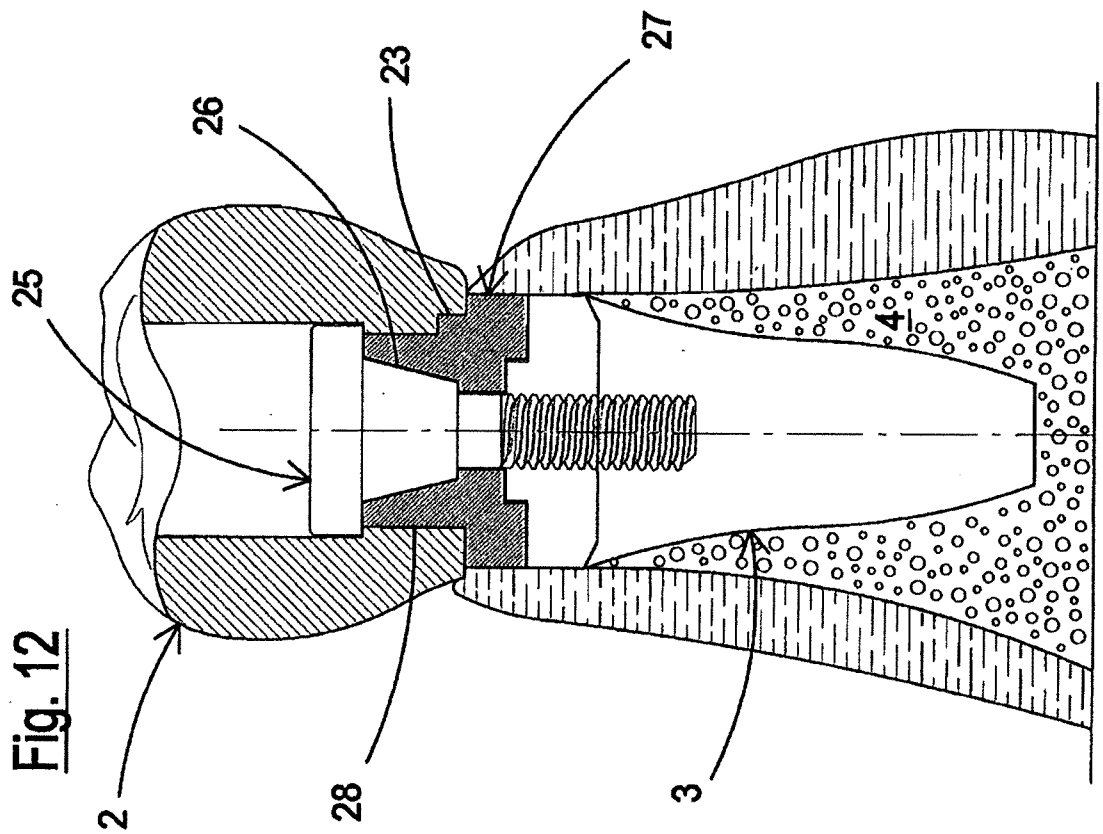
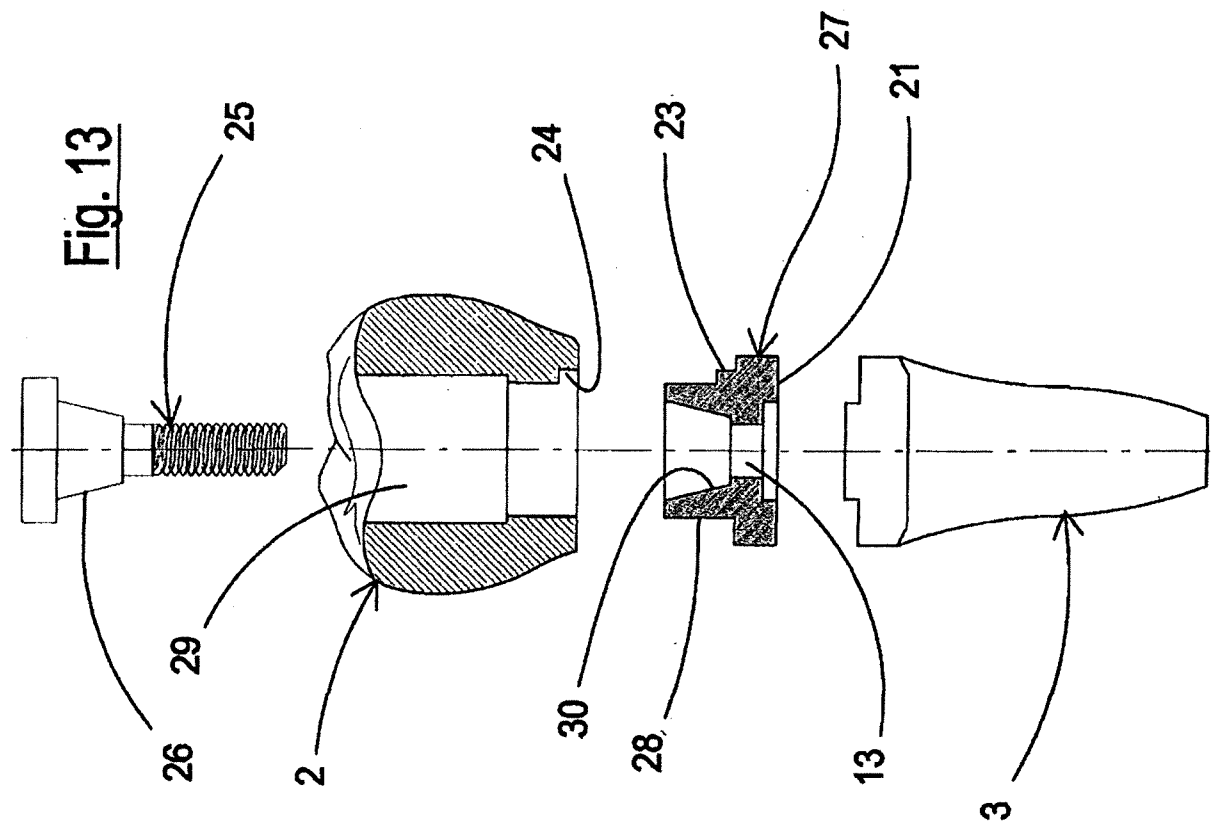
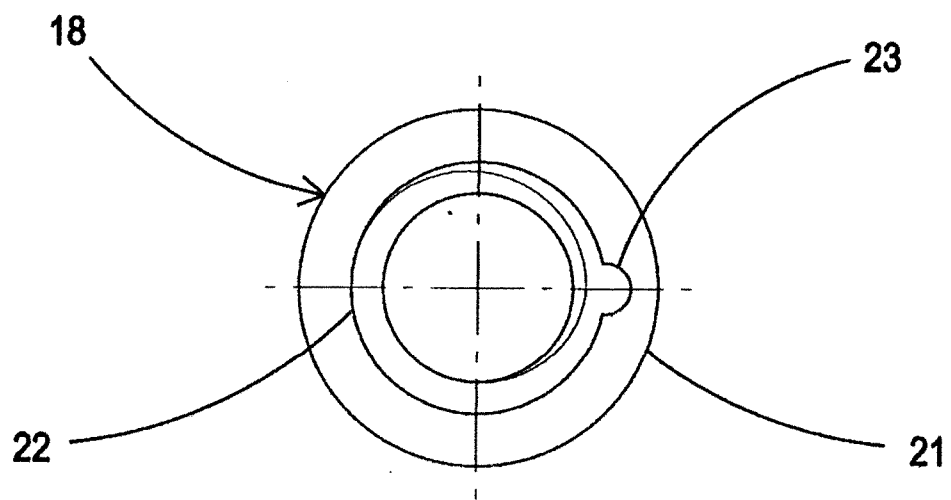


Fig. 13



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Fig. 14



INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2015/000098

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-4(completely); 7-9(partially)

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2015/000098

A. CLASSIFICATION OF SUBJECT MATTER

INV. A61C8/00

ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A61C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 89 05 201 U1 (KANTH, LOTHAR) 7 September 1989 (1989-09-07) the whole document	1-4,7-9
X	----- EP 0 370 590 A2 (IMZ FERTIGUNG VERTRIEB [DE]) 30 May 1990 (1990-05-30) figure 1 column 7, lines 27-28	1-4,7-9
X	----- US 4 993 950 A (MENSOR JR MERRILL C [US]) 19 February 1991 (1991-02-19) figure 3 -----	1-4,7-9



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

27 March 2015

Date of mailing of the international search report

23/06/2015

Name and mailing address of the ISA/

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Authorized officer

Kerner, Bodo

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2015/000098

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 8905201	U1	07-09-1989	NONE
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US 4993950	A	19-02-1991	NONE

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-4(completely); 7-9(partially)

dampening insert, in particular with threaded portion

2. claims: 5(completely); 7-9(partially)

dampening insert with expansion feature

3. claims: 6(completely); 7-9(partially)

dampening insert with anti-rotation feature
