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(54) **Title:** METHOD OF MANUFACTURING A DENTAL PROSTHESIS ABUTMENT, DEVICE AND MACHINE FOR IMPLEMENTING THE METHOD AND ABUTMENT OBTAINED BY THE METHOD

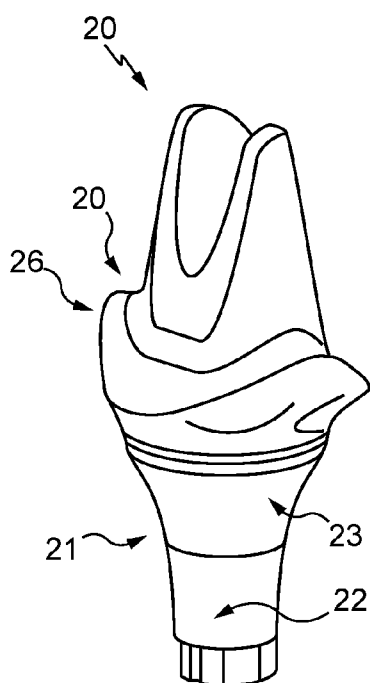


Fig. 5

(57) **Abstract:** The present application concerns a method of manufacturing an implant abutment (20) comprising a step of providing an insert (21) in a format and material that are predetermined and a step of forming a stump (26) of specific geometry by laser melting of a powder of the same material as the insert starting from a surface of the insert (21). It also concerns a device for its implementation comprising a plate comprising a planar upper surface with a plurality of cavities. It also concerns a machine, for implementing the method and comprising the device, as well as the abutment (20) so obtained. The insert comprises an upper part (21) having a roughness comprised between approximately 0.1 μm and 0.3 μm and a lower part (22) having a roughness comprised between approximately 0.7 μm and 0.9 μm and the stump (26) has a roughness comprised between approximately 5 and 10 μm .



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METHOD OF MANUFACTURING A DENTAL PROSTHESIS ABUTMENT,
DEVICE AND MACHINE FOR IMPLEMENTING THE METHOD AND
ABUTMENT OBTAINED BY THE METHOD

5 The present application concerns the manufacture of a dental prosthesis, and in particular a dental prosthesis abutment.

 In dental implant dentistry, the production of prostheses on an implant is achieved via an interface situated between the implant and the crown: the dental abutment

10 The dental abutment has a prominent role in success regarding the implant on account of the fact that it provides both the transmission of the occlusal forces and an aesthetic component by the healing of the gum tissues.

 Therefore, each abutment is specific to an implant and to a crown, which crown is produced on a case-by-case basis. In order for the positioning of the abutment to be right, the lower part of the abutment must be precisely
15 configured according to the implant, and an upper part of the implant is configured according to the crown which represents the tooth to replace.

 For this, abutments may therefore be manufactured using different methods.

20 For example, they may be manufactured using a standard method which consists of purchasing abutments of generic forms from a catalog then having them adjusted by the prosthetist in order to configure them to the needs of the anatomical sectors concerned.

 According to another example, they may be manufactured using a
25 customized method which consists in particular in conventional unitary machining based on a blank of material, generally of chromium-cobalt or titanium in encapsulation-casting by the lost-wax technique over a "burnout" abutment. This method makes it possible to obtain geometries that are suited to the prosthetic and anatomical morphologies of the patient.

30 However, such a method is long and costly, mainly on account of the fact that the abutments are then produced on a case-by-case basis.

The subject-matter of the present application is directed to providing an improved method, capable furthermore of leading to other advantages.

To that end, according to a first aspect there is provided a method of manufacturing an implant abutment for a dental prosthesis comprising:

- 5 - A step of providing an insert in a predetermined format and of a predetermined material;
- A step of forming a stump of specific geometry by laser melting of a powder of the same material as the insert starting from a surface of the insert.

10 An abutment according to the invention thus comprises a lower part, formed to begin with by the insert, which is standard, and an upper part, formed by the stump, which is made to measure.

 As a matter of fact, the design constraints proved not to be as severe for the upper part as for the lower part. In fact, it proved to be superfluous for
15 the upper part to be as accurately machined as the lower part, or to have such a good surface state. In other words, it has proved possible for the lower part to have a standard geometry provided it has the desired surface state as well as specific geometric and dimensional tolerances, while the upper part may have a more arbitrary surface state provided the geometry is configured according to
20 the crown.

 Therefore, it is possible to use a “universal” insert, for example machined in advance and with a predetermined surface state in accordance with needs, and to make grow thereon, in particular by laser melting, a specific stump according to the crown, preferably of the same material.

25 Thus, contrary to methods of the prior art, the abutment according to the invention is in part formed in a standard manner and in part made to measure.

 It has in fact proved to be particularly advantageous to apply a step of a method, for example of fast prototyping, to part only of the abutment.

30 The method thus makes it possible to obtain unitary implant abutments, for example of metal, such as titanium or a chromium-cobalt alloy,

but also of ceramic, in particular by laser melting additive manufacturing technology, in a particularly fast and economical way.

According to one embodiment of implementation, the method comprises a step of sending data representing geometrical features of the stump to a manufacturing machine.

The step of forming the stump for example comprises a step of welding a base of the stump to the insert and/or for example a step of sintering or of melting of a metal or ceramic powder.

According to particular advantageous provisions, the method comprises a step of positioning the insert on a on a plate prior to the step of forming the stump.

In particular, the step of positioning the insert on the plate comprises a step of inserting the insert into a cavity of the plate with a predetermined orientation and indexation, in particular by virtue of a system for holding orientation and indexation of the insert in the cavity.

Furthermore, is preferable for a surface of the insert to be flush with an upper, planar, surface of the plate.

“Orientation” here means an angular positioning of the insert relative to another element, for example relative to the cavity in which it is inserted or an intermediate element, and “indexation” here means a longitudinal positioning of the insert relative to another element, for example relative to the cavity in which it is inserted or an intermediate element.

According to a particular embodiment, the step of positioning the insert comprises a step of inserting the insert into a support in a predetermined orientation.

According to another particular embodiment, the method comprises a step of inserting the support into a body of a clamping device in a predetermined orientation.

According to still another particular embodiment, the method comprises a step of inserting the body of the clamping device into a cavity of the plate in a predetermined orientation.

According to a convenient embodiment, the method comprises a step of simultaneously forming a plurality of stumps, each stump being formed from a corresponding insert.

Simultaneously here means that the stumps are formed at least
5 during the same baking operation.

According to another aspect, a device is provided to implement the method as described above.

The device comprises for example a plate comprising a planar upper surface and a plurality of cavities, the cavities being disposed in a matrix
10 arrangement on the upper surface.

According to an example embodiment, the device comprises at least one insert inserted into a cavity, a surface of the insert being flush with the planar upper surface of the plate, and the device comprises a system for holding orientation and indexation of the insert in the cavity.

15 For example, the surface of the insert is a planar surface.

According to an example embodiment, the insert is inserted into a support and the support comprises a system for holding orientation of the insert in the support.

This is for example achieved by complementary shapes respectively
20 present on the insert and on the support.

According to another example embodiment, the support is inserted into a body of a clamping device and the body comprises a system for holding orientation and indexation of the support in the body.

The system for holding orientation and indexation of the body
25 comprises for example at least one key inserted into an aperture of the body holding at least indexation of the support in the body.

According to still another example embodiment, the device comprises a system for holding orientation of the body in a cavity.

According to a particularly advantageous example embodiment, the
30 device comprises a plurality of inserts which are all identical, each of the inserts being inserted into one of the cavities.

According to another aspect, a machine is also provided for implementing the method as described above comprising a device comprising all or some of the above-mentioned features.

Lastly, according to another aspect, there is provided an abutment
5 comprising an insert and a stump, the insert and the stump being constituted by a same material and optionally defining between them a sintering interface. The insert comprises an upper part having a roughness (Ra) comprised between for example approximately 0.1 μm and 0.3 μm , preferably approximately 0.2 μm , referred to as "mirror finish". The insert also comprises a lower part having a
10 roughness (Ra) comprised between approximately 0.7 μm and 0.9 μm , preferably 0.8 μm . The stump for example has a roughness (Ra) comprised between approximately 5 and 10 μm .

It is in particular an abutment obtained by a method comprising at least some of the steps described above.

15 The invention, according to an example embodiment, will be well understood and its advantages will be clearer on reading the following detailed description, given by way of illustrative example that is in no way limiting, with reference to the accompanying drawings in which.

Figure 1 shows an exploded view of a dental prosthesis comprising a
20 crown, an abutment and an implant.

Figure 2 is a diagram of a prosthesis positioned in a jaw of a patient.

Figure 3 presents an abutment insert according to an example embodiment of the present invention,

Figures 4 and 5 present the insert of the abutment of Figure 3
25 surmounted by a stump in course of formation (Figure 4) and fully formed (Figure 5) according to an example embodiment of the present invention.

Figure 6 presents a cross-section of an abutment according to an example embodiment positioned in an implant.

Figures 7 and 8 illustrate a positioning of an insert on a support,

30 Figures 9 and 10 illustrate an exploded view and cross-section of a clamping device of an assembly comprising the insert and the support according to an example embodiment of the present invention,

Figure 11 presents a plate according to an example embodiment of the present invention,

Figure 12 shows the plate of Figure 11 of which all the cavities comprise a clamping device,

5 Figure 13 diagrammatically represents a manufacturing machine manufacturing several abutments simultaneously, and

Figure 14 presents an example of an abutment produced according to an embodiment of the present invention.

10 Identical elements represented in the aforementioned Figures are identified by identical numerical references.

As Figure 1 shows, a dental prosthesis 10 conventionally comprises three main elements: a crown 11, an abutment 12 and an implant 13.

15 The crown 11 is generally produced from ceramic and has the form of the tooth to be replaced. It is connected to the implant 13 via the abutment 12. To that end, the crown 11 comprises an aperture 18 in which is inserted a first part 16 of the abutment 12 and the crown 11 is joined therewith for example by sealing.

20 The implant 13 enables the prosthesis to be anchored in the jaw of a patient. For this, the implant 13 comprises a shank 14, for example threaded, and an aperture 15 formed in line with the shank 14 into which inserts a second part 17 of the abutment 12. The abutment 12 and the implant 13 are for example attached together by screwing.

25 So as to join the crown 11 to the implant 13, the abutment 12 thus comprises two parts: the first part 16, or upper part, and the second part 17, or lower part. Once each of these parts has been respectively inserted into the crown 11 and the implant 13, the abutment 12 is at least partly, or even wholly, recessed, as for example shown by Figure 2 wherein the prosthesis, such as the prosthesis 10 of Figure 1, is assembled and inserted into a jaw of a patient between two teeth. It is furthermore visible that the implant 13 serves as a root
30 for the artificial tooth which the prosthesis 10 constitutes.

Here, the abutment 12 has a symmetry of revolution. The lower part 17 has a substantially conical shape and comprises two ends of which one, an

upper end forming a junction with the upper part 16, has a greater diameter than the other, a lower end forming a free end of the lower part 17 adapted to be inserted deeper into the implant 13. Furthermore, here, from the junction end with the upper part 16 to the free end, the lower part 17 has a diameter which
5 decreases substantially regularly.

The upper part 16 here has a flared conical shape. It also comprises two ends one of which, a lower end, forms the junction with the lower part 17 and the other, an upper end, forms a free end configured to be inserted deeper into the crown 11. The lower end has greater diameter than the upper end and,
10 here, the upper part 16 has a diameter which increases from the upper end to the lower end while flaring towards the lower end.

Yet, conventionally, such an abutment is obtained either by machining from a standard abutment, or is totally made to measure.

However, it has turned out that the upper part and the lower part are
15 not subjected to the same design constraints.

Figures 3 to 5 show how a abutment 20 is obtained according to an example embodiment of a method according to the invention.

The abutment 20 is formed from an insert 21 shown individually in Figure 3, which may have been machined for the needs of the prosthesis.

20 The insert 21 has a symmetry of revolution and comprises two parts: a lower part 22 and an upper part 23 formed in line with each other along an axis of revolution of the insert. Furthermore, an outside wall of the lower part 22 and of the upper part 23 are for example smooth, free of screw thread, and with a desired surface state.

25 The lower part 22 comprises a connector portion 25 for connection with a future implant 27. The connector portion 25 comprises for example at least one flute serving for indexation and angular orientation of the abutment relative to the implant when it is inserted therein.

The upper part 23 corresponds to what is referred to as a
30 "transgingival" part of the insert. It comprises two ends one of which serves as an interface with the lower part 22 and the other comprises a planar surface 24, which is for example at a right angle to the axis of revolution of the insert.

The method according to an example embodiment of the present invention consists in starting from such an insert 21, possibly machined if need be, taking the connector portion of the corresponding implant system, as illustrated for example in Figure 3, and in forming thereon, for example by
5 additive manufacture by laser melting, the form of a customized unitary stump 26 (shown in Figures 4 and 5) which the prosthetist and/or the dentist will have determined in advance, and will have sent, for example by a 3D file. The stump 26 may thus have any type of form.

10 In the example represented in Figures 3 to 5, the stump 26 is formed on the planar surface 24 of the insert and on account of the method generating a molten bath from the powder thereon, the junction between the two elements is produced by welding.

To improve the adhesion of the stump to the insert, the insert and the stump are for example of the same material. They are for example produced
15 from metal or from ceramic.

As Figure 6 shows, the abutment 20 so formed is then inserted into the implant 27. A joining screw 28 is for example inserted into a longitudinal hole 29 passing entirely through the abutment 20 for the purpose of joining the abutment to the implant. In the present example embodiment, a head of the
20 joining screw 28 comes to bear on the stop formed on a wall of the longitudinal hole 29 of the insert 21, which may possibly be the planar surface 24, and a threaded shank of the joining screw 28 engages in an at least partly tapped hole of the implant 27. Figure 6 furthermore enables it to be noted that the implant 27 comprises an external screw thread for the purpose of its positioning in the jaw
25 of a patient.

An example of a device for producing an abutment 20 such as described above is shown in Figures 7 to 13.

In Figures 7 and 8, the insert 21 is inserted into a support 30 which is for example here an analogous dental implant.

30 The support 30 comprises a segment 31, referred to as upper segment 31, of external section which is circular here and of uniform diameter which extends from one end of the support 30, referred to as upper end.

The upper segment 31 comprises a hole 32, opening at the upper end, at least part of which has a form that is complementary with the lower part 22 and in particular with the connection portion 25 so as to hold the insert 21 in a predetermined fixed orientation in the support 30. This is for example best
5 seen in the cross-section view of Figure 10. Thus the device comprises a system for holding orientation between the insert and the support formed in part by the part having a zone of form complementary to the connector portion 25, the orientation holding being achieved here by its cooperation with the connector portion 25.

10 The support 30 further comprises two distinct truncated portions 33, 34 which here each comprise a flat 35, 36. Without taking into account their flat, in the embodiment represented here, the portions 33 and 34 have a circular external section of the same diameter as the upper segment 31. For convenience of production, the flat 35 of the portion 33 and the flat 36 of the
15 portion 34 are coplanar. The portion 34 here extends from an opposite end of the support 30 to the upper end, which is thus referred to as the lower end. The portion 33 here extends remotely from the upper end and from the lower end of the support 30. The portion 33 is distinct from the portion 34 in that there extends between the portion 33 and the portion 34 a segment 37 of smaller
20 external section, which furthermore is circular here. In similar manner, the portion 33 is distinct from the upper end in that there extends between them the upper segment 31.

As Figure 8 shows, once the insert 21 has been inserted into the support 30, and in particular into the hole 32, the upper part 23 of the insert 21
25 juts, entirely here, from the upper end of the support 30. This makes it possible to form a zone for gripping the insert by an operator in order to be able to position it in the support and to remove it therefrom easily.

The support 30 with the insert 21 are then introduced into a body 41 of a clamping device 40, also designated body 41 for convenience, as Figures 9
30 and 10 illustrate; the clamping device 40 comprising the body 41 and a key 48 which will be described later.

The body 41 here comprises a first part 42 and a second part 43. The first part 42 is here referred to as lower part. It is of substantially cylindrical shape with a circular section and also comprises a flat 44 which, in cooperation with the screw 48, serves to hold the clamping device 40 rotationally when it is inserted into a cavity of a plate, as will be described later with reference to Figures 11 and 12. The second part 43 here surmounts the first part 42 thereby forming what is referred to as upper part. It also has a substantially cylindrical shape with a circular section. Furthermore, it has a diameter which is greater here than a diameter of the first part 42.

The body 41 further comprises a hole 45. The hole 45 is at least formed from an upper surface 46 from which extends the second part 43. Furthermore, in the present example embodiment, the hole 45 passes entirely through the body 41, that is to say that it extends within the first part 42 and the second part 43, and also opens in an opposite lower surface to the upper surface 46.

Furthermore, the hole 45 for example comprises at least one portion of a section with a form complementary to at least one of the portions 33 and 34 of the support 30 preventing relative rotation of the support 30 in relation to the body 41 once the support has been inserted into the hole 45. Thus, once the insert 21 has been inserted into the support 30 itself inserted into the hole 45, the insert 21 is rotationally held in the support 30, which is itself rotationally fixed relative to the body 41, and so the orientation of the insert 21 is thus fixed in terms of orientation relative to the body 41 of the clamping device. In other words, the device also comprises a system for holding orientation of the support 30 in the body 41 which is, for example here, at least partly formed by the portion of complementary form to the portions 33 and 34 of the support; the orientation holding is thus also achieved here by its cooperation with the support 30.

Furthermore, in the present example embodiment, once the support 30 with the insert 21 have entered the hole 45, the planar surface 24 of the insert 21 and the upper surface 46 of the body 41 are substantially coplanar, as Figure 10 shows.

The body 41 also comprises an aperture 47 formed starting from the flat 44 and opening into the hole 45. The aperture 47 enables the key 48 to be inserted therein.

5 The key 48 serves as a reference marker for indexation of the support 30 in the hole 45. Here, once the support 30 is in the hole 45, its segment 37 is located opposite the aperture 47 and the portions 33 and 34 are respectively located above and below the aperture 47 such that once inserted in the aperture 47 the key 48 is located below between the portions 33 and 34 with minimal play such that the support 30 is longitudinally held in the hole 45.

10 In other words, the device comprises a system for holding indexation of the support in the body which is here formed by the key. The key 48 is for example a screw and the aperture 47 is then for example a tapped hole. Thus, here, the device comprises a system for holding orientation and indexation which is formed by a system for holding orientation and also formed by a
15 system for holding indexation; however, according to another example embodiment, a single system could of course ensure both the orientation holding and the indexation holding.

The clamping device 40, with the support 30 and the insert 21, is next inserted into an cavity of a plate 50 represented for example in Figure 11.

20 The plate 50 mainly comprises a planar upper surface 51 and at least one cavity 52 and preferably, as this is shown here, multiple cavities 52, for example in a matrix arrangement. Each cavity 52 opens onto the upper surface 51 and here comprises a form that is substantially complementary to the clamping device 40 in order to form a system for holding orientation of the body
25 41 in the cavity 52.

In the present example embodiment, each cavity 52 comprises two parts: a first part of cylindrical shape with a circular section of diameter substantially equal to the diameter of the upper part 43 of the body 41 of the clamping device 40 and which extends from the upper surface 51 over a height
30 substantially equal to the height of the upper part 43 of the body 41, then a second part which extends from the first part, i.e. here below the first part relative to the upper surface 51, which is of substantially truncated cylindrical

shape, i.e. a shape substantially complementary to the lower part 42 of the body 41 taking into account possible jutting of the key 48 as is for example shown in Figure 10.

Thus, when the clamping device 40 is inserted into a cavity 52, the device is rotationally held in the cavity and the planar surface 24 of the insert 21 is flush with the upper surface 51 of the plate 50.

The positioning and the orientation of an insert 21 in a plate 50 may thus be known with precision.

Without taking into account the cavities, the plate would correspond to a removable part of a laser melting manufacturing machine which would enter directly into contact with the machine frame. Thus the plate for example has standard dimensions. The cavities may thus for example be added to a standard plate.

According to a particularly advantageous example embodiment, all the cavities of the plate contain an insert, or even a clamping device into which is inserted a support with an insert. All the inserts are also identical, and where appropriate all the clamping devices are then also advantageously identical. However, it is then possible to manufacture abutments which can all be different.

More particularly, as illustrated diagrammatically by Figure 13, once the insert or inserts have been positioned on a plate, at least fixed in position and orientation on the plate, for example by virtue of a support and a clamping device as described above, the plate is then baked in a manufacturing machine which for example comprises a control unit to which is sent data for the manufacturing of one or several abutments. It is thus possible simultaneously to manufacture multiple abutments, it being understood that simultaneously here means at least during the same baking operation. However, if the machine so enables, all the abutments may advantageously be produced at the same time.

By way of example, Figure 14 presents an abutment obtained by such a method. It is thus possible to note that the insert presents a surface state often qualified as "mirror" while that of the stump is coarser. Furthermore, by

virtue of the method, a demarcation between the insert and the stump is practically invisible.

Naturally, the present invention is limited neither to the preceding description nor to the appended drawings, but encompasses any variant form
5 within the capability of the person skilled in the art.

The different features presented may be advantageously combined. Their presence in the description does not, indeed, exclude the possibility of combining them.

The terms "comprising" or "having" are to be interpreted here as
10 "including" in the broad sense and not limitatively, exclusively or exhaustively.

* * *

CLAIMS

- 5 1. A method of manufacturing an implant abutment (20) for a dental prosthesis comprising:
- A step of providing an insert (21) in a predetermined format and of a predetermined material;
 - A step of forming a stump (26) of specific geometry by laser melting
- 10 of a powder of the same material as the insert (21) starting from a surface of the insert (21).
2. A method according to claim 1, wherein the step of forming the stump (26) comprises a step of welding a base of the stump (26) to the insert (21).
- 15 3. A method according to any one of claims 1 or 2, wherein the step of forming the stump (26) comprises a step of sintering or of melting a powder of metal or of ceramic.
4. A method according to any one of claims 1 to 3, comprising step of positioning the insert (21) on a on a plate (50) prior to the step of forming
- 20 the stump (26).
5. A method according to claim 4, wherein the step of positioning the insert (21) comprises a step of inserting the insert (21) into a support (30) in a predetermined orientation.
- 25 6. A method according to claim 5 comprising a step of inserting the support (30) into a body (41) of a clamping device (40) in a predetermined orientation.

7. A method according to claim 6, comprising a step of inserting the body (41) of the clamping device (40) into a cavity (52) of the plate (50) in a predetermined orientation.
8. A method according to any one of claims 1 to 7 comprising a step of simultaneously forming a plurality of stumps (26), each stump (26) being formed from a corresponding insert (21).
9. A device for implementing the method according to any one of claims 1 to 8, characterized in that it comprises a plate (50) comprising a planar upper surface (51) and a plurality of cavities (52), the cavities (52) being disposed in a matrix arrangement on the upper surface (51).
10. A device according to claim 9 characterized in that it comprises at least one insert (21) inserted into a cavity (52), and in that a surface of the insert (21) is flush with the planar upper surface (51) of the plate (50) and in that the device comprises a system for holding orientation and indexation of the insert (21) in the cavity (52).
11. A device according to claim 10 characterized in that the surface of the insert (21) is a planar surface (24).
12. A device according to any one of claims 10 or 11 characterized in that the insert (21) is inserted into a support (30), and in that the support (30) comprises a system for holding orientation of the insert in the support (30).
13. A device according to claim 12 characterized in that the support (30) is inserted into a body (41) of a clamping device (40) and in that the body (41) comprises a system for holding orientation and indexation of the support (30) in the body (41).
14. A device according to claim 13 characterized in that the system for holding orientation and indexation of the body (41) comprises at least one key (48) inserted into an aperture (47) of the body (41) holding at least indexation of the support (30) in the body (41).

15. A device according to any one of claims 13 or 14 characterized in that it comprises a system for holding orientation of the body (41) in a cavity (52).
- 5 16. A device according to any one of claims 9 to 15 characterized in that it comprises a plurality of inserts (21) which are all identical, each of the inserts (21) being inserted into one of the cavities (52).
17. A machine for implementing the method according to any one of claims 1 to 8 comprising a device according to any one of claims 9 to 16.
- 10 18. An abutment obtained by the method according to any one of claims 1 to 8 comprising an insert (21) and a stump (26), the insert (21) and the stump (26) being constituted by the same material, the insert (21) comprising an upper part (23) having a roughness (Ra) comprised between approximately 0.1 μm and 0.3 μm , preferably approximately 0.2 μm referred to as "mirror finish" and a lower part (22) having a
15 roughness (Ra) comprised between approximately 0.7 μm and 0.9 μm , preferably 0.8 μm , and the stump (26) having a roughness (Ra) comprised between approximately 5 and 10 μm , the insert (21) and the stump (26) defining between them a sintering interface.

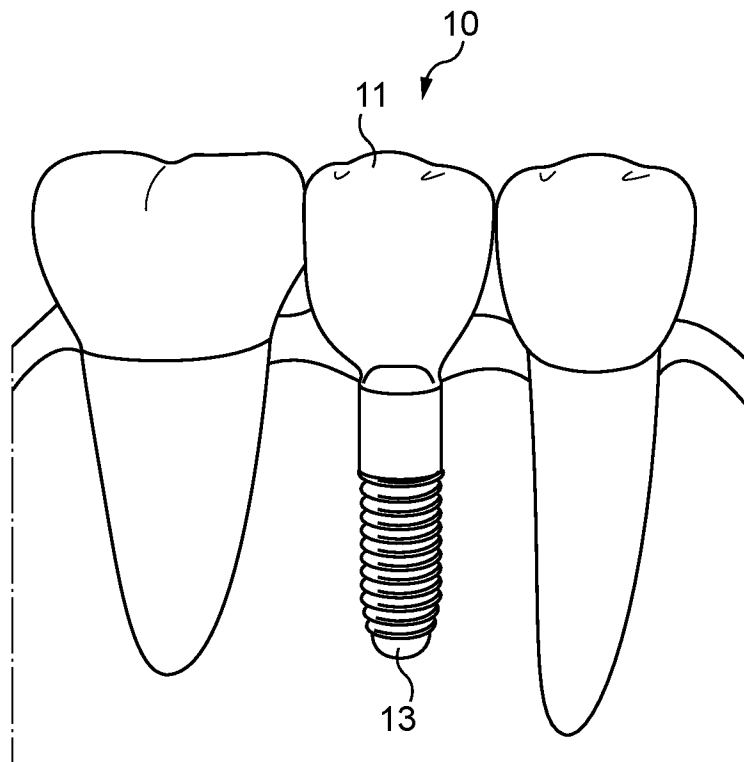
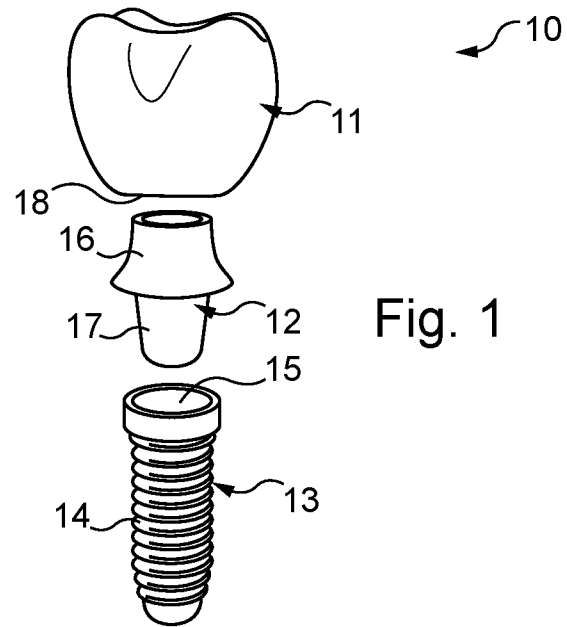


Fig. 2

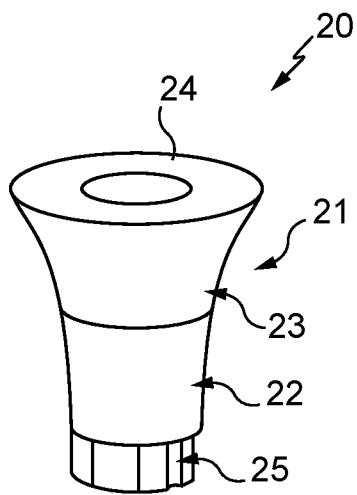


Fig. 3

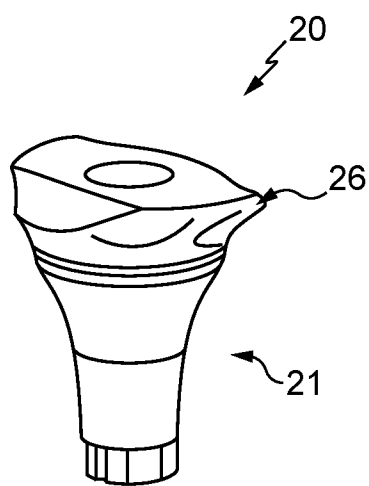


Fig. 4

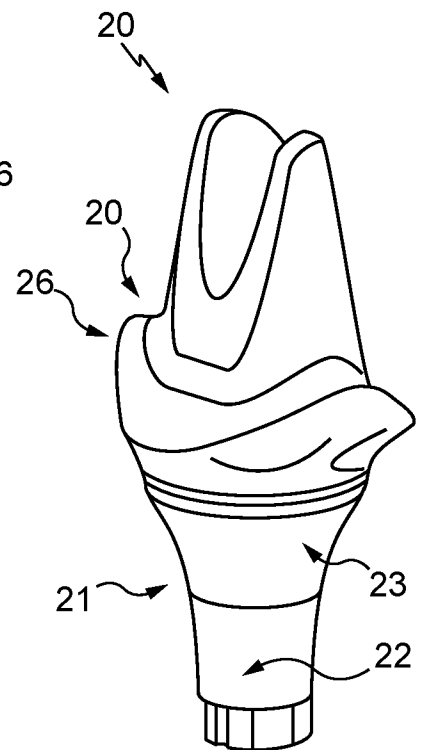


Fig. 5

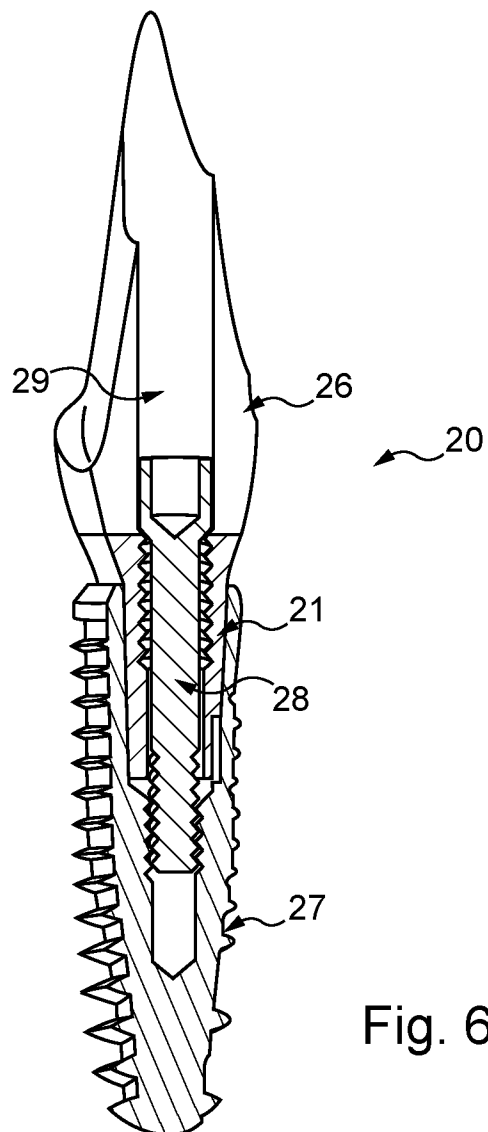


Fig. 6

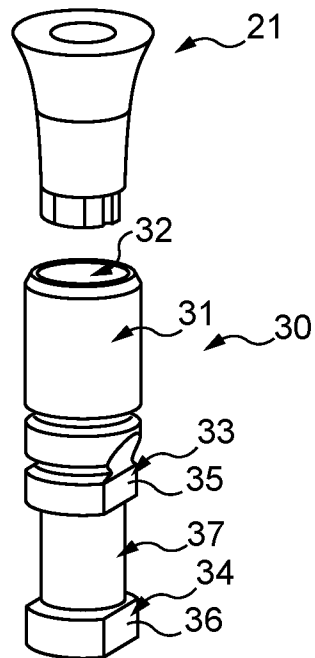


Fig. 7

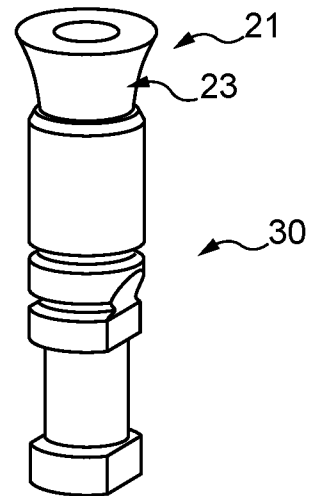


Fig. 8

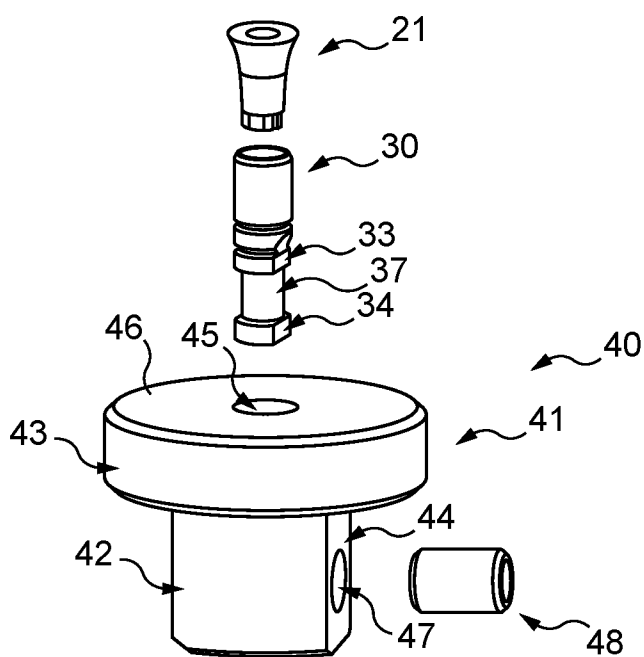


Fig. 9

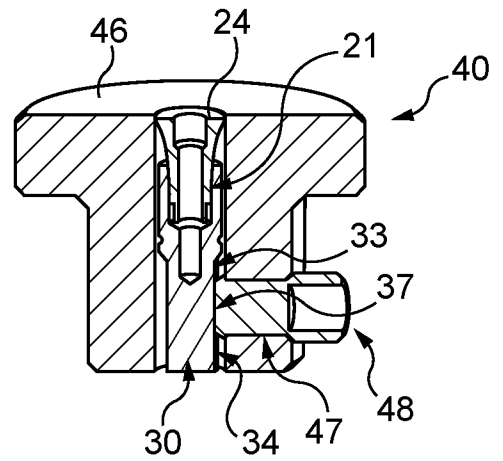


Fig. 10

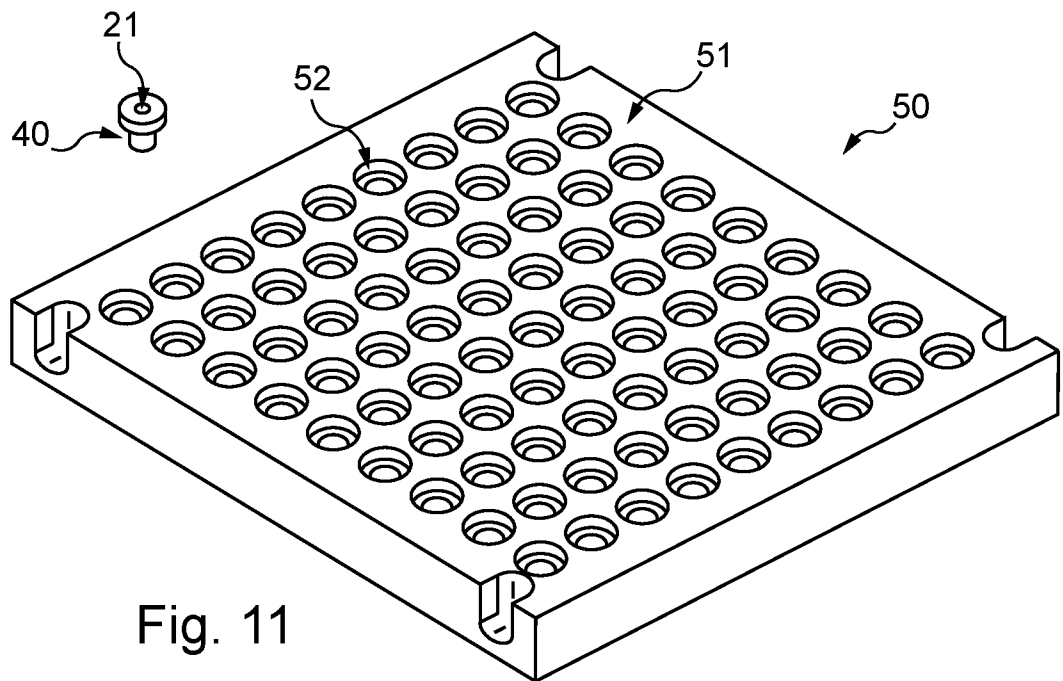


Fig. 11

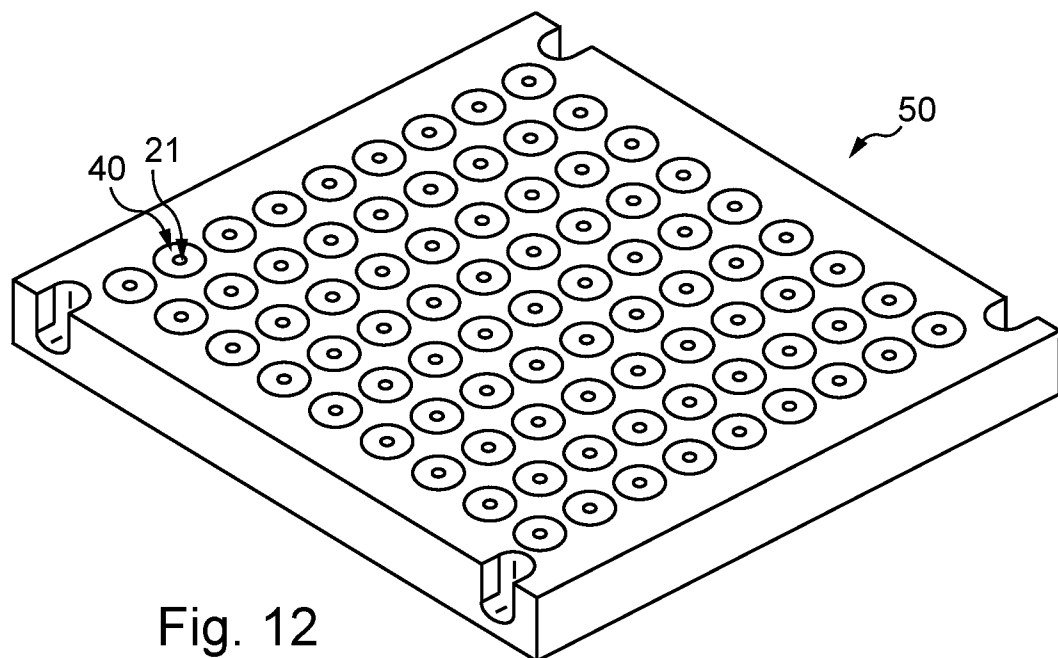


Fig. 12

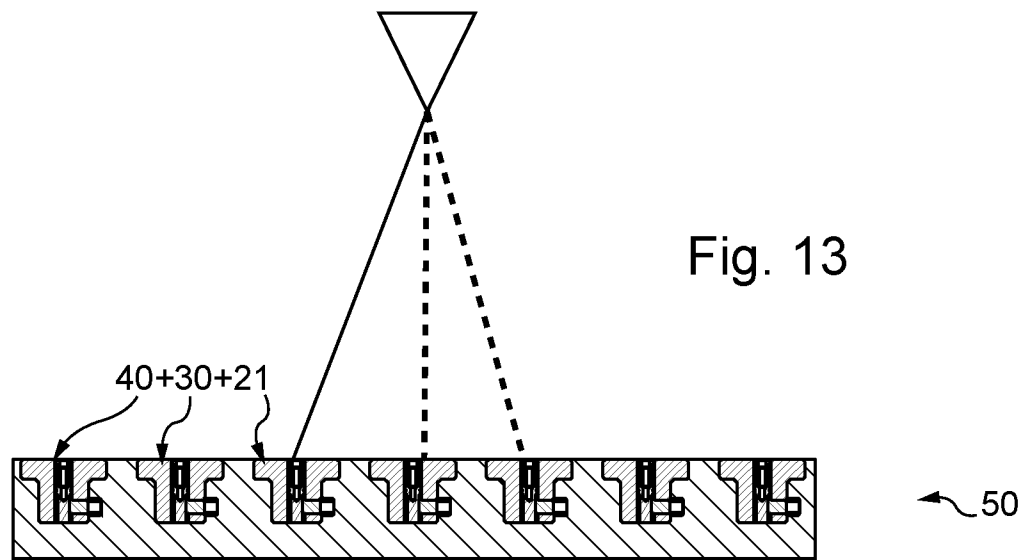
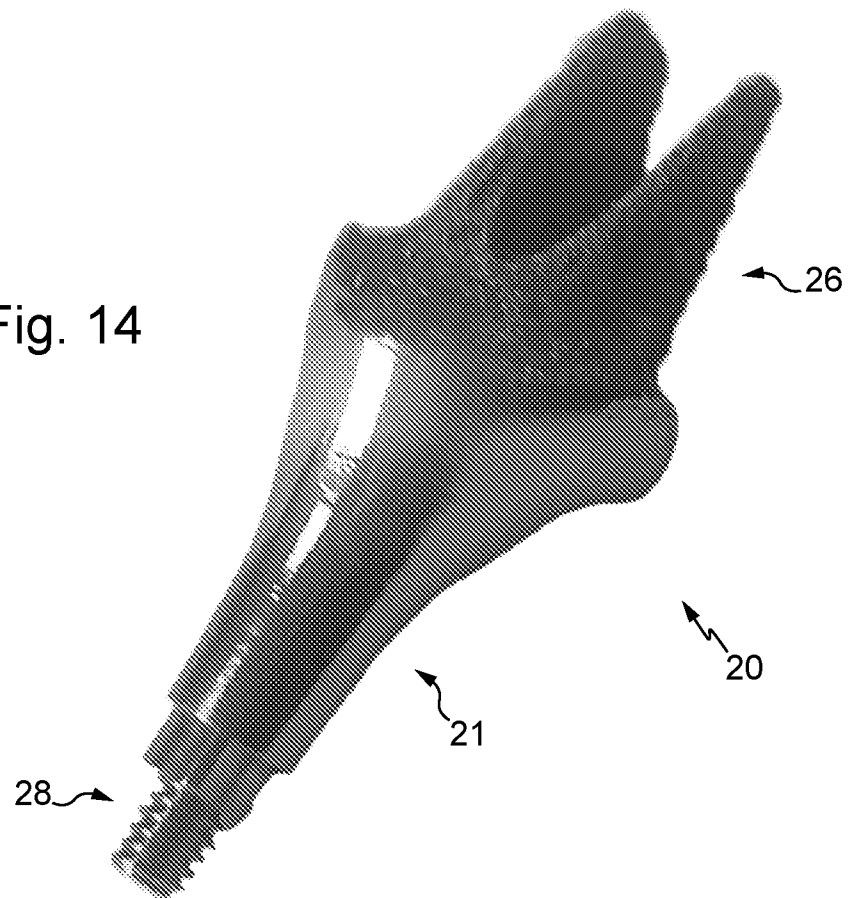


Fig. 14



INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2016/050140

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61C13/00 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)

EP0-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	paragraphs [0002], [0007], [0013], [0039], [0042] - [0044], [0047]; figures 1-4	5,6,8, 10-12, 16,18

X	EP 1 062 916 A2 (DCS FORSCHUNGS & ENTWICKLUNGS [CH]) 27 December 2000 (2000-12-27)	9,17
Y	paragraph [0043]; figures 7A,7B	10-12,16

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Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

15 March 2016

Date of mailing of the international search report

29/03/2016

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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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International application No

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