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(54) Title: DENTAL PROSTHESIS AND A METHOD FOR MAKING THE PROSTHESIS

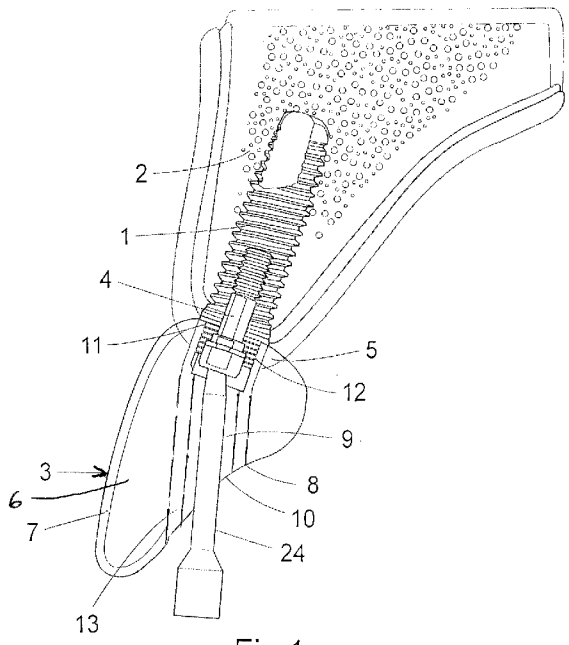

Fig.1

(57) Abstract: The invention relates to a dental prosthesis, such as a dental bridge restoration or a single unit restoration (3, 3'), having a main body and a base portion (5, ') for connection to a dental implant system (1,1'). The prosthesis comprises at least one angled communication channel (9,9') for a prosthetic screw member (4, 4',4") for fixation of the prosthesis to the dental implant system (1,1 '). The communication channel (9,9') has a first mouth (10,10') on a side of the prosthesis and a second mouth (11, 11 ') in said base portion (5, 5') for the fixation of the prosthesis to the dental implant system and wherein said communication channel (9,9') is forming a through passage between the first mouth (10,10') and the second mouth (11, 11'). According to the invention the angled communication channel (9,9') is constituted by a bendable, elongated tube (13,13',13") attached onto the implant or the implant abutment level for defining a desired angle of said communication channel (9, 9') and for a subsequent wax-up of the final restoration. The elongated tube (13') is attached either directly onto the implant or the implant abutment level by means of the prosthetic screw member (4', 4") for defining the desired angle of the communication channel (9, 9') or indirectly by means of an interface abutment (12) for fixation onto the implant or implant abutment level of the dental implant system (1). The invention also relates to a method for manufacturing such prosthesis.

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Dental prosthesis and a method for making the prosthesis

The present invention relates to a dental prosthesis, such as a dental bridge restoration or a single unit restoration. Specifically the invention relates to a dental prosthesis to be connected to a dental implant system.

It is previously known to implant titanium screws, so-called fixtures, in the jaw bone of a more or less toothless person. There are different dental implant systems on the market today which are based on such biocompatible screw elements.

There are also different methods for attaching a dental prosthesis/superstructure to the implant, either directly to the implant screw itself, or indirectly by means of a spacer/abutment applied onto the implant screw. The dental prosthesis is applied for instance by cementing or by means of separate securing screws. One example of a dental prosthesis in the form of a bridge restoration is illustrated in US 6,319,000 B1.

In case of a screw-retained prosthesis the securing screw is applied through a screw channel in the prosthesis. This could be a problem because the screw access hole might be on the visual side of the prosthesis due to the jaw bone situation. For esthetical reasons it is previously known to use angulated spacers or the like, see for instance EP1267744 B1. However, there are drawbacks by using angulated spacers as they often add an undesired significant height to the prosthesis.

In order to solve this it is previously known in EP2053985 to provide an "angled" screw channel in the prosthesis itself in such a way that the screw channel has a first mouth through which the screw should be inserted and a screw member seat with a second mouth, for providing support to the head of the securing screw during fixation of the dental prosthesis to a spacer element or an implant through the second mouth. A communication is then obtained between the first mouth and the second mouth and by drilling the communication such that at least one part of a central axis of the screw channel and a central axis of the second mouth do not coincide it might be possible to locate the mouth of the screw channel so that it is not visible from outside the patients mouth. A special screw driver having a rotatable handle portion and flexible and/or bendable shaft portion should be used for fixing the securing screw.

According to EP2053985 the screw member seat for providing support to the head of the screw is integrated with the dental prosthesis/superstructure. However, it is also illustrated one example of a separate seat for the screw member head that may subsequently be inserted and attached to the superstructure. It is also mentioned that in another embodiment the superstructure could be provided with a dental implant seat or a spacer element seat, such as a recess suitable for receiving a protrusion on the dental implant or spacer element. In case of the integrated screw member seat the shoulders of the screw member seat are created by a drill bit to provide an arched or semi-spherical shape. A matching screw member with a bevelled, such as arched, spherical or semi-spherical head, is then used for securing the dental prosthesis/superstructure.

As to the manufacturing method the communication channel is drilled. Specifically, the drilling procedure comprises a drilling of a first straight bore from a first point, and a drilling of a second straight bore from a second point, such that the first bore and the second bore intersect in the interior of the prosthesis/superstructure to form the communication channel.

Even if the described superstructure makes it possible to place the mouth of the screw channel on a non-visual surface of the dental superstructure, the specific drilling procedure and the creation of a specific shaped screw member seat integrated with the dental superstructure is a rather complex and troublesome task for the dental practitioner.

Therefore, there is a need to design the dental prosthesis, bridge or superstructure with an angled screw channel (passage) which provides a more simple and flexible way to place the mouth of the channel on an aesthetically unimportant surface of the prosthesis, for example on the inside or occlusal surface of the dental bridge or superstructure.

According to the invention the angled screw channel passage through the dental prosthesis, the communication channel, is constituted by a bendable, elongated tube attached onto the implant or the implant abutment level for defining a desired angle of said communication channel and for a subsequent wax-up of the final restoration.

According to one embodiment of the invention the elongated tube is attached directly onto the implant or the implant abutment level by means of a prosthetic screw member.

According to another embodiment of the invention the elongated tube is attached to the implant or the implant abutment level via an interface abutment for fixation onto the implant or implant abutment level. So in this case the communication channel is constituted by the interface abutment and the bendable, elongated tube that fits onto the interface abutment.

According to a preferred embodiment of the invention the bendable tube is made of a plastic material, such as PMMA or a similar material, so that the tube is possible to bend into a desired angle with flame/heat.

According to a further embodiment of the invention the bending of the tube is performed by means of a specific tool to the desired angle of the tube.

In the following the invention will be described more in detail with reference to the following drawings, in which

Figure 1 is a schematic overview of a dental prosthetic situation for a first embodiment of the invention,

Figure 2 is a side view of two interface abutments according to the invention,

Figure 3 is a longitudinal section of a bendable tube according to the invention,

Figure 4a is a side view illustrating the bending of the tube by means of a one-piece tool bending the tube mounted onto the interface abutment,

Figure 4b is a side view illustrating a prepared prosthesis attached to analogues by means of a prosthetic screw,

Figure 5 illustrates the use of scan bodies for dental CAD-CAM technology,

Figure 6 is a schematic overview of a dental prosthetic situation for a second embodiment of the invention,

Figure 7 is a longitudinal section of a first type of a bendable tube according to the second embodiment of the invention,

Figure 8 is a longitudinal section of a second type of a bendable tube,

Figure 9 is a longitudinal section of a prosthetic screw to be used with the first type of bendable tube illustrated in figure 7,

Figure 10 is a longitudinal section of a prosthetic screw to be used with the second type of bendable tube illustrated in figure 8, and

Figure 11 is a side view illustrating the bending of the tube by means of a one-piece metal tool.

Figures 1- 5 are related to a first embodiment of the invention. Figure 1 illustrates a dental prosthetic situation in which a conventional dental implant screw 1 is anchored into the jaw bone 2 by means of conventional technique which is not described here. A dental prosthesis/superstructure 3 is attached to the implant screw 1 by means of a prosthetic screw 4. It should be understood that the prosthesis 3 could be attached either directly to the implant screw itself as illustrated in figure 1, or indirectly by means of a spacer/abutment applied onto the implant screw. The prosthesis 3 comprises a main body having a base portion 5 and a top portion 6 with a front surface 7 as well as a back or inside (occlusal) surface 8.

The prosthetic screw 4 is applied by means of a screwdriver 24 through a screw channel 9 in the prosthesis. The screwdriver 24 might be a standard screwdriver having a hexagonal, square or Torx ball end for inserting the prosthetic screw with an angle up to 30°. Such ball end precision tools are available on the market and will not be described more in detail here. The screw channel 9 has a first mouth 10, a screw access hole, through which the screw 4 is inserted and a second mouth 11 in the base portion 5 of the prosthesis. In this way the channel 9 forms a through communication between the first mouth 10 and the second mouth 11 in the prosthesis. The communication channel 9 is angled so that the first mouth is located on the aesthetically unimportant surface of the prosthesis, the inside or occlusal surface 8.

According to the inventive concept of this first embodiment the angled screw channel 9 through the dental prosthesis is constituted by an interface abutment 12 for fixation onto the implant screw 1 and a bendable, elongated tube 13 that fits onto the interface abutment for defining said angled screw channel 9 and on which tube a wax-up of the final dental prosthesis is prepared.

In figure 2 two examples of interface abutments 12 are illustrated more in detail. The abutment has a base portion in the form of a cylindrical collar 14 for fixation onto the implant or an implant abutment level by means of said standard prosthetic screw 4, a cylindrical or conical main body provided with retention grooves 15 for optimal bonding strength and long term stability and a top portion 16 with tripod shape for non-rotational of the bendable tube 13. The interface abutment is pre-fabricated/machined with industrial precision and could be made of various biocompatible materials, such as titanium, zirconium, cobalt chrome, gold or the like. For casting into any dental alloy of choice, the interface abutment might also be made of a burn-out material. The base portion interface has an internal or external connection compatible with existing dental implant systems on the market. The connection might be non-engaging for multiple unit restorations such as a dental bridge or engaging for single unit restorations.

Figure 3 illustrates a bendable, plastic tube 13 that fits onto the interface abutment 12 and used for wax-up of the final bridge restoration configuration/shape. The tube is made of a plastic material such as PMMA or the like which material is possible to be angled with flame/heat and burn-out for dental casting technique. By using a special bending tool (see figure 4) a desired angle of up to 30° could be obtained.

The through passage of the tube 13 has a base portion 17 which fits onto a cylindrical interface abutment and has a cylindrical inner tripod shape for a non-rotational fit. In figure 4 it is illustrated how the bending of the tube 13 could be achieved by means of a tool 18.

The bendable plastic tube 13 is designed to fit onto a conical interface abutment and the base portion 17 therefore has a slightly conical inner tripod shape. The base portion 17 also has a slightly larger outer diameter compared to the diameter of the cylindrical top portion 19 of the tube. As also illustrated in figure 3 the tube has a waist portion 20 formed by reduced wall material thickness, defining the desired bending area of the tube 13. The outer surface of the

cylindrical portion 19 is made with retention grooves 21 for increased mechanical bonding to the wax-up material used. The bending is achieved by means of a one-piece tool 18 comprising a screw access shape member 22 while the base portion 17 is fitted to a conical interface abutment onto analogues 23, see figure 4a.

Figure 4b further illustrates a prepared prosthesis with interface abutment 12 attached to analogues 23 by means of a prosthetic screw 4. The prosthetic screw 4 might be a standard prosthetic screw with a hexagonal standard grip, preferably made of titanium, DLC coated or similar, for cooperation with a screwdriver 24 having a hexagonal, square or Torx ball end.

According to the inventive protocol the interface abutments 12 are mounted and fixed onto analogues 23 using the prosthetic screws 4. Then the plastic tubes 13 are positioned onto the interface abutments 12 and a desired optimal prosthetic screw access angle output is defined. The plastic tubes are then angled by means of said bending tool 18 and flame or hot air 25 into a defined optimal prosthetic screw access angle output. A conventional wax-up is prepared onto the plastic tubes 13 into wished final shape, whereupon the tubes are cut at the occlusal level. Conventional dental casting technique is then used for transforming the wax-up model into a bridge restoration in the material of choice, such as any suitable dental metal alloy (gold, cobalt chrome etc) or press-ceramics. The fit of the framework on the interface abutments 12 is checked and eventually adjusted in the laboratory. Cosmetic veneering of choice is then applied according to conventional protocol.

As an alternative to the laboratory work by a dental technician, dental CAD-CAM technology could be used for the restoration. Then special scan bodies 26 made of a PEEK material are positioned into the plastic tubes 13 as illustrated in figure 5. A conventional wax-up framework is prepared onto the plastic tubes with the scan bodies and scanned with any existing, commercialized dental scanner or conventional 3D scanner. A choice of material between titanium, cobalt chrome and zirconium can then be made. The scan file is checked and sent in stl format to a production center.

Figures 6 - 11 are related to a second embodiment of the invention in which the elongated tube is attached directly onto the implant or the implant abutment level by means of a prosthetic screw member, i.e. without any interface abutment.

Figure 6 illustrates a dental prosthetic situation in which a conventional dental implant screw 1′ is anchored into the jaw bone 2′ by means of conventional technique which is not described here. A dental prosthesis/superstructure 3′ is attached to the implant screw 1′ by means of a prosthetic screw 4′. Like in figure 1 it should be understood that the prosthesis 3′ could be attached either directly to the implant screw itself, or indirectly by means of a spacer/abutment applied onto the implant screw. The prosthesis 3′ comprises a main body having a base portion 5′ and a top portion 6′ with a front surface 7′ as well as a back or inside (occlusal) surface 8′.

The prosthetic screw 4′ is applied by means of a screwdriver, schematically indicated by the line 27, through a screw channel 9′ in the prosthesis. The screwdriver 27 might be a standard screwdriver having a hexagonal ball end for inserting the prosthetic screw with an angle of for instance 30°. Such ball end precision hex tools are available on the market and will not be described more in detail here. The screw channel 9′ has a first mouth 10′, a screw access hole, through which the screw 4′ is inserted and a second mouth 11′ in the base portion 5′of the prosthesis. In this way the channel 9′ forms a through communication between the first mouth 10′ and the second mouth 11′ in the prosthesis. The communication channel 9′ is angled so that the first mouth is located on the aesthetically unimportant surface of the prosthesis, the inside or occlusal surface 8′.

By "angled" is in this invention understood that the occlusal portion of the screw channel 9′ of the prosthesis is angulated versus the symmetry axis 1′′ of the fixture 1′. This angle can be varied between 0 and 45 degrees.

According to this second embodiment of the invention the angled screw channel 9′ through the dental prosthesis is constituted by a bendable, elongated tube 13′ for fixation directly onto the implant screw 1′or indirectly by means of a spacer/abutment applied onto the implant screw for defining said angled screw channel 9′ and on which tube a wax-up of the final dental prosthesis is prepared by e.g. the "lost-wax" casting technique, CAD/CAM or other methods for producing a dental prosthesis.

Figure 7 illustrates more in detail a first type of a bendable, plastic tube 13′ that fits onto the implant screw 1′ and used for wax-up of the final bridge restoration configuration/shape. The interface of the base portion 14′ has an internal or external connection geometry compatible

with a corresponding external or internal connection geometry of existing dental implant systems available on the market. The connection might be non-engaging for multiple unit restorations such as a dental bridge or engaging for single unit restorations.

The tube is preferably made of a plastic material such as PMMA or the like which material is possible to be angled with flame/heat and burn-out for dental casting technique. By using a special bending tool (see figure 11) a desired angle of up to 45° could be obtained.

The through passage of the tube 13′ has a seat 15′ for the prosthetic screw head for final fixation of the dental superstructure to the implant screw. The seat is formed as a rounded shoulder having a conical interface to cooperate with a corresponding conical interface of the head of a prosthetic screw, see figure 9 below. The base portion 14′ has a slightly larger outer diameter compared to the diameter of the cylindrical top portion 16′ of the tube for increased wall thickness and a conical outer surface 17′.

In figure 8 it is illustrated a slightly different bendable plastic tube 13′′ which fits onto a conical interface of an implant abutment and the base portion 14′′ therefore has a conical inner shape 18′. As also illustrated in figure 8 the tube 13′′ has a seat 15′′ for the prosthetic screw head for final fixation of the dental superstructure to the implant screw. In this case the seat 15′′ is formed as a sharp edge shoulder with an upper planar seat surface 28 to cooperate with a corresponding planar interface surface 29 of the head of a prosthetic screw, see figure 10 below. The base portion 14′ has a slightly larger outer diameter compared to the diameter of the cylindrical top portion 16′ for increased wall thickness of the tube. The outer surface of this base portion might be cylindrical or slightly conical.

The outer surface of the cylindrical portions 16′ of the tubes might be made with retention grooves (as illustrated in figure 6) for increased mechanical bonding to the wax-up material used.

Figures 9 and 10 illustrate two examples of prosthetic screws 4′, 4′′ to be used for fixation of the tubes in figure 7 and figure 8, respectively, to the implant screw or implant abutment. The prosthetic screw heads are provided with a recess 31, 31′ for receiving the screw driver 27. The shape of the recess may be a slit, a star configuration or any other type of known recess shape to be used with a cooperating screw driver. Specifically, the prosthetic screw might

also be a standard prosthetic screw with a hexagonal standard grip, preferably made of titanium, DLC coated or similar, for cooperation with a screwdriver 27 having a hexagonal ball end.

In figure 11 it is illustrated how the bending of the tube 13′ could be achieved by means of a metal tool 32 having a main body 33 with a protruding member 34 adapted to the through passage of the tube. Bending of the tube 13′ is effectuated by heating the bending area of the tube with a flame or hot air using the tool 32. The plastic tubes are angled by means of said bending tool and flame or hot air into a defined optimal prosthetic screw access angle output. A conventional wax-up is prepared onto the plastic tubes 13′,13′′ into wished final shape, whereupon the tubes are cut at the occlusal level of the final dental prosthesis.

The invention is not limited to the examples described here but can be varied within the scope of the following claims.

CLAIMS

1. A dental prosthesis, such as a dental bridge restoration or a single unit restoration (3,3′), having a main body and a base portion (5,5′) for connection to a dental implant system (1,1′) and comprising at least one angled communication channel (9,9′) for a prosthetic screw member (4,4′,4′′) for fixation of the prosthesis to the dental implant system (1,1′), said communication channel (9,9′) having a first mouth (10,10′) on a side of the prosthesis and a second mouth (11,11′) in said base portion (5,5′) for the fixation of the prosthesis to the dental implant system and wherein said communication channel (9,9′) is forming a through passage between the first mouth (10,10′) and the second mouth (11,11′), characterised in that the angled communication channel (9,9′) is constituted by a bendable, elongated tube (13,13′) attached onto the implant or the implant abutment level of the dental implant system (1,1′) for defining a desired angle of said communication channel (9,9′) and for a subsequent wax-up of the final restoration (3,3′).

2. A dental prosthesis according to claim 1, characterised in that the elongated tube (13′,13′′) is attached directly onto the implant or the implant abutment level by means of the prosthetic screw member (4′,4′′) for defining the desired angle of the communication channel (9′).

3. A dental prosthesis according to claim 2, characterised in that the interface of the base portion (14′,14′′) of the bendable tube (13′,13′′) has an internal or external connection geometry compatible with a corresponding external or internal connection geometry of existing dental implant systems available on the market including both fixtures, abutments or other attachment interfaces.

4. A dental prosthesis according to claim 3, characterised in that the interface connection is non-engaging for multiple unit restorations such as a dental bridge or engaging for single unit restorations.

5. A dental prosthesis according to claim 1, characterised in that the elongated tube (13) is attached to the implant or implant abutment level via an interface abutment (12) for fixation onto the implant or implant abutment level.

6. A dental prosthesis according to claim 1, c h a r a c t e r i s e d i n that said bendable tube (13,13′) is made of a plastic material, such as PMMA or a similar material so that the tube is possible to bend into a desired angle with flame/heat (25).

7. A dental prosthesis according to claim 5, c h a r a c t e r i s e d i n that the bending of the tube (13) to the desired angle for the communication channel (9) is performed by means of a tool (18) comprising a member (22) for insertion into the free end of the tube while the other end, the base portion (17) of the tube is connected to the interface abutment (12).

8. A dental prosthesis according to claim 5, c h a r a c t e r i s e d i n that the interface abutment (12) has a base portion in the form of a cylindrical collar (14) for fixation onto the implant or an implant abutment level by means of the prosthetic screw member (4), a cylindrical or conical main body provided with retention grooves (15) for optimal bonding strength and long term stability and a top portion (16) with tripod shape for non-rotational of the bendable tube (13)

9. A dental prosthesis according to claim 8, c h a r a c t e r i z e d i n that the base portion of the interface abutment (12) has an internal or external connection compatible with dental implant systems on the market.

10. A dental prosthesis according to claim 9, c h a r a c t e r i z e d i n that the interface abutment connection is non-engaging for multiple unit restorations such as a dental bridge or engaging for single unit restorations.

11. A dental prosthesis according to claim 1, c h a r a c t e r i z e d i n that the bendable tube (13) has a base portion (17) with a slightly conical inner tripod shape and a slightly larger outer diameter compared to the diameter of the cylindrical top portion (19) of the tube and a waist portion (20) formed by reduced wall material thickness and defining a desired bending area of the tube (13).

12. A dental prosthesis according to claim 11, c h a r a c t e r i z e d i n that the outer surface of the cylindrical portion (19) of the bendable tube (13,13′) is made with retention grooves (21) for increased mechanical bonding to the wax-up material used.

13. A dental prosthesis according to claim 1, characterised in that the through passage of the tube (13′) has a seat (15′,) for the prosthetic screw head for final fixation of the dental prosthesis to the implant system, and wherein the seat is formed as a rounded shoulder having a conical interface to cooperate with a corresponding conical interface of the head of the prosthetic screw (4′).

14. A dental prosthesis according to claim 1, characterised in that the through passage of the tube (13′′) has a seat (15′′) for the prosthetic screw head for final fixation of the dental prosthesis to the implant system, and wherein the seat (15′′) is formed as a sharp edge shoulder with an upper planar seat surface (28) to cooperate with a corresponding planar interface surface (29) of the head of the prosthetic screw (4′′).

15. A method for manufacturing a dental prosthesis such as a dental bridge restoration or a single unit restoration (3,3), having a main body and a base portion (5,5′) for connection to a dental implant system (1,1′) and comprising at least one angled communication channel (9,9′) for a prosthetic screw member (4,4′,4′′) for fixation of the prosthesis to the dental implant system (1,1), said communication channel (9′,9) having a first mouth (10,10′) on a side of the prosthesis and a second mouth (11,11′) in said base portion (5,5′) for the fixation of the prosthesis to the dental implant system and wherein said communication channel (9,9′) is forming a through passage between the first mouth (10,10′) and the second mouth (11,11′), characterized by defining said communication channel (9,9′) by means of a bendable plastic tube (13,13′,13′′), bending said plastic tube (13,13′,13′′) by means of a bending tool (18,32) and flame or hot air (25) into a desired optimal prosthetic screw access angle output and preparing a wax-up model onto the plastic tubes (13,13′,13′′) and transforming said wax-up model into the final restoration.

16. A method for manufacturing a dental prosthesis according to claim 15, characterized by transforming said wax-up model by means of conventional dental casting technique.

17. A method for manufacturing a dental prosthesis according to claim 15, characterized by transforming said wax-up model by means of dental CAD-CAM technology.

18. A method for manufacturing a dental prosthesis according to claim 17, characterized by positioning scan bodies (26) into the plastic tubes (13), preparing the wax-up model onto the plastic tubes with the scan bodies, scanning the framework with a dental scanner, sending the scan-file to a production center for transforming the wax-up model into the final restoration.

AMENDED CLAIMS
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1. A dental prosthesis, such as a dental bridge restoration or a single unit restoration (3,3′), having a main body and a base portion (5,5′) for connection to a dental implant system (1,1′) and comprising at least one angled communication channel (9,9′) for a prosthetic screw member (4,4′,4′′) for fixation of the prosthesis to the dental implant system (1,1′), said communication channel (9,9′) having a first mouth (10,10′) on a side of the prosthesis and a second mouth (11,11′) in said base portion (5,5′) for the fixation of the prosthesis to the dental implant system and wherein said communication channel (9,9′) is forming a through passage between the first mouth (10,10′) and the second mouth (11,11′), characterised in that the angled communication channel (9,9′) is constituted by a bendable, elongated tube (13,13′) attached onto the implant or an implant abutment level of the dental implant system (1,1′) for defining a desired angle of said communication channel (9,9′) by means of flame/heat (25) and a bending tool (18) and for a subsequent wax-up of the final restoration (3,3′).

2. A dental prosthesis according to claim 1, characterised in that the elongated tube (13′,13′′) is attached directly onto the implant or the implant abutment level by means of the prosthetic screw member (4′,4′′) for defining the desired angle of the communication channel (9′).

3. A dental prosthesis according to claim 2, characterised in that the interface of the base portion (14′,14′′) of the bendable tube (13′,13′′) has an internal or external connection geometry compatible with a corresponding external or internal connection geometry of existing dental implant systems available on the market including both fixtures, abutments or other attachment interfaces.

4. A dental prosthesis according to claim 3, characterised in that the interface connection is non-engaging for multiple unit restorations such as a dental bridge or engaging for single unit restorations.

5. A dental prosthesis according to claim 1, characterised in that the elongated tube (13) is attached to the implant or implant abutment level via an interface abutment (12) for fixation onto the implant or implant abutment level.

6. A dental prosthesis according to claim 1, c h a r a c t e r i s e d i n that said bendable tube (13,13′) is made of a plastic material, such as PMMA or a similar material so that the tube is possible to bend into a desired angle with flame/heat (25).

7. A dental prosthesis according to claim 5, c h a r a c t e r i s e d i n that the bending of the tube (13) to the desired angle for the communication channel (9) is performed by means of a tool (18) comprising a member (22) for insertion into the free end of the tube while the other end, the base portion (17) of the tube is connected to the interface abutment (12).

8. A dental prosthesis according to claim 5, c h a r a c t e r i s e d i n that the interface abutment (12) has a base portion in the form of a cylindrical collar (14) for fixation onto the implant or an implant abutment level by means of the prosthetic screw member (4), a cylindrical or conical main body provided with retention grooves (15) for optimal bonding strength and long term stability and a top portion (16) with tripod shape for non-rotational of the bendable tube (13)

9. A dental prosthesis according to claim 8, c h a r a c t e r i z e d i n that the base portion of the interface abutment (12) has an internal or external connection compatible with dental implant systems on the market.

10. A dental prosthesis according to claim 9, c h a r a c t e r i z e d i n that the interface abutment connection is non-engaging for multiple unit restorations such as a dental bridge or engaging for single unit restorations.

11. A dental prosthesis according to claim 1, c h a r a c t e r i z e d i n that the bendable tube (13) has a base portion (17) with a slightly conical inner tripod shape and a slightly larger outer diameter compared to the diameter of the cylindrical top portion (19) of the tube and a waist portion (20) formed by reduced wall material thickness and defining a desired bending area of the tube (13).

12. A dental prosthesis according to claim 11, characterized in that the outer surface of the cylindrical portion (19) of the bendable tube (13,13′) is made with retention grooves (21) for increased mechanical bonding to the wax-up material used.

13. A dental prosthesis according to claim 1, characterised in that the through passage of the tube (13′) has a seat (15′,) for the prosthetic screw head for final fixation of the dental prosthesis to the implant system, and wherein the seat is formed as a rounded shoulder having a conical interface to cooperate with a corresponding conical interface of the head of the prosthetic screw (4′).

14. A dental prosthesis according to claim 1, characterised in that the through passage of the tube (13′′) has a seat (15′′) for the prosthetic screw head for final fixation of the dental prosthesis to the implant system, and wherein the seat (15′′) is formed as a sharp edge shoulder with an upper planar seat surface (28) to cooperate with a corresponding planar interface surface (29) of the head of the prosthetic screw (4′′).

15. A method for manufacturing a dental prosthesis such as a dental bridge restoration or a single unit restoration (3,3), having a main body and a base portion (5,5′) for connection to a dental implant system (1,1′) and comprising at least one angled communication channel (9,9′) for a prosthetic screw member (4,4′,4′′) for fixation of the prosthesis to the dental implant system (1,1), said communication channel (9′,9) having a first mouth (10,10′) on a side of the prosthesis and a second mouth (11,11′) in said base portion (5,5′) for the fixation of the prosthesis to the dental implant system and wherein said communication channel (9,9′) is forming a through passage between the first mouth (10,10′) and the second mouth (11,11′), characterized by defining said communication channel (9,9′) by means of a bendable plastic tube (13,13′,13′′), bending said plastic tube (13,13′,13′′) by means of a bending tool (18,32) and flame or hot air (25) into a desired optimal prosthetic screw access angle output and preparing a wax-up model onto the plastic tubes (13,13′,13′′) and transforming said wax-up model into the final restoration.

16. A method for manufacturing a dental prosthesis according to claim 15, characterized by transforming said wax-up model by means of conventional dental casting technique.

17. A method for manufacturing a dental prosthesis according to claim 15, characterized by transforming said wax-up model by means of dental CAD-CAM technology.

18. A method for manufacturing a dental prosthesis according to claim 17, characterized by positioning scan bodies (26) into the plastic tubes (13), preparing the wax-up model onto the plastic tubes with the scan bodies, scanning the framework with a dental scanner, sending the scan-file to a production center for transforming the wax-up model into the final restoration.

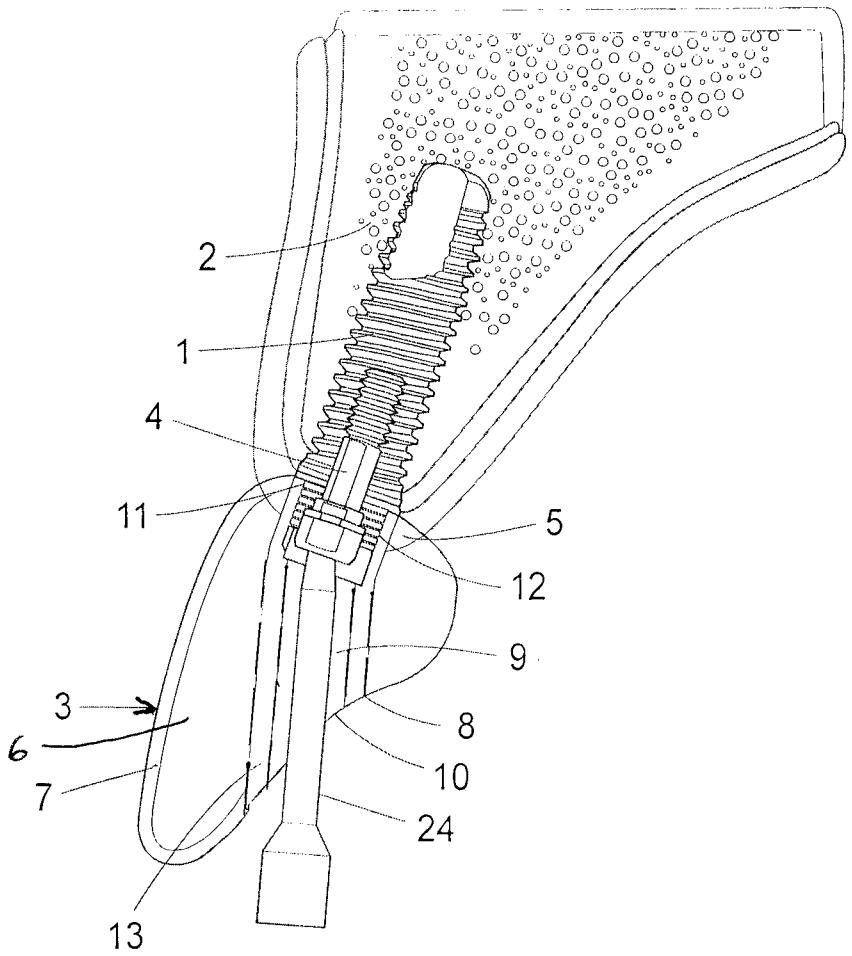

Fig.1

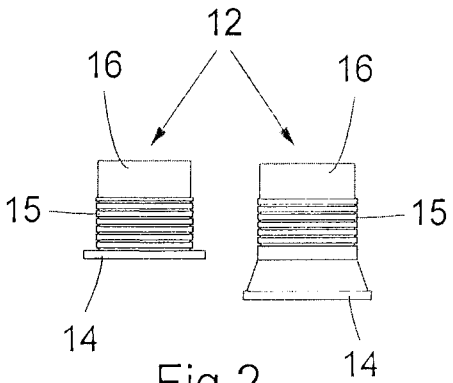

Fig.2

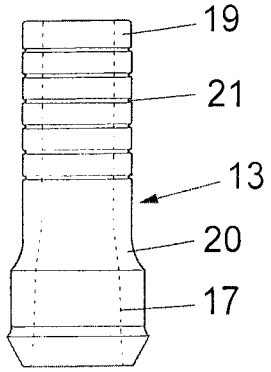

Fig.3

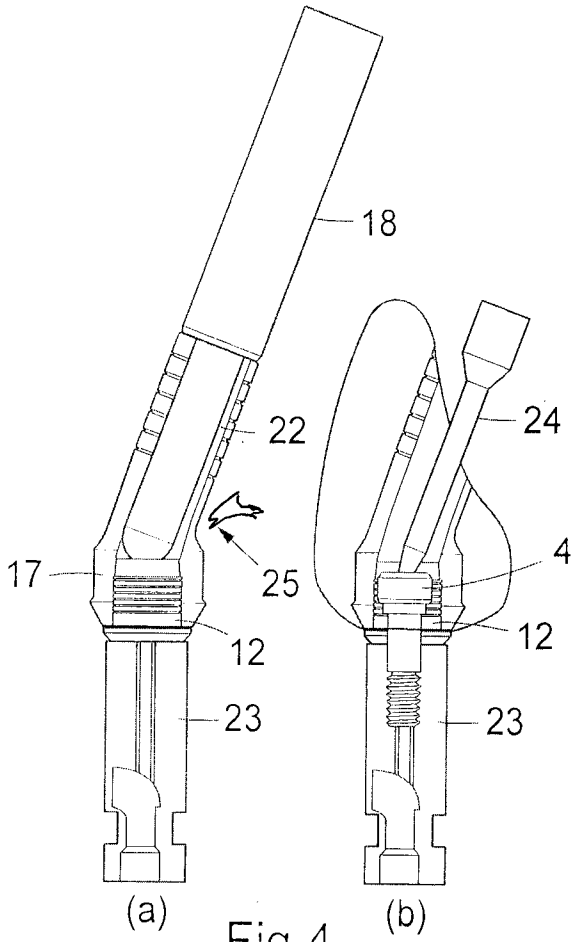

Fig.4

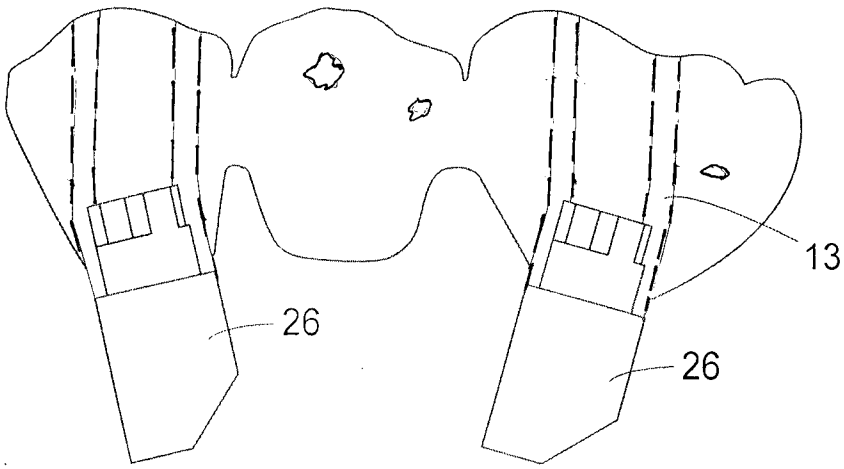

Fig.5

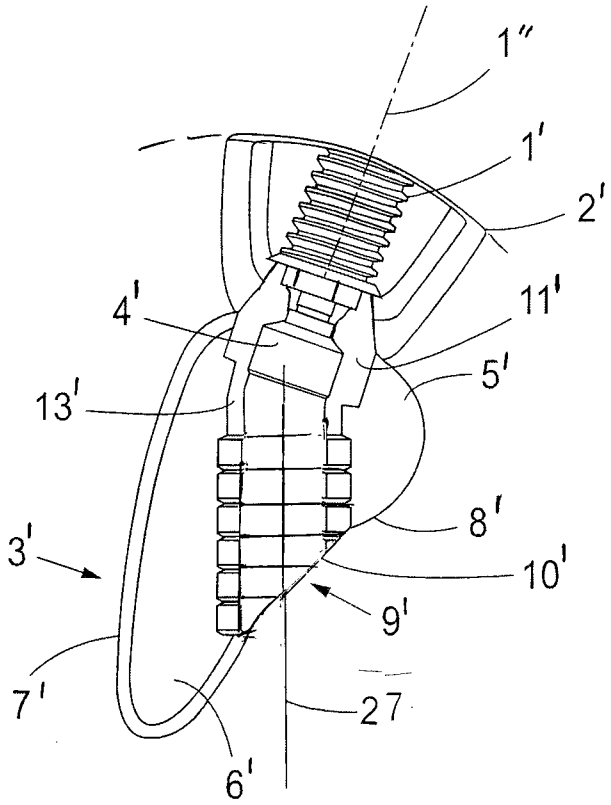

Fig.6

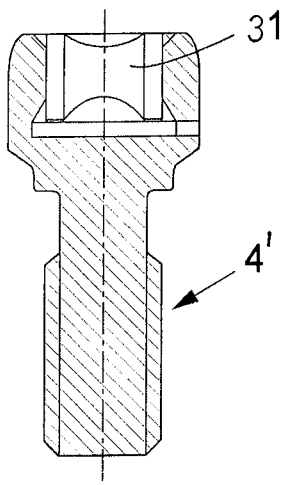

Fig.9

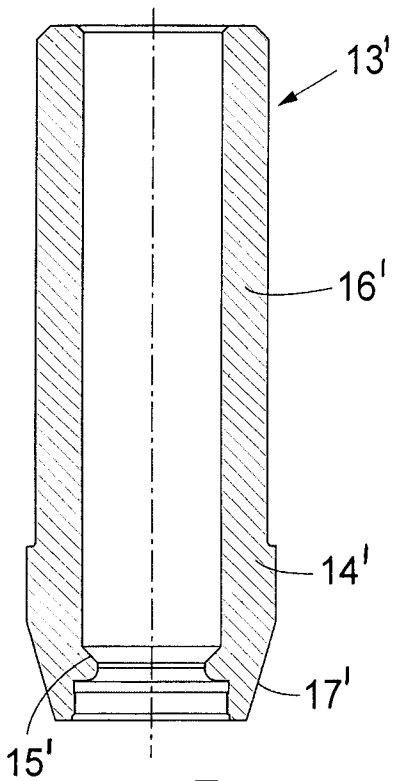

Fig. 7

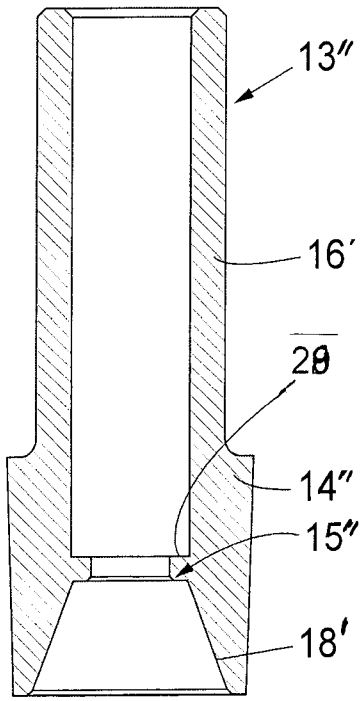

Fig.8

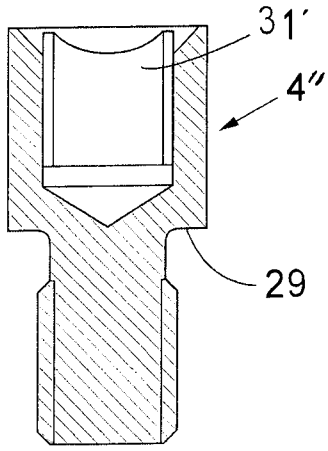

Fig.10

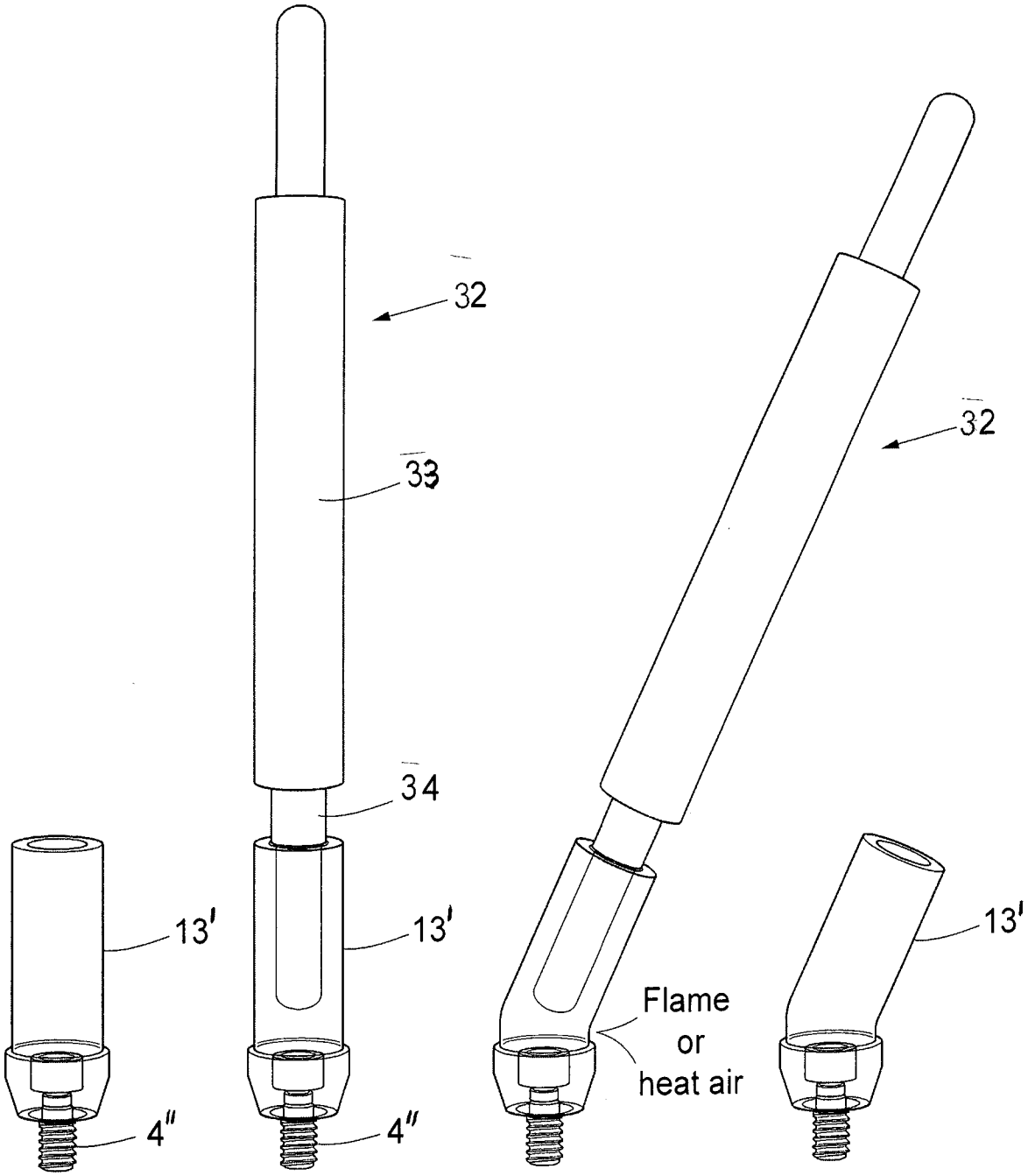

Fig.11

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2014/000076

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

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)

IPC: A61C

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

SE, DK, FI, NO classes as above

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

EPO-Internal, PAJ, WPI data, MEDLINE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2004105632 A1 (POLYDENT MEDICAL DEVICES LTD ET AL), 9 December 2004 (2004-12-09); page 12, line 14 - page 15, line 7; figures 1A-1B --	1-5, 11-14
X	US 5527182 A (WILLOUGHBY ANDREW J M), 18 June 1996 (1996-06-18); column 42, line 53 - column 43, line 31; figures 26-27 --	1, 5-6, 11-18
A	WO 2013014643 A2 (HAREL IAN -(A3) HONIG IULIAN [IL]), 31 January 2013 (2013-01-31); abstract; figures 1-2 --	1-18

☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
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"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	Date of mailing of the international search report
12-09-2014	15-09-2014
Name and mailing address of the ISA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. + 46 8 666 02 86	Authorized officer Leif Brander Telephone No. + 46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2014/000076

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 0002495 A1 (NOBEL BIOCARE AB ET AL), 20 January 2000 (2000-01-20); abstract; figure 5 --	1-18
A	EP 2486889 A1 (FARRE BERGA RAMON ET AL), 15 August 2012 (2012-08-15); abstract; figure 2 -- --------	1-18

International application No.
PCT/SE2014/000076

Continuation of: second sheet

International Patent Classification (IPC)

A61C 8/00 (2006.01)
A61C 13/00 (2006.01)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/SE2014/000076

WO	2004105632	A1	09/12/2004	US	20070099151	A1	03/05/2007
US	5527182	A	18/06/1996	WO	9625120	A1	22/08/1996
WO	2013014643	A2	31/01/2013	EP	2736446	A2	04/06/2014
				US	20140170597	A1	19/06/2014
WO	0002495	A1	20/01/2000	AT	329545	T	15/07/2006
				AU	4946999	A	01/02/2000
				AU	753274	B2	10/10/2002
				CA	2336978	A1	20/01/2000
				DE	69931923	D1	27/07/2006
				EP	1096895	A1	09/05/2001
				JP	2002520083	A	09/07/2002
				SE	9802495	A	11/01/2000
				SE	512277	C2	21/02/2000
EP	2486889	A1	15/08/2012	ES	2357204	B1	06/03/2012
				US	20120246916	A1	04/10/2012
				WO	2011042583	A1	14/04/2011