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(54) **Title**: ABUTMENTS AND IMPRESSION POSTS FOR DENTAL IMPLANT PROCEDURES

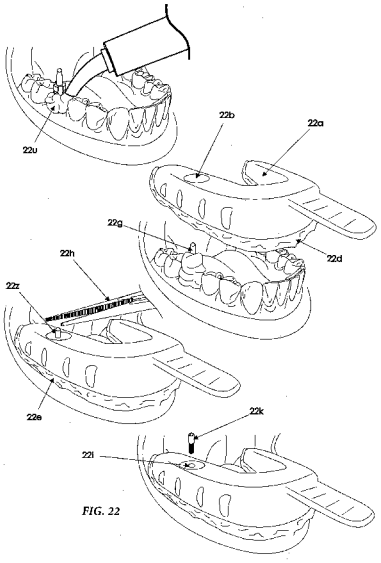

FIG. 22

(57) **Abstract**: The fabrication of straight and angulated, custom, potentially modifiable abutments; straight, custom, potentially modifiable open tray impression posts; and straight and angulated, custom, potentially modifiable closed tray impression posts is provided. The custom abutments achieve the development of a three dimensionally customized gingival emergence profile according to the needs of each clinical case in different sizes and dimensions around the implant platform. Impression posts corresponding to the custom abutments in dimensions and angulations allow the recording and transfer of the developed gingival profile from the mouth onto the working cast in order for the final prosthesis to be fabricated accurately, while they also have independent parts that improve the quality of the results of the implant treatment process. The custom abutments and impression posts moreover can be modified to be temporary abutments used to support a temporary prosthesis and can also be scanned by a digital scanner in order to generate a digital impression and or digital working cast.

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ABUTMENTS AND IMPRESSION POSTS FOR DENTAL IMPLANT PROCEDURES

This application claims the benefit and is a continuation-in-part of Greek Patent Application Serial Nos. 20140100327 (filed June 13, 2014), 20140100642 (filed December 16, 2014), 20150100090 (filed March 4, 2015), and 20150100111 (filed March 12, 2015), which are each incorporated by reference herein in their entirety.

TECHNICAL FIELD

This invention is directed to molds and methods of using molds for the fabrication of straight and angulated, custom, potentially modifiable intra-orally and extra-orally, abutments and impression posts that can be utilized at the surgical and restorative phase of dental implant treatment and the use of such abutments and impression posts in dental implant related procedures.

BACKGROUND

The replacement of missing and hopeless teeth with dental implants is a very common practice. Once an implant is surgically placed, it is usually allowed to heal for a time frame of a few weeks in order for the process of its osseointegration with the jaw is completed, before it can receive its final prosthesis. Today a part known as healing abutment is coupled with the implant immediately after the latter is placed in the jaw, or at a later stage after the osseointegration process has been completed, in order to protect the prosthetic connection of the implant from the invasion of soft and, or hard tissue. This ensures the accessibility of the prosthetic connection of the implant after osseointegration is complete and it is desired to carry out the process of the prosthetic rehabilitation of the implant. Thus, after the completion of osseointegration, a process that may take from one to nine months, the healing abutment is disconnected from the implant and an impression post replaces it in order to proceed with the impression stage of the implant.

There are two different types of impression posts, the closed tray impression posts and the open tray impression posts. The closed tray impression posts couple with the implant with a short retention screw and are used in the closed tray impression technique with the use of an impression tray with solid base. Following the completion of the impression process, the dentist removes them from the mouth and he manually installs them into their negative replication into the impression. These impression posts are available with two different designs. One of the designs (Type A) includes the body of the impression post that is coupled with the implant and a separate plastic part that couples externally onto the proximal part of the impression post. During the impression stage an impression tray with solid base is used that is filled with impression material. The tray is placed in the mouth in a way that it includes within its borders the alveolar ridge along

with the teeth and the impression posts present in the jaw. After the impression material is cured and set the tray is removed from the mouth and it includes in its body entrapped the plastic part of the impression post. Following this, the body of the impression post is uncoupled from the implant and removed from the mouth and the dentist then couples it with the plastic part that is embedded into the impression, manually. The second design impression post (Type B) includes an impression post that has a shape that is usually a pillar with two, or three flat seats and is coupled with the implant. During the impression stage an impression tray with solid base is used that is filled with impression material. The tray is placed in the mouth in a way that it includes within its borders the alveolar ridge along with the teeth and the impression posts present in the jaw. After the impression material is cured and set the tray is removed from the mouth and then the impression post is uncoupled from the implant and removed from the mouth and the dentist, following the orientation of the flat seats, installs it into its negative replication into the impression.

The open tray impression posts are used with an impression tray that has large open bores on its base and after the completion of the impression process they are located entrapped into the impression. Specifically the impression posts have a design of a cylinder with groves and extensions of rectangular shape that allow the entrapping of the impression post into the impression material. The impression posts are coupled with the implants with short retention screws that their head is located within the hollow channel of the impression post or with long retention screws that their head is located outside of the proximal end of the impression post extending a distance of a few millimeters. During the impression stage a tray with open bores on its bottom surface, that are located to the corresponding in space locations of the implants in the mouth, is used. The tray is filled with impression material and is placed in the mouth in a way that it includes within its borders the alveolar ridge, the teeth and the impression posts present in the jaw. At this stage before the impression material is completely cured and set, any impression material located over the open bores of the base of the tray is removed in order for the head of the long retention screws or for the entrance of the short retention screws into the hollow channel of the impression posts to be exposed. After the impression material is set the retention screws are removed from the impression posts and then the impression tray with the impression material is removed from the mouth. The impression now has the open tray impression posts entrapped into its body.

Following this, the dentist removes the healing abutment, or the temporary prosthesis from the mouth and he replaces it with the final implant prosthesis (e.g., implant crown), which is supported by the dental implant that is anchored in the jaw.

The available in the market, healing abutments and impression posts along with the methodology involved in their use, present a lot of limitations and shortcomings.

Today, the dentists face a significant problem with the limitations in choice of shape, size and material of fabrication of the healing abutments and impression posts that are provided by the different implant companies.

The healing abutments available today are straight. This generates an important clinical problem in all the clinical cases where the implant is located in the jaw with angulations different than the one of the longitudinal axis of the final prosthesis that it will receive, or the one of the adjacent teeth or implants. In these cases the straight healing abutment will generate a gingival emergence profile that has angulations and shape that is different than the ones of the desired final prosthesis.

The available in the market healing abutments with their relatively narrow cylindrical shape generate a narrow gingival emergence profile and this creates difficulties at the stage of the final implant prosthesis installment onto the implant, due to the difference in shape and dimensions between the gingival emergence profile and the emergence profile of the final prosthesis. The consequence of the above is that during prosthesis installment the latter pinches and traumatizes the soft tissue causing bleeding in the area and pain to the patient making necessary the use of local anesthesia. Alternatively, the emergence profile of the prosthesis is fabricated corresponding to the shape and dimensions of the narrow gingival emergence profile and this leads to the generation of crown shape that has undercuts on its sub-gingival portion which enhance the accumulation of food remnants and the development of bacteria. Today there are some implant supply companies that have large diameter titanium healing abutments. The fact that they are made out of titanium does not allow their proper modification, when this is necessary. Thus, the use of large size healing abutments in many clinical cases is impossible because their body will interfere with the adjacent teeth making impossible their installation onto the implant without any modifications of their size and shape. Thus, in clinical cases that the mesial-distal dimension of the edentulous space is smaller than the facial-lingual dimension the healing abutment will not be able to be installed onto the implant due to interference of its body with the crowns of the adjacent teeth. The dentist will now have to utilize a smaller size healing abutment to overcome this problem and this will lead to the generation of an emergence profile that does not have the proper dimensions facial – lingual. Moreover in clinical cases where the implant is placed out of the center point of the edentulous space, in proximity to one of the

adjacent teeth, or the angulations of the implant is different to the one of the longitudinal axis of the final prosthesis that the implant will receive, then the straight not customizable healing abutment generates a gingival emergence profile that is off center and with different angulations compared to the ones desired by the ideal crown emergence profile.

The healing abutments available today from most of the implant supply companies are made out of titanium and their modifications are not recommended, when this is necessary. Thus, the use of large size healing abutments in many clinical cases is impossible because their body will interfere with the adjacent teeth making impossible their installation onto the implant without any modifications of their size and shape.

Moreover, the healing abutments available today from most of the implant supply companies cannot be modified height wise. Thus, in some clinical cases the dentist must choose a healing abutment with a shorter height so that it does not come in contact with the opposing teeth at functional occlusion. However this height might be too short in order for the healing abutment to extend outside the soft tissue and be accessible to the dentist.

The healing abutments available today do not have the design or the properties that allow their safe modification and use as temporary abutments that can support a temporary prosthesis when this is desired.

Most of the healing abutments available today have a flat type prosthetic connection that does not engage into the prosthetic connection of the implant and does not have anti-rotational properties. This type of prosthetic connection allows the presence of micro-movement between the healing abutment and the implant. This type of micro-movement can lead to loosening and disconnection of the healing abutment from the implant at any time during the phase of healing and osseointegration of the latter, causing localized inflammation in the surrounding soft and hard tissue. The available today healing abutments with non engaging prosthetic connections and without anti-rotational properties make unsafe the application of oral hygiene on them while they are coupled with the implant in the mouth as they can become uncoupled from the implant with all the negative consequences of the latter, such as gingival inflammation, soft tissue invasion into the prosthetic connection of the implant, complete disengagement of the healing abutment from the implant and possible swallowing, or aspiration of it, from the patient.

At this moment in small scale some implant companies have available straight, customized asymmetrical healing abutments that correspond to the shape of specific tooth type only (i.e., maxillary central incisor). Their use is no universal as per tooth type and their dimensions and shape do not account for many factors like the implant position, the implant angulations, patient's tooth shape and size characteristics, etc. Moreover, they are made out of

peek material, which is difficult to polish and establish a smooth and polished surface after it is modified in any way by abrasion.

In a small scale today there are healing abutments that can be scanned by a digital scanner in order for a digital impression to be fabricated. The disadvantage of these healing abutments is that they are not customizable and thus they fail to generate a three dimensionally ideal in shape gingival emergence profile in all the clinical cases. This does not allow the dentist to take full advantage of the tools that the digital dentistry through CAD-Cam machinery provides to him.

It is a common practice among the dentists to use dental implants and parts from more than one different implant companies, which have available healing abutments and impression posts of different dimensions and shapes. The mismatch between the parts supplied by the different implant companies, forces the dentists to change their utilized protocols of treatment between different clinical cases, depending on the company that supplied the utilized implant.

Today the dentists face a significant problem with the shortcomings in choice of shape, size, angulations and material of fabrication of the impression posts available by the different implant supply companies.

The open and closed tray impression posts available from the different implant companies have a narrow emergence profile that corresponds to the narrow emergence profile of the healing abutments they provide and do not have properties that allow their safe customization with the use of a biocompatible material. The large diameter of their sub-gingival portion makes difficult the process of introduction of the biocompatible material in the space between the gingival emergence profile and the body of the impression post. Moreover their smooth surface does not ensure a stable mechanical retention of the biocompatible material on them. Thus at the different stages of the restorative treatment the biocompatible material might move from its initial position making impossible the proper use of the impression post. This makes difficult and unpredictable the accurate and predictable process of their customization intra-orally or extra-orally. A dentist that has created a custom emergence profile thru the use of a temporary prosthesis, or a custom abutment finds himself in a difficult situation as to the way that he can record and transfer accurately the created custom gingival emergence profile from the mouth to the working cast, due to the difference in shape and dimensions of the latter with the shape and the dimensions of the impression posts available to him by the implant supply companies. The aforementioned limitation of the available impression posts generates an even bigger problem in the clinical cases where the impression of multiple implants placed in the same jaw must be taken. In these cases short after the healing abutments have been uncoupled from the implants, the gingival start collapsing altering the shape of the developed emergence profile. Thus, in the

time needed for the installation of the impression posts and the impression taking from the first to the fifth, or eighth implant the gingival emergence profile will be altered. Moreover the collapsing of the gingival before the installation of the impression posts is complete makes the whole process difficult, causing pain and bleeding to the patient and thus making the process uncomfortable for both the patient and the dentist.

The impression posts available today from most of the implant supply companies are made out of titanium and their modifications are not recommended, even when it is necessary. Thus, in many clinical cases where the edentulous space dimensions are atypical, or the implant is placed in the space off center then the body of the impression posts might interfere with the adjacent teeth making impossible the installation of the impression post onto the implant without any modifications of their size and shape.

The impression posts available today do not have properties that allow them to be scanned by a digital scanner in order for a digital impression and working cast to be fabricated so that prosthesis through CAD-Cam machinery can then be fabricated.

The open and closed tray impression posts available today are straight. There are not prefabricated angulated impression posts available in the market. Thus in clinical cases that the implant is located in the jaw with angulations different than the ones of the adjacent teeth, or the adjacent implants the dentist might not be able to install onto the implant the straight impression post as its body may interfere with the crowns of the adjacent teeth or the impression posts of the adjacent implants. Moreover the impression post might make difficult the process of the proper impression tray placement in the mouth due to interference of the tray with the crowns of the adjacent teeth, the impression posts of adjacent implants, the cheeks and, or the tongue. Even more, at the stage of impression removal from the mouth the different angulations of the aforementioned elements might lead to the development of areas of deformation of the impression material around the impression post, a fact that negatively affects the precision of the impression.

The closed tray impression posts available today (Types A and B) are available in short lengths only. In clinical cases where there is a large amount of bone height loss in the edentulous space of the patient and subsequently the distance between the implant platforms and the oclusal surface of the adjacent teeth is large, the short impression posts make difficult the proper placement of the impression tray with the impression material around their body. Moreover their limited height compared to the volume of the impression material in the area makes difficult the secure and stable positioning of the impression post within its negative replication in the impression, thus the impression post

might be mobile within the impression when it is located at its final position, a fact that makes necessary the repeat of the impression stage.

The closed tray impression posts available today (Types A and B) do not have available extra parts coupling with them that can be used for the generation of verification jig of the accuracy of the impression and of the working cast fabricated by the latter. This verification jig is very useful in clinical cases where multiple implants have been placed in a jaw and an impression of all of them is taken. In these cases many times inaccuracies that present during the impression stage or at the stage of the working cast fabrication, unfortunately are identified at a later stage, during the phase of fabrication of the final implant prosthesis (e.g. after the fabrication of the metal or zirconium framework of the prosthesis) and they make necessary the repeat of different previously performed stages, resulting in a n increase of work load, time needed and cost for the patient and the dentist.

The type A, closed tray impression posts available today often generate impressions that present with inaccuracies due to the fact that the precision of their impression is depended exclusively from the accurate fit of the plastic part on their body during the whole time of the impression process. Thus, during the impression process there might be some movement and displacement of the plastic part because of the handling of the impression material and subsequently misfit of the plastic part to the body of the impression post before the curing and setting of the impression material is complete. The closed tray with the impression material in it, does not allow to the dentist to be able to visualize this type of complication and this results to inaccurate recording of the position of the implant in space, meaning to an inaccurate impression. The frequency of this complication is higher in clinical cases of impression of multiple implants, especially if the angulations of the implants diverge significantly to each other. Moreover the plastic part that fits to the impression post after several uses can be damaged and deformed affecting its absolute and accurate fit on the impression post; for that reason it is recommended that they be used only for one time. This fact increases the cost of treatment for the dentist and the patient.

There are type A, closed tray impression posts made out of titanium available today in a small scale. Their body is a final titanium abutment that is intended to be used for the support of the final implant prosthesis. The use of these abutments is not recommended for the support of a temporary prosthesis due to their smooth surface and their design. Moreover their unrecommended use as temporary abutments will generate the need of use

of a new final abutment for the support of the final prosthesis, a fact that leads to an increase of the cost of the treatment.

The type A, closed tray impression posts available today, in the majority can be used only for the impression stage. The material that they are fabricated from (aluminum), their design and their surface characteristics do not allow them to be used additionally as temporary abutments for the support of temporary implant prostheses since their modification by abrasion intra-orally or extra-orally, is not recommended. Thus in clinical cases where the dentist wishes to fabricate a temporary prosthesis he has to order and use a temporary abutment, a fact that leads to increase of the cost and time of treatment.

The type B, closed tray impression posts available today present difficulty at the stage of their installation into their negative representation in the impression after they are removed from the mouth. Specifically while their design with the flat side walls allow their lateral orientation and alignment into the impression they do not have a characteristic or design that allows the dentist to be sure if they have been placed correctly depth wise into the impression. Moreover, their design has sharp areas of connections of their different side walls that many times tear the elastomeric material of the impression during the removal of the impression from the mouth. These tears are difficult to be optically identified by the dental technician and they can interfere with the right positioning of the impression posts into the impression. This specific complication is more frequent in cases where the angulations of the implants and thus the ones of the impression posts is different than the one of the long axis of the adjacent teeth or the one of the impression posts of adjacent implants. Moreover, these impression posts have a hollow channel that receives the short retention screw that connects them to the implant. The hollow channel use during the impression stage allows the invention of impression material into it. The impression material that records the negative representation of the hollow channel after it is set, it presents micro mobility due to its elastic nature and its size and it can interfere with the right vertical positioning of the impression post into the impression. In order to avoid this complication it is necessary for the dental technician to remove this part of the elastomeric material before he can place the impression post into the impression. This process due the limited working space is very often difficult to be executed properly. In a small scale there are impression posts without a hollow channel present that their bottom part is a thread and they are coupled by threads with the implant without the use of a separate retention screw. These impression posts require a specialized tool for them to be coupled with the implant, a fact that makes the process more complicated and increases

the cost for the dentist. Moreover these impression posts cannot couple and uncouple their threads safely from an implant that has low initial stability in clinical cases of immediate loading protocols. In these cases at the time of installation or un-installation of the impression post the implant due to its low initial stability might rotate along with the impression post, changing the orientation of its prosthetic connection and its platform location harming the impression stage and making impossible the execution of the immediate loading protocol.

The type B, closed tray impression posts available today can be used only for the execution of the impression stage of treatment. The material that they are fabricated from (aluminum), their design and their surface do not allow them to be used additionally as temporary abutments for the support of temporary implant prostheses, since their modification by abrasion intra-orally or extra-orally is not recommended. Thus in clinical cases where the dentist wishes to fabricate a temporary prosthesis he has to order and use a temporary abutment, a fact that leads to increase of the cost and time of treatment.

The open tray impression posts available today require at the impression stage that the dentist locates the top open bore of the hollow channel of the impression post through the open bore of the base of the open impression tray, before the impression material is completely set and subsequently removes the excess of the impression material that is located over the impression post in order to make accessible the head of the long retention screw of the impression post, or the open bore of the hollow channel that within it sits the short retention screw of the impression post. This way the dentist makes the retention screw accessible for removal, after the impression material is set, in order for the impression post to be able to uncouple from the implant and stay entrapped into the impression after the latter is removed from the mouth. This process due to the limits in available lengths of the existing impression posts (short lengths available) many times becomes difficult due to the limited access available intra-orally. Moreover this process becomes more difficult in clinical cases where an impression of multiple implants located in the same jaw with similar or different angulations to each other, takes place. Thus, clinically many times during the effort of the dentist to locate the open bores of the hollow channels, or the head of the long retention screws of the impression posts, the impression tray moves causing deformations to the elastomeric material during its setting process. This results in an impression generated that is inaccurate.

The open tray impression posts available today can be used only for the execution of the impression stage. The material they are fabricated from (aluminum), their design

and their surface do not allow them to be used additionally as temporary abutments for the support of temporary implant prostheses since their modification by abrasion intra-orally or extra-orally is not recommended. Thus, in clinical cases where the dentist wishes to fabricate a temporary prosthesis he has to order and use a temporary abutment, a fact that leads to increase of the cost and time of treatment.

Today there is not available in the market a tool that can be used for the intra-oral easy and fast accurate identification of the proper size and shape custom abutment that corresponds to the dimensions and shape of the edentulous pace. Moreover there is not a tool available that can be additionally used for the identification and marking of the ideal position for the initiation of the implant osteotomy in the jaw on this same edentulous space.

SUMMARY OF INVENTION

This invention relates to straight and angulated custom, potentially modifiable intra-orally and extra-orally, abutments and impression posts that can be utilized at the surgical and restorative phase of dental implant treatment. Such a custom abutment can be used at the surgical stage of implant placement immediately or at a later stage (surgical protocol of one and two stages, respectively) for the development of a custom gingival emergence profile around an implant that presents the same or different angulations towards the longitudinal axis of the final prosthesis that it will receive and to the one of the adjacent teeth or implants. These custom abutments have a design and properties that allow them to be modified intra-orally with the same way as per natural teeth preparation and this way they can be used after their proper modification as temporary abutments that can support a temporary prosthesis. Moreover their design and properties provide them with the ability to be scanned intra-orally with a digital scanner aiming to the generation of a digital impression and eliminating this way the need for classic implant impression taking with an elastomeric impression material. The straight and angulated custom potentially modifiable impression posts following the same indications of clinical use as per the custom abutments they can be used at the impression stage for the accurate recording and transfer of the implant prosthetic connection orientation, the location of the implant platform and the gingival emergence profile, generated around the latter by the aforementioned custom abutments, onto the working cast where the final prosthesis will be fabricated.

Our invention relates to straight and angulated, custom, potentially modifiable abutments and straight and angulated, custom, potentially modifiable impression posts, parts and methods that are applicable in the surgical and restorative stage of dental implant treatment.

The inventive custom abutments are straight and angulated. The availability of the angulated abutments solves the clinical problems where the angulations of the implants in the jaw is different than the one of the longitudinal axis of the final prosthesis that the implants will receive. The choice of a custom abutment with the same angulations similar to the one of the longitudinal axis of the final prosthesis ensures the generation of the desired gingival emergence profile in shape and dimensions around the implant platform. Moreover it makes easier the process of the custom abutment installation onto the implant avoiding any interferences with the crowns of the adjacent teeth or the custom abutments of adjacent implants that have angulations different than the one of the implant mentioned before.

The inventive custom abutments have oval shape that gradually expands laterally upwards that represents the root trunk of teeth. This design allows the generation of a gingival emergence profile with oval shape that is gradually expandable laterally upwards, that ensures the proper emergence profile fabrication for the final prosthesis that will be installed to the implant. This design creates a gingival emergence profile with improved characteristics corresponding in shape with the tooth root trunk and subsequently that assists the proper design and installation of the final prosthesis onto the implant avoiding the creation of accurate undercuts on its sub-gingival portion that can make the oral hygiene application difficult, can allow food trap and enhance the accumulation of bacteria in these areas. Moreover this gingival emergence profile facilitates the different intermittent steps of the prosthetic rehabilitation like the impression taking, the metal framework try in, the bisquit try in, etc., for the dentist and the patient.

The inventive custom abutments are made out of materials and have a design that allow their safe customization and modification aiming to the generation of a customized gingival emergence profile around an implant platform according to the needs of each individual clinical case. This allow the generation of the desired emergence profile three dimensionally overcoming problems associated with the improper location or angulations of the implant in the edentulous space, or even from the atypical dimensions of the latter in several clinical cases.

The inventive custom abutments can be customized also height wise. Thus the dentist can choose the right height custom abutment and modify it height-wise by abrasion intra-orally or extra-orally, ensuring at the same time that the custom abutment does not interfere with the opposing teeth in occlusion and it is not covered by the gingival tissue being easily accessible to the dentist.

The inventive custom abutments achieve the generation of a customized gingival emergence profile around an implant platform within a few days after their installment with the implant. This reduces significantly the time, the cost and the complexity involved in the prosthetically driven emergence profile development by the use of sequentially exchangeable temporary prostheses over a period of several weeks or months.

The inventive custom abutments have a design and properties that allow their intra-oral and extra-oral modification to temporary abutments that can be used for the support of temporary prostheses when this is desired. Specifically, the upper part of the custom abutment of our invention that comprises curable biocompatible material can be abraded intra-orally on its supra-gingival part, while it is coupled with the implant following the basic principles of tooth preparation. Following that a classic impression technique of the modified custom abutment is performed and the temporary prosthesis fabricated in the dental office or lab, can be directly cemented onto the modified custom abutment utilizing cement, or other bonding agents. This way there is no need for the dentist to take an implant level impression, thus the need for disconnection of the custom abutment from the implant. Moreover, there is no need for the dentist to use a new temporary abutment, new abutment retention screw and implant analog. The process becomes simpler and the cost of treatment is reduced. Moreover the reduction of the frequency of connections and disconnections of the custom abutment with the implant has been proven that it enhances the final outcome of the implant treatment, reducing the recession of the soft and hard peri-implant tissue (Abrahamsson I, et al. The mucosal barrier following abutment dis/reconnection. An experimental study in dogs. J Clin Periodontol. 1997Aug;24(8):568-72) (Koutouzis T, et al. The effect of healing abutment reconnection and disconnection on soft and hard peri-implant tissues: a short-term randomized controlled clinical trial. Int J Oral Maxillofac Implants. 2013 May-Jun; 28(3):807-14).

The inventive custom abutments can be configured with different types of prosthetic connections, which have anti-rotational properties and accurate fitting to the prosthetic connection of the implant and they are retained on the implant with a retention screw which can be screwed into the implant with high torque values according to its mechanical properties (range from about 5 to about 40 N/cm). These types of prosthetic connections minimize the presence of micro-movement between the implant and the abutment and this way they minimize the incidence of loosening of the connection between the abutment and the implant. This property makes the custom abutments of our invention friendly for the soft and hard tissue (Merz BR, et al. Mechanics of the implant-abutment connection: an 8-degree taper compared to a butt joint connection. Int J Oral MaxillofacImplants. 2000 Jul-Aug;15(4):519-26) (Burguete RL, et al. Tightening characteristics for screwed joints in osseointegrated dental implants. J

Prosthet Dent. 1994 Jun;71(6):592-9). Moreover, the before mentioned stable connection of the custom abutment and the implant makes possible the application of oral hygiene directly onto the custom abutment by the patient in order for the surface of the custom abutment to stay free of bacteria during the healing phase; a process that enhances the quality of healing and promotes the maturation of the peri-implant soft and hard tissue.

The inventive custom abutments have a second part which comprises a titanium shoulder with polished, or lightly abraded at a microscopic level, regular surface and a third part that comprises a curable, biocompatible material with regular surface and the ability to be highly polished. The advantage of the aforementioned characteristics of the custom abutments of our invention, in contrast to the irregular surfaces of the custom healing abutments described in the US patent application 20140124969 is that scientific research has proven that highly polished and regular surfaces of biocompatible materials, like titanium, composite, acrylic resin, allow the attachment of the soft tissue to their surface, improving the final esthetic and biological outcome of the treatment (Chu SJ, et al. The dual-zone therapeutic concept of managing immediate implant placement and provisional restoration in anterior extraction sockets. Compend Contin Educ Dent. 2012 Jul-Aug;33(7):524-32, 534.) (Chu SJ, Tarnow DP. Managing esthetic challenges with anterior implants. Part 1: mid-facial recession defects from etiology to resolution. Compend Contin Educ Dent. 2013 Oct;34 Spec No 7:26-31).

Also, the second part of the custom abutment of our invention with the highly polished titanium surface allows the preservation of a zone of connective tissue attachment, known as the biologic zone, that protects the underlying hard tissue (Albrektsson T, Jansson T, Lekholm U. Osseointegrated dental implants. DentClin North Am. 1986 Jan;30(1):151-74.). Moreover, the shoulder ensures that the curable biocompatible material that is connected with the titanium cylinder maintains a distance from the implant platform and the surrounding hard tissue equal to the height of the abutment shoulder. This distance ensures the appropriate displacement of the micro gap present between the two different surfaces (top border of the shoulder and bottom border of curable biocompatible material) from the peri-implant hard tissue. (Boynueğri AD, et al. Effect of different localizations of micro-gap on clinical parameters and inflammatory cytokines in peri-implant crevicular fluid: a prospective comparative study. Clin Oral Investig. 2012 Apr;16(2):353-61).)

The shape of the inventive custom abutments does not represent the shape of different tooth types. It resembles in reality a tooth root trunk that has oval shape and symmetrical section and different sizes that relate to the diameter of the implant, the diameter of the prosthetic connection and the size of the edentulous space available. It does not relate to the tooth type that is replaced by the implant, so it does not relate with the different shapes of different teeth but it

only relates to the parameters we previously described. This characteristic, allows their universal use irrespectively of the tooth type that has been replaced by the implant. For example, one size of the custom abutments of our invention can be used for any type of tooth in the mouth, like a first molar, a second molar, first premolar, second premolar, central incisor, canine, etc., either maxillary or mandibular, either of the right or of the left side. This characteristic makes them more user-friendly and reduces the cost of inventory and the required work time for the dentist.

The inventive custom abutments have the design and the properties that allow them to be scanned by a digital scanner intra-orally and extra-orally aiming to the generation of an abutment or implant level digital impression and working cast. Their ability to generate a custom gingival emergence profile and at the same time to be digitally scanned eliminates the need for a regular impression taking with the use of impression posts for the dentist that has access to such a technology. This characteristic favors the improvement of the final outcome of treatment through the utilization of CAD-CAM machinery for the fabrication of their final prosthesis.

The inventive custom abutments are available in a vast variety of sizes, shapes and angulations and they can be potentially modified according to the needs of each individual clinical case. This fact makes them user-friendly for the total of clinical cases treated by the dentist in his everyday clinical practice, irrespectively to the brand of the implants he might be using.

The inventive custom impression posts have a custom body that is the exact negative replication of the custom body of the inventive custom abutments. This allows their safe and easy use at the impression stage ensuring the accurate recording and transfer of the gingival emergence profile that the custom body of the custom abutment generated around the implant platform. This characteristic of theirs also is very useful in these clinical cases where an impression of multiple implants that have been placed in the same jaw is taken. More specifically, after the custom abutment is uncoupled from the implant it is immediately replaced by the custom impression post that corresponds in shape, dimensions and angulations. The custom body of the impression post fills completely the space within the emergence profile and in this way it supports the gingival tissue maintaining the shape of the gingival emergence profile intact throughout the whole process. Also in this way, the functional work time available for the dentist to install the total number of the impression posts and subsequently take the impression is increased. Thus, the dentist can take an impression under ideal conditions that will ensure a higher quality end result for the impression stage.

The custom body of the inventive impression posts is made out of a biocompatible material that can be easily modified by abrasion intra-orally and extra-orally. Thus, it can be modified in a safe and easy manner in all the clinical cases where the edentulous space has

atypical shape and dimensions or where the implant is not located at the center of the edentulous space. In these clinical cases the custom body of the impression post before its modification could interfere with the crowns of the adjacent teeth making impossible the installment of the post to the implant. In these clinical cases the dentist can modify the custom body of the impression post with abrasion in a way that it will allow the easy and free installment of the impression post with the implant making the impression taking possible.

The inventive custom impression posts have the design and the properties that allow them to be scanned by a digital aiming to the generation of a digital impression and working cast that can be used for the fabrication of a temporary or final prosthesis through the utilization of CAD-CAM machinery.

The inventive custom impression posts are straight or angulated. The availability of the angulated impression posts solves the clinical problems where the angulations of the implants in the jaw is different than the one of the longitudinal axis of the final prosthesis that the implant will receive. The choice of an impression post with angulations similar to the one of the longitudinal axis of the final prosthesis makes easier the process of the impression post installation onto the implant avoiding any interferences with the crowns of the adjacent teeth or with the custom impression post of adjacent implants, it also makes easier the placement of the impression tray into the mouth avoiding any interferences of the tray with the teeth, the cheeks or the tongue. Finally it is ensured for both single and multiple implant cases with different angulations, the establishment of a favorable pathway of insertion of the impression tray with the impression material in the mouth that minimizes the development of areas of distortion of the impression material around the impression posts during the placement and removal of the impression in the mouth. The latter improves the quality and accuracy of the impression taken.

The inventive straight and angulated closed tray impression posts are available in different lengths making the impression process easier in different clinical scenarios. Thus, for example in patients with small size mouths the short impression posts can be used in order to make the impression process easier, while in patients with large size mouths or with increased amount of bone loss where the distance of the implant platform from the oclusal surfaces of the adjacent teeth is long, the long impression posts can be used. This makes the introduction of the impression material around the body of the impression post easier but it also makes more favorable the ratio of impression post height to the height of the impression material. This means that the part of the impression post located into the impression material is long enough and allows the stable re-installment of the post into the

impression material, eliminating the presence of any mobility of the impression post into the latter.

The inventive straight and angulated closed tray impression posts have a separate system of parts that are used in multiple implant cases in order to fabricate a jig for verification of the accuracy of the impression and of the working cast. This way the dentist can provide to the dental technician along with the impression a verification jig so that he can evaluate the accuracy of the impression and of the working cast fabricated by the latter before he proceeds with the rest of the stages of the fabrication of the final implant prosthesis.

The inventive straight and angulated, closed tray impression posts have a design and follow a methodology of use that generates their negative replication into the impression material without tears and deformations of the latter making safe and predictable the placement of the impression post into the impression in one only functional position, both laterally and vertically. The inventive impression posts are one piece and the accuracy of the result they produce is not dependent on the proper fitting on top of them of extra parts as it happens with the Type A closed tray impression posts that are currently available. Moreover because the inventive impression posts have a core that is made out of a titanium and a custom body that is made out of biocompatible material acting as one piece, their safe re-use is possible.

The inventive straight and angulated, closed tray impression posts have a separate part that couples into their hollow channel that we call impression cap. This cap allows through its coupling with the impression post the stable and safe isolation of the hollow channel of the latter during the process of impression prohibiting the invasion of impression material into the hollow channel and after the impression stage. The aforementioned properties make the impression process easier and increase the predictability and quality of its final outcome by making easier the installment of the impression post into its negative replication into the impression without the need for any modifications of the impression to take place by the dental technician.

The inventive straight and angulated, closed tray impression posts couple by threads with the implant with the use of a retention screw. After the impression taking in clinical cases of immediate loading where the implant has low initial stability the inventive impression posts can be safely uncoupled from the implant as follows. The impression post is held in position by the dentist while at the same time he unscrews and removes the retention screw providing for the trouble free removal of the impression post from the

implant. The holding of the impression post to a stable position does not allow the rotation of the implant the same way it can happen with the use of impression posts without a hollow channel and independent retention screw that couples by threads as one piece onto the implant.

The inventive straight and angulated, closed tray impression posts have a design and properties that allow their intra-oral and extra-oral modification to temporary abutments that can be used for the support of temporary prostheses when this is desired.

The inventive open tray impression posts are available in different lengths and can be utilized in combination with short and long retention screws making the impression process easier in different clinical scenarios. Their use with short retention screws takes place in combination to the use of an isolation cap. The cap can be installed into the hollow channel of the impression post in a stable position and is extending outside the top end of the impression post in different lengths according to its length size specifications. This part that extends outside the post can be further modified by abrasion from the dentist according to the clinical needs. Specifically this application is very useful in the clinical cases where an impression is taken of multiple implants located in different areas of the same jaw that presents different anatomical conditions. In these cases the dentist can overcome the difficulties that arise from the aforementioned conditions by utilizing impression posts of the same length for all of the implants but with isolation caps of different lengths for some or all of the implants. This methodology makes easier the impression process with the open tray technique.

The inventive open tray impression posts have a design and properties that allow their intra-oral and extra-oral modification of temporary abutments that can be used for the support of temporary prostheses when this is desired.

Finally, it is a common practice among dentists to utilize in their daily practice more than one different implant system where there are differences between the design and parts available of the impression posts, and thus it will be an extra advantage for the dentists to have a system of impression posts and parts with improved and innovative characteristics that can fulfill the needs of all of the clinical cases independent to the implant system that has been utilized in each clinical case.

The mass production of the inventive custom abutments and impression posts can be achieved by a new mold. The new mold of production of the inventive custom abutments and impression posts has a design that allows it to produce straight and angulated custom potentially modifiable abutments and impression posts in mass

quantities and in shorter time and cost effective way in comparison to molds used in the past. Thus, the inventive mold can fabricate a vast number of straight and angulated, custom, potentially modifiable abutments and impression posts in different sizes and angulations according to the needs of the implant treatment and that they can be provided pre-fabricated to the dentist that does not have available other molds, or does not wish to devote the time needed for him to fabricate them himself.

The methodology involved in the choice of the right shape and size custom abutment for every particular clinical case can be assisted by the use of a guide system that comprises a retention handle and an extra part that couples with one of its free end. This extra part is the full or partial exact negative replication of the custom body of the custom abutment. The dentist by using this system can identify intra-orally in a fast and easy manner the right size and shape custom abutment for this particular edentulous space. Moreover the surgeon can utilize this system at the time of surgical implant placement for identifying and marking on the alveolar process the ideal point of initiation of the implant osteotomy.

This invention relates to straight and angulated custom potentially modifiable intra-orally and extra-orally, abutments and impression posts that have improved design, technical characteristics, variety in length and angulations and specifications for modification intra-orally and extra-orally that allows them to generate a custom gingival emergence profile, the accurate analog or digital recording of the location of the implant platform and of the orientation of the prosthetic implant connection and the recording of the gingival emergence profile as this has been developed around the latter in the total of the clinical cases. Moreover the material they are made from in combination to the design allows their safe re-use by the dentist or even their modification to temporary abutments used to support temporary prosthesis when this is desired. The inventive custom impression posts moreover have extra parts that make easier and better the impression process and allow the fabrication of a jig used for the verification of the accuracy of the impression and the working cast fabricated by the latter. Finally there is a system that can be utilized for the easy and accurate selection of the right size and shape custom abutment in each different clinical case but also for the identification and marking of the ideal position for the initiation of the implant osteotomy at the time of implant placement.

BRIEF DESCRIPTION OF THE DRAWINGS

Figs. 1A-1C are perspective views of exemplary abutments;

Fig. 1D is a cross-sectional view of an exemplary abutment;

Fig. 2A is a perspective view of an exemplary abutment;

Fig. 2B is cross-sectional view of an exemplary abutment;

Figs. 2C-2E are perspective views of exemplary abutments;

Fig. 2F is a cross-sectional view of an exemplary abutment;

Fig. 2G is a perspective view of an exemplary abutment;

Fig. 2H is a perspective view of an exemplary implant platform and prosthetic connection;

Fig. 2I are perspective views of exemplary prosthetic connections;

Figs. 3A-3C are perspective views of exemplary abutments;

Fig. 3D is a cross-sectional view of an exemplary abutment;

Figs. 4A-4F are perspective views of exemplary impression posts;

Figs. 5A-5C are perspective views of exemplary closed tray impression posts;

Fig. 5D is a cross-sectional view of an exemplary closed tray impression post;

Figs. 6A-6I are perspective views of exemplary abutments and impression posts;

Figs. 7A-7C are perspective views of exemplary impression posts;

Fig. 7D is a cross-sectional view of an exemplary impression post;

Figs. 8A-8G are perspective views of exemplary isolation caps and retention screws;

Figs. 9A-9D are perspective views of exemplary verification caps;

Fig. 9E is a cross-sectional view of an exemplary verification cap;

Figs. 10A-10I are perspective views of exemplary abutments and impression posts;

Figs. 11A-11C are perspective views of exemplary abutments;

Figs. 11D-11F are perspective views of exemplary impression posts;

Fig. 12A is a perspective view of an exemplary mold;

Fig. 12B is a perspective view of components of an exemplary mold;

Fig. 12C is an exploded, perspective view of portions of an exemplary mold;

Figs. 13A-13I are perspective views of exemplary abutments and impression posts;

Figs. 14A-14C are perspective views of exemplary impression posts;

Fig. 14D is a cross-sectional view of an exemplary impression post;

Fig. 15 is perspective views of aspects of an exemplary process in dental implant treatment;

Fig. 16 is perspective views of aspects of an exemplary process in dental implant treatment;

Fig. 17 is perspective views of aspects of an exemplary process in dental implant treatment;

Fig. 18 is perspective views of aspects of an exemplary process in dental implant treatment;

Fig. 19 is perspective views of aspects of an exemplary process in dental implant treatment;

Fig. 20 is perspective views of aspects of an exemplary process for digitally scanning in dental implant treatment;

Fig. 21 is perspective views of aspects of an exemplary process for applying an impression post and other steps in dental implant treatment;

Fig. 22 is perspective views of aspects of an exemplary process for applying an impression post and other steps in dental implant treatment;

Fig. 23 is perspective views of aspects of an exemplary process for applying an impression post and other steps in dental implant treatment;

Fig. 24 is perspective views of aspects of an exemplary process for applying an impression post and other steps in dental implant treatment;

Fig. 25 is perspective views of aspects of exemplary processes of abrasion and polishing;

Fig. 26 is perspective views of aspects of an exemplary process for applying an impression post to support a temporary prosthesis and other steps in dental implant treatment;

Fig. 27 is perspective views of aspects of an exemplary process for applying an impression post to support a temporary prosthesis and other steps in dental implant treatment;

Fig. 28 is perspective views of aspects of an exemplary process for applying an impression post to support a temporary prosthesis and other steps in dental implant treatment;

Fig. 29 is perspective views of aspects of an exemplary process concerning dental implants treatment;

Fig. 30 is perspective views of aspects of an exemplary process concerning dental implant treatment;

Fig. 31 is perspective views of exemplary abutments and impression posts;

Fig. 32 is perspective views of aspects of an exemplary process concerning dental implant treatment;

Fig. 33 is perspective and cross-sectional views of exemplary custom potentially modifiable two-piece straight and angulated abutments and impression posts with abutment caps and impression abutment caps;

Figs. 34A-34F are exploded cross-sectional views of portions of exemplary molds;

Fig. 35A is a perspective view of an exemplary component comprising a handle and a replica of an abutment;

Fig. 35B is a perspective view of the exemplary sub-components of the component of Fig. 35A;

Figs. 35C-35E are perspective views of exemplary replicas of abutments; and

Fig. 36 is perspective views of aspects of an exemplary process for choosing abutments and marking an alveolar process using the components of Fig. 35A-35E.

DESCRIPTION OF EMBODIMENTS

Embodiments of the invention are described below with the assistance of examples and with reference to the accompanying drawings.

Figs. 1A-1D describe a straight one-piece custom abutment (1.g) that descriptively comprises three parts as one piece. A prosthetic connection (1.p), a shoulder (1.o) and a custom body (1.j). The custom body (1.j) comprises a pillar (1.k) that is connected with biocompatible modifiable material (1.z). The prosthetic connection (1.p), the shoulder (1.o) and the pillar (1.k) of the custom body (1.j) are one piece (2.a, 2.b) that is preferably made out of the same material and it functions as the core of the custom abutment (1.g, 6.b, 6.n, 6.k), while the biocompatible modifiable material (1.z) is one piece that is connected mechanically and or chemically with the pillar of the core (1.k) and it is preferably made out of the same or different material.

The prosthetic connection (1.p) is a pillar with conical (6.h) or polyhedron (6.i) shape that resembles the negative replication of the prosthetic connection of an implant (2.p) and thus its shape may be conical (2.l), or external hexagonal (2.h), or internal hexagonal (2.u), or triangular (2.i) or octagonal (2.k), or circular with vertical groves (2.m), or rectangular (2.n) all of which with different degrees of bevel and depth. The prosthetic connection (1.p) presents angulations towards the vertical that is equal to zero degrees (Figs. 1C-1D). The prosthetic connection (1.p) is preferably made out of titanium or stainless steel or metal alloy or ceramic or plastic material.

The shoulder (1.o) is preferably made out of titanium, or steel, or metal alloy, or ceramic, or plastic material and it is a cylinder with variable section that has a base (1.r) of which the diameter and shape corresponds completely to the diameter and shape of the implant prosthetic platform (2.o), while in continuation to the base (1.r) it presents lateral walls (1.u) which are straight (11.a), or convex (11.g), or concave (11.b), or curved (Fig. 1D) and they end up at the upper surface of the shoulder (1.h) which has a diameter that is equal or larger than the one of the shoulder base (1.r) while the height of the shoulder (1.o) varies from about one-half to about seven millimeters and the surface of the shoulder (1.o) is polished or slightly abraded on a microscopic level.

The custom body (1.j) comprises a core, that is a pillar (1.k) and which is connected with mechanical and or chemical connection to a biocompatible material (1.z). The pillar (1.k) has a rough surface (10.b) or rough and polished surface (10.a) and has a cylindrical shape (2.a), or a polyhedron shape (2.b) with flat or flat and curved seats (2.s) where the flat seats (2.s, 6.o) are

fully aligned in space with the flat seats of the prosthetic connection (2.t, 6.i) of the abutment. Laterally to the pillar (1.k) and connected with it is the custom body (1.z) of the custom body (1.j) of the custom abutment (1.g). This part (1.z) has an oval shape, gradually expandable laterally upwards with symmetrical section (Fig. 1D section A-A) and regular surfaces (1.b), while it expands height wise from the upper surface of the shoulder (1.h) to a part (13.a) or to the upper end of the core (1.l, 13.b). The angulation of the custom body (1.j) towards the vertical is zero degrees (Figs. 1A-1D). The pillar (1.k) of the custom body (1.j) is preferably made out of titanium or stainless steel or metal alloy or ceramic or plastic material. The customizable part (1.z) is preferably made out of biocompatible material that is amenable to modifications through abrasion and polishing (Fig. 29), has radio-opaque properties and can be digitally scanned by a digital scanner (Fig. 20). The angulation of the custom body (1.j) is parallel to the vertical.

The custom abutment (1.g) has a hollow channel (1.a) with two open bores, one upper (1.d) and one bottom (1.n); The hollow channel (1.a) descriptively is divided in two parts, an upper (1.e) of larger diameter (Fig. 1D, section A-A) that has (6.k) or does not have (1.g) a threaded portion (6.l) that couples by threads with the thread (8.ua) of a metallic cap (8.u) and a lower part (1.m) of smaller diameter. The upper bore (1.d) of the hollow channel (1.a) is present on the upper surface (1.l) of the custom body (1.j). The bottom bore (1.n) of the hollow channel (1.a) is present on the bottom surface of the prosthetic connection (1.p) of all of the custom abutments (1.g).

Figs. 3A-3D describe an angulated one-piece custom abutment (3.r) that descriptively comprises three parts as one piece. A prosthetic connection (3.p), a shoulder (3.o) and a custom body (3.j). The custom body (3.j) comprises a pillar (3.d) that is connected with biocompatible modifiable material (3.e). The prosthetic connection (3.p), the shoulder (3.o) and the pillar (3.d) of the custom body (3.j) are one piece (2.g, 2.d, 2.e) that is made out of the same material and it functions as the core of the custom abutment (3.r), while the biocompatible modifiable material (3.e) is one piece that is connected mechanically and or chemically with the pillar (3.d) of the core and it is made out of the same or different material.

The prosthetic connection (3.p) is a pillar with conical (2.j) or polyhedron (2.r, 6.u) shape that resembles the negative replication of the prosthetic connection of an implant (2.p) and thus its shape might be conical (2.l), or external hexagonal (2.h), or internal hexagonal (2.u), or triangular (2.i) or octagonal (2.k), or circular with vertical groves (2.m), or rectangular (2.n), all of which may have different degrees of bevel and depth. The prosthetic connection (3.p) presents angulations (3.aa) towards the vertical that varies from about one to about forty-five degrees. The prosthetic connection (3.p) is preferably made out of titanium or stainless steel or metal alloy or ceramic or plastic material.

The shoulder (3.o) is preferably made out of titanium, or steel, or metal alloy, or ceramic, or plastic material and it is a cylinder with a variable section that has a base (3.n) of which the diameter and shape corresponds completely to the diameter and shape of the implant prosthetic platform (2.o), while in continuation to the base (3.n) it presents lateral walls (3.h) which are straight (11.a), or convex (11.g), or concave (11.b), or curved (Fig. 3D section A-A) and they end up at the upper surface of the shoulder (3.z) which has a diameter that is equal or larger than the one of the shoulder base (3.n) while the height of the shoulder (3.o) varies from half to seven millimeters and the surface of the shoulder (3.o) is polished or slightly abraded on a microscopic level.

The custom body (3.j) comprises a core that is a pillar (3.d), which is connected with mechanical and or chemical connection to a biocompatible customizable material (3.e). The pillar (3.d) has a rough surface (10.d) or rough and polished surface (10.g) and has a cylindrical shape (2.g), or a polyhedron shape (2.d) with flat or flat and curved seats (2.t, 6.z) where the flat seats (2.t, 6.z) are fully aligned in space with one or more of the flat seats (6.u, 2.r) of the prosthetic connection of the abutment (3.p). Laterally to the pillar (3.d) and connected with it is the customizable part (3.e) of the custom body (3.j) of the custom abutment (3.r). This part (3.e) has an oval shape, gradually expandable laterally upwards with symmetrical section (Fig. 3D section A-A) and regular surfaces (3.b), while it expands height wise from the upper surface of the shoulder (3.z) to a part (3.k, 13.g) or to the upper end of the core (3.k, 13.d). The angulation of the custom body (3.j) towards the vertical is zero degrees (Fig. 3D). The pillar (3.d) of the custom body (3.j) is preferably made out of titanium or stainless steel or metal alloy or ceramic or plastic material. The customizable part (3.e) is preferably made out of biocompatible material that is amenable to modifications through abrasion and polishing (Fig. 29), has radio-opaque properties and can be digitally scanned by a digital scanner (Fig. 20). The angulation of the custom body (3.j) is parallel to the vertical.

The angulated custom abutment (3.r) has a hollow channel (3.a) with two open bores, one upper (3.g) and one bottom (3.m); The hollow channel (3.a) descriptively is divided in two parts, an upper (3.i) of larger diameter (Fig. 3D, section A-A) that has (6.a) or does not have (3.r) a threaded portion (6.p) that coupe threads with the thread (8.ua) of a metallic cap (8.u) and a lower part (3.l) of smaller diameter. The upper bore (3.g) of the hollow channel (3.a) is present on the upper surface of the custom body (3.j). The bottom bore (3.m) of the hollow channel (3.a) is present on the bottom surface of the prosthetic connection (3.p) of all of the angulated custom abutments (3.r).

Figs. 5A-5D describe an angulated custom potentially modifiable closed tray one piece impression post (5.b) that descriptively comprises five parts as one piece: A prosthetic

connection (5.t), a shoulder (5.s), a custom body (5.r) that consist of a pillar (5.u) that is connected with biocompatible modifiable material (5.h), a pillar that is free of biocompatible material (5.c) and a polymorphic part (5.f). The prosthetic connection (5.t), the shoulder (5.s), the pillar (5.u) of the custom body (5.r), the free of biocompatible customizable material pillar (5.c) and the polymorphic part (5.f) are one piece (4.g, 4.d) that is made out of the same material and it functions as the core (6.g) of the angulated custom closed tray impression post (5.b), while the biocompatible modifiable material (5.h) is one piece that is connected mechanically and or chemically with the pillar of the core (5.u) and it is made out of the same or different material.

The prosthetic connection (5.t) is a pillar with conical (6.j) or polyhedron (6.d) shape that resembles the negative replication of the prosthetic connection of an implant (2.p) thus its shape might be conical (2.l), or external hexagonal (2.h), or internal hexagonal (2.u), or (2.i) or octagonal (2.κ), or circular with vertical groves (2.m), or rectangular (2.n), all of which may have different degrees of bevel and depth. The prosthetic connection (5.t) presents angulations (5.aa) towards the vertical and it varies from about one to about forty-five degrees (Figs. 5A-5D). The prosthetic connection (5.t) is preferably made out of titanium or stainless steel or metal alloy or ceramic or plastic material.

The shoulder (5.s) is preferably made out of titanium, or steel, or metal alloy, or ceramic, or plastic material and it is a cylinder with variable section that has a base (5.y) of which the diameter and shape corresponds completely to the diameter and shape of the implant prosthetic platform (2.o), while in continuation to the base (5.y) it presents lateral walls (5.k) which are straight (11.d), or convex (11.z), or concave (11.e), or curved (Fig. 5D section A-A) and they end up at the upper surface of the shoulder (5.i) which has a diameter that is equal or larger than the one of the shoulder base (5.y) while the height of the shoulder (5.s) varies from about one half to about seven millimeters and the surface of the shoulder (5.s) is polished or slightly abraded on a microscopic level.

The custom body (5.r) comprises a core, which is a pillar (5.u) that is connected with mechanical and or chemical connection to a biocompatible material (5.h). The pillar (5.u) has a rough surface (4.d, 13.h, 13.u) and a cylindrical shape (4.g), or a polyhedron shape (4.d, 6.g) with flat or flat and curved seats (4.p) where the flat seats are fully aligned in space with the flat seats of the prosthetic connection of the abutment (4.o). Laterally to the pillar (5.u) and connected with it is the customizable part (5.h) of the custom body (5.r) of the custom abutment (5.b). This part (5.h) has an oval shape, gradually expandable laterally upwards with symmetrical section (Fig. 5D section A-A) and regular surfaces (15.g), while it expands height wise from the upper surface of the shoulder (5.i) to the bottom end (5.o) of the pillar (5.c, 13.h) or up to the bottom border of the polymorphic part (5.f, 13.u). The angulation of the custom body (5.r)

towards the vertical is zero degrees (Fig. 5D section A-A). The pillar (5.u) of the custom body (5.r) is preferably made out of titanium or stainless steel or metal alloy or ceramic or plastic material. The customizable part (5.h) is preferably made out of biocompatible material that is amenable to modifications through abrasion and polishing (Fig. 25), has radio-opaque properties and can be digitally scanned by a digital scanner.

The free of biocompatible customizable material pillar (5.c) is cylindrical (4.g) or polyhedron (4.d) with flat or flat and curved seats (4.p) where the flat seats are fully aligned in space with the flat seats of the prosthetic connection of the abutment (4.o). The pillar (5.c) has a polished surface (13.h) and it expands height wise from the upper surface of the customized body (5.o) to the bottom border of the polymorphic part (5.f). The angulation of the pillar (5.c) towards the vertical is zero degrees (Fig. 5D section A-A). The pillar (5.c) is preferably made out of titanium or stainless steel or metal alloy or ceramic or plastic material.

The polymorphic part (5.f) is a cylinder with variable section that comprises three vertical curved surfaces (5.e) that separate from each other from three vertical concave (5.x) surfaces of smaller radius and which curved (5.e, 4.s, 6.gb) and concave (5.x) surfaces are fully aligned in space with some of the flat seats (4.o, 6.ga, 5.l) of the prosthetic connection of the impression posts (5.t). Each of the vertical curved surfaces (5.e) is divided in two convex parts, upper (5.ea) and lower (5.eb), from a horizontal concave (5.z) surface of smaller radius that is located at their middle portion (Fig. 5D). The height of the polymorphic part (5.f) varies and its surface is polished, while its angulations towards the prosthetic connection of the impression post varies from about zero to about forty-five degrees (Fig. 5D section A-A). The polymorphic part (5.f) is preferably made out of titanium or stainless steel or metal alloy or ceramic or plastic material.

The angulated custom potentially modifiable closed tray one-piece impression post (5.b) has a hollow channel (5.a) that its upper open bore (5.n) is located on the upper surface and or a side wall of the custom body (5.r) and or on one of the concave surfaces (5.x) of the polymorphic part (5.f). The bottom open bore (5.m) is located on the bottom surface of the prosthetic connection (5.t). The hollow channel (5.a) is descriptively divided in two parts, an upper (5.j) and a lower (5.p). The upper part (5.j) has a larger diameter than the bottom part (5.f)(Fig. 5D section A-A). The angulations (5.aa) of the hollow channel (5.a) towards the vertical is the same to the one of the prosthetic connection (5.t). There will also be available angulated custom closed tray impression posts (5.b, 6.g) where the upper part (5.j) of the hollow channel (5.a) has a threaded portion (6.r) that allows the coupling by threading of a metallic cap (8.u) through its threaded portion (8.ua).

Figs. 7A-7D describe a straight custom potentially modifiable open tray one piece impression post (7.b) that descriptively comprises five parts as one piece: A prosthetic connection (7.t), a shoulder (7.s), a custom body (7.r) that consist of a pillar (7.l) that is connected with biocompatible modifiable material (7.k), a pillar, which is free of biocompatible material (7.f) and a polymorphic part (7.p). The prosthetic connection (7.t), the shoulder (7.s), the pillar (7.l) of the custom body (7.r), the free of biocompatible customizable material pillar (7.f) and the polymorphic part (7.p) are one piece (4.b, 4.e) that is made out of the same material and it functions as the core (6.m, 13.i) of the straight custom open tray impression post (7.b), while the biocompatible modifiable material (7.k) is one piece that is connected mechanically and or chemically with the pillar of the core (7.l) and it is made out of the same or different material.

The prosthetic connection (7.t) is a pillar with conical (4.j) or polyhedron (4.r) shape that resembles the negative replication of the prosthetic connection of an implant (2.p) and thus its shape might be conical (2.l), or external hexagonal (2.h), or internal hexagonal (2.u), or triangular (2.i) or octagonal (2.κ), or circular with vertical groves (2.m), or rectangular (2.n), all of which may have different degrees of bevel and depth. The prosthetic connection here (7.t) presents angulations towards the vertical of zero degrees (Fig. 7C). The prosthetic connection (7.t) is preferably made out of titanium or stainless steel or metal alloy or ceramic or plastic material.

The shoulder (7.s) is preferably made out of titanium, or steel, or metal alloy, or ceramic, or plastic material and it is a cylinder with variable section that has a base (7.y) of which the diameter and shape corresponds completely to the diameter and shape of the implant prosthetic platform (2.o), while in continuation to the base (7.y, 7.j) and it presents lateral walls (7.n) which are straight (11.d), or convex (11.z), or concave (11.e), or curved (Fig. 7D section A-A) and they end up at the upper surface of the shoulder (7.m) which has a diameter that is equal or larger than the one of the shoulder base (7.j, 7.y) while the height of the shoulder (7.s) varies from half to seven millimeters and the surface of the shoulder (7.s) is polished or slightly abraded on a microscopic level.

The custom body (7.r) comprises a pillar (7.l) and a customizable part (7.k). The pillar (7.l) has a rough surface (4.b, 4.e) and a cylindrical shape (4.b), or a polyhedron shape (4.e) with flat or flat and curved seats (4.ra) where the flat seats are fully aligned in space with the flat seats (4.r) of the prosthetic connection of the abutment (7.t). Lateral to the pillar (7.l) and connected with it is the customizable part (7.k) of the custom body (7.r) of the custom impression post (7.b). This part (7.k) has an oval shape, gradually expandable laterally upwards with symmetrical section (Fig. 7D section A-A) and regular surfaces (7.g), while it expands height wise from the

upper surface of the shoulder (7.m) to the bottom end (7.u) of the pillar (7.f). The angulation of the custom body (7.r) towards the vertical is zero degrees (Fig. 7D section A-A). The pillar (7.l) of the custom body (7.r) is made out of titanium or stainless steel or metal alloy or ceramic or plastic material. The customizable part (7.k) is preferably made out of biocompatible material that is amenable to modifications through abrasion and polishing (Fig. 25), has radio-opaque properties and can be digitally scanned by a digital scanner.

The free of biocompatible customizable material pillar (7.f) is cylindrical (4.b) or polyhedron (4.e) with flat or flat and curved seats (4.rb) where the flat seats are fully aligned in space with the flat seats (4.r) of the prosthetic connection of the impression post (7.t). The pillar (7.f) has a rough surface (4.b, 4.e, 13.i) and it expands height wise from the upper surface of the customized body (7.u) to the bottom border of the polymorphic part (7.ub). The angulation of the pillar (7.f) towards the vertical is zero degrees (Fig. 7D section A-A). The pillar (7.f) is preferably made out of titanium or stainless steel or metal alloy or ceramic or plastic material.

The polymorphic part (7.p) is a cylinder with variable sections that comprise three vertical curved surfaces (7.e) that separate from each other from three vertical concave (7.x) surfaces of smaller radius and which curved (7.e, 4.rd) are fully aligned in space with some of the flat seats (4.r) of the prosthetic connection of the impression posts (7.t). Each of the vertical curved surfaces (7.e) is divided in two convex parts, upper (7.ea) and lower (7.eb), from a horizontal convex surface of smaller radius (7.z) that is located at their middle portion (Fig. 7C). The height of the polymorphic part (7.p) varies and its surface is polished, while its angulations towards the vertical is zero degrees (Fig. 7D section A-A). The polymorphic part (7.p) is preferably made out of titanium or stainless steel or metal alloy or ceramic or plastic material.

The straight custom potentially modifiable open tray impression post (7.b) has a hollow channel (7.a) that its upper open bore (7.d) is located on the upper surface of the polymorphic part (7.p). The bottom open bore (7.o) is located on the bottom surface of the prosthetic connection (7.t). The hollow channel (7.a) is descriptively divided in two parts, an upper (7.h) and a lower (7.i). The upper part (7.h) has a larger diameter than the bottom part (7.i)(Fig. 7D section A-A). The angulation of the hollow channel (7.a) towards the vertical is zero degrees (Fig. 7D section A-A). There will also be available straight custom open tray impression posts (6.m) where the upper part (7.h) of the hollow channel (7.a) has a threaded portion (6.eg) that allows the coupling by threading of a metallic cap (8.u) through its threaded portion (8.ua).

Figs. 14A-14D describe a straight custom potentially modifiable closed tray one piece impression post (14.b) that descriptively comprises five parts as one piece: A prosthetic connection (14.t), a shoulder (14.s), a custom body (14.r) that comprises a pillar (14.u)

that is connected with biocompatible modifiable material (14.h), a pillar which is free of biocompatible material (14.c) and a polymorphic part (14.f). The prosthetic connection (14.t), the shoulder (14.s), the pillar of the custom body (14.u), the free of biocompatible customizable material pillar (14.c) and the polymorphic part (14.f) are one piece (4.a, 4.z) that is made out of the same material and it functions as the core (13.e, 13.z) of the straight custom closed tray impression post (14.b), while the biocompatible modifiable material (14.h) is one piece that is connected mechanically and or chemically with the pillar of the core (14.u) and it is made out of the same or different material.

The prosthetic connection (14.t) is a pillar with conical (6.j) or polyhedron (6.d) shape that resembles the negative replication of the prosthetic connection of an implant (2.p) and thus its shape may be conical (2.l), or external hexagonal (2.h), or internal hexagonal (2.u), or triangular (2.i) or octagonal (2.κ), or circular with vertical groves (2.m), or rectangular (2.n), all of which have different degrees of bevel and depth. The prosthetic connection (14.t) presents angulations towards the vertical that is zero degrees (Fig. 14D section A-A). The prosthetic connection (14.t) is preferably made out of titanium or stainless steel or metal alloy or ceramic or plastic material.

The shoulder (14.s) is preferably made out of titanium, or steel, or metal alloy, or ceramic, or plastic material and it is a cylinder with variable section that has a base (14.y, 14.l) of which the diameter and shape corresponds completely to the diameter and shape of the implant prosthetic platform (2.o), and while in continuation to the base (14.y, 14.l) it presents lateral walls (14.k) which are straight (11.d), or convex (11.z), or concave (11.e), or curved (Fig. 14D section A-A) and they end up at the upper surface of the shoulder (14.i) which has a diameter that is equal or larger than the one of the shoulder base (14.y, 14.l) while the height of the shoulder (14.s) varies from about one half to about seven millimeters and the surface of the shoulder (14.s) is polished or slightly abraded on a microscopic level.

The custom body (14.r) comprises a pillar (14.u) and a customizable part (14.h). The pillar (14.u) has a rough surface and a cylindrical shape (4.a), or a polyhedron shape (4.z, 6.d) with flat or flat and curved seats (6.dg) where the flat seats are fully aligned in space with the flat seats of the prosthetic connection of the impression post (6.da). Laterally to the pillar (14.u) and connected with it is the customizable part (14.h) of the custom body (14.r) of the custom impression post (14.b). This part (14.h) has an oval shape, gradually expandable laterally upwards with symmetrical section (Fig. 14D section A-A) and regular surfaces (14.g), while it expands height wise from the upper surface of the shoulder (14.i) to the bottom end (14.o) of the free of biocompatible material pillar (14.c, 13.e), or of the polymorphic part (14.f, 13.z). The angulations of the custom body (14.r) towards the vertical that is zero degrees (Fig. 14D section

A-A). The pillar (14.u) of the custom body (14.r) is preferably made out of titanium or stainless steel or metal alloy or ceramic or plastic material. The customizable part (14.h) is preferably made out of biocompatible material that is amenable to modifications through abrasion and polishing (Fig. 25), has radio-opaque properties and can be digitally scanned by a digital scanner.

The free of biocompatible customizable material pillar (14.c) is cylindrical (4.a) or polyhedron (4.z, 6.d) with flat or flat and curved seats where the flat seats are fully aligned in space with the flat seats (6.da) of the prosthetic connection of the impression post (14.t). The pillar (14.c) has a polished surface (13.e) and it expands height wise from the upper surface of the customized body (14.o) to the bottom border of the polymorphic part (14.f). The angulation of the pillar (14.c) towards the vertical is zero degrees (Fig. 14B section A-A). The pillar (14.c) is preferably made out of titanium or stainless steel or metal alloy or ceramic or plastic material.

The polymorphic part (14.f) is a cylinder with variable section that comprises three vertical curved surfaces (14.e) that separate from each other from three vertical concave (14.x) surfaces of smaller radius and which curved (14.e, 6.db) and concave surfaces (14.x) are fully aligned in space with some of the flat seats (6.da) of the prosthetic connection of the impression posts (14.t). Each of the vertical curved surfaces (14.e) is divided in two convex parts, upper (14.ea) and lower (14.eb), from a horizontal concave surface of smaller radius (14.z) that is located at their middle portion (Fig. 14C). The height of the polymorphic part (14.f) varies and its surface is polished, while its angulation towards the vertical is zero degrees (Fig. 14D section A-A). The polymorphic part (14.f) is preferably made out of titanium or stainless steel or metal alloy or ceramic or plastic material.

The straight custom potentially modifiable closed tray impression post (14.b) has a hollow channel (14.a) that its upper open bore (14.n) is located on the upper surface of the polymorphic part (14.f). The bottom open bore (14.m) is located on the bottom surface of the prosthetic connection (14.t). The hollow channel (14.a) is descriptively divided in two parts, an upper (14.j) and a lower (14.p). The upper part (14.j) has a larger diameter than the bottom part (14.p). The angulation of the hollow channel (14.a) towards the vertical is zero degrees (Fig. 14D). There will also be available straight custom closed tray impression posts (14.b, 6.d, 6.j) where the upper part (14.j) of the hollow channel (14.a) has a threaded portion (6.e, 6.eb) that allows the coupling by threading of a metallic cap (8.u) through its threaded portion (8.ua).

Figs. 8A-8G describe an isolation cap of the hollow channel, of the one-piece straight custom potentially modifiable open tray impression post and of the one-piece straight and angulated custom potentially modifiable closed tray impression post (8.a, 8.b, 8.u). The isolation cap (8.a, 8.b) is a one-piece solid cylinder of variable section (Figs. 8A, 8E) made out of a

material with small elasticity that descriptively comprises two parts (8.ag, 8.ab, 8.bg, 8.ba) formed into one piece (Figs. 8A-8G). The first part (8.ab, 8.ba) is conical and has a diameter that increases gradually in a manner that allows the friction fit of it (8.ab, 8.ba) with the impression post (7.b, 14.b, 5.b) isolating (16.b) at the same time its hollow channel (7.a, 14.a, 5.a). The second part (8.ag, 8.bg) is a convex cylinder of variable section with hemispherical head (Figs. 8A, 8E) and diameter larger than the maximum diameter of the impression post hollow channel (7.a, 14.a, 5.a) but at the same time smaller or equal to the diameter of the upper surface of the polymorphic part (7.p, 14.f, 5.f). The isolation cap (8.a, 8.b) as a whole, but also its two parts (8.ab, 8.ba, 8.ag, 8.bg) separately have a height and diameter that varies. There will also be available isolation caps preferably made out of metal (8.u). The bottom part (8.ua) of the metallic isolation cap is a threaded cylinder that couples by threads with the threaded portion of the hollow channel of the custom abutment and impression post (6.l, 6.p, 6.eg, 6.e, 6.r), while the upper part (8.ub) has the exact same design and dimensions as per the upper part of the isolation cap made out of material with small flexibility (8.a) that we previously described.

Figs. 8B-8D also describe a retention screw (8.g, 8.d), which is short (8.d) or long (8.g). The short retention screw (8.d) is used with all of the custom abutments (1.g, 3.r) and for all of the impression posts (5.b, 7.b, 14.b) while the long retention screw (8.g) is used with the open tray impression post (7.b). The long (8.g) and short (8.d) retention screw is preferably out of stainless steel, or titanium, or metal alloy and is descriptively divided to its thread (8.da, 8.ga) and to its head (8.db, 8.gb). The head (8.db, 8.gb) of the retention screw has a diameter that is larger than the one of the thread (8.da, 8.ga) and on its upper surface has a socket (8.dd, 8.gg) of a geometrical shape that is hexagonal, or rectangular, or conical that resembles the negative replication of the tip of a screwdriver or similar tool with corresponding geometrical shape and size. The depth of the socket (8.dd, 8.gg) varies from to about two to about five millimeters and the diameter from about one to about five millimeters. The diameter of the thread (8.da) of the short retention screw (8.d) is smaller than the minimum diameter of the hollow channel (1.a, 3.a, 7.a, 14.a, 5.a, 33.ho, 33.io) of all of the abutments (33.h, 33.u, 33.i) of the two pieces custom abutments and impression posts (33.e, 33.m, 33.z, 33.n), and all of the one-piece custom abutments (1.g, 3.r) and impression posts (7.b, 14.b, 5.b), while the diameter of the head (8.db) of the short retention screw (8.d) is smaller from the one of the upper part (1.e, 3.i, 7.h, 14.j, 5.j, 33.jb, 33.ou) and at the same time larger than the one of the bottom part (1.m, 3.l, 7.i, 14.p, 5.p, 33.ju, 33.oh) of the hollow channel (1.a, 3.a, 7.a, 14.a, 5.a, 33.ho, 33.io) of all of the abutments (33.h, 33.u, 33.i) of the two- piece custom abutments and impression posts (33.e, 33.m, 33.z, 33.n) and of the one-piece custom abutments (1.g, 3.r) and impression posts (7.b, 14.b, 5.b). The diameter of the head (8.gb) of the long retention screw (8.g) is larger than the maximum

diameter of the hollow channel (7.a) and the diameter of the thread (8.ga) of the long retention screw (8.g) is smaller than the one of the bottom part, of the hollow channel (7.i) of the one-piece straight custom open tray impression posts (7.b).

Figs. 9A-9E describe a verification cap (9.g) utilized for the fabrication of a jig used for the verification of the accuracy of the impression and of the working cast fabricated by the latter. The verification cap (9.g) is made out of a material with small elasticity and couples (9.a, 9.b) onto the upper portion (14.fb, 5.fb) of the polymorphic part (14.f, 5.f) of the one piece, straight and angulated closed tray impression posts (14.b, 5.b). The verification cap (9.g) descriptively comprises three parts (9.z, 9.e, 9.d) that forms one piece (Fig. 9D). The fist part (9.z) is a cylinder of variable section which on its external surface presents three vertical convex surfaces (9.za) that separate from each other through three vertical concave surfaces of smaller radius (9.zb) and all of them are fully corresponded in space with the vertical convex (14.ea, 5.ea) and concave (14.x, 5.x) surfaces of the upper portion of the polymorphic part (14.fb, 5.fb) of the one-piece, straight (14.b) and angulated (5.b) custom potentially modifiable closed tray impression post and as a consequence of that they are fully corresponded in space with all or some of the flat seats (9.zd, 9.zz) of the prosthetic connection of the impression posts (14.t, 5.t). The internal surface of the first part of the verification cap (9.z) consists the exact negative replication (9.k) of the external surface of the upper part of the polymorphic part (14.fb, 5.fb) from the portion of the horizontal concave surface (14.z, 5.z, 9.m) that is located at the middle portion of it to the upper end of it (14.f, 5.f, Fig. 9B, 9.b). This design (9.k, 9.l, 9.m) allows the accurate and stable fit of the isolation cap (9.g) on the impression post (9.a, 9.b) in three functional positions that correspond to the same orientation of the prosthetic connection of the impression post (5.t, 14.t), where the convex (9.za) and concave (9.zb) surfaces of the cap (9.g) are fully aligned with the vertical convex (9.zg) and concave (9.ze) surfaces of the polymorphic part (5.f, 14.f) and with the flat seats of the prosthetic connection of the impression post (9.zd, 9.zz). The second part of the verification cap (9.e) is a solid cylinder with a radius that is equal or larger than the one of the first part (9.z). The third part of the verification cap (9.d) is a cube of variable section that is descriptively divided in two parts, upper (9.u) and lower (9.i). The lower part (9.i) is solid and has a diameter that is smaller than the one of the upper part (9.u) and at the same time equal or smaller than the one of the cylinder (9.e). The upper part (9.u) has a diameter that is smaller, or equal, or larger than the one of the cylinder (9.e) and presents one or two open bores (9.h) on two and or on all four of its sidewalls (Fig. 9D).

Fig. 33 describes various examples of an embodiment of a custom potentially modifiable two-piece straight and angulated abutment (33.e, 33.m). This abutment (33.e, 33.m) comprises an abutment (33.h, 33.i) and a custom abutment cap (33.ha) that snaps on the pillar of a straight

or angulated abutment (33.hb, 33.ib) aiming to the fabrication of a two-piece straight (33.e) and angulated (33.m) custom potentially modifiable abutment. The custom abutment cap (33.ha) couples onto the abutment pillar (33.hb, 33.ib) through a blind bore with length equal to the height of the pillar (33.hb, 33.ib) that has its open bore on its bottom part. The custom abutment cap (33.ha) descriptively comprises a core (33.aa) that is a pillar with stable or variable section and regular or irregular surfaces that are polished or rough and it has a shape that is cylindrical or cylindrical with one flat seat, or polyhedron where the flat seat or seats are fully aligned in space with one or more of the flat seats of the prosthetic connection (33.je, 33.oe) of the abutment (33.e, 33.i). The core (33.aa) of the custom abutment cap (33.ha) extends in height from the upper surface of the abutment shoulder (33.jg, 33.og) to the upper border of the abutment pillar or further than the latter (33.jh, 33.oa). The inner surface of the core (33.aa) is the exact negative replication of the external surface, or and part of the upper portion of the hollow channel (33.jb, 33.ou) of the abutment pillar (33.ab, 33.hb, 33.ib), providing for the stable and precise coupling of the two parts together (33.ba, 33.ka) with friction fit, or and with snap on fit (34.z) through a convex surface with curved borders (34.ea) that has on its inner surface bottom part in proximity to its bottom end (34.e) and which comprises the exact negative replication of a concave with curved borders grove (34.eb) that exists on the corresponding location of the abutment pillar in proximity to the abutment shoulder (34.e). The second part of the custom abutment cap (33.hg) is mechanically and or chemically integrated to the core (33.aa) and it covers the latter height wise completely or partially and it is made out of curable biocompatible material and has an oval shape, gradually expandable laterally upwards, with symmetrical, or asymmetrical section and regular surfaces (Figs. 33, 31).

Fig. 33 also describes custom potentially modifiable two-piece straight and angulated impression posts (33.z, 33.n) that comprise straight (33.u) or angulated (33.i) abutment and a custom impression abutment cap (33.ua). The custom impression abutment cap (33.ua) couples on the pillar of a straight or angulated abutment (33.ub, 33.ib) leading to the fabrication of a two-piece straight (33.z) and angulated (33.n) custom potentially modifiable impression post. The custom impression abutment cap (33.ua) couples onto the abutment pillar (33.ub, 33.ib) through a blind bore with length equal to the height of the pillar (33.ub, 33.ib) that has its open bore on its bottom part. The custom impression abutment cap (33.ua) descriptively comprises a core (33.ga) that is mechanically and or chemically integrated as one piece to the custom body (33.ug) of the impression abutment cap. The core (33.ga) is a post with a variable section that descriptively is divided in two parts but is one piece (33.ia, 33.ib). The first part (33.ia) is a pillar that is cylindrical or cylindrical with one flat seat, or polyhedron where the flat seat or seats are fully aligned in space with one or more of the flat seats of the prosthetic connection (33.je,

33.oe) of the abutment (33.u, 33.j, 33.i, 33.o). The pillar (33.ia) has a stable or variable section and regular or irregular external surface that is polished or rough while its internal surface is the exact negative replication of the external surface or and part of the upper portion of the hollow channel (33.jb, 33.ou) of the abutment pillar (33.ub, 33.ib), providing for the stable and precise coupling of the two parts (33.ga, 33.ub, 33.ib) together (33.d, 33.l) with friction fit, or and with snap on fit (34.za) through a convex surface with curved borders (34.ea) that has on its inner surface bottom part (34.e) in proximity to its bottom end and which consists the exact negative replication of a concave with curved borders grove (34.eb) that exists on the corresponding location of the abutment pillar in proximity to the abutment shoulder (34.e). The second part (33.ib) of the core is a cylinder of variable section with three vertical curved surfaces (33.ih) that separate from each other through three vertical convex surfaces of smaller radius (33.id). Each of the three vertical curved surfaces (33.ih) is fully aligned in space with one or more of the flat seats (4.k) of the prosthetic connection (33.je, 33.oe) of the abutment (33.u, 33.i). Each of the three vertical curved surfaces (33.ih) of the cylinder (33.ib) is divided in two convex parts, upper (33.ie) and lower (33.iz) through a horizontal convex surface of smaller radius (33.ig) located at their mid-portion (Fig. 33). The maximum diameter of the cylinder (33.ib) is smaller or equal or larger than the diameter of the base of the abutment shoulder (33.jk, 33.ok). The horizontal convex surface (33.ig) has a diameter that is smaller, or equal, or larger than the one of the pillar (33.ia). The cylinder (33.ib) as a whole has a polished or rough surface and its height varies from three to twenty millimeters. Each of the vertical curved (33.ih), and or convex (33.id) surfaces of the cylinder (33.ib) is fully aligned in space with at least one of the flat seats (4.k) of the prosthetic connection of the abutment (33.je, 33.oe). The core (33.ga) has the same angulations towards the vertical with the abutment pillar (33.ub, 33.ib). The second part of the custom impression abutment cap (33.ug) is integrated mechanically and or chemically with the core (33.ga) and it partially or completely covers its bottom part (33.ia), height wise. It is made out of a curable biocompatible material and has an oval shape, gradually expandable laterally upwards, with symmetrical or asymmetrical section and regular surfaces.

Figs. 12A-12C and 34A-34E describe a mold used for the mass production of custom potentially modifiable one-piece and two-piece straight and angulated abutments (1.g, 3.r, 33.e) and impression posts (14.b, 5.b, 7.b, 33.z). The mold (12.a) comprises a base (12.i) with open wells (12.ba, 12.ea, 12.za, 12.ha, 12.da) that receive within them the cores of the straight and angulated custom potentially modifiable abutments and impression posts (Figs. 2A-2D, 4A-4D, 10A-10I, 34A-34E) and allow the stable coupling with the latter. The open wells (12.ba, 12.ea, 12.za, 12.ha, 12.da) comprise the exact negative replication of the straight and angulated custom potentially modifiable abutments and impression posts (Fig. 34A-E) from their prosthetic

connection (1.p, 3.p, 14.t, 5.t, 7.t, 33.je, 33.oe) up to the upper border of their custom body (1.j, 3.j, 14.r, 5.r, 7.r, 33.ug, 33.hg). The base of the mold (12.i) incorporates channels (12.g) that allow the free flow of flow-able biocompatible material aiming to the filling of the open space available between the pillar of the core of the custom body of the abutments (12.b, 12.e) and of the impression posts (12.z, 12.h, 12.d) and the sidewalls of the wells (12.ea, 12.ha, 12.ba, 12.da, 12.za). The base of the mold (12.i) is completely sealed by the upper part of the mold (12.ab) through coupling of cylindrical pillars of variable sections (12.u) and following this, the process of flow of the biocompatible material through the channels (12.g) of the base (12.i) into the wells (12.ea, 12.ha, 12.ba, 12.da, 12.za) takes place in a secure manner (12.k). After the curing and setting of the biocompatible material is complete, the latter is mechanically and or chemically connected with the abutment and impression cores and the abutment and impression abutment caps. Following this, the two parts of the mold (12.i, 12.ab) uncouple and then the fabricated one-piece and two-piece, straight and angulated, custom potentially modifiable abutments and impression posts (1.g, 3.r, 14.b, 5.b, 7.b, 33.e, 33.z, 33.m, 33.n, Figs. 6A-6I, Figs. 13A-13I) are removed from the base of the mold (12.i).

Figs. 35 and 36 describe a system (35.a) and method that is used for the facilitation of the process of choosing the right size and shape custom abutment but also for the identification and marking on the alveolar process of the ideal point for the initiation of the implant osteotomy at the time of implant placement (Fig. 36). This system (35.a) comprises a handle (35.ba) and a part (35.bg) that snaps on one of the free ends of the handle (35.ba) with the use of an elastomeric o-ring (35.bb). The part (35.bg) on its free end has a blind threaded bore that couples with threads with one of the ends of a cylindrical tube (35.bd). This cylindrical tube has a threaded portion on both of its free ends. One of the free ends of the cylindrical tube (35.bd) couples with threads with the blind bore of the part (35.bg) while its other part receives and couples with threads with the threaded portion of the blind bore (35.bz) available on the replica of the custom abutment (35.be). The replica of the custom abutment (35.be) has a blind threaded bore (35.bz) on one or more of its sidewalls. The replica of the custom abutment (35.be) has sidewalls that are flat or curved and it also has an upper and lower surface that is flat or curved. The upper and lower surface of the custom abutment replica (35.be) have two visible lines that are perpendicular to each other and intersect the top and bottom surfaces at their mid-portion. The custom abutment replica (35.be) has a hollow channel (35.bh) that has its two open bores located at its top and bottom surface. The shape of the custom abutment replicas (35.be) is cylindrical (35.d) or oval (35.g), symmetrical or asymmetrical (Figs. 35C-35E) and they are available in different sizes. There will also be available replica abutment parts that will consist of more than one replica abutment that is connected in full alignment or on a curved direction with each other (35.e).

These parts (35.e) will be ale to be used in edentulous spaces where multiple teeth are missing and more than one implant will be placed for the identification and marking of the implant osteotomies and also for the selection of the right shape and size custom abutments that these implants will receive.

To potentially enhance the understanding of all of the above we present the following examples.

EXAMPLE 1

In a first example (Figs. 15, 16, 17, 18, 19) an edentulous patient has received four implants (15.a) that have been placed by the surgeon with 20 degrees of angulations (15.aa, 15.gg) and zero degrees of angulations (15.ab, 15.ad) towards the longitudinal axis of the final implant prosthesis. Following implant placement the two angulated implants receive two custom abutments (15.ba, 15.bg) with 20 degrees of angulations and the two straight implants receive two straight custom abutments (15.bb, 15.bd). All of the custom abutments are coupled with threads with the implants with short retention screws (8.d). The custom abutments have shape and dimensions that correspond to the available prosthetic space (15.b). Specifically, the custom abutments are oriented within the outer borders of the desired final prosthesis (19.e) and the custom body presents angulations similar to one of the longitudinal axis of the final prosthesis (19.e). Following this, the gingival is sutured around the custom abutments and the implants are allowed to heal. After the osseointegration period is finished the custom abutments are uncoupled from the implants (15.g) revealing a gingival emergence profile with oval shape gradually expandable laterally upwards and with an angulations similar to the one of the emergence profile of the final prosthesis, as this have been developed by the custom abutments (15.ga, 15.gg, 15.gb, 15.gd) at this stage with the implants, which are coupled with four custom close tray impression posts (16.a) with corresponding size, shape and angulations to the custom abutments (16.aa, 16.ag, 16.ab, 16.ad). Following this, the dentist isolates the hollow channels of the impression posts with isolation caps (16.be, 16.bh, 16.bu). And then he creates by abrasion an artificial groove on the supra-gingival surface of the custom body of the impression posts (16.ba, 16.bg, 16.bb, 16.bd) and following this he takes the impression with a close tray technique (16.g). After the impression material is set the impression tray is removed from the mouth and the impression material representations of the negative replication of the jaw, the teeth and the impression posts (18.a). Following this, the dentist removes the isolation caps making accessible the retention screws of the impression post. Then he couples onto the top portion of the polymorphic portion of the impression post the verification caps (17.aa). Following this, he interconnects these caps with floss (17.ba) that he passes through the open bores of the top part (17.b) and then he applies around the top part of the verification caps and

the floss a curable material (17.ga) (e.g. acrylic resin). After the curing and setting of this material all of the verification caps are connected to each other as one piece (17.g) fabricating this way a superstructure that we call a verification jig that verifies the accuracy of the impression and of the working cast fabricated by the latter (17.da). Following this, the dentist removes the verification jig from the impression posts (17.d) and he unscrews the short retention screws (8.d) and then he removes the impression posts from the mouth and replaces them with the corresponding custom abutments (15.b). Then, the dental technician couples the impression posts with implant analogs with a corresponding type and size prosthetic connection and he installs them into their negative replication into the impression (18.ag, 18.ad, 18.ab, 18.aa), being oriented properly by the negative replication of the artificial groove present into the impression (18.ba). Thus the lab technician now has available an implant impression (18.a) and a verification jig of the accuracy of the impression (17.da). Following this the dental technician introduces silicon gingival mask (18.ga) around the part of the impression post that is free of impression material into the impression (18.g). Following this he pulls the impression with gypsum (19.aa) and after the setting of the latter he separates the fabricated gypsum working cast from the impression and then he also uncouples the impression posts from the implant analogs that are embedded into the working cast. This working cast (19.b) is the exact replication of the jaw, the teeth, the location of the implants in the jaw and the orientation and angulations of the prosthetic connection of the implant and of the gingival emergence profile around the platform of the latter as this has been generated by the custom abutments (15.g). In order for the dental technician to verify the accuracy of the impression (18.a) and the working cast (19.b) he couples the impression posts (19.ga) with the implant analogs in the working cast (19.g) and then he couples onto the top part of the polymorphic part of the impression post the verification jig (19.gb). The stable and precise fit of the latter on all of the impression posts (19.d) verifies the accuracy of the fabricated working cast (19.b). Onto this working cast the lab technician will fabricate the final prosthesis that the dentist will install on the implants in the mouth (19.e).

EXAMPLE 2

In a second example (Fig. 20) we describe a methodology of use of a straight and angulated custom potentially modifiable abutment for the generation of a digital impression. Specifically a custom abutment with a pillar that has polyhedron shape (20.aa) is installed with the implant in the mouth (20.a). Following this, the dentist scans with a digital scanner the custom abutment the teeth and the jaw (20.b). All the data from the scanning are transmitted into special software compatible with a digital scanner (20.g). This software takes under consideration the shape, the size and the angulations of the custom abutment (20.aa) and can identify digitally the location of the implant platform and the orientation of the implant

prosthetic connection along with the gingival emergence profile developed around the implant platform. The orientation of the implant prosthetic connection is achieved through the scanning of the flat seats of the abutment pillar (6.o) that are fully aligned with the flat seats of the prosthetic connection of the abutment (6.i) and of the implant prosthetic connection (2.p).

EXAMPLE 3

In a third example (Figs. 21-24) we describe the methodology of use with the custom open tray impression post with the use of a short retention screw. Specifically, after the completion of the osseointegration period the custom abutment or the temporary prosthesis is removed from the mouth (21.a) and the dentist replaces them with a custom open tray impression post (21.g) that couples by threads with the implant with a short retention screw (21.d). The upper open bore of the hollow channel (21.e) is isolated by an isolation cap (21.z) of the impression post, which extends a few millimeters outside the proximal end of the impression post (21.h). Following this, a tray (22.a) with an open bore on its base (22.b) corresponding in location to one of the isolation caps (22.g) is filled with impression material (22.d) and also impression material is introduced around the impression post (22.u). Then the impression tray is placed in the mouth in a way that it includes within its borders the alveolar ridge, the impression post with the isolation cap and the teeth of the patient (22.e). At this stage the cap penetrates the impression material and its proximal end becomes evident through the tray's open bore in the mouth (22.z). After the setting of the impression material the dentist removes the isolation cap with pliers (22.h). Thus, an entrance channel towards the hollow channel of the impression post (22.i) and the head of the short retention screw (22.k) is established. Following this, the dentist unscrews and removes the retention screw (22.k) and then he removes the impression from the mouth. The impression (23.b) now represents the negative replication of the jaw and the teeth and has embedded in its body the impression post in a stable position (23.a). The impression post (23.e, 23.u) is coupled with an implant analog (23.d, 23.h), which corresponds in size and shape with the prosthetic connection, with a short retention screw (23.k) and a silicone mask (24.b) is introduced (24.a) around the part of the impression post that is free of impression material (24.g) into the impression. Following this, the impression (24.z) is poured by the dental technician with gypsum (24.e) and after the setting of the latter, the impression is separated from the fabricated gypsum-working cast (24.u). This working cast (24.u) has the implant analog embedded into its body that establishes the accurate information of the orientation of the prosthetic implant connection and of the location of the implant platform in the mouth, along with the custom emergence profile (21.b) as this has been developed around the implant platform and it is replicated onto the working cast by the silicone gingival mask (24.h).

EXAMPLE 4

In a fourth example (Figs. 25-28) we describe the methodology used for the modification of the straight and angulated closed tray impression posts (14.b, 5.b) and custom open tray straight impression posts (7.b) to temporary abutments (26.b) that can support a temporary prosthesis (26.d). Specifically, after the impression is taken and the working cast is fabricated as it was previously described the dental technician with abrasion (25.a) separates and removes the polymorphic part from the rest of the impression post (25.m, 25.b). Following this he layers biocompatible material (25.e) in order to increase the volume of the custom body (25.h) wherever this is needed (25.z). Following this, he modifies this supra gingival part with abrasion (25.u) according to the basic principles as per natural teeth preparation (25.k) and he then fabricates a temporary prosthesis (26.a) that couples precisely onto the modified abutment (26.b). The dentist couples the modified abutment (26.b) with the implant in the mouth (26.z, 26.e) and then he cements onto it the temporary prosthesis (26.h). The dental technician can also fabricate (27.a) a temporary prosthesis (27.e) that is one piece (27.u) with the modified abutment (27.b). He can achieve that by cementing the temporary prosthesis on to the modified abutment extra-orally (27.e) while at the same time he ensures the maintenance of an open hollow channel (27.h, 27.d) on the prosthesis (27.u) that is in continuation to the hollow channel of the impression post that has been modified to a temporary abutment (5.a, 7.a, 14.a). This hollow channel (27.h, 27.d) allows the free pass of the retention screw (27.z) that couples by threads to the system temporary abutment-temporary prosthesis (27.u) with the implant analog (27.i). Thus in these clinical cases the dentist can couple this system (28.b) onto the implant (28.g) as one piece (28.z) with a retention screw (28.a) that inserts into the system (28.b) through the open bore of its hollow channel (28.e).

EXAMPLE 5

In a fifth example the custom abutment (29.b) is coupled with an implant in the mouth (29.g) and the rehabilitation of the implant is desired (29.h) in order for a gradual loading process of the implant to be achieved before the final prosthesis is installed. At this stage the dentist can intra-orally prep the supra-gingival portion of the custom abutment (29.b) following the same principles as per natural teeth preparation (Fig. 29). Thus the custom abutment now has been modified to a replica of a prepped natural tooth with supra-gingival prosthetic borders (29.e) while the emergence profile of the custom modified abutment remains intact as there was no preparation of it done sub-gingivally. Following this, the dentist can directly install by cementation a temporary prosthesis on the supra-gingival portion (29.h) of the modified abutment (29.d) in the mouth (29.u).

EXAMPLE 6

In a sixth example in an edentulous jaw two implants have been placed on the right side with angulations of 25 degrees (30.aa) and 0 degrees (30.ab) towards the longitudinal axis of the final implant prosthesis (30.ga) and two implants have been placed on the left side with angulations of 25 degrees (30.ag) and 15 degrees (30.ad) towards the longitudinal axis of the final implant prosthesis (30.ga). After the osseointegration of the implant is complete the custom abutments are removed from the implants, they are replaced by the dentist with four custom impression posts with corresponding size, shape and angulations to the abutments and implants used (30.a). Following this, the dentist takes the impression and the dental technician fabricates the working cast following the same steps as previously described in the first example. The dental technician after the fabrication of the working cast, modifies the impression posts by removing the polymorphic part from the rest of the impression post by abrasion (30.bg) and thus he modifies the impression posts (30.ba, 30.bb, 30.bg, 30.bd) to custom temporary angulated abutments (30.gd). Then he preps the supra-gingival portion of the temporary abutments with the aid of special machinery following the same principals as per natural teeth preparation and establishing parallelism between the sidewalls of all four temporary abutments (30.g). Following this, he fabricates a temporary prosthesis (30.ga) that is supported by the temporary abutments (30.gd) and which has one path of insertion onto them as this is established by the parallelism present between the side walls of the temporary abutments. Following this, the dentist uncouples the custom abutments from the implants in the mouth and replaces them with the corresponding temporary abutments. Then he installs on the supra-gingival portion of these abutments the temporary prosthesis by cementation (30.d).

EXAMPLE 7

For this example, embodiments are provided to illustrate exemplary aspects of the invention.

1. One-piece and two-piece, straight and angulated, custom, potentially modifiable abutments (1.g, 33.e, 3.r, 33.m) and one-piece, straight, custom, potentially modifiable open tray impression posts (7.b) and one-piece and two-piece, straight and angulated, custom, potentially modifiable closed tray impression posts (14.b, 33.z, 5.b, 33.n) that are fabricated by a mold (12.a) of mass production, where the one-piece straight and angulated, custom, potentially modifiable abutments (1.g, 3.r) comprise a straight (1.p) or angulated (3.p) prosthetic connection, a shoulder (1.o, 3.o) and a custom body (1.j, 3.j) as one-piece (Figs. 1A-1D, 3A-3D), while the two-piece, straight (33.e) and angulated (33.m), custom, potentially modifiable abutments comprise a straight (33.h, 2.a) or angulated (33.i, 2.d) abutment that comprises a straight (33.je, 2.aae) or angulated (33.oe, 2.dde) prosthetic connection, a shoulder (33.jd, 2.aad, 33.od, 2.ddd) and a pillar (2.aaz, 33.ub, 2.ddb, 33.ib) that couples with a custom abutment cap (33.ha) as two

snap on pieces (33.e, 33.m) and which one-piece and two-piece, custom abutments (1.g, 33.e, 3.r, 33.m) that are selected with use of a system guide for the selection of proper shape and size custom abutment (35.a) and couple by threads with the prosthetic connection (2.p) of an implant (2.z), that has been placed in an osteotomy that has been created by the marking of its location by the selection guide system (35.a), with a retention screw (8.d) that they receive through their hollow channel (1.a, 3.a, 2.ao, 2.do, 33.ho, 33.io) and they generate a custom gingival emergence profile (21.b) around the platform (2.o) of an implant (2.z), while they moreover can be modified with abrasion to temporary abutments used for supporting a temporary prosthesis (Fig. 29), or can be scanned intra-orally by a digital scanner for the generation of a digital impression (Fig. 20); and one-piece, straight custom open tray impression posts (7.b) and one-piece straight (14.b) and angulated (5.b) custom closed tray impression posts that consist of a straight (7.t, 14.t) or angulated (5.t) prosthetic connection, a shoulder (7.s, 14.s, 5.s), a custom body (7.r, 14.r, 5.r), a pillar free of customizable material (7.u, 14.c, 5.c) and a polymorphic part (7.p, 14.f, 5.f), all of them as one piece (Figs. 7A-7D, 14A-14D, 5A-5D) and two pieces straight (33.z) and angulated (33.n) custom closed tray impression posts (Fig. 33) that consist of an abutment (33.u, 33.i) that comprises a straight (33.je) or angulated (33.oe) prosthetic connection, a shoulder (33.jd, 33.od) and a pillar (33.ub, 33.jz, 33.ib, 33.ob) that couples with a custom impression abutment cap (33.ua) as two snap on pieces and which one-piece and two-piece custom impression posts (7.b, 14.b, 5.b, 33.z, 33.n) couple by threads with the prosthetic connection (2.p) of an implant (2.z) with a retention screw (8.g, 8.d) that they receive through their hollow channel (7.a, 14.a, 5.a, 33.ho, 33.io) which has a top open bore (7.d, 14.n, 5.n) that for the one-piece impression posts (7.b, 14.b, 5.b) is sealed by an isolation cap (8.b, 8.a) and they are used for the implant impression process (Figs. 22, 23, 15, 16) or after proper modification they are used as temporary abutments for the support of a temporary prosthesis (Figs. 30, 25) fabricated with an analog process by the dental technician (Fig. 25, 26, 27), or digitally from a CAD-CAM machine after their digital scanning (Fig. 20), while the upper portion of the polymorphic part (14.fb, 5.fb) of the one-piece straight and angulated closed tray custom impression posts (14.b, 5.b) couples (9.a, 9.b) with a verification cap (9.g) that is utilized for the generation of a verification jig (17.da, 19.gb) of the accuracy of the impression (18.a) and, or the working cast (19.d) generated by the latter (Figs. 17, 19).

2. One-piece and two-piece, straight and angulated, custom potentially modifiable abutments (1.g, 33.e, 3.r, 33.m) and one-piece, straight custom potentially modifiable open tray impression posts (7.b) and one-piece and two-piece, straight and angulated, custom potentially modifiable closed tray impression posts (14.b, 33.z, 5.b, 33.n) as referred in embodiment 1 of this example, where their prosthetic connection (1.p, 3.p, 7.t, 14.t, 5.t, 2.aae, 2.dde, 33.je, 33.oe)

is preferably made out of titanium, or steel, or metal alloy, or ceramic, or plastic material and resembles the negative replication of the prosthetic connection (2.p) of an implant (2.z) and it is a conical pillar (6.h, 2.j, 6.m, 6.j), or a polyhedron pillar (6.i, 6.u, 4.o, 6.d, 6.g) that has an external hexagonal (2.h), or internal hexagonal (2.u), or triangular (2.i) or octagonal (2.k), or circular with vertical groves (2.m), or rectangular (2.n) all of which with different degrees of bevel and depth and presents an angulation towards the vertical that is equal to zero degrees from the straight, custom, potentially modifiable abutments and the straight, custom, potentially modifiable impression posts (Figs. 1A-1D, 7A-7D, 14A-14D, 33A-33F) while it varies from about one to about forty-five degrees for the angulated, custom, potentially modifiable abutments and the angulated, custom, potentially modifiable impression posts (Fig. 3D, 3.aa, Fig. 5D, 5.aa, Fig. 33).

3. One-piece and two-piece, straight and angulated, custom, potentially modifiable abutments (1.g, 33.e, 3.r, 33.m) and one-piece, straight, custom, potentially modifiable open tray impression posts (7.b) and one-piece and two-piece, straight and angulated, custom, potentially modifiable closed tray impression posts (14.b, 33.z, 5.b, 33.n) as referred in embodiment 1 of this example, where their shoulder (1.o, 3.o, 7.s, 14.s, 5.s, 33.jd, 33.od) is preferably made out of titanium, or steel, or metal alloy, or ceramic, or plastic material and it is a cylinder with variable section that has a base (1.r, 3.n, 7.y, 14.y, 5.y, 33.jk, 33.ok) of which the diameter and shape corresponds completely to the diameter and shape of the implant prosthetic platform (2.o), while in continuation to the base (1.r, 3.n, 7.y, 14.y, 5.y, 33.jk, 33.ok) it presents lateral walls (1.u, 3.h, 7.n, 14.k, 5.k, 33.jl, 33.ol) which are straight (11.a, 11.d), or convex (11.g, 11.z), or concave (11.b, 11.e), or curved (Figs. 1A-D, 3A-D, 7A-D, 14A-D, 5D section A-A, 14.k, 33.j, 33.o) and they end up at the upper surface of the shoulder (1.h, 3.z, 7.m, 14.i, 5.i, 33.jg, 33.og) which has a diameter that is equal or larger than the one of the shoulder base (1.r, 3.n, 7.y, 14.y, 5.y, 33.jk, 33.ok) while the height of the shoulder (1.o, 3.o, 7.s, 14.s, 5.s, 33.jd, 33.od) varies from half to seven millimeters and the surface of the shoulder is polished or slightly abraded on a microscopic level.

4. One-piece and two-piece, straight and angulated, custom potentially modifiable abutments (1.g, 33.e, 3.r, 33.m) as referred to in embodiment 1 of this example, where their custom body (1.j, 3.j, 33.eb, 33.mb) presents an angulation towards their prosthetic connection (Fig. 1D section A-A, Fig. 3D section A-A, Fig. 33A-33F) that varies from zero to forty-five degrees and which custom body (1.j, 3.j, 33.eb, 33.mb) comprises a core, that is a one piece pillar (1.k, 3.d) or a two coupled pieces pillar (33.ba, 33.ka), with rough (10.b, 10.d) or polished and rough surface (10.a, 10.g) and is preferably made out of titanium, or steel, or metal alloy, or ceramic, or plastic material and has a cylindrical shape (2.a, 2.g), or a polyhedron shape (2.b,

2.d) with flat or flat and curved seats (2.s, 2.t) where the flat seats (2.s, 2.t) are fully aligned in space with the flat seats of the prosthetic connection (2.t, 2.r) of the abutment. Laterally to the pillar (1.k, 3.d, 33.ba, 33.ka) and coupled to it with mechanical and or chemical connection to the customizable part of the custom body (1.z, 3.e, 33.eb, 33.mb) which is made out of biocompatible material that is amenable to modifications through abrasion and polishing (Fig. 29), has radio-opaque properties and can be digitally scanned by a digital scanner (Fig. 20) and has an oval shape, gradually expandable laterally upwards with symmetrical section (Fig.1D section A-A, Fig. 3D section A-A, Fig. 33) and regular surfaces (1.b, 3.b, 33.hg, 33.ug), while it expands height wise (13.b, 13.d) from the upper surface of the shoulder (1.h, 3.z, 33.jg, 33.og) to a part (13.a, 13.g) or to the upper end of the core (13.b, 13.d).

5. One-piece and two-piece, straight and angulated, custom, potentially modifiable abutments (31.a, 31.g, 31.b, 31.d) as referred to in embodiment 1 of this example, where their custom body (1.h, 3.j, 33.eb, 33.mb) has an oval shape, gradually expandable laterally upwards with asymmetrical section and regular surfaces (Fig. 31).

6. One-piece, straight custom potentially modifiable open tray impression posts (7.b, 31.k, 31.i) and one-piece straight and angulated, custom potentially modifiable closed tray impression posts (14.b, 31.e, 31.h, 5.b, 31.z, 31.u) as referred to in embodiment 1 of this example, where their custom body (7.r, 14.r, 5.r) presents an angulation towards their prosthetic connection (Fig. 7A-7D, 14A-14D, 5D section A-A) that varies from zero to forty-five degrees and comprises a pillar (7.l, 14.u, 5.u) preferably made out of titanium, or stainless steel, or metal alloy, or ceramic, or plastic material with cylindrical shape (4.b, 4.a, 4.g) or polyhedron shape (4.e, 4.z, 4.d), with rough (10.i, 10.z, 10.u) or rough and polished surfaces (10.e, 10.h); Laterally to the pillar (7.l, 14.u, 5.u) and coupled to it with a mechanical and or chemical connection is the customizable part (7.k, 14.h, 5.h) of the custom body (7.r, 14.r, 5.r) which (7.k, 14.h, 5.h) is made out of biocompatible material that is amenable to modifications through abrasion and polishing (Figs. 25, 30), has radio-opaque properties and can be digitally scanned by a digital scanner (20.b) and has an oval shape, gradually expandable laterally upwards with symmetrical (Figs. 7A-7D, 14A-14D, 5D section A-A), or asymmetrical (31.i, 31.k, 31.e, 31.h, 31.z, 31.u) section and regular surfaces (7.g, 14.g, 5.g), while it expands height wise from the upper surface of the shoulder (7.m, 14.i, 5.i) to the bottom border (7.u, 14.o, 5.o) of the pillar free of biocompatible material (13.i, 13.e, 13.h) or to bottom border (7.p, 14.f, 5.f) of the polymorphic part (13.z, 13.u).

7. One-piece, straight, custom, potentially modifiable open tray impression posts (7.b) and one-piece straight and angulated, custom, potentially modifiable closed tray impression posts (14.b, 5.b) as referred to in embodiment 1 of this example, where in continuation to their

custom body (7.r, 14.r, 5.r) they present a fourth pair (7.f, 14.c, 5.c) that is a pillar free of biocompatible material that has a shape that is cylindrical (4.b, 4.a, 4.g), or polyhedron (4.e, 4.z, 4.d) and it expands from the upper border of the custom body (7.u, 14.o, 5.o) to the bottom border of the polymorphic part (7.p, 14.f, 5.f) and it has a diameter that is equal to the one of the pillars of the custom body (7.l, 14.u, 5.u), it has a height that varies and a surface that is rough (10.i, 10.z, 10.u) or polished (10.e, 10.h) while its angulation towards the prosthetic connection varies from zero to forty five degrees (Figs. 7A-7D, 14A-14D, 5A-5D).

8. One-piece, straight, custom, potentially modifiable open tray impression posts (7.b) and one-piece straight and angulated, custom, potentially modifiable closed tray impression posts (14.b, 5.b) as referred to in embodiment 1 of this example, where their polymorphic part (7.p, 14.f, 5.f) is a cylinder with a variable section that comprises three vertical curved surfaces (7.e, 14.e, 5.e) that separate from each other from three vertical convex (7.x) or concave (14.x, 5.x) surfaces of smaller radius and which curved (7.e, 14.e ,5.e) and convex (7.x) or concave (14.x, 5.x) surfaces are fully aligned in space with some of the flat seats (4.r, 6.da, 6.ga) of the prosthetic connection of the impression posts (7.t, 14.t, 5.t). Each of the vertical curved surfaces (7.e, 14.e, 5.e) is divided in two convex parts, upper (7.ea, 14.ea, 5.ea) and lower (7.eb, 14.eb, 5.eb), from a horizontal convex (7.z) or concave (14.z, 5.z) surface of smaller radius that is located at their middle portion (Figs. 7A-7D, 14A-14D, 5A-5D). The height of the polymorphic part (7.p, 14.f, 5.f) varies and its surface is polished, while its angulations towards the prosthetic connection of the impression post varies from zero to forty-five degrees (Figs. 7A-7D, 14A-14D, 5D section A-A).

9. One-piece straight and angulated, custom, potentially modifiable abutments (1.g, 3.r) and straight and angulated abutments (33.h, 33.i) of the two-piece straight and angulated, custom, abutments (33.e, 33.m) as referred to in embodiment 1 of this example, which have a hollow channel (1.a, 3.a, 33.ho, 33.io) with two open bores, one upper (1.d, 3.g, 33.ja, 33.oi) and one bottom (1.n, 3.m, 33.ji, 33.oz); The hollow channel descriptively is divided in two parts, an upper (1.e, 3.i, 33.jb, 33.ou) of larger diameter that has (6.k, 6.a) or does not have (1.g, 3.r) a threaded portion and a lower part (1.m, 3.l, 33.ju, 33.oh) of smaller diameter. The upper bore (1.d, 3.g, 33.ja, 33.oi) of the hollow channel (1.a, 3.a, 33.ho, 33.io) is present on the upper surface of the custom body (1.j, 3.j) and the abutment pillar (33.jz, 33.hb) and or on a side wall of the custom body (1.b, 3.b) or of the abutment pillar (33.ob, 33.ib). The bottom bore (1.n, 3.m, 33.ji, 33.oz) of the hollow channel (1.a, 3.a, 33.ho, 33.io) is present on the bottom surface of the prosthetic connection (1.p, 3.p, 33.je, 33.oe) of all of the one piece custom abutments (1.g, 3.r) and all of the abutments (33.h, 33.i) of the two pieces custom abutments (33.e, 33.m).

10. One-piece, straight, custom, potentially modifiable open tray impression posts (7.b) and one-piece straight and angulated, custom, potentially modifiable closed tray impression posts (14.b, 5.b) as referred to in embodiment 1 of this example, which have a hollow channel (7.a, 14.a, 5.a) with two open bores (7.d, 14.n, 5.n, 7.o, 14.m, 5.m), that is descriptively divided in two parts, an upper (7.h, 14.j, 5.j) of larger diameter that has (6.m, 6.d, 6.g) or does not have (7.b, 14.b, 5.b) a threaded portion and a lower part (7.i, 14.p, 5.p) of smaller diameter (Figs. 7A-7D, 14A-14D, 5D section A-A). The upper bore (7.d, 14.n, 5.n) of the hollow channel (7.a, 14.a, 5.a) is present on the upper surface of the polymorphic part (7.p, 14.f) for the straight custom impression posts (7.b, 14.b) and on a side wall of the polymorphic part (5.f) and or a side wall of the pillar (5.c), and or the upper surface of the custom body (5.r), and or a side wall of the latter (5.r), for the angulated custom impression posts (5.b). The bottom bore (7.o, 14.m, 5.m) of the hollow channel (7.a, 14.a, 5.a), is present on the bottom surface of the prosthetic connection (7.t, 14.t, 5.t) of all of the custom impression posts (7.b, 14.b, 5.b). The angulation of the hollow channel (7.a, 14.a, 5.a) towards the vertical is identical to the one of the prosthetic connection (7.t, 14.t, 5.t) of the custom impression posts.

11. A retention screw (8.g, 8.d), as referred to in embodiment 1 of this example, which is short (8.d) or long (8.g) and is preferably made out of stainless steel, or titanium, or metal alloy and is descriptively divided to its thread (8.da, 8.ga) and to its head (8.db, 8.gb). The head (8.db, 8.gb) of the retention screw has a diameter that is larger than the one of the thread (8.da, 8.ga) and on its upper surface has a socket (8.dd, 8.gg) of a geometrical shape that is hexagonal, or rectangular, or conical that resembles the negative replication of the tip of a screwdriver or other similar tool with corresponding geometrical shape and size. The depth of the socket (8.dd, 8.gg) varies from to two to five millimeters and the diameter from one to five millimeters. The diameter of the thread (8.da) of the short retention screw (8.d) is smaller than the minimum diameter of the hollow channel (1.a, 3.a, 7.a, 14.a, 5.a, 33.ho, 33.io) of all of the abutments (33.h, 33.u, 33.i) of the two-piece, custom, abutments and impression posts (33.e, 33.m, 33.z, 33.n), and all of the one-piece, custom, abutments (1.g, 3.r) and impression posts (7.b, 14.b, 5.b), while the diameter of the head (8.db) of the short retention screw (8.d) is smaller than the one of the upper part (1.e, 3.i, 7.h, 14.j, 5.j, 33.jb, 33.ou) and at the same time larger than the one of the bottom part (1.m, 3.l, 7.i, 14.p, 5.p, 33.ju, 33.oh) of the hollow channel (1.a, 3.a, 7.a, 14.a, 5.a, 33.ho, 33.io) of all of the abutments (33.h, 33.u, 33.i) of the two-piece, custom, abutments and impression posts (33.e, 33.m, 33.z, 33.n) and of the one-piece, custom, abutments (1.g, 3.r) and impression posts (7.b, 14.b, 5.b). The diameter of the head (8.gb) of the long retention screw (8.g) is larger than the maximum diameter of the hollow channel (7.a) and the diameter of the

thread (8.ga) of the long retention screw (8.g) is smaller than the one of the bottom part, of the hollow channel (7.i) of the one piece straight custom open tray impression posts (7.b).

12. An isolation cap (8.a, 8.b) of the hollow channel (7.a, 14.a, 5.a), of the one-piece straight, custom, potentially modifiable open tray impression post (7.b) and of the one-piece straight and angulated, custom, potentially modifiable closed tray impression post (14.b, 5.b) as referred to in embodiment 1 of this example, that is a one-piece solid cylinder of variable section (Fig. 8A-8G) made out of a material with small elasticity that descriptively comprises two parts (8.ag, 8.ab, 8.bg, 8.ba) as one piece (Figs. 8A-8G). The first part (8.ab, 8.ba) is conical and has a diameter that increases gradually in a manner that allows the friction fit of it (8.ab, 8.ba) with the impression post (7.b, 14.b, 5.b) isolating (16.b) at the same time its hollow channel (7.a, 14.a, 5.a). The second part (8.ag, 8.bg) is a convex cylinder of variable section with hemispherical head (Fig. 8A-8G) and diameter larger than the maximum diameter of the impression post hollow channel (7.a, 14.a, 5.a) but at the same time smaller or equal to the diameter of the upper surface of the polymorphic part (7.p, 14.f, 5.f). The isolation cap (8.a, 8.b) as a whole, but also its two parts (8.ab, 8.ba, 8.ag, 8.bg) separately, have a height and diameter that varies.

13. An isolation cap (8.u) of the hollow channel (1.a, 3.a, 7.a, 14.a, 5.a), of the one-piece straight and angulated, custom, potentially modifiable abutments (1.g, 3.r) and one-piece straight, custom, potentially modifiable open tray impression posts (7.b) and one-piece straight and angulated, custom, potentially modifiable closed tray impression posts (14.b, 5.b) as referred to in embodiment 1 of this example, that is a solid cylinder of variable section (Figs. 8A-8G) made out of metal. The bottom part (8.ua) of the metallic isolation cap is a threaded cylinder that couples by threads with the threaded portion of the hollow channel of the custom abutment and impression post (6.l, 6.p, 6.eg, 6.e, 6.r), while the upper part (8.ub) is a convex cylinder with variable section and hemispherical head (Figs. 8A-8G) and a diameter larger than the one of the hollow channel of the custom abutments (1.a, 3.r) and impression posts (7.a, 14.a, 5.a) but at the same time smaller or equal to the diameter of the upper surface of the custom body of the abutments (1.j, 3.j) and of the upper surface of the polymorphic part of the impression posts (7.p, 14.f, 5.f).

14. A verification cap (9.g) for the accuracy of the impression and of the working cast that couples (9.a, 9.b) to the upper portion (14.fb, 5.fb) of the polymorphic part (14.f, 5.f) of the one- piece, straight and angulated closed tray impression posts (14.b, 5.b) as referred to in embodiment 1 of this example, where the verification cap (9.g) is made out of a material with small elasticity and descriptively comprises three parts (9.z, 9.e, 9.d) as one piece (Fig. 9A-9E). The first part (9.z) is a cylinder of variable section which on its external surface presents three vertical convex or curved surfaces (9.za) that separate from each other through three vertical

concave surfaces of smaller radius (9.zb) and all of them are fully corresponded in space with the vertical convex (14.ea, 5.ea) and concave (14.x, 5.x) surfaces of the upper portion of the polymorphic part (14.fb, 5.fb) of the one-piece, straight (14.b) and angulated (5.b), custom, potentially modifiable closed tray impression post and as a consequence of that they are fully corresponded in space with all or some of the flat seats (9.zd, 9.zz) of the prosthetic connection of the impression posts (14.t, 5.t). The internal surface of the first part of the verification cap (9.z) consists the exact negative replication (9.k, 9.l, 9.m, Fig. 9E section A-A) of the external surface of the upper part of the polymorphic part (14.fb, 5.fb) from the portion of the horizontal concave surface (14.z, 5.z) that is located at the middle portion of it to the upper end of it (14.f, 5.f, Fig. 9D, 9.b). The second part of the verification cap (9.e) is a solid cylinder with a radius that is equal or larger than the one of the first part (9.z). The third part of the verification cap (9.d) is a cube of variable section that is descriptively divided in two parts, upper (9.u) and lower (9.i). The lower part (9.i) is solid and has a diameter that is smaller than the one of the upper part (9.u) and at the same time equal or smaller than the one of the cylinder (9.e). The upper part (9.u) has a diameter that is smaller, or equal, or larger than the one of the cylinder (9.e) and presents one or two open bores (9.h) on two and or on all four of its sidewalls (Figs. 9A-9E).

15. A custom abutment cap (33.ha) that snaps on the pillar of a straight or angulated abutment (33.hb, 33.ib) aiming to the fabrication of a two-piece straight (33.e) and angulated (33.m), custom, potentially modifiable abutment. The custom abutment cap (33.ha) couples onto the abutment pillar (33.hb, 33.ib) through a blind bore with length equal to the height of the pillar (33.hb, 33.ib) that has its open bore on its bottom part. The custom abutment cap (33.ha) descriptively comprises a core (33.aa) that is a pillar with stable or variable section and regular or irregular surfaces that are polished or rough and it has a shape that is cylindrical or cylindrical with one flat seat, or polyhedron where the flat seat or seats are fully aligned in space with one or more of the flat seats of the prosthetic connection (33.je, 33.oe) of the abutment (33.e, 33.i). The core (33.aa) of the custom abutment cap (33.ha) extends in height from the upper surface of the abutment shoulder (33.jg, 33.og) to the upper border of the abutment pillar or further than the latter (33.jh, 33.oa). The inner surface of the core (33.aa) is the exact negative replication of the external surface, or and part of the upper portion of the hollow channel (33.jb, 33.ou) of the abutment pillar (33.ab, 33.hb, 33.ib), providing for the stable and precise coupling of the two parts together (33.ba, 33.ka) with friction fit, or with snap on fit (34.za) through a convex surface with curved borders (34.ea) that has on its inner surface bottom part in proximity to its bottom end (34.e) and which consists the exact negative replication of a concave with curved borders grove (34.eb) that exists on the corresponding location of the abutment pillar in proximity to the abutment shoulder (34.e). The second part of the custom abutment cap (33.hg) is mechanically

and or chemically integrated to the core (33.aa) and it covers the latter height wise completely or partially and it is made out of curable biocompatible material and has an oval shape, gradually expandable laterally upwards, with symmetrical, or asymmetrical section and regular surfaces.

16. A custom impression abutment cap (33.ua) that couples on the pillar of a straight or angulated abutment (33.ub, 33.ib) for the fabrication of a two-piece straight (33.z) and angulated (33.n), custom, potentially modifiable impression post. The custom impression abutment cap (33.ua) couples onto the abutment pillar (33.ub, 33.ib) through a blind bore with length equal to the height of the pillar (33.ub, 33.ib) that has its open bore on its bottom part. The custom impression abutment cap (33.ua) descriptively comprises a core (33.ga) that is mechanically and or chemically integrated as one piece to the custom body (33.ug) of the impression abutment cap. The core (33.ga) is a post with variable section that descriptively is divided in two parts as one piece (33.ia, 33.ib). The first part (33.ia) is a pillar that is cylindrical or cylindrical with one flat seat, or polyhedron where the flat seat or seats are fully aligned in space with one or more of the flat seats of the prosthetic connection (33.je, 33.oe) of the abutment (33.u, 33.j, 33.i, 33.o). The pillar (33.ia) has a stable or variable section and regular or irregular external surface that is polished or rough while it internal surface is the exact negative replication of the external surface or and part of the upper portion of the hollow channel (33.jb, 33.ou) of the abutment pillar (33.ub, 33.ib), providing for the stable and precise coupling of the two parts (33.ga, 33.ub, 33.ib) together (33.d, 33.l) with friction fit, or and with snap on fit (34.za) through a convex surface with curved borders (34.ea) that has on its inner surface bottom part (34.e) in proximity to its bottom end and which consists the exact negative replication of a concave with curved borders grove (34.eb) that exists on the corresponding location of the abutment pillar in proximity to the abutment shoulder (34.e). The second part (33.ib) of the core is a cylinder of variable section with three vertical curved surfaces (33.ih) that separate from each other through three vertical convex surfaces of smaller radius (33.id). Each of the three vertical curved surfaces (33.ih) is fully aligned in space with one or more of the flat seats (4.k) of the prosthetic connection (33.je, 33.oe) of the abutment (33.u, 33.i). Each of the three vertical curved surfaces (33.ih) of the cylinder (33.ib) is divided in two convex parts, upper (33.ie) and lower (33.iz) through a horizontal convex surface of smaller radius (33.ig) located at their mid-portion (Fig. 33). The maximum diameter of the cylinder (33.ib) is smaller or equal or larger than the diameter of the base of the abutment shoulder (33.jk, 33.ok). The horizontal convex surface (33.ig) has a diameter that is smaller, or equal, or larger than the one of the pillar (33.ia). The cylinder (33.ib) as a whole has a polished or rough surface and its height varies from three to twenty millimeters. Each of the vertical curved (33.ih), and or convex (33.id) surfaces of the cylinder (33.ib) is fully aligned in space with at least one of the flat seats (4.k) of the prosthetic connection of the

abutment (33.je, 33.oe). The core (33.ga) has the same angulations towards the vertical with the abutment pillar (33.ub, 33.ib). The second part of the custom impression abutment cap (33.ug) is integrated mechanically and or chemically with the core (33.ga) and it partially or completely covers its bottom part (33.ia), height wise. It is made out of a curable biocompatible material and has an oval shape, gradually expandable laterally upwards, with symmetrical or asymmetrical section and regular surfaces.

17. A mold (12.a) and the methodology involved for the mass production of the one-piece and two-piece, straight and angulated, custom, potentially modifiable abutments (1.g, 33.e, 3.r, 33.m) and one-piece and two-piece, straight and angulated, custom, potentially modifiable closed tray impression posts (14.b, 33.z, 5.b, 33.n) and one-piece, straight, custom, potentially modifiable open tray impression posts (7.b) as referred to in embodiment 1 of this example, where the mold (12.a) comprises a base (12.i) with open wells (12.ba, 12.ea, 12.za, 12.ha, 12.da) that receive within them the cores of the straight and angulated custom potentially modifiable abutments and impression posts (Figs. 2A-2E, 4A-4F, 10A-10I, 34A-34F) and allow the stable coupling with the latter. The open wells (12.ba, 12.ea, 12.za, 12.ha, 12.da) comprise the exact negative replication of the straight and angulated, custom, potentially modifiable abutments and impression posts (Figs. 6A-6I) from their prosthetic connection (1.p, 3.p, 14.t, 5.t, 7.t, 33.je, 33.oe,) up to the upper border of their custom body (1.j, 3.j, 14.r, 5.r, 7.r, 33.ug, 33.hg). The base of the mold (12.i) incorporates channels (12.g) that allow the free flow of flow-able biocompatible material aiming to the filling of the open space available between the pillar of the core of the custom body of the abutments and of the impression posts (1.k, 3.d, 5.u, 7.l, 14.u, 33.ba, 33.ka, 33.da, 33.la) and the sidewalls of the wells (12.k). The base of the mold (12.i) is completely sealed by the upper part of the mold (12.ab) through coupling of cylindrical pillars of variable sections (12.u) and following the process of flow of the biocompatible material (1.z, 3.e, 14.h, 5.h, 7.k, 33.hg, 33.ug) through the channels (12.g) of the base (12.i) into the wells (12.ba, 12.ea, 12.za, 12.ha, 12.da) takes place in a secure manner. After the curing and setting of the biocompatible material is complete the two parts of the mold (12.i, 12.ab) uncouple and following this the fabricated one-piece and two-piece, straight and angulated, custom, potentially modifiable abutments and impression posts (1.g, 3.r, 14.b, 5.b, 7.b, 33.e, 33.z, 33.m, 33.n, Figs. 6A-6I, Figs. 13A-13I) are removed from the base of the mold (12.i).

18. A system of selection of size and shape of custom abutment and identification and marking of the point of initiation of the implant osteotomy in the alveolar ridge (35.a) as referred to in embodiment 1 of this example, where the system (35.a) comprises a handle (35.ba), a second retention part (35.bg), a cylindrical tube (35.bd) and a part that is the replica of the custom abutment (35.be) that all of them are fabricated by the same or different material and is

metal or ceramic, or plastic. The handle (35.ba) is a solid cylinder with variable section and of which the one free end is the negative replication of the inner surface of the retention part (35.bg) and has a concave groove that receives an elastomeric o-ring (35.bb). The retention part (35.bg) is a cylinder with a variable section that snaps on one of the free ends of the handle (35.ba) with the use of an elastomeric o-ring (35.bb). The retention part (35.bg) on its free end has a blind threaded bore that couples by threads with one of the ends of a cylindrical tube (35.bd). This cylindrical tube has a threaded portion on both of its free ends. One of the free ends of the cylindrical tube (35.bd) couples by threads with the blind bore of the retention part (35.bg), or is connected as one piece with it, while its other part receives and couples by threads with the threaded portion of a blind bore (35.bz) present on the replica of the custom abutment part (35.be). The cylindrical tube (35.bd) is straight or curved. The replica of the custom abutment part (35.be) has a blind threaded bore (35.bz) on one or more of its sidewalls. The replica of the custom abutment (35.be) has sidewalls that are flat or curved and it also has an upper and lower surface that is flat or curved. The upper and lower surface of the custom abutment replica (35.be) have two visible lines that are perpendicular to each other and intersect the top and bottom surfaces at their mid-portion. The custom abutment replica part (35.be) has one or more hollow channels (35.bh) that has its two open bores located at the center, or off center of its top and bottom surface. The shape of the custom abutment replica part (35.be) is cylindrical (35.d) or oval (35.g), symmetrical or asymmetrical (Fig. 35) and its dimensions vary, replicating in shape and dimensions the shape and dimension of one (35.g, 35.d) or more custom abutments connected to each other in different combinations (35.e).

19. A method of use of the one-piece and two-piece, straight and angulated, custom, potentially modifiable abutments (1.g, 33.e, 3.r, 33.m) for the generation of a custom gingival emergence profile around an implant (2.z, Fig. 15) and/or for the support of a temporary prosthesis after their modification to temporary abutments (Fig. 29), where the method includes:

- The availability and use of a system (35.a) of selection of shape and size of custom abutments for the identification of the ideal position for the initiation of the implant osteotomy in the alveolar process and for the identification of the proper size and shape custom abutment that will be utilized on this specific edentulous space (Fig. 36), as referred to in embodiment 1 of this example.
- The availability and use of a one-piece or two-piece, straight and or angulated, custom, potentially modifiable abutment (1.g, 33.e, 3.r, 33.m) as referred to in embodiment 1 of this example.
- The coupling of the straight (15.bb, 15.bd) and or angulated (15.ba, 15.bg) custom potentially modifiable abutments with the implants that present parallel (15.ab, 15.ad) or angulated

(15.aa, 15.ag) inclination towards the long axis of the final implant prosthesis respectively with the use of short retention screws (8.d).

- The uncoupling of the custom abutments (15.bb, 15.bd, 15.ba, 15.bg) before the initiation of the next steps of the implant treatment process and the reveal of a custom gingival emergence profile around the implant platforms (15.gb, 15.gd, 15.ga, 15.gg).
- The intra-oral abrasion-preparation (29.a) of the supra-gingival part (29.b) of the custom potentially modifiable abutment (1.g, 3.r, 33.e, 33.m) by the dentist according to the basic principles as per tooth abrasion-preparation.
- The fabrication and installation of a temporary prosthesis (29.d) that couples onto the supra-gingival part of the abraded-prepped custom abutment (29.e) with the use of bonding agents (29.h) intra-orally (29.u).

20. A method of use of the one-piece and two-piece, straight (1.g, 33.e) and angulated (3.r, 33.m), custom, potentially modifiable abutments for the generation of a digital impression (Fig. 20), where the method includes:

- The availability and use of a one-piece or two-piece, straight (1.g, 33.e) and or angulated (3.r, 33.m), custom, potentially modifiable abutment that have a core pillar with polyhedron shape (6.k, 6.a, 33.ba, 33.ka), as referred to in embodiment 1 of this example.
- The coupling of the straight (1.g, 33.e) and or angulated (3.r, 33.m) custom potentially modifiable abutments with the implant (2.z) in the mouth (20.a) with short retention screws (8.d).
- The intra-oral scanning of the straight (1.g, 33.e) and or angulated (3.r, 33.m) custom potentially modifiable abutments with a digital scanner (20.b).
- The generation of a digital impression through the use of appropriate software in a pc (20.g) that takes under the dimensions and the angulations of the custom abutment (1.g, 33.e, 3.r, 33.m) in space, but it can also detect the location and the orientation of the prosthetic connection of the implant (2.p) in space corresponding the latter with the flat seats of the polyhedron pillar (6.o, 6.z) that they are fully re-aligned with the flat seats of the prosthetic connection of the custom abutment (6.i, 6.u) that couple with the flat seats of the prosthetic connection (2.p) of the implant (2.z).
- The fabrication of prosthesis with the utilization of digital CAD-CAM technology directed by the information of the digital impression (20.g).

21. A method of use of the one-piece straight (14.b) and angulated (5.b), custom, potentially modifiable closed tray impression posts as referred to in embodiment 1 of this example, where the method includes:

- The availability and use of the one-piece straight (14.b) and angulated (5.b), custom potentially modifiable closed tray impression posts
- The coupling of the straight custom potentially modifiable closed tray impression posts (16.ab, 16.ad) with implants presenting an angulations that is parallel towards the long axis of the final prosthesis; and the coupling of the angulated, custom, potentially modifiable closed tray impression posts (16.aa, 16.ag) with implants presenting the same degrees of angulations towards the long axis of the final prosthesis as per the angulations of the prosthetic connection of the impression post towards its custom body and polymorphic part (Fig. 16, 16.a).
- The isolation of the hollow channel (14.a, 5.a) of the impression posts (14.b, 5.b) with the installation of an isolation cap (8.a) on their open bore (16.bz, 16.bu, 16.be, 16.bh).
- The establishment of an artificial grove by abrasion (16.bb, 16.bd, 16.bg, 16.ba) on one of the supra-gingival surfaces of the custom body (14.g, 5.g) of the impression posts (14.b, 5.b) to establish a single surface with distinct difference in shape and volume from the rest of the surfaces of the custom body (Fig. 16, 16.b).
- The impression taking with the use of a solid impression tray filled with impression material (16.g).
- The removal of the impression tray from the mouth after the curing and setting of the impression material (16.g) is complete and following the removal of the isolation caps (16.bz, 16.bu, 16.be, 16.bh) from the impression posts (16.ab, 16.ad, 16.aa, 16.ag) and following the removal of the retention screws (8.d) and subsequent uncoupling of the impression posts (16.ab, 16.ad, 16.aa, 16.ag) from the implants (15.ab, 15.ad, 15.aa, 15.ag).
- The coupling of the impression posts with appropriate implant analogs and their installation into their negative replication (18.ad, 18.ab, 18.aa, 18.ag) into the impression (18.a), oriented by the negative replication of the artificial grove (18.ba).
- The introduction of silicone mask (18.ga) around the part of the impression posts that is free of impression material into the impression (18.ag).
- The pouring of gypsum into the impression (19.aa) and following the setting of the latter the uncoupling of the impression and the generation of the working cast (19.g).
- Following this,, the uncoupling of the impression posts from the implant analogs that are embedded into the working cast and the subsequent reveal of a working cast that incorporates all the information regarding the orientation of the prosthetic connection of the implants (2.p), the location of the prosthetic platform (2.o) and the gingival emergence profile developed around the latter (19.b).

22. A method of use of the two-piece straight (33.z) and angulated (33.n), custom, potentially modifiable closed tray impression posts as referred to in embodiment 1 of this example, where the method includes:

- The availability and use of the two pieces straight (33.z) and angulated (33.n), custom potentially modifiable closed tray impression posts.
- The coupling of the straight, custom, potentially modifiable closed tray impression posts (33.z) with implants presenting an angulations that is parallel towards the long axis of the final prosthesis (15.gb, 15.gd); and the coupling of the angulated custom potentially modifiable closed tray impression posts (33.n) with implants presenting the same degrees of angulations towards the long axis of the final prosthesis as per the angulations of the prosthetic connection of the impression post towards its custom body (15.aa, 15.ag).
- The impression taking with the use of a solid impression tray filled with impression material (16.g).
- The removal of the impression tray from the mouth after the curing and setting of the impression material is complete, with the custom impression abutment caps (33.ua) being embedded into the impression material.
- The uncoupling of the abutments (33.u, 33.i) from the implants with removal of their retention screws (8.d) and following coupling of them with corresponding implant analogs.
- The coupling of the system abutment-implant analog into the corresponding custom impression abutment caps that are embedded into the impression (18.g).
- The introduction of silicone mask (18.ga) around the part of the impression posts that is free of impression material into the impression (18.g).
- The pouring of the impression with gypsum (19.aa) and following the setting of the latter the uncoupling of the impression from the generated working gypsum cast (19.g).
- Following this pouring, the uncoupling of the two pieces impression posts (33.z, 33.n) from the implant analogs that are embedded into the gypsum and the reveal of a working cast that incorporates all the information regarding the orientation of the implant prosthetic connection (2.p), the location of the implant platform (2.o) and the developed gingival emergence profile around the latter (19.b).

23. A method of use of the one-piece straight, custom, potentially modifiable open tray impression posts (7.b) as referred to in embodiment 1 of this example, where the method includes:

- The availability and use of the one-piece straight, custom, potentially modifiable open tray impression posts (7.b) as referred to in embodiment 1 of this example.

- The coupling of the custom impression post (21.g) with an implant (21.b) in the mouth with the use of a short (21.d, 8.d) or long (8.g) retention screw.
- The isolation (21.h) of the hollow channel (7.a) of the impression post (21.g) with an isolation cap coupled to the open bore (21.e) of its hollow channel (21.z), in the event that a short retention screw has been used (21.d).
- The impression taking with the use of an impression tray (22.a) filled with impression material that has an open bore on its bottom surface (22.b) in a location that corresponds to the location and angulations of the axis of the impression post (21.g) in the mouth.
- The uncoupling of the isolation cap (22.z) from the impression post after the impression material is cured and set (22.d, 22.u) and following the removal of the short retention screw (22.k) of the impression post (21.e), or alternatively the immediate removal of the long retention screw (8.g) from the impression post (21.e).
- The removal of the impression tray with the impression material as one piece (23.b) from the mouth (23.g), where the custom open tray impression post (23.a) is found embedded within the impression material.
- The coupling of a corresponding implant analog (23.d) with the impression post (23.e) and following the introduction (24.a) of silicone mask (24.b, 24.d) around the part of the impression posts that is free of impression material (24.g) into the impression (23.b).
- The pouring of the impression (24.z) with gypsum (24.e) and following the setting of the latter the uncoupling of the impression and the custom impression posts from the generated working gypsum cast (24.u) that incorporates all the information regarding the orientation of the implant prosthetic connection (2.p), the location of the implant platform (2.o) and the developed gingival emergence profile around the latter (23.g).

24. A method of modification of the one-piece, straight, custom, potentially modifiable open tray impression posts and of the one-piece straight and angulated, custom, potentially modifiable closed tray impression posts to temporary abutments (Figs. 25, 26, 27, 28), as referred to in embodiment 1 of this example, where the method involves:

- The availability and use of one-piece straight and angulated, custom, potentially modifiable closed tray impression posts (7.b, 14.b, 5.b) and one-piece, straight, custom, potentially modifiable open tray impression posts, as referred to in embodiment 1 of this example.
- Following the implant impression stage and the generation of the gypsum working cast (Fig. 25) the polymorphic part (7.p, 14.f, 5.f) of the impression posts is severed apart by abrasion (25.a, 25.m) from the rest of the body of the impression posts (25.b, 25.g) that are coupled with the implant analogs on the working cast (Fig. 25).

- The proper modification of the supra-gingival part and following utilization (Fig. 25) of the modified custom impression post (26.b) as a temporary abutment that can support a temporary implant prosthesis (26.a) fitted on its supra-gingival portion (25.k), that this temporary prosthesis is fabricated directly by the dental technician following analogical methodology, or digitally by a CAD-CAM technology machine after their digital scanning (Fig. 27).
- The installation of the temporary prosthesis (26.d) with intra-oral (26.z) bonding of it onto the modified impression posts (26.e) that are coupled with the implants, or alternatively the extra-oral bonding of the prosthesis onto the modified impression posts (28.b) and following the coupling of the system modified impression posts – temporary prosthesis with the implants (28.g) in the mouth (Fig. 28) with the use of short retention screws (28.a).

25. A method of use of the verification cap (9.g) of the implant impression and working cast accuracy, where the method involves:

- The availability and use of one-piece straight (14.b) and angulated (5.b), custom, potentially modifiable closed tray impression posts, as referred to in embodiment 1 of this example.
- The coupling of the impression posts with the implants in the mouth, the isolation of their hollow channel with the isolation caps, the impression taking and following the removal of the impression and of the isolation caps from the mouth (Figs. 15, 16).
- The coupling of the verification caps (17.aa) with the upper portion of the polymorphic part of all of the impression posts (17.a).
- The connection of all of the verification caps to each other with floss, or wire, or rod (17.ba) that passes through their open bores (9.h) located at their third, top part.
- The introduction of curable material (17.ga) onto and around the top third part (9.d) of the verification caps (17.aa) and the floss, or wire, or rod (17.ba) that interconnects them.
- Following the curing and setting of the curable material (17.ga) all the verification caps (17.aa) are interconnected and are uncoupled from the impression posts as a one piece superstructure (17.da) that we call implant impression and working cast verification jig (17.d).
- Following the generation of the working cast (19.b) from the impression (18.a, 18.g, 19.a, 19.b) the dental technician couples the impression posts (19.ga) with the implant analogs embedded into the working cast and following couples the verification jig (19.gb) with all of the impression posts on the working cast (19.d).
- The accurate fit of the verification jig with all of the impression posts verifies the accuracy of the impression and of the working cast fabricated by the latter (19.d).
- In case the verification jig does not fit accurately with one or some of the impression posts (32.aa), the dental technician uncouples the verification jig (32.b) and following uncouples

the specific impression posts along with the implant analogs they are connected from the working cast (32.b) and following this he couples them to the verification jig outside of the working cast. Following this, he couples the verification jig also with the rest of the impression posts on to the working cast (32.g) and stabilizes the removed impression posts-implant analogs to their new position into the working cast by pouring and letting set new gypsum (32.da) around the body (32.d) of the implant analogs. Following this the set of the gypsum the dental technician uncouples the verification jig from the impression post (32.e).

- The lab technician fabricates on this new verified working cast the final prosthesis that fits accurately with all of the implants in the mouth (19.e).

26. A set to be used for the fabrication and use of the one-piece and two-piece, straight (1.g, 33.e) and angulated (3.r, 33.m), custom, potentially modifiable abutments and one piece and two pieces, straight (14.b, 33.z) and angulated (5.b, 33.n), custom potentially modifiable closed tray impression posts and one-piece, straight (7.b) custom potentially modifiable open tray impression posts as referred in embodiment 1 of this example, where the set includes:

- One-piece, straight (1.g, 33.e) and angulated (3.r, 33.m), custom, potentially modifiable abutments.
- One-piece, straight, custom, potentially modifiable open tray impression posts (7.b).
- One and two-piece, straight (14.b, 33.z) and angulated (5.b, 33.n), custom potentially modifiable closed tray impression posts.
- Custom abutment cap (33.ha).
- Custom impression abutment cap (33.ua).
- Short (8.d) and long (8.g) retention screws.
- Elastic (8.a, 8.b) and metallic (8.u) isolation caps of the hollow channel (1.a, 3.a, 7.a, 14.a, 5.a) of the one-piece, straight (1.g) and angulated (3.r), custom, potentially modifiable abutments and of the hollow channel of the one-piece, straight, custom, potentially modifiable open tray impression posts (7.b) and of the hollow channel of the one-piece, straight (14.b) and angulated (5.b), custom, potentially modifiable closed tray impression posts.
- Verification caps (9.g) for the accuracy verification of the impression (18.a) and the working cast (19.b) generated by the latter.
- A mold (12.a) for the mass production of the one-piece and two-piece, straight (1.g, 33.e) and angulated (3.r, 33.m), custom potentially modifiable abutments and one-piece and two-piece, straight (14.b, 33.z) and angulated (5.b, 33.n), custom potentially modifiable closed tray impression posts and one-piece, straight custom potentially modifiable open tray impression posts (7.b).

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- Straight and angulated abutments and impression posts that function as cores (Figs. 10A-10I) for the fabrication of the one and two pieces, custom, potentially modifiable, abutments and impression posts (Figs. 10A-10I, 13A-13I).
- Abutment cap (33.aa) that snaps on the pillar of a straight or angulated abutment (33.hb, 33.ib) and functions as a core (33.ba, 33.ka) for the fabrication of the custom abutment cap (33.hg).
- Abutment impression cap (33.ga) that snaps on the pillar of a straight or angulated abutment (33.ub, 33.ib) and functions as a core (33.da, 33.la) for the fabrication of the custom impression abutment cap (33.ua).
- Customizable, biocompatible material with radio-opaque properties and ability to be digitally scanned and functions as the customizable part (1.z, 3.e, 7.k, 14.h, 5.h, 33.hg, 33.ug) of the custom potentially modifiable abutments and impression posts (Figs. 6A-6I, 13A-13I, 33).

The present invention can be embodied in other specific forms without departing from its spirit or essential characteristics. Thus, the described examples, implementations and embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is, therefore, indicated by the appended claims as properly construed rather then by the foregoing descriptions. All changes that come within the meaning and range of equivalency of the claimed subject matter are to be embraced as within the scope of the claims.

INDUSTRIAL APPLICABILITY

This invention is applied herein to the surgical and prosthetic process of dental implant treatment and it is also directed to molds and methods of using molds for the fabrication of custom, modifiable intra-orally and extra-orally, abutments and impression posts that can be used in the surgical and prosthetic stage of dental implant treatment.

CLAIMS

1. A one-piece, custom and modifiable dental abutment that is straight or with a varied degree of angulation with respect to the vertical plane, said custom and modifiable dental abutment comprising,

a straight or angulated prosthetic connection,

a shoulder that is attached to the prosthetic connection, and

a custom body that is attached to the shoulder.

2. A two-piece, custom and modifiable dental abutment that is straight or with a varied degree of angulation with respect to the vertical plane, said custom and modifiable dental abutment comprising,

a core comprising a straight or angulated abutment that comprises a straight or angulated prosthetic connection, a shoulder, and a pillar, and

a custom abutment cap that can attach to the core.

3. A one-piece, custom and modifiable open tray dental impression post that is straight, said custom and modifiable open tray impression post comprising,

a straight prosthetic connection,

a shoulder that is attached to the prosthetic connection,

a custom body that is attached to the shoulder,

a pillar that is free of customizable material that is attached to the custom body, and

a polymorphic part that is attached to the pillar,

said one-piece, custom and modifiable open tray impression post further comprising at least one hollow channel with a top open bore through which a retention screw can pass to attach the one-piece, custom and modifiable open tray impression post to an implant.

4. A one-piece, custom and modifiable closed tray dental impression post that is straight or with a varied degree of angulation with respect to the vertical plane, said custom and modifiable closed tray impression post comprising,

a straight or angulated prosthetic connection,

a shoulder attached to the prosthetic connection,

a custom body attached to the shoulder,

a pillar that is free of customizable material that is attached to the custom body, and

a polymorphic part that is attached to the pillar,

said one-piece, custom and modifiable closed tray impression post further comprising at least one hollow channel with a top open bore through which a retention screw can pass to attach the one-piece, custom and modifiable closed tray impression post to an implant.

5. A two-piece, custom and modifiable closed tray dental impression post that is straight or with varied degrees of angulation with respect to the vertical plane, said custom and modifiable closed tray impression post comprising,

a core comprising a straight or angulated abutment that comprises a straight or angulated prosthetic connection, a shoulder, and a pillar, and

a custom impression abutment cap that can attach to the core,

said two-piece, custom and modifiable closed tray impression post further comprising at least one hollow channel with a top open bore through which a retention screw can pass to attach the two-piece, custom and modifiable closed tray impression post to an implant.

6. A fabrication mold for customized and modifiable dental implant abutments and impression posts that are straight or with varied degrees of angulation with respect to the vertical plane and that comprise a prosthetic connection and a custom body with an upper border, said fabrication mold comprising:

a mold base comprising a plurality of open wells that each receive and couple to a core of an abutment or impression post, said open wells comprising a negative replication of the customized and modifiable dental implant abutment or impression post from their prosthetic connection to the upper border of their custom body,

said mold base further comprising channels through which curable biocompatible material can flow to the open wells, and

an upper part of the mold that couples to the mold base and seals in the curable biocompatible material.

7. A kit for the fabrication of customized and modifiable dental implant abutments and impression posts comprising,

the fabrication mold of claim 6,

a plurality of cores for use in said fabrication mold comprising abutments and impression posts of dental implants,

a plurality of retention screws,

a plurality of abutment caps,

a plurality of impression abutment caps, and

curable biocompatible material.

8. A method of fabricating a customized dental implant abutment or impression post comprising,

attaching a core comprising an abutment or an impression post to the fabrication mold of claim 6 with a retaining screw,

introducing a curable biocompatible material to the fabrication mold,

curing and setting said curable biocompatible material in said fabrication mold,

removing the cured customized and modifiable dental implant abutment or impression post from said fabrication mold by removing the retaining screw,

attaching the customized and modifiable dental implant abutment or impression post to a retention handle, and

modifying said customized and modifiable dental implant abutment or impression post with abrasion and polishing.

9. The method of claim 8 further comprising,

attaching an abutment cap or an impression abutment cap to the core abutment,

removing the cured customized and modifiable abutment cap or impression abutment cap from the core abutment after removing the cured customized and modifiable dental implant abutment from the fabrication mold.

10. A selection guide system for selection of abutments of the proper shape and size and for marking the point of initiation of an implant osteotomy, said system comprising,

a handle,

a retention part attached to the handle,

a cylindrical tube that is attached to the retention part, and

a replica of at least one one-piece or one two-piece, custom and modifiable dental abutment that is attached to the cylindrical tube.

11. A verification jig used for verifying the accuracy of an impression or of a working cast comprising,

a plurality of verification caps, and

a plurality of one-piece, custom and modifiable closed tray dental impression posts of claim 4 that each comprise a polymorphic part that couples with one verification cap.

12. A method for fabricating a customized abutment and/or impression post comprising,

attaching a core comprising an abutment to the fabrication mold of claim 1 with a retaining screw through a hollow channel in the abutment,

attaching an abutment cap or an impression abutment cap to the core,

introducing a curable biocompatible material to the fabrication mold,

curing and setting said curable biocompatible material in the fabrication mold so that a customized cap is formed,

removing the customized cap from the fabrication mold,

removing the retaining screw and the abutment from the fabrication mold,

attaching the customized cap to the abutment to form a customized abutment and/or impression post,

polishing the customized abutment and/or impression post using a retention handle or other holding device.

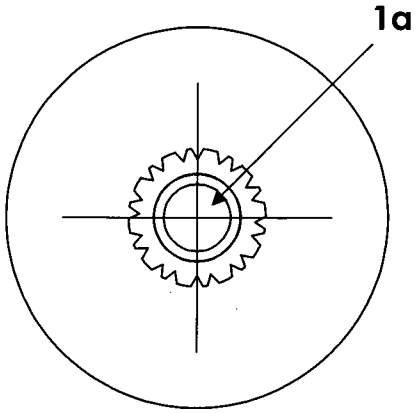


FIG. 1A

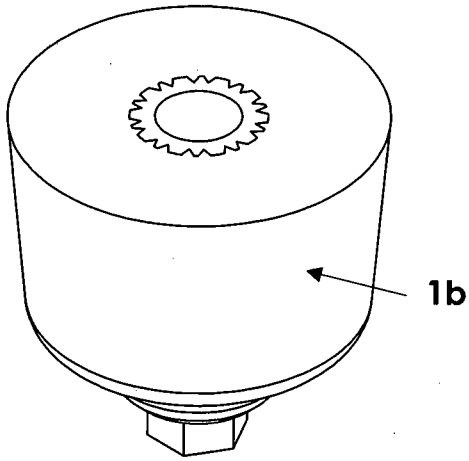


FIG. 1B

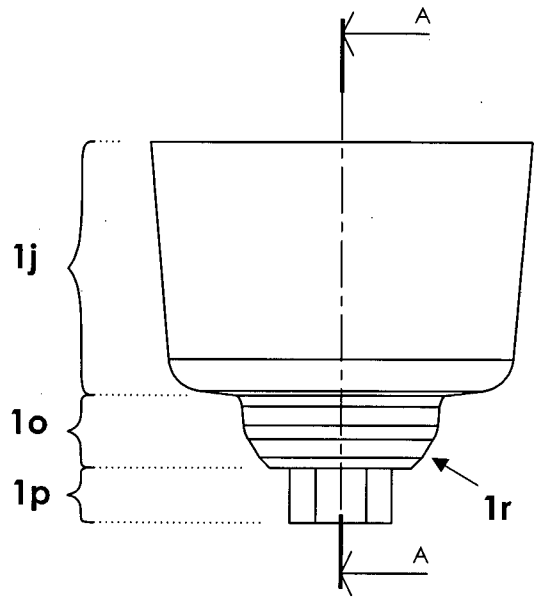


FIG. 1C

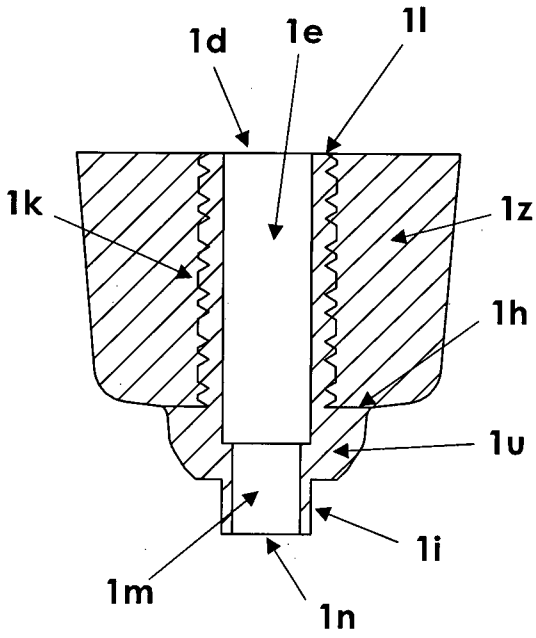


FIG. 1D

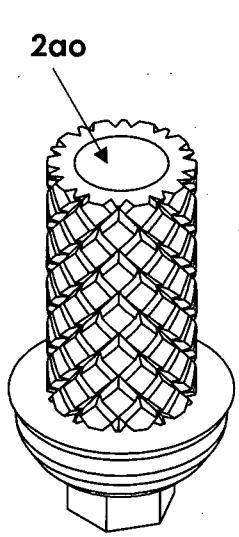


FIG. 2A

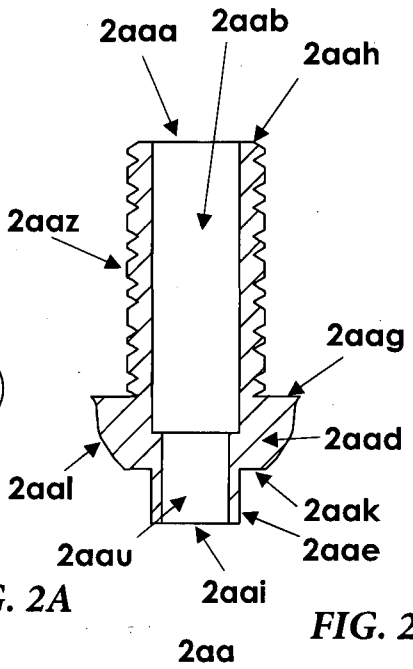


FIG. 2B

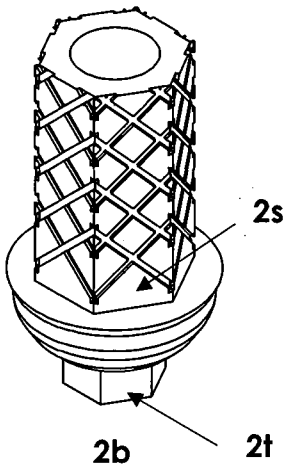


FIG. 2C

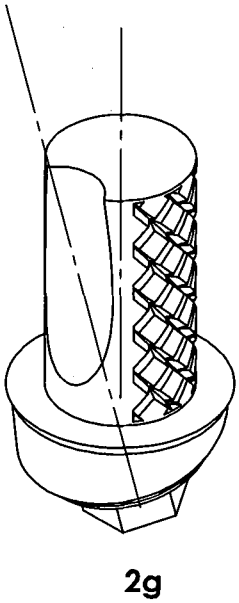


FIG. 2D

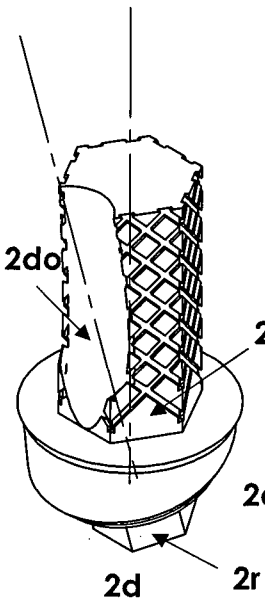


FIG. 2E

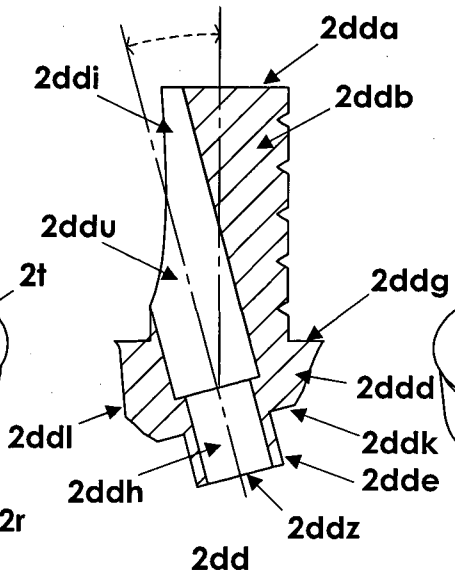


FIG. 2F

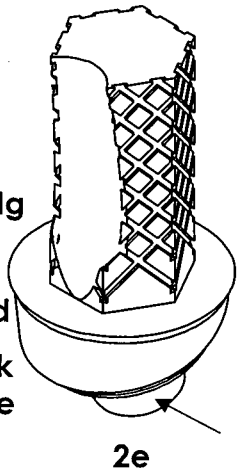


FIG. 2G

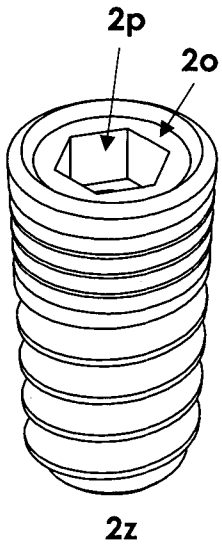


FIG. 2H

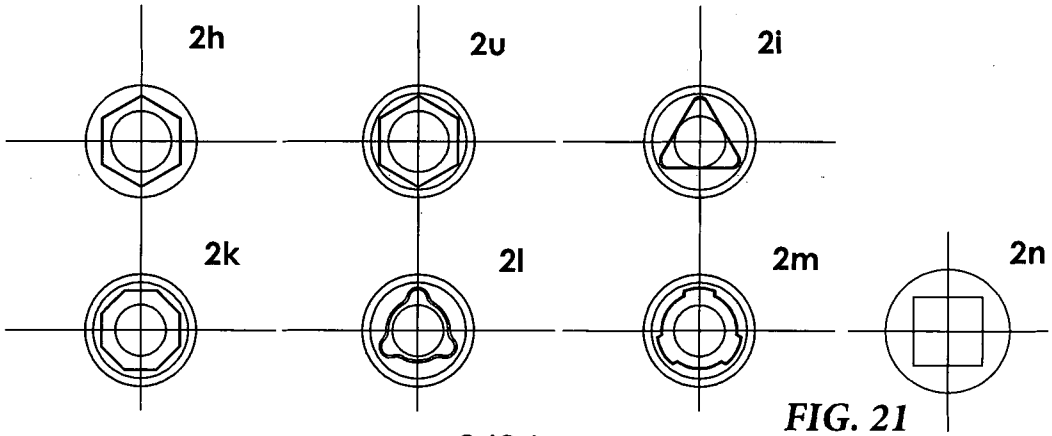


FIG. 21

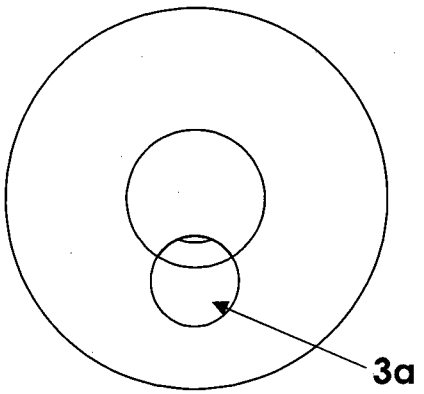


FIG. 3A

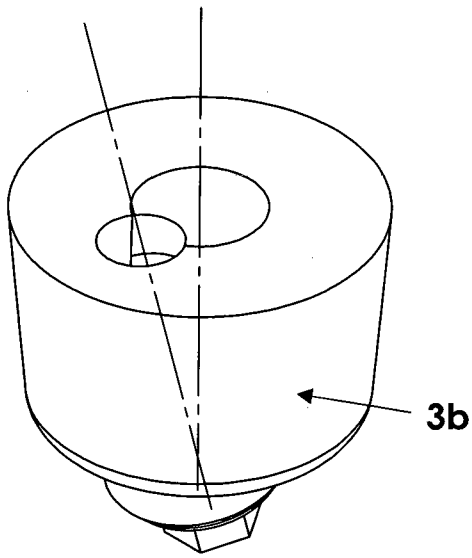


FIG. 3B

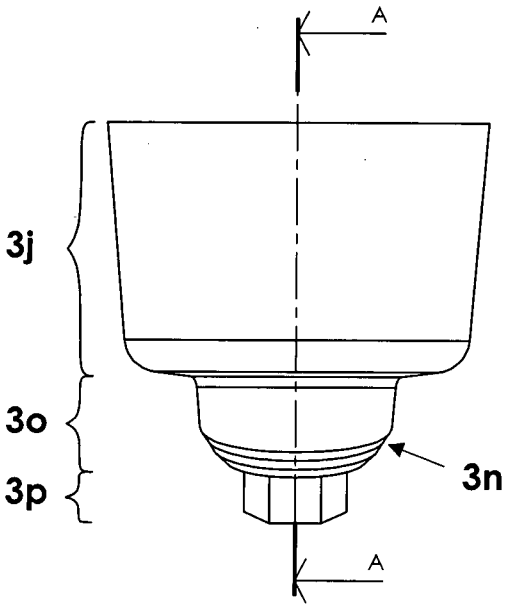


FIG. 3C

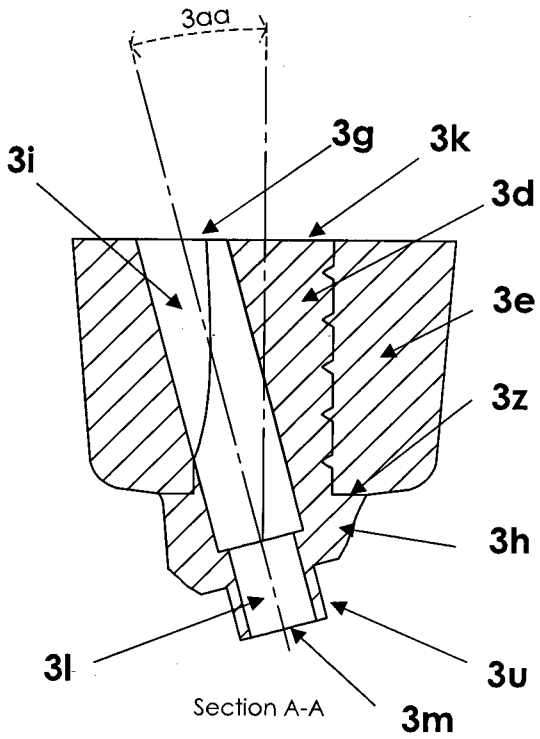


FIG. 3D

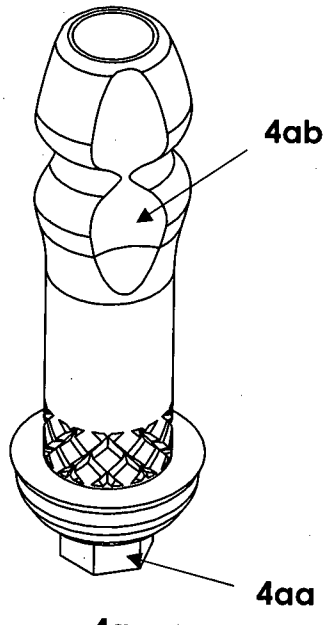


FIG. 4A

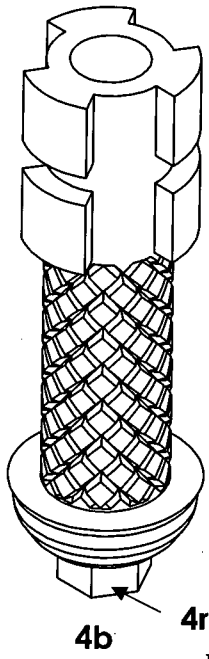


FIG. 4B

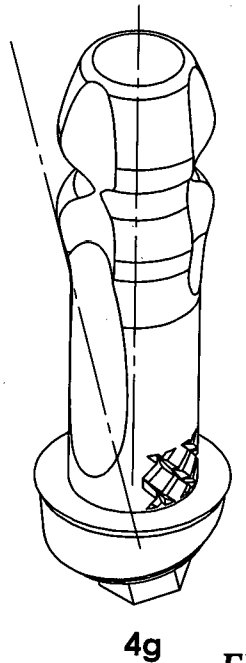


FIG. 4C

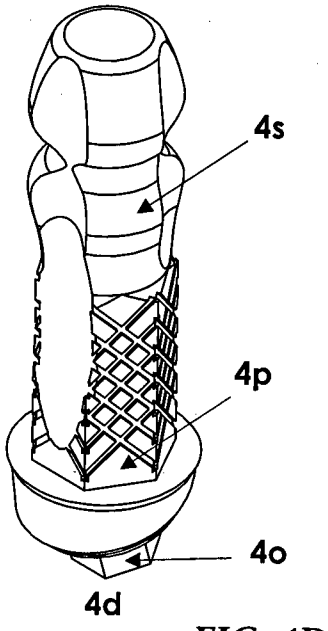


FIG. 4D

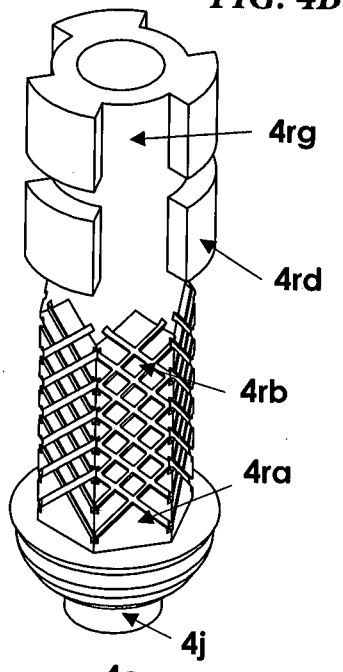


FIG. 4E

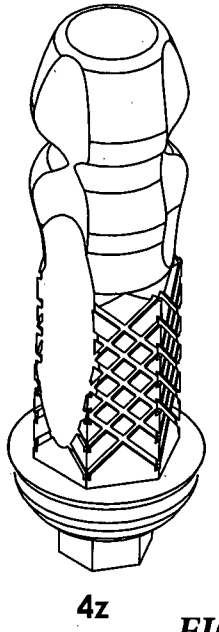


FIG. 4F

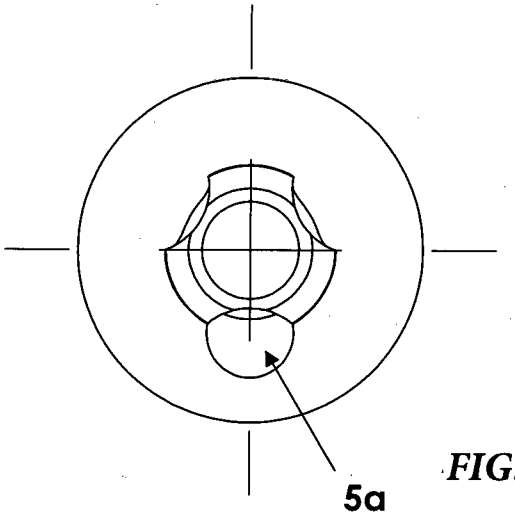


FIG. 5A

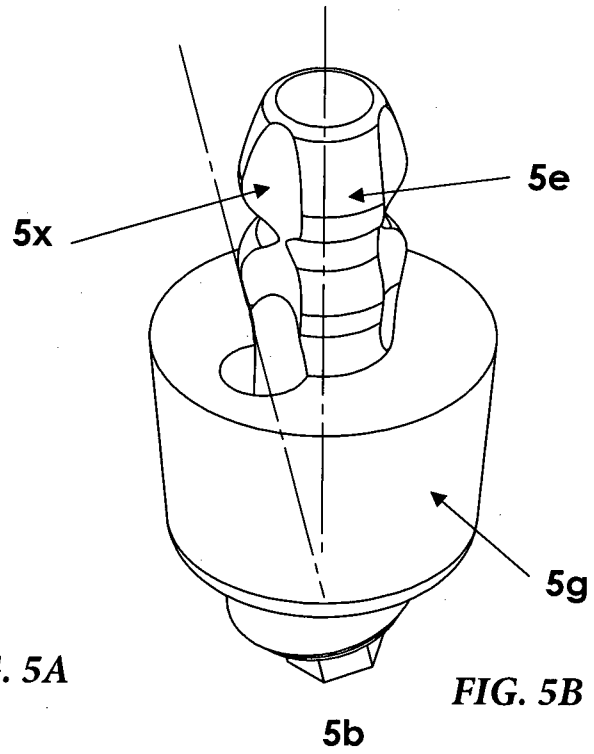


FIG. 5B

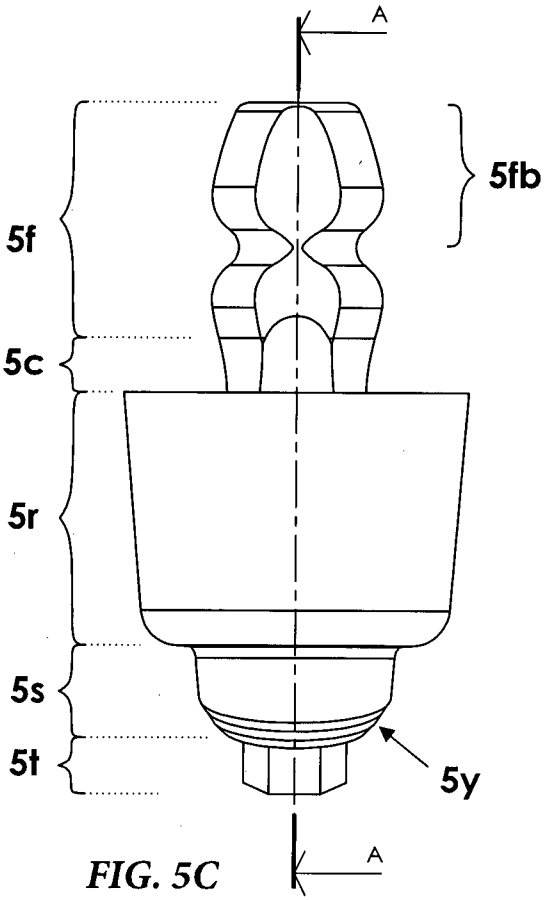


FIG. 5C

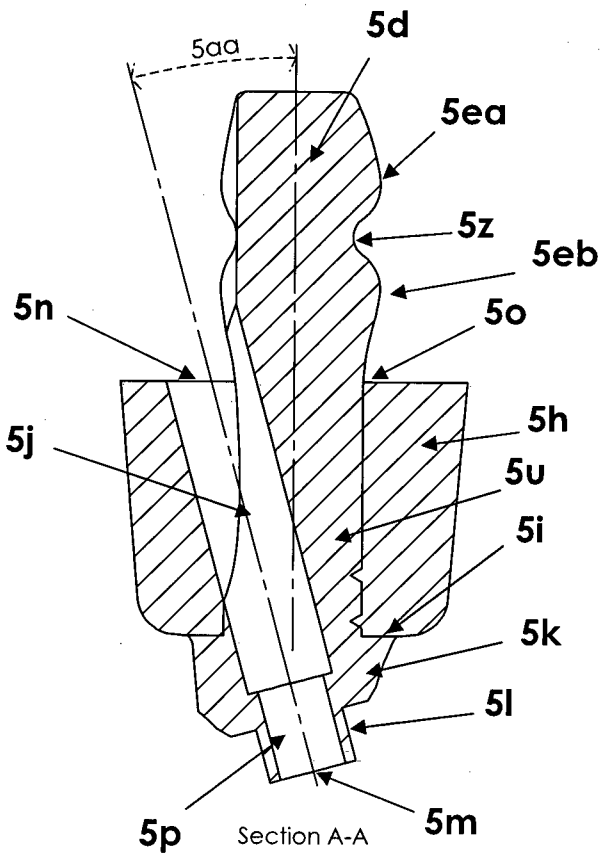


FIG. 5D

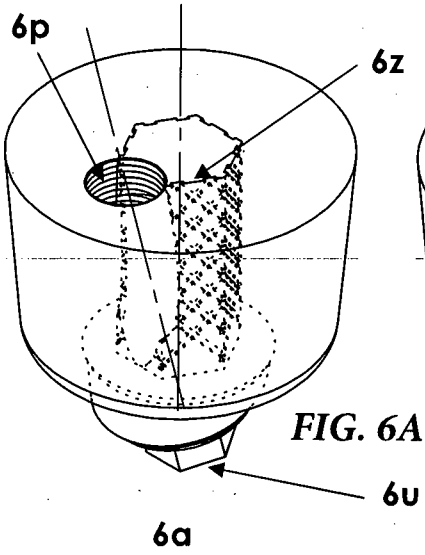


FIG. 6A

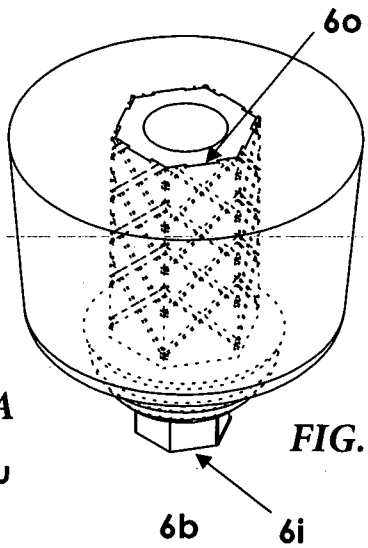


FIG. 6B

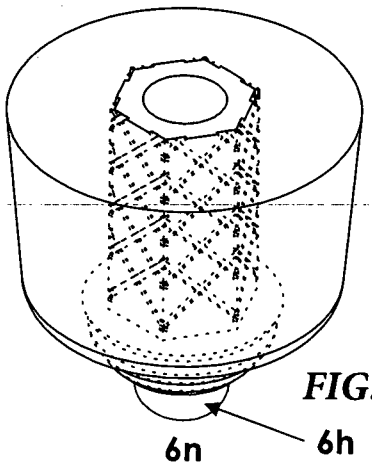


FIG. 6C

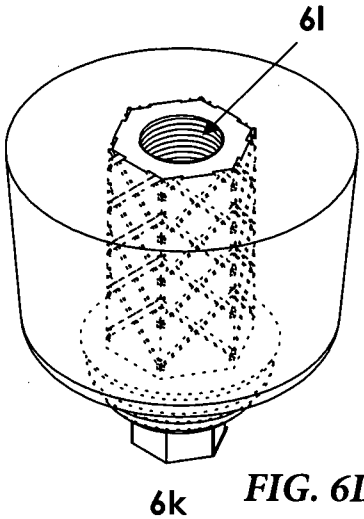


FIG. 6D

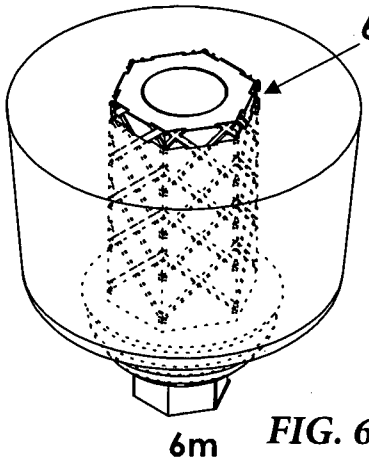


FIG. 6E

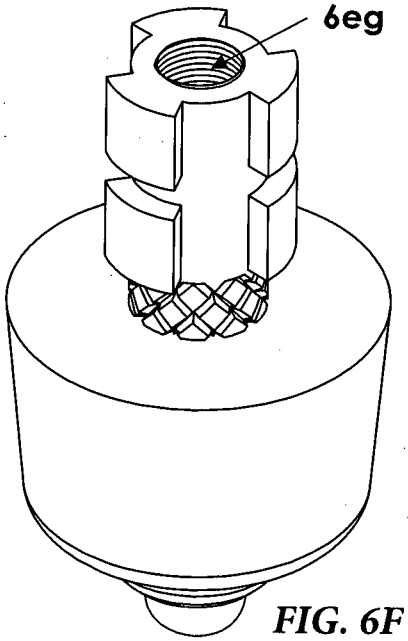


FIG. 6F

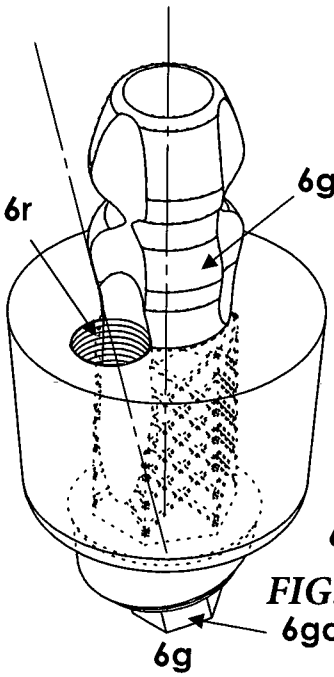


FIG. 6G

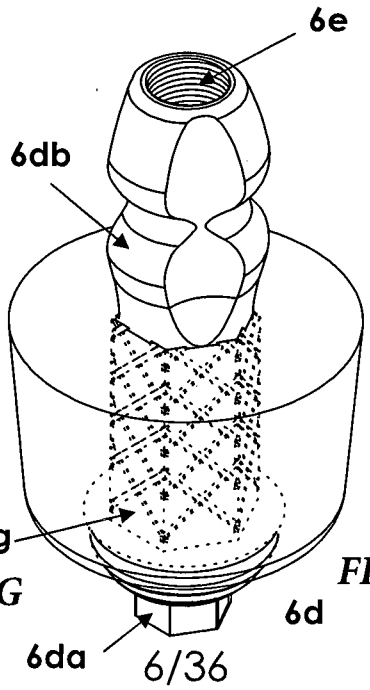


FIG. 6H

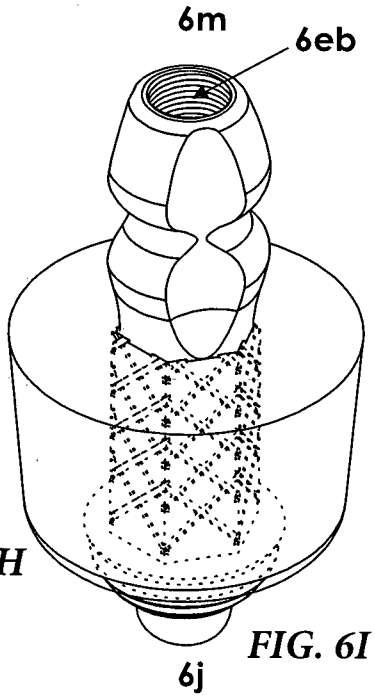


FIG. 6I

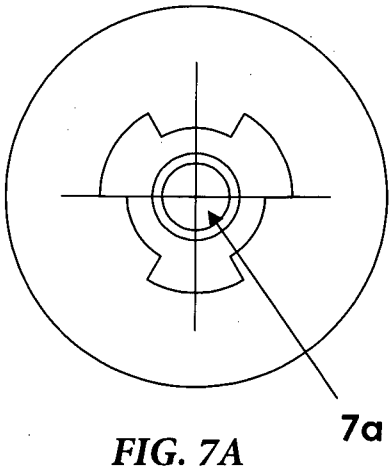


FIG. 7A

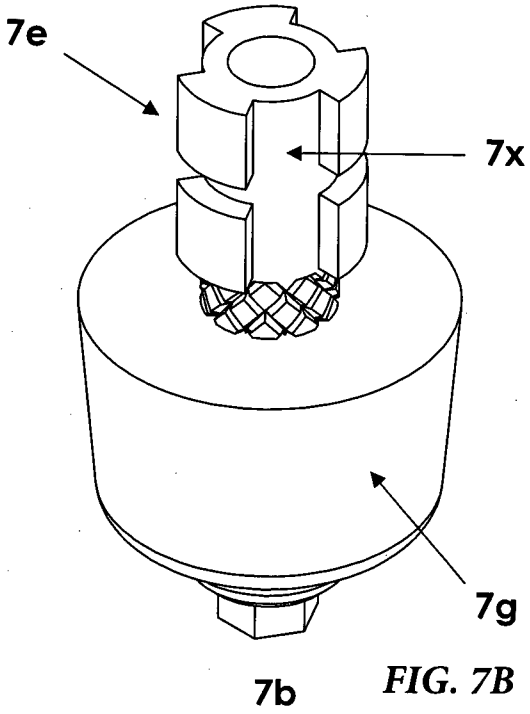


FIG. 7B

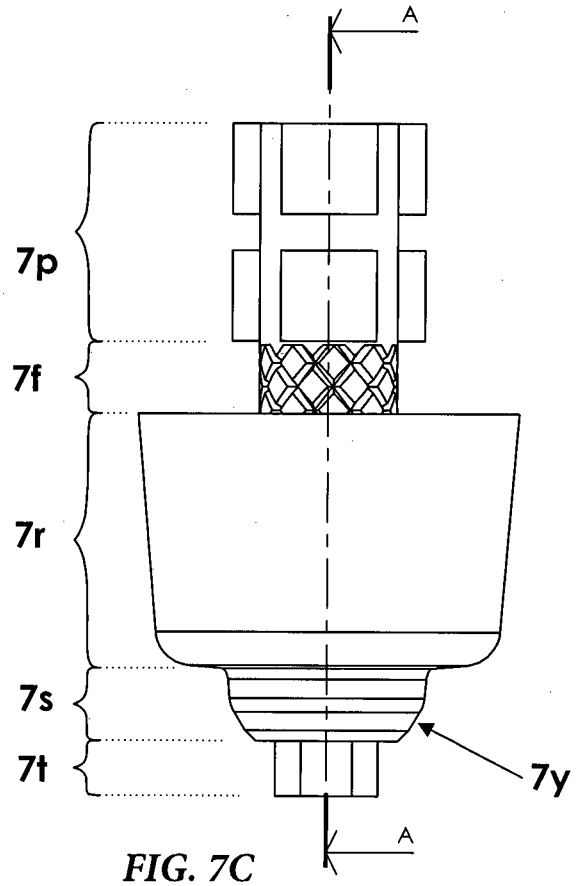


FIG. 7C

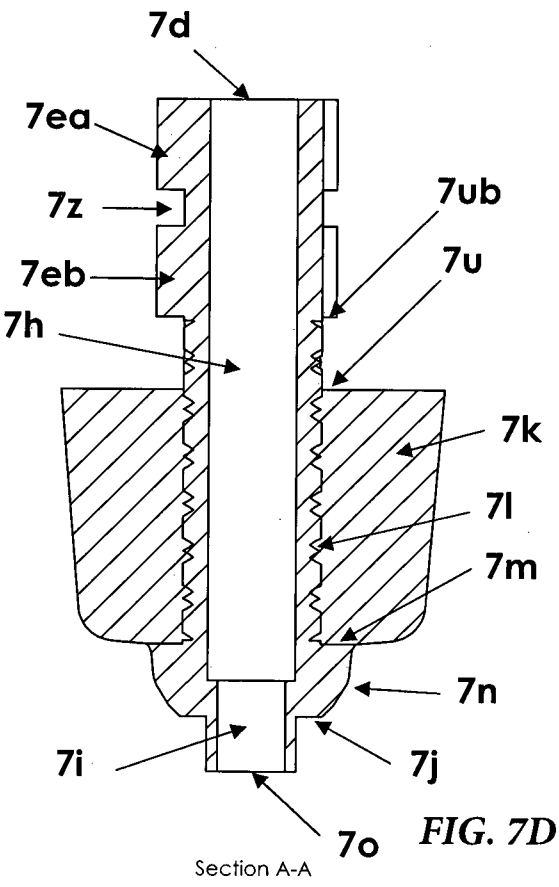


FIG. 7D

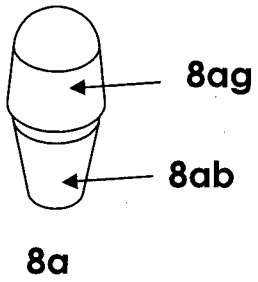


FIG. 8A

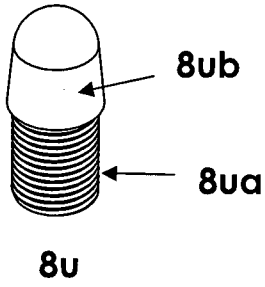


FIG. 8B

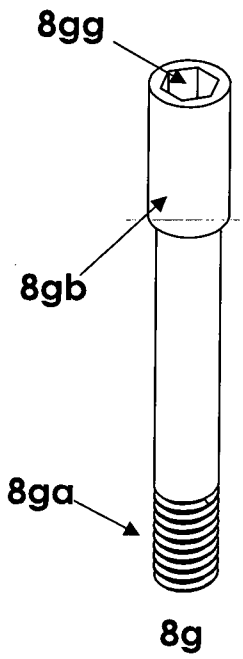


FIG. 8C

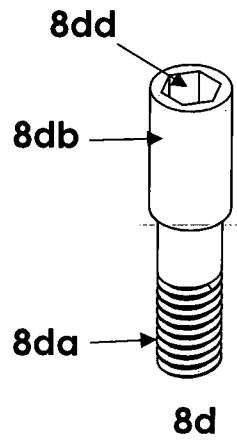


FIG. 8D

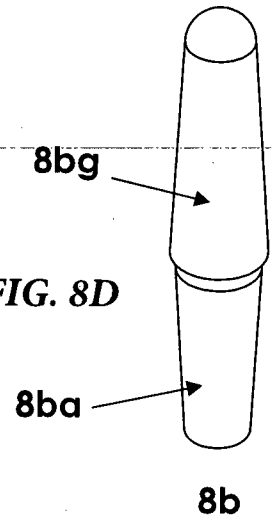


FIG. 8E

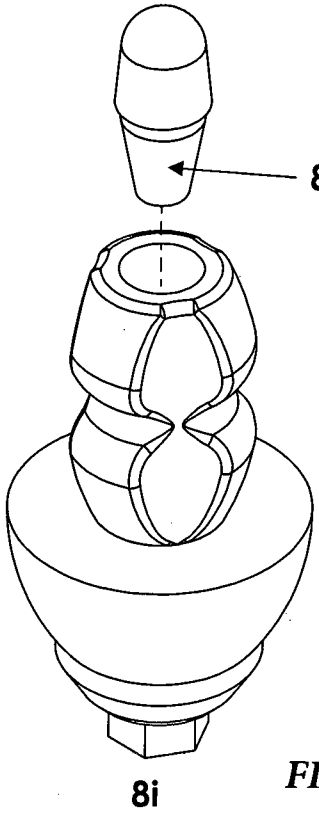


FIG. 8F

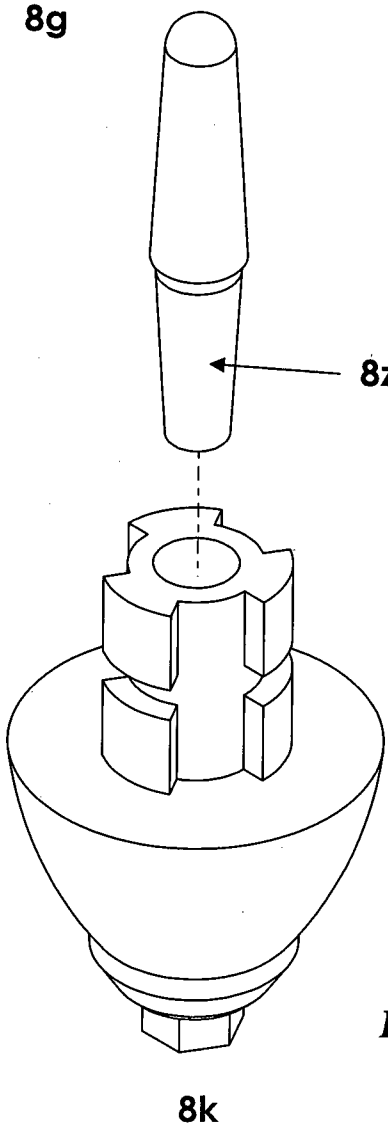


FIG. 8G

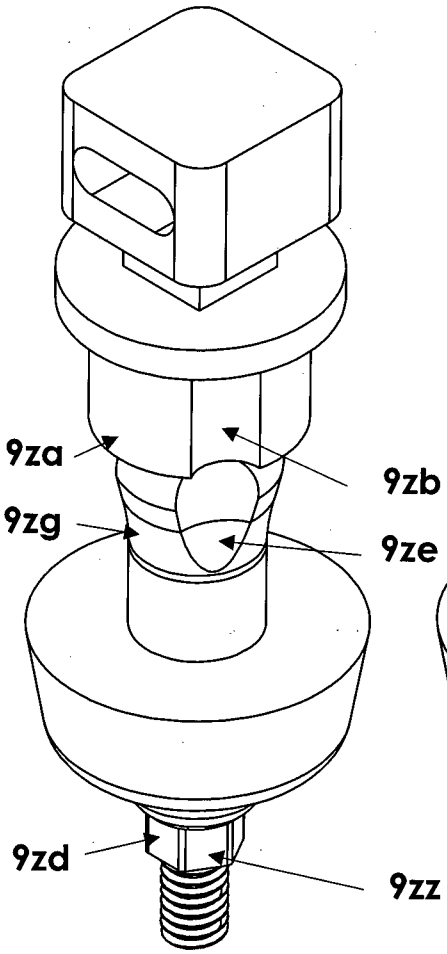


FIG. 9A

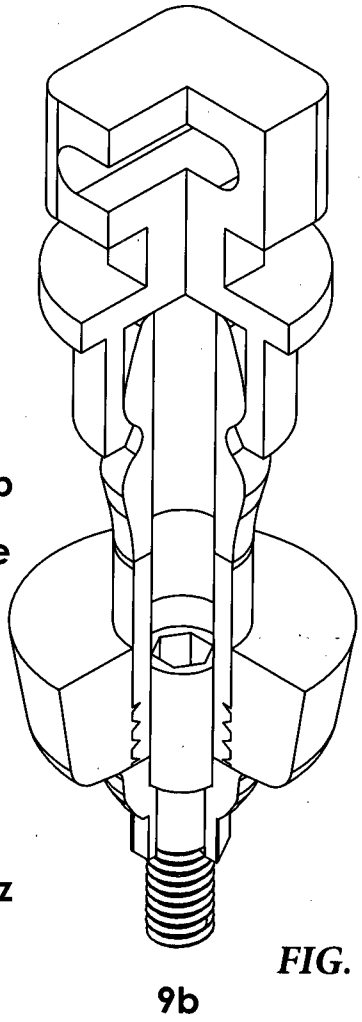


FIG. 9B

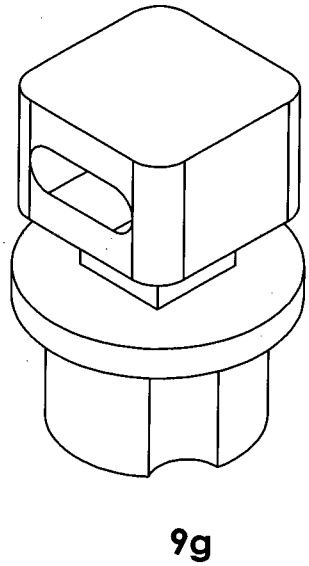


FIG. 9C

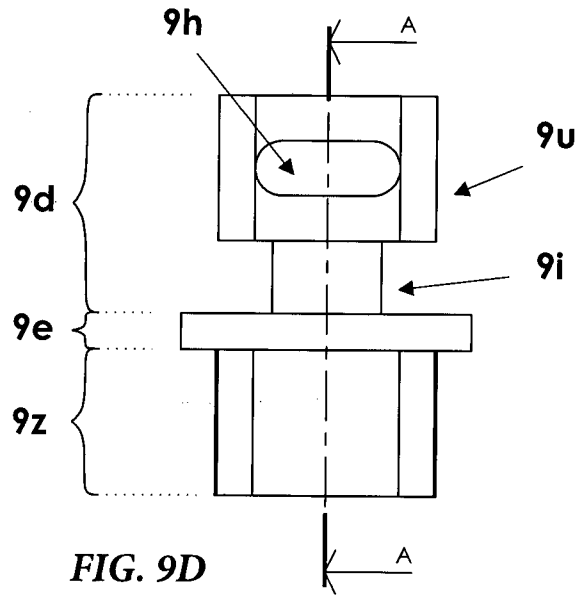


FIG. 9D

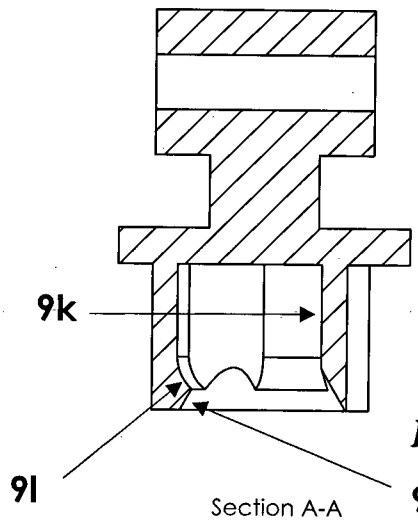
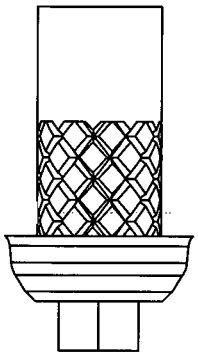
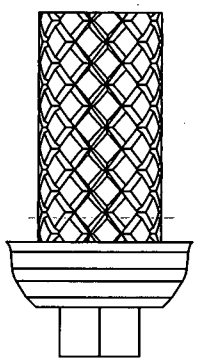


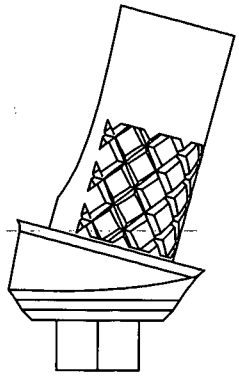
FIG. 9E



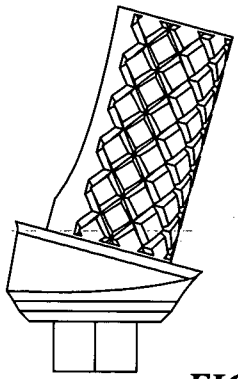
10a FIG. 1OA



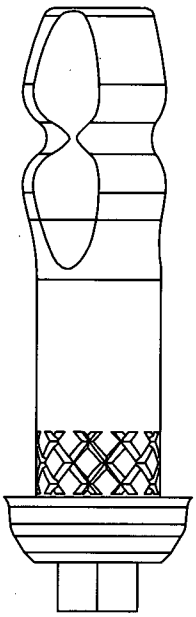
10b FIG. 10B



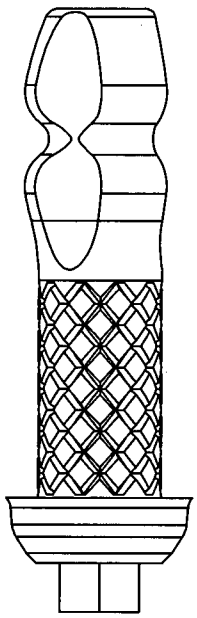
10g FIG. 10C



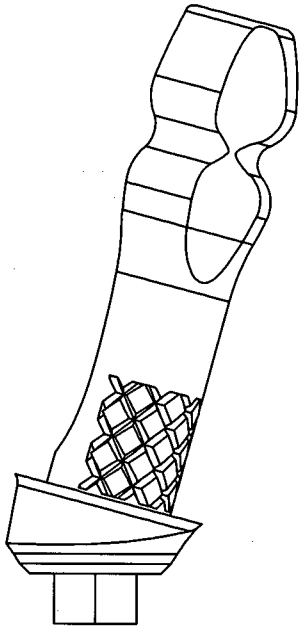
10d FIG. 10D



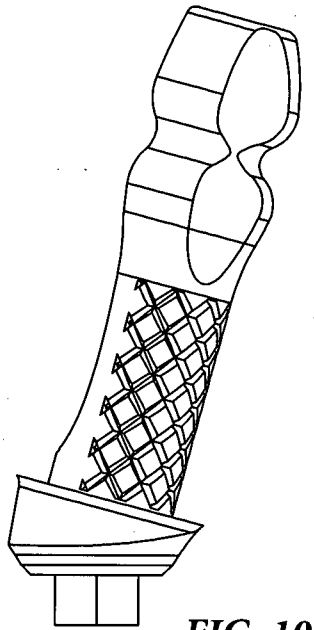
10e FIG. 10E



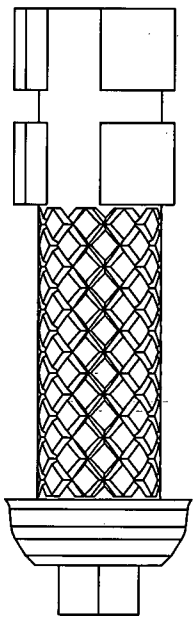
10z FIG. 10F



10h FIG. 10G



10u FIG. 10H



10i FIG. 10I

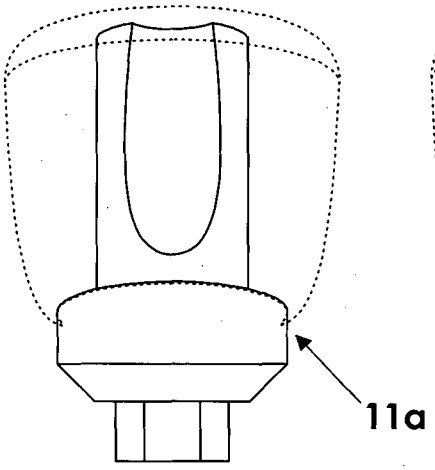


FIG. 11A

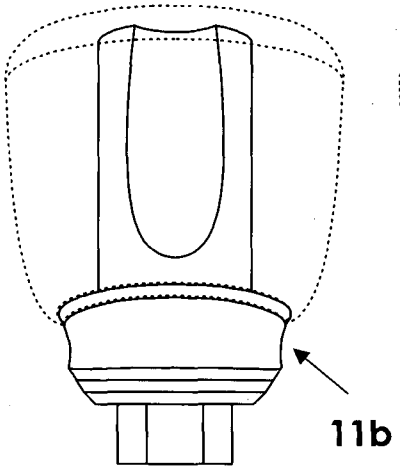


FIG. 11B

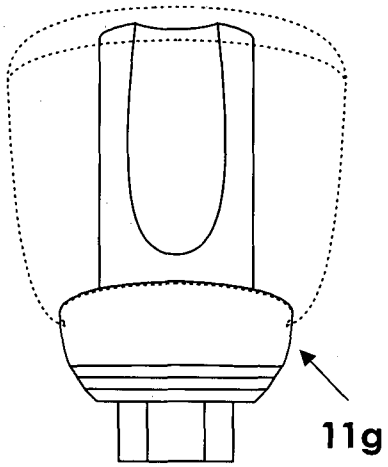


FIG. 11C

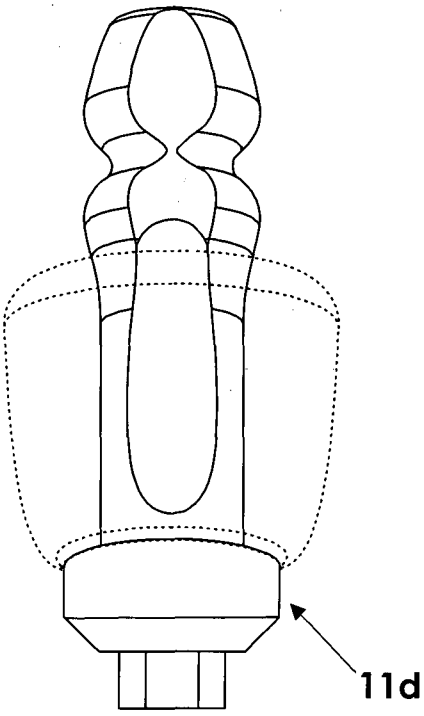


FIG. 11D

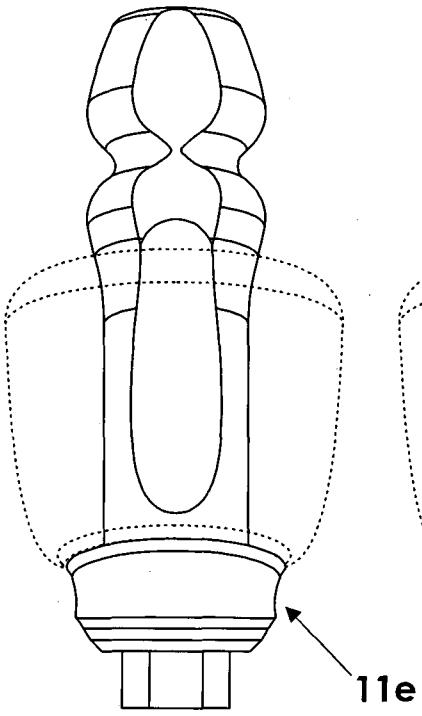


FIG. 11E

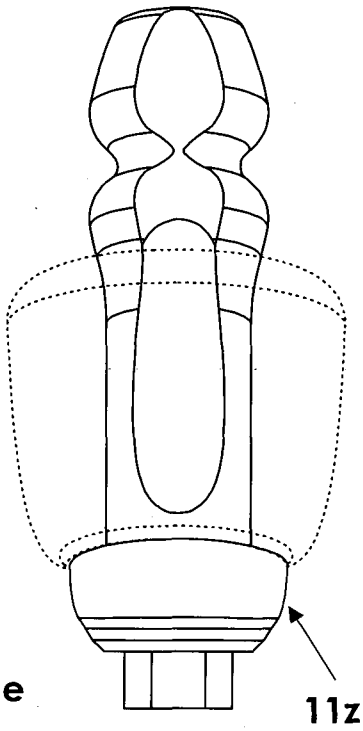


FIG. 11F

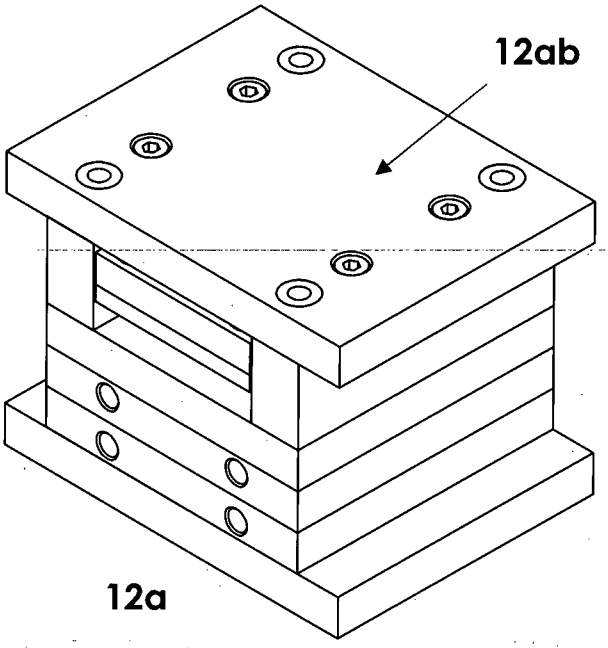


FIG. 12A

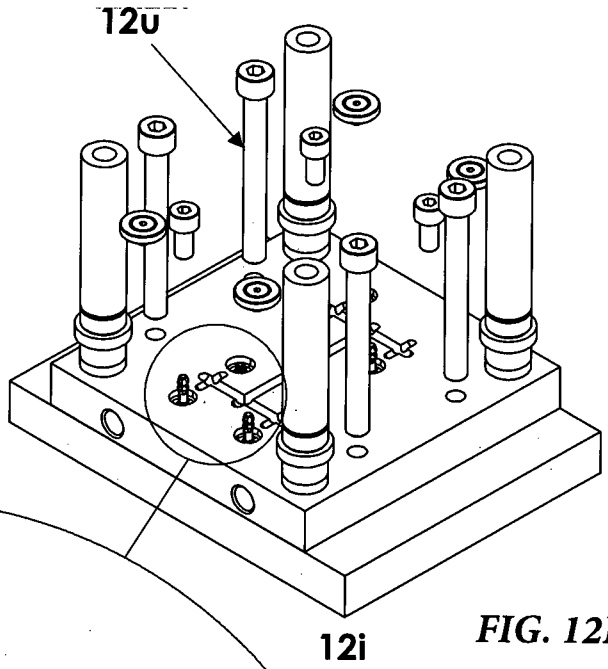


FIG. 12B

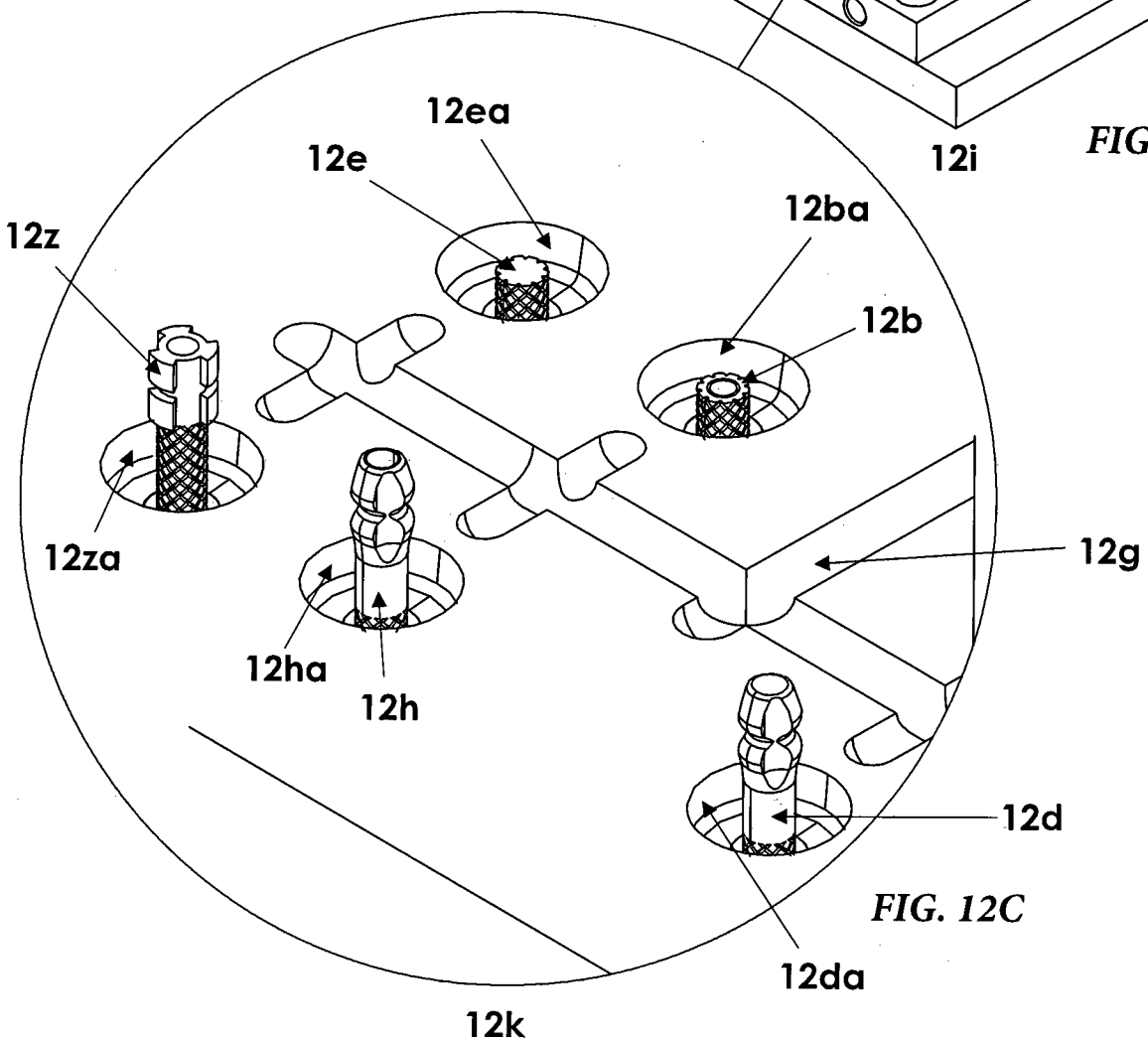
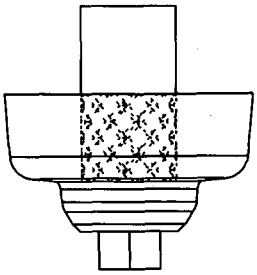
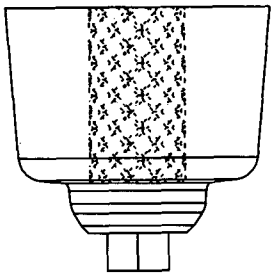


FIG. 12C



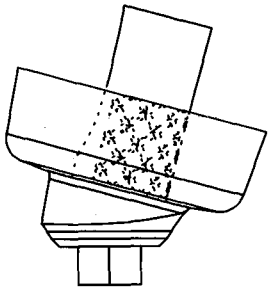
13a

FIG. 13A



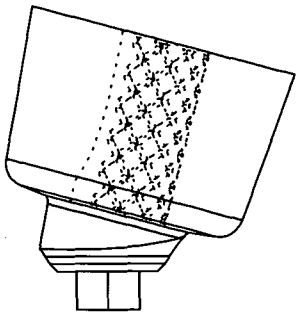
13b

FIG. 13B



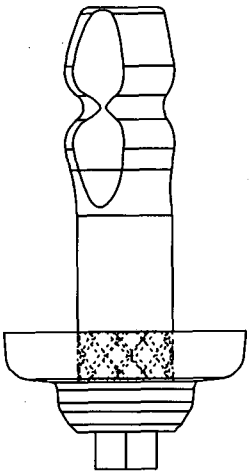
13g

FIG. 13C



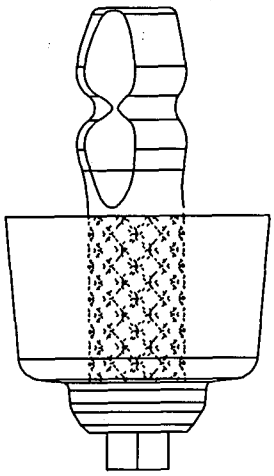
13d

FIG. 13D



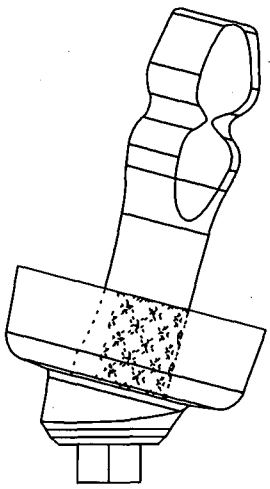
13e

FIG. 13E



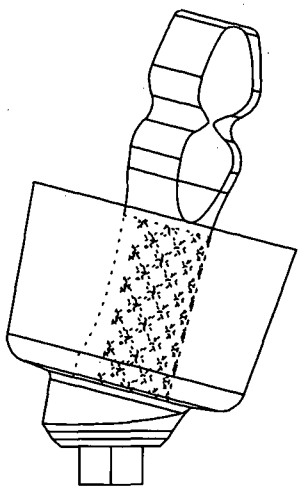
13z

FIG. 13F



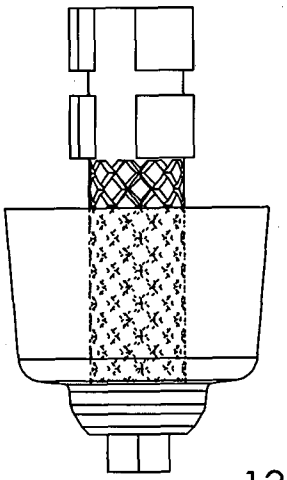
13h

FIG. 13G



13u

FIG. 13H



13i

FIG. 13I

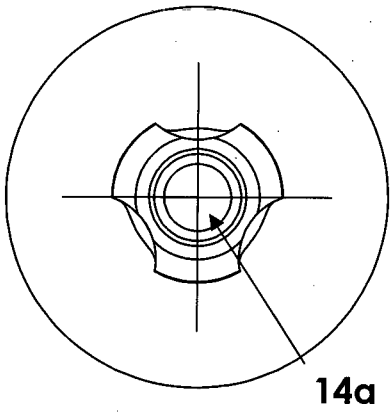


FIG. 14A

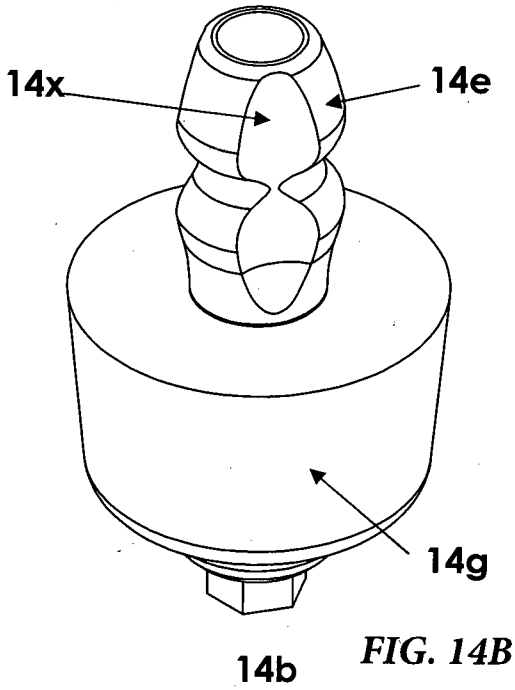


FIG. 14B

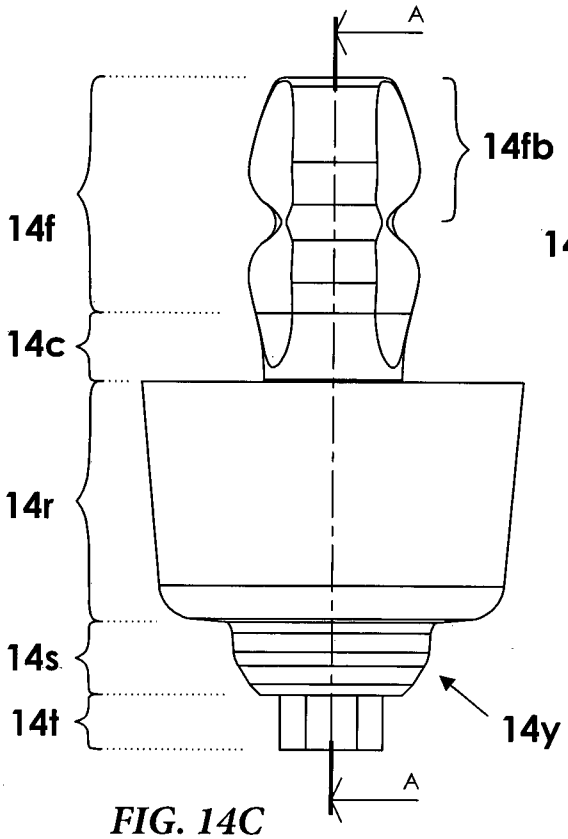


FIG. 14C

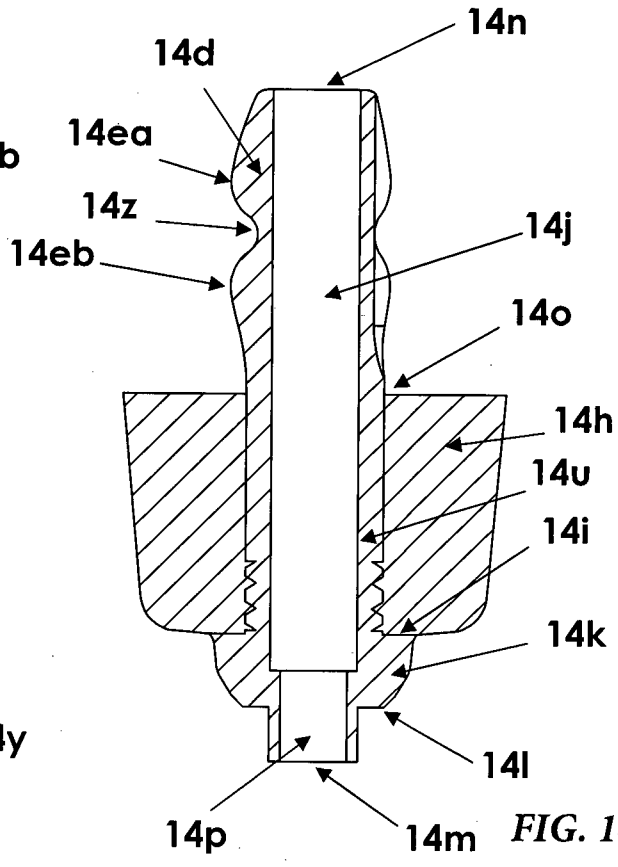


FIG. 14D

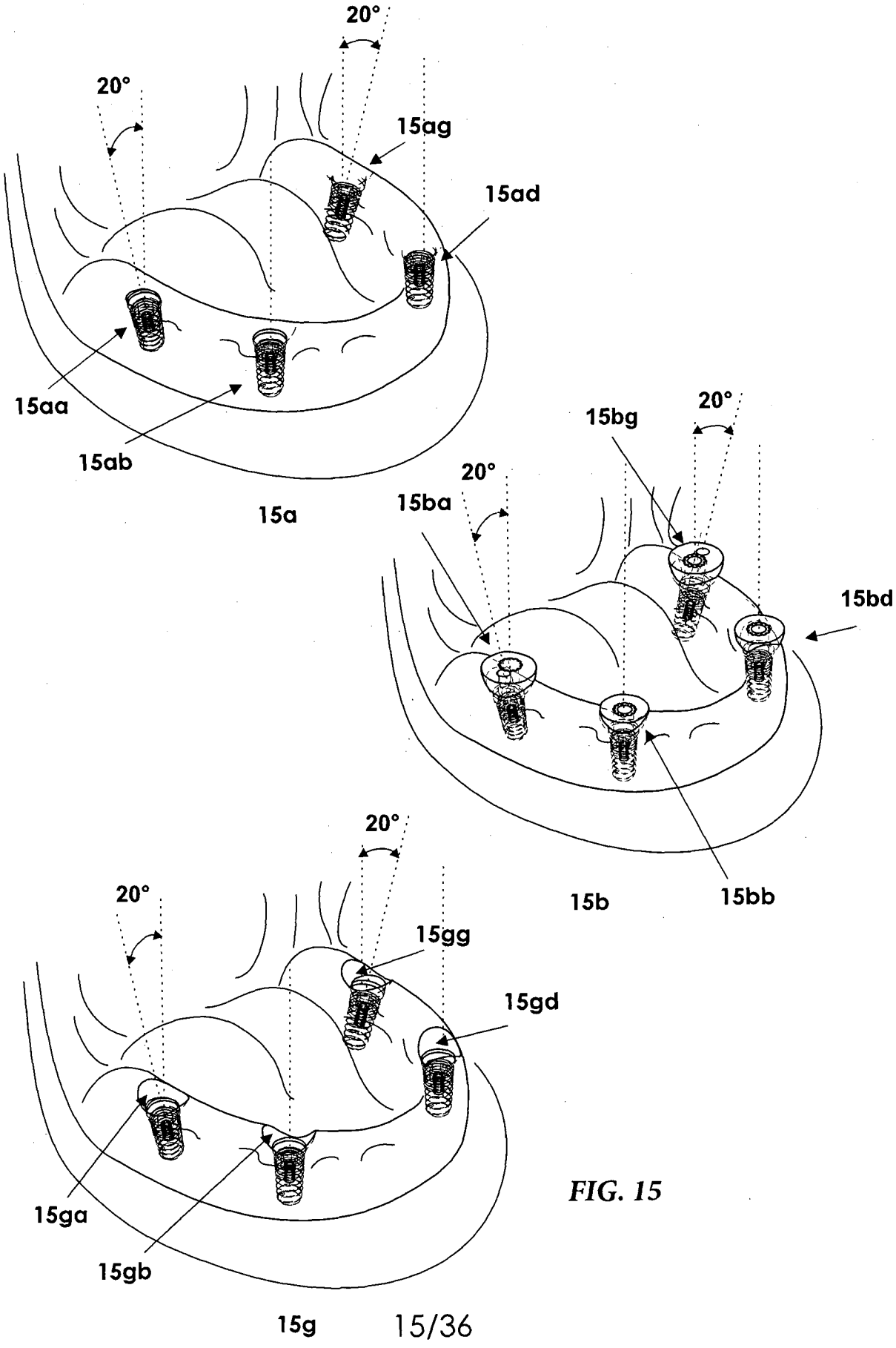

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FIG. 15

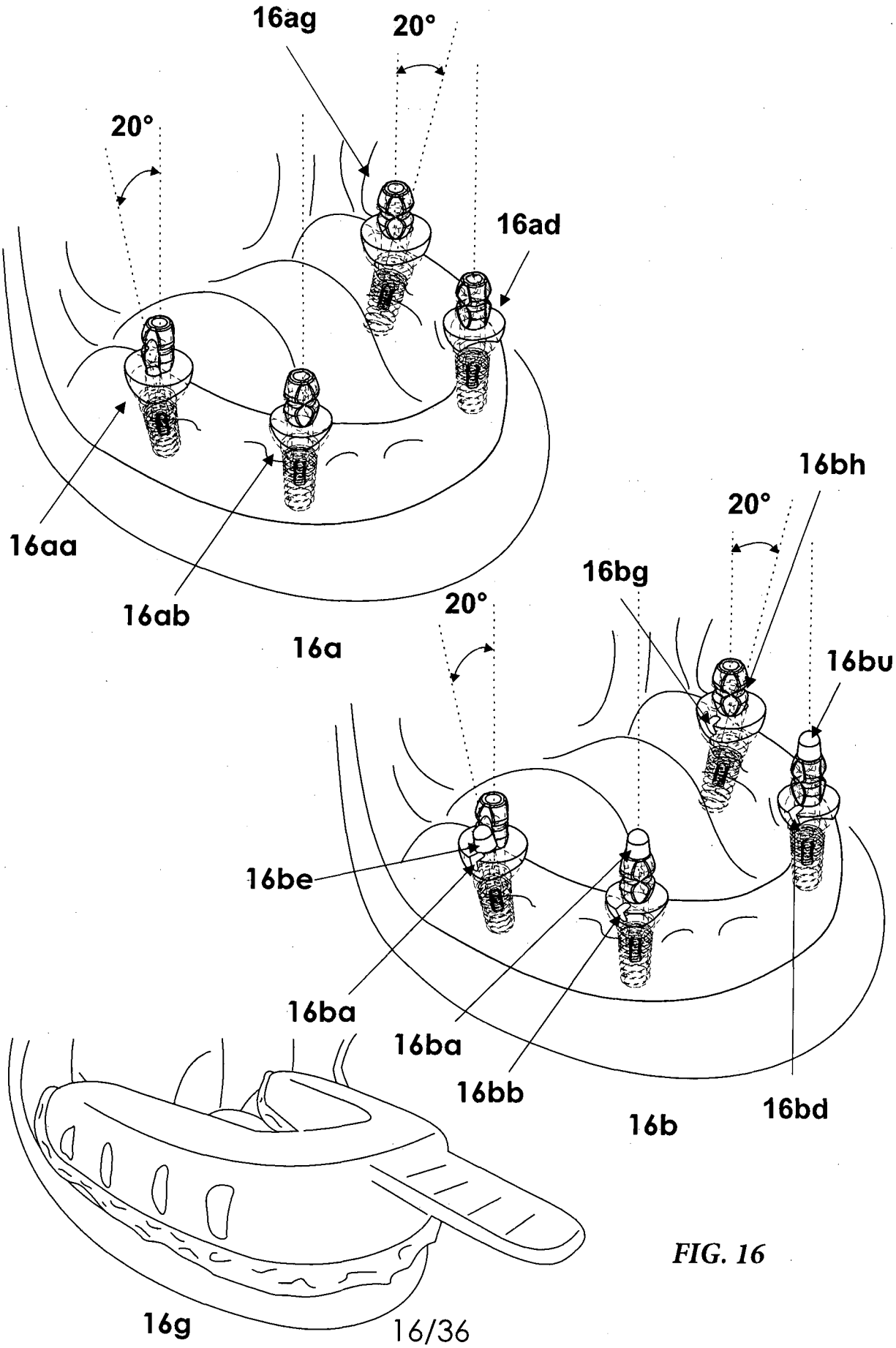
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FIG. 16

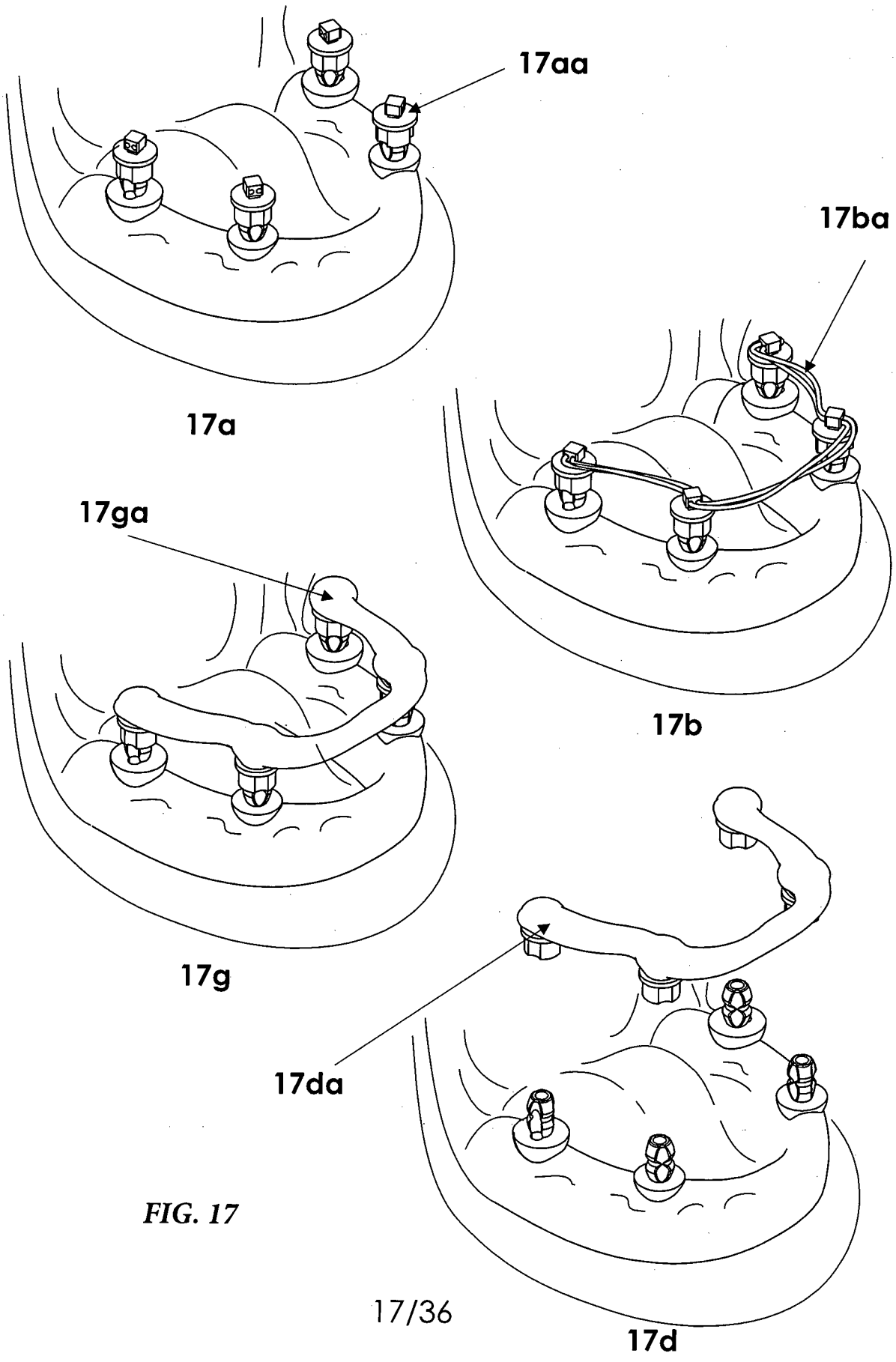


FIG. 17

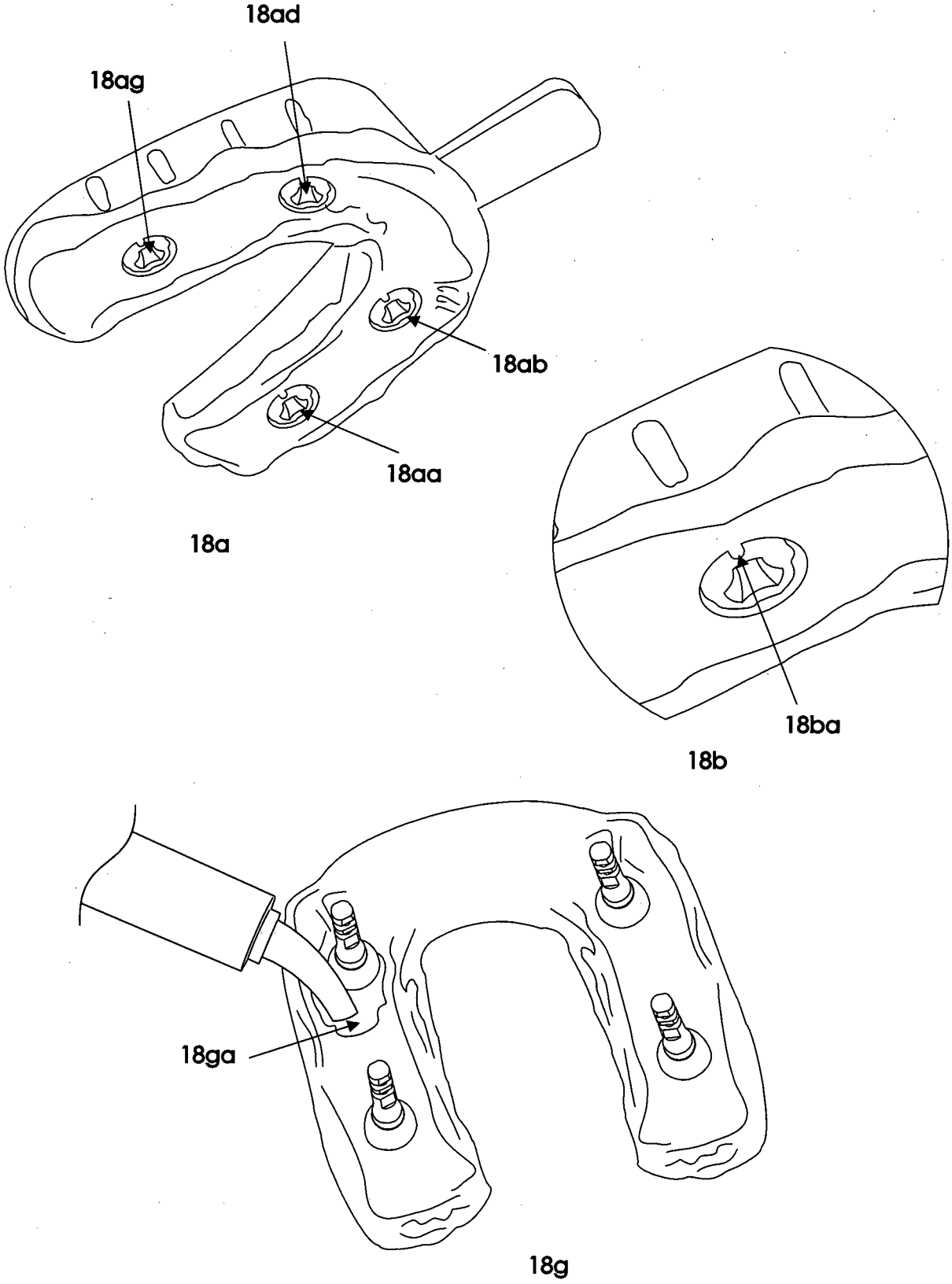


FIG. 18

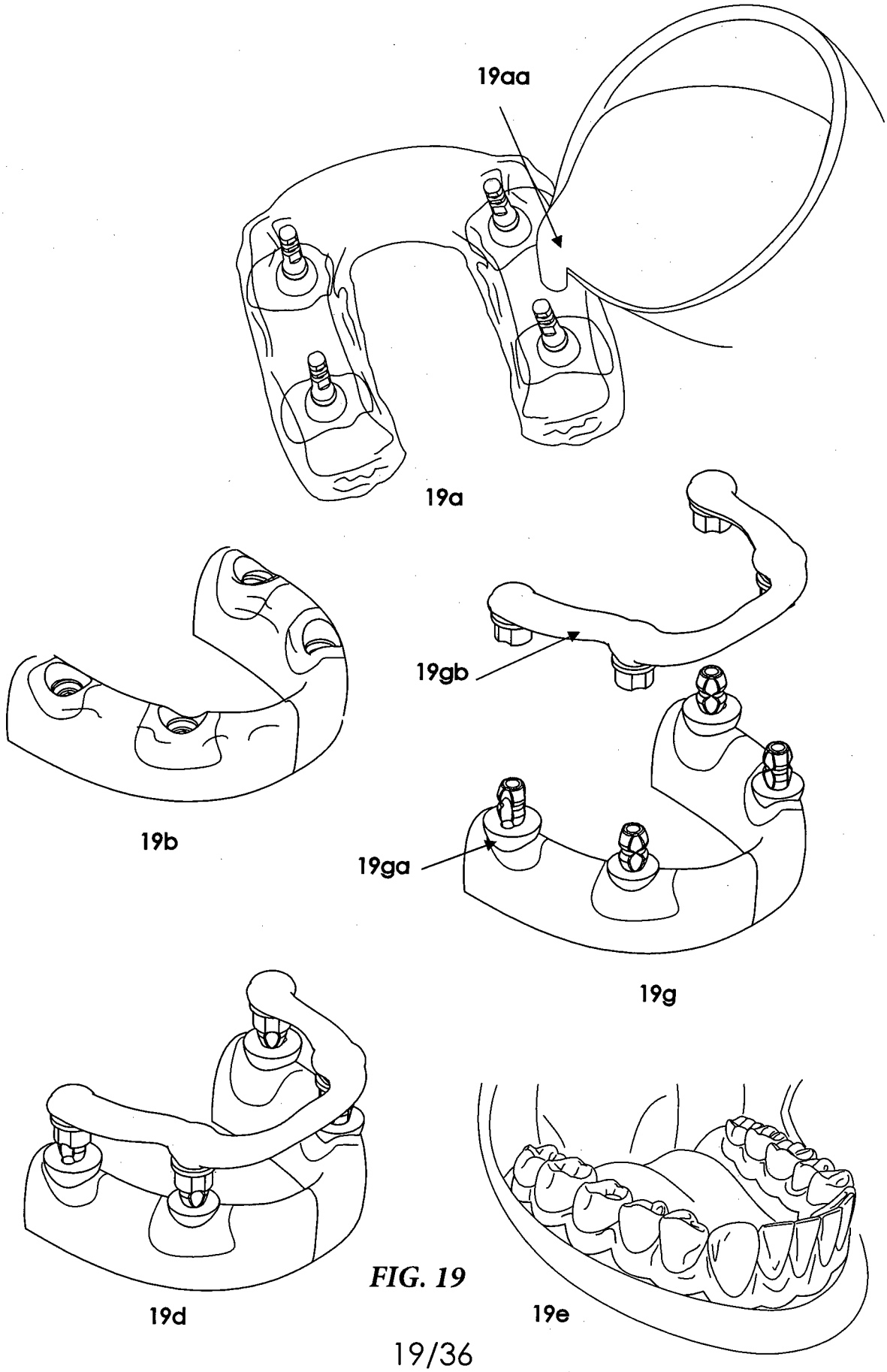


FIG. 19

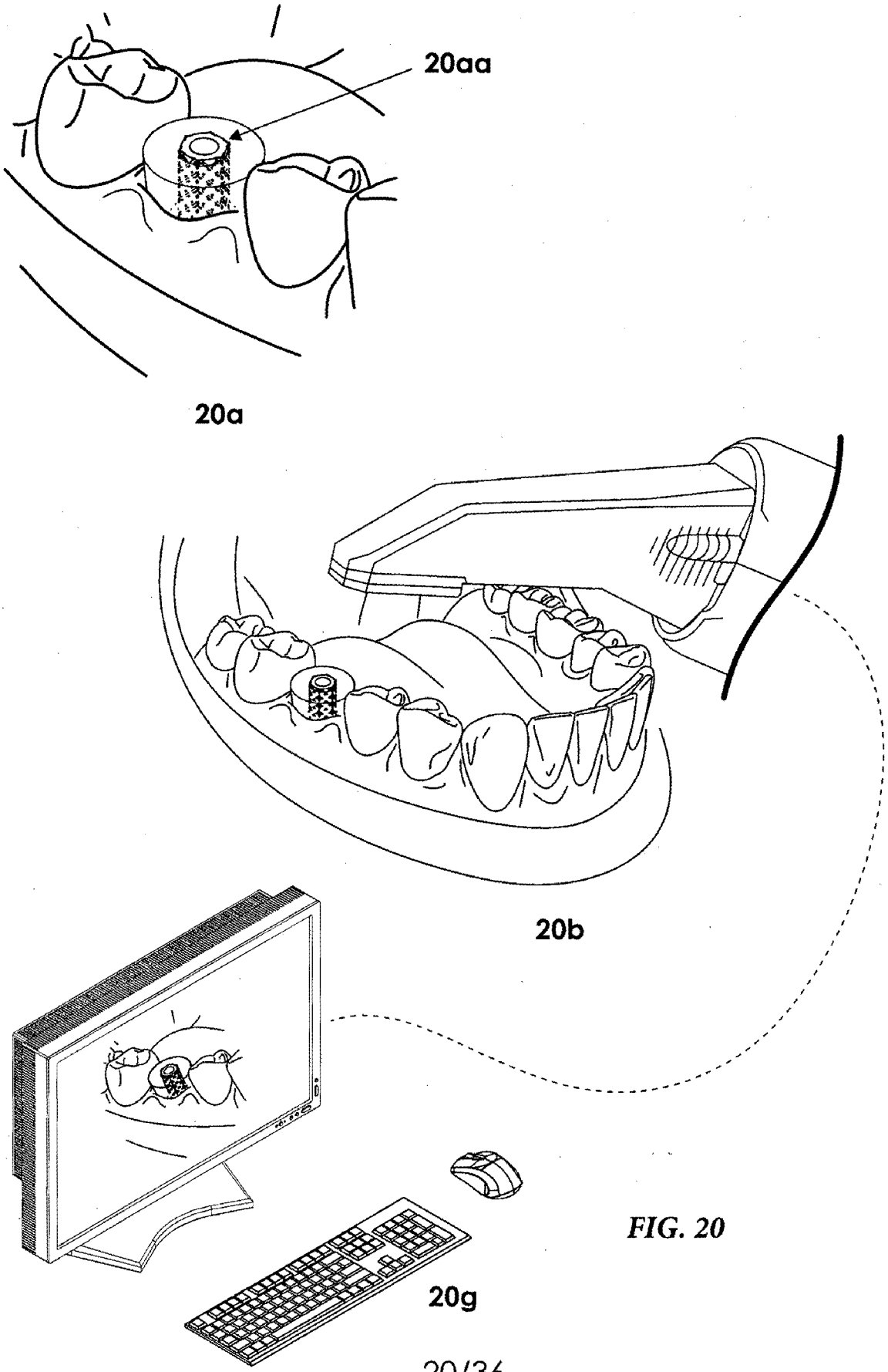


FIG. 20

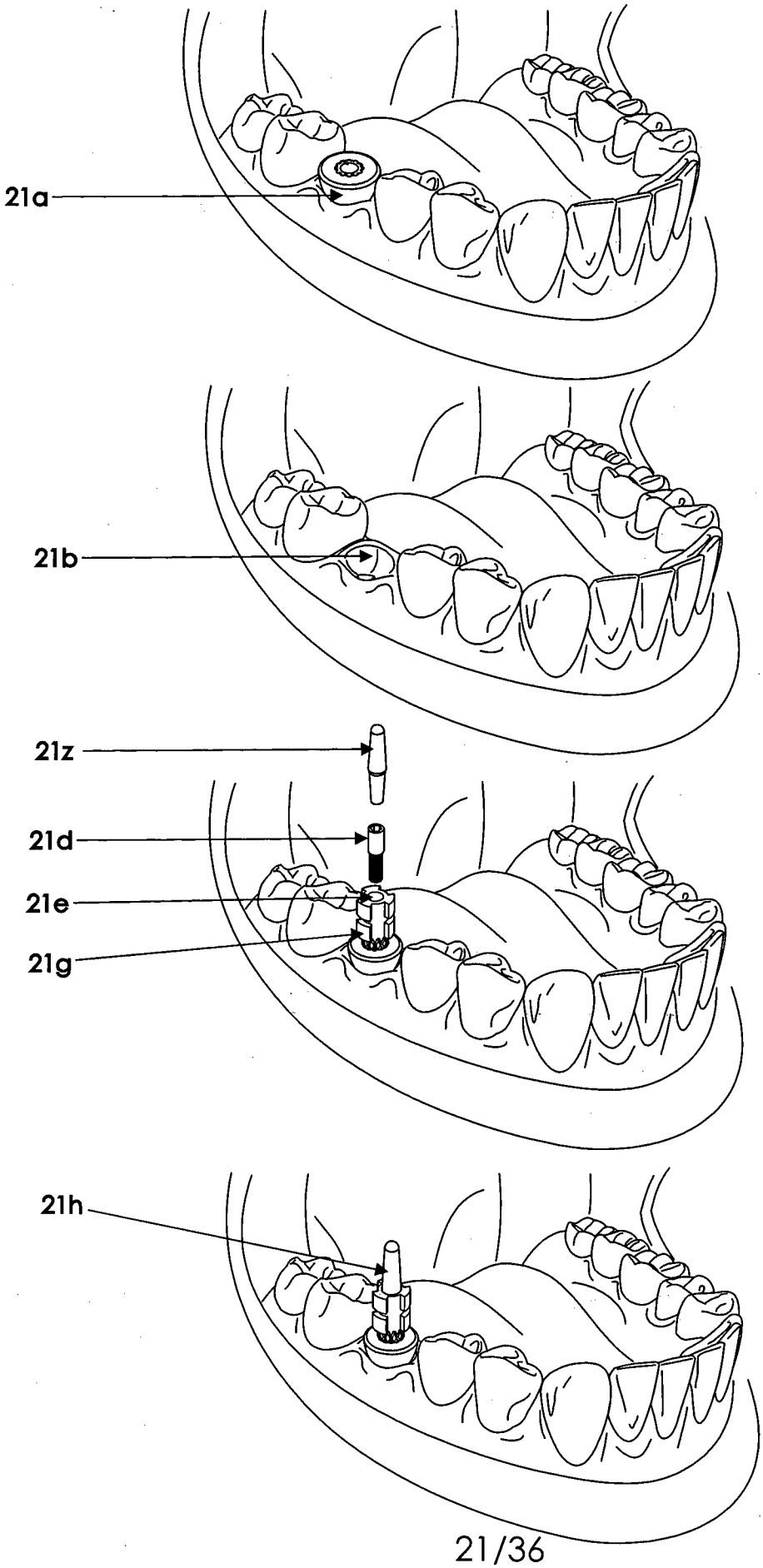


FIG. 21

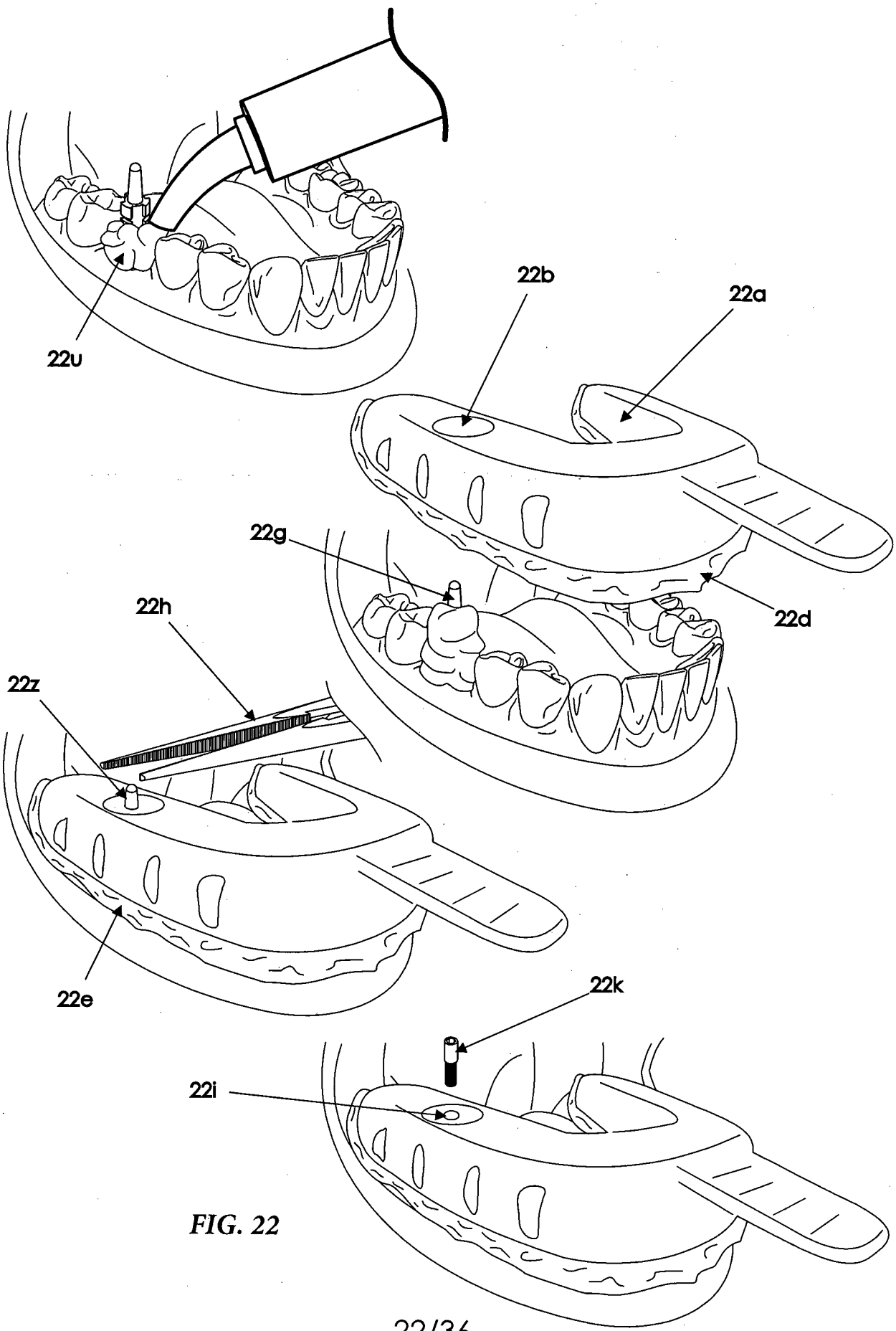


FIG. 22

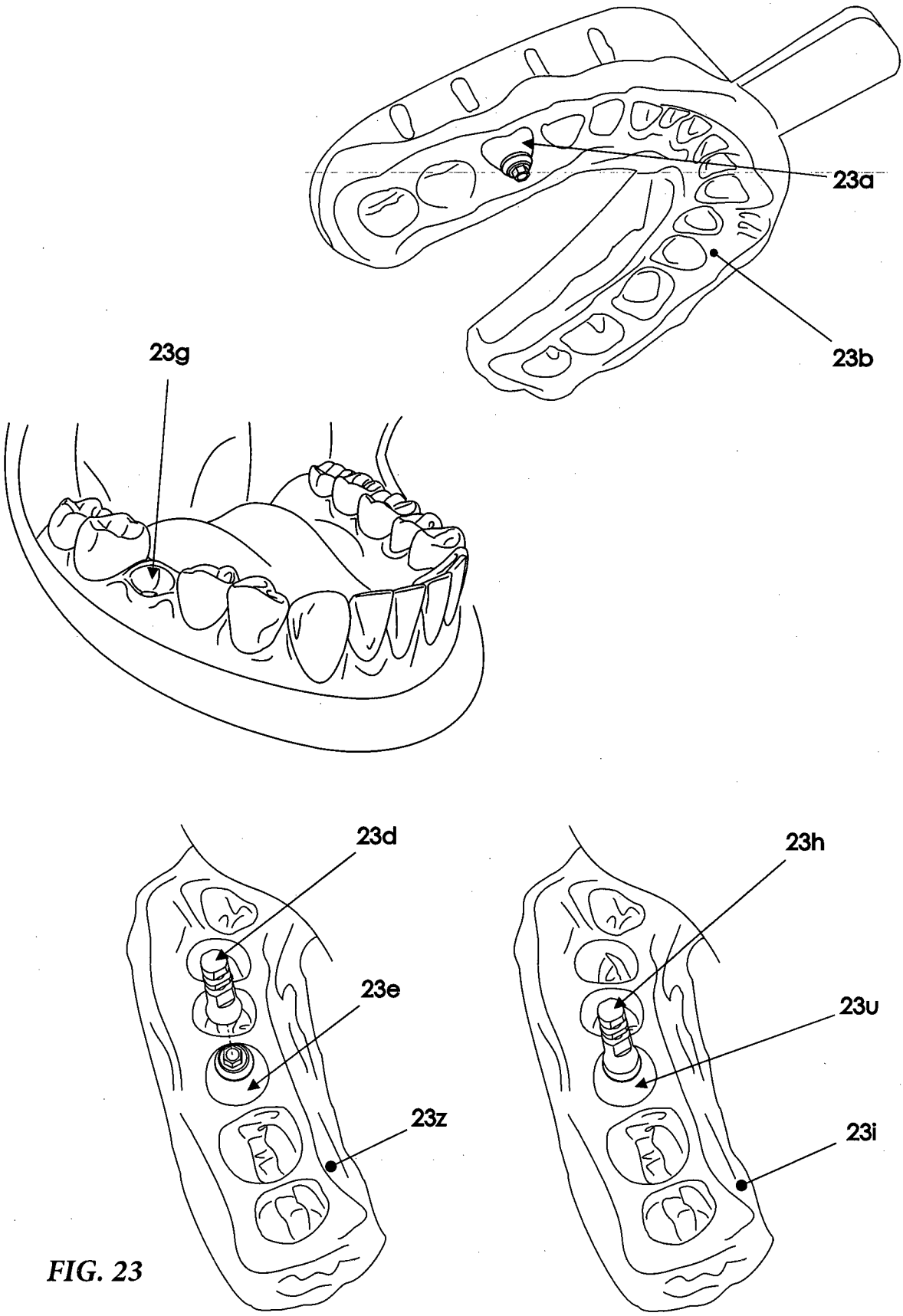
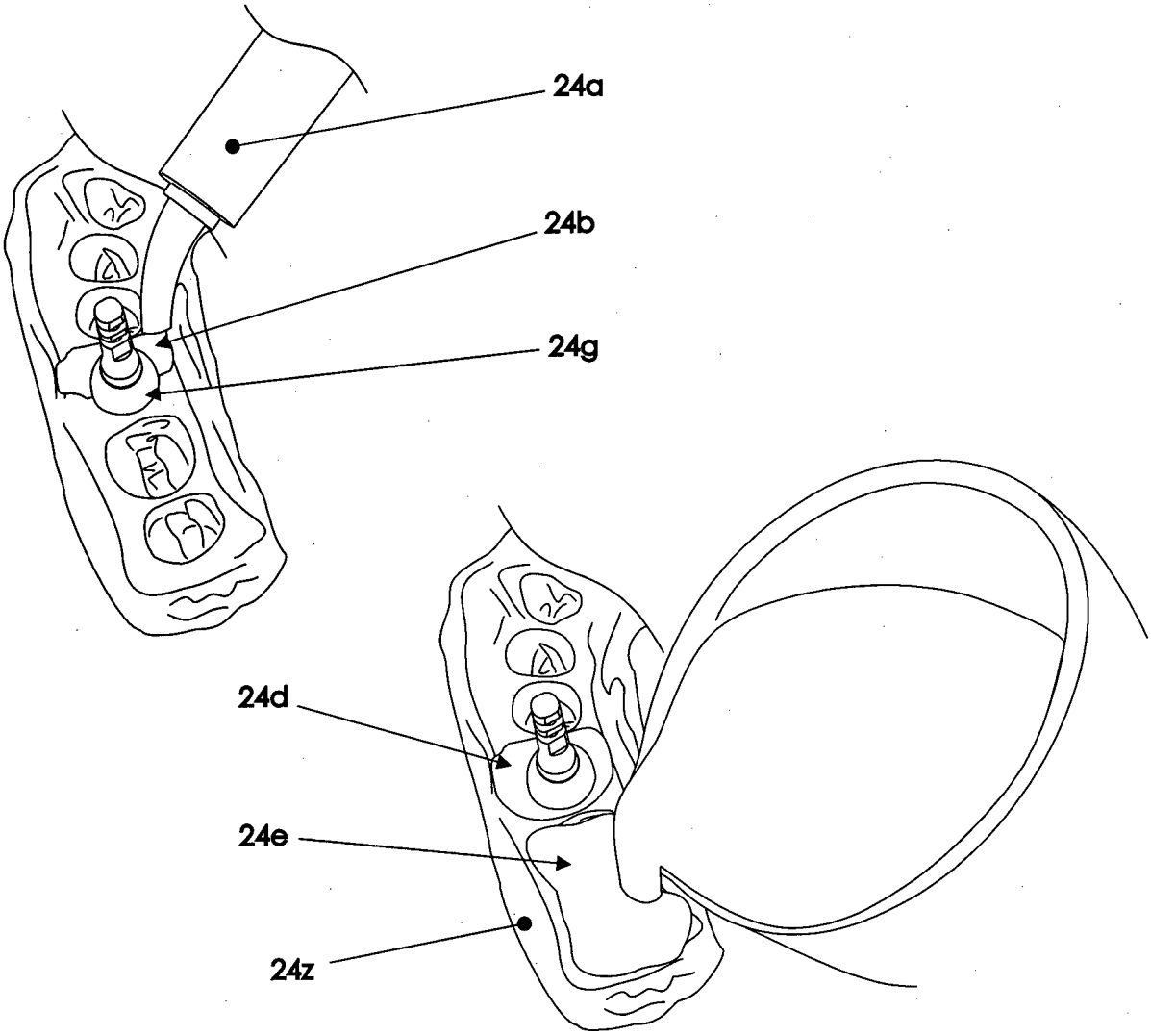


FIG. 23



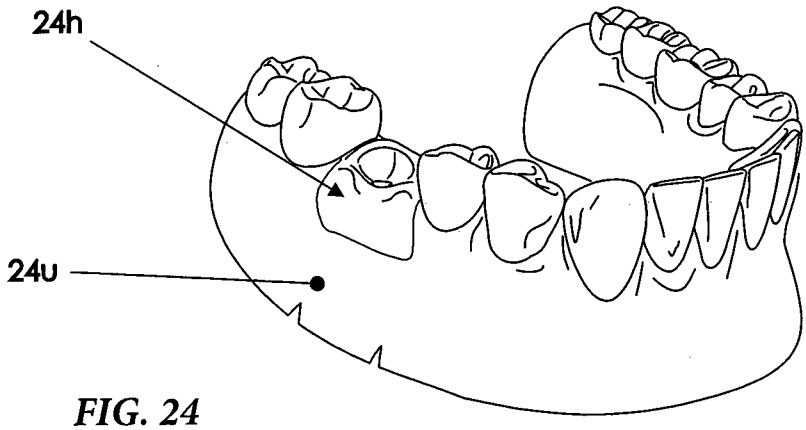


FIG. 24

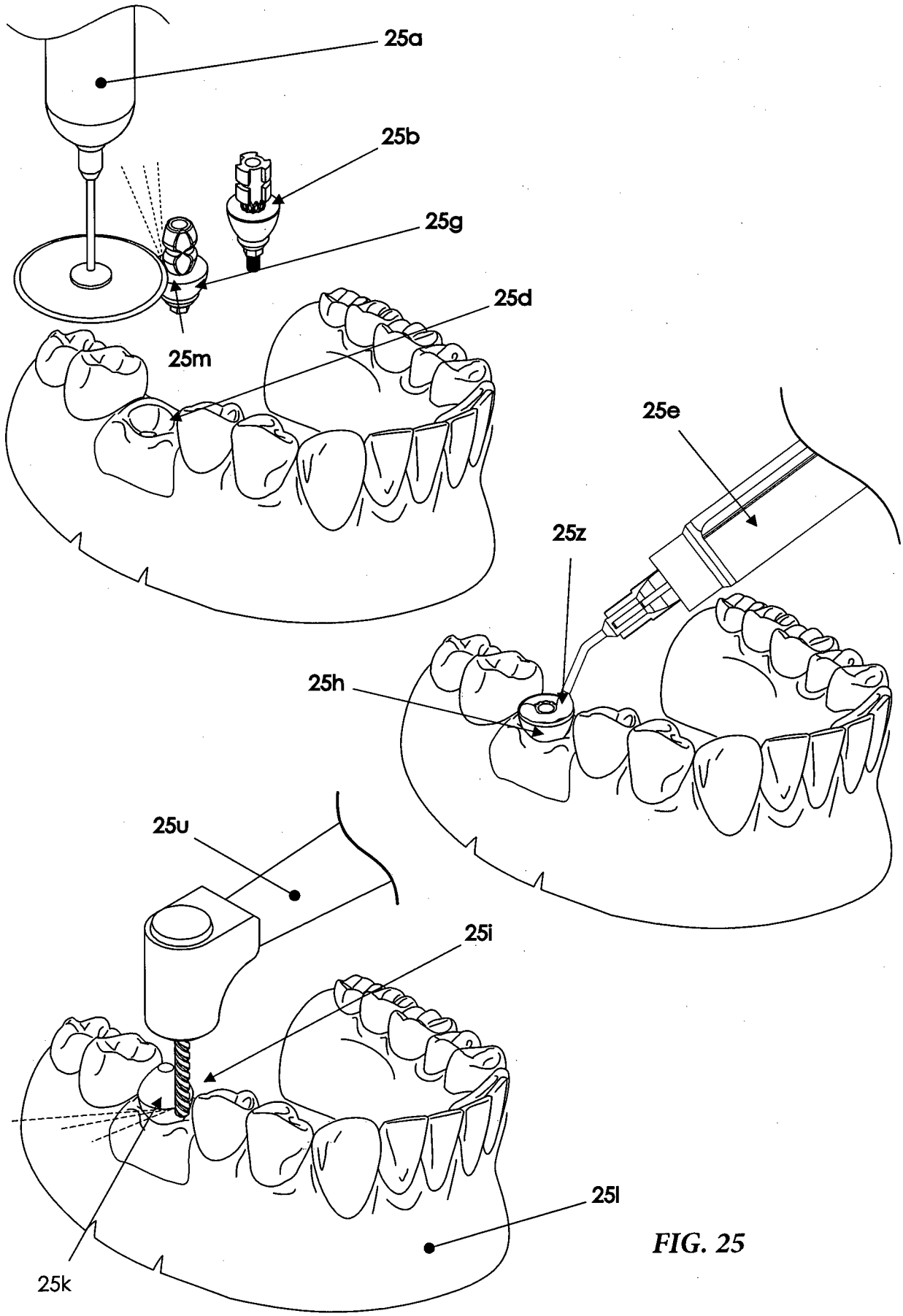


FIG. 25

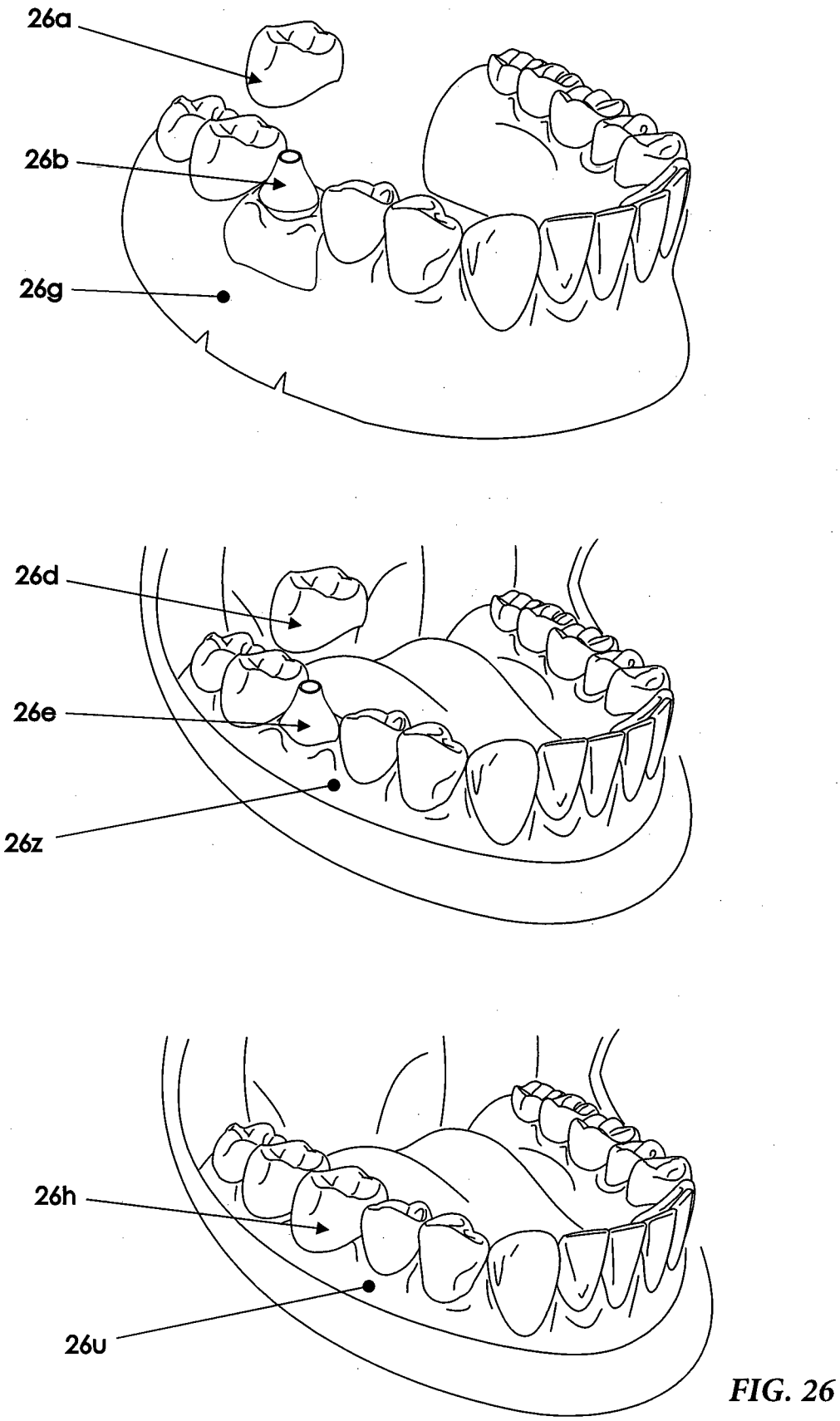


FIG. 26

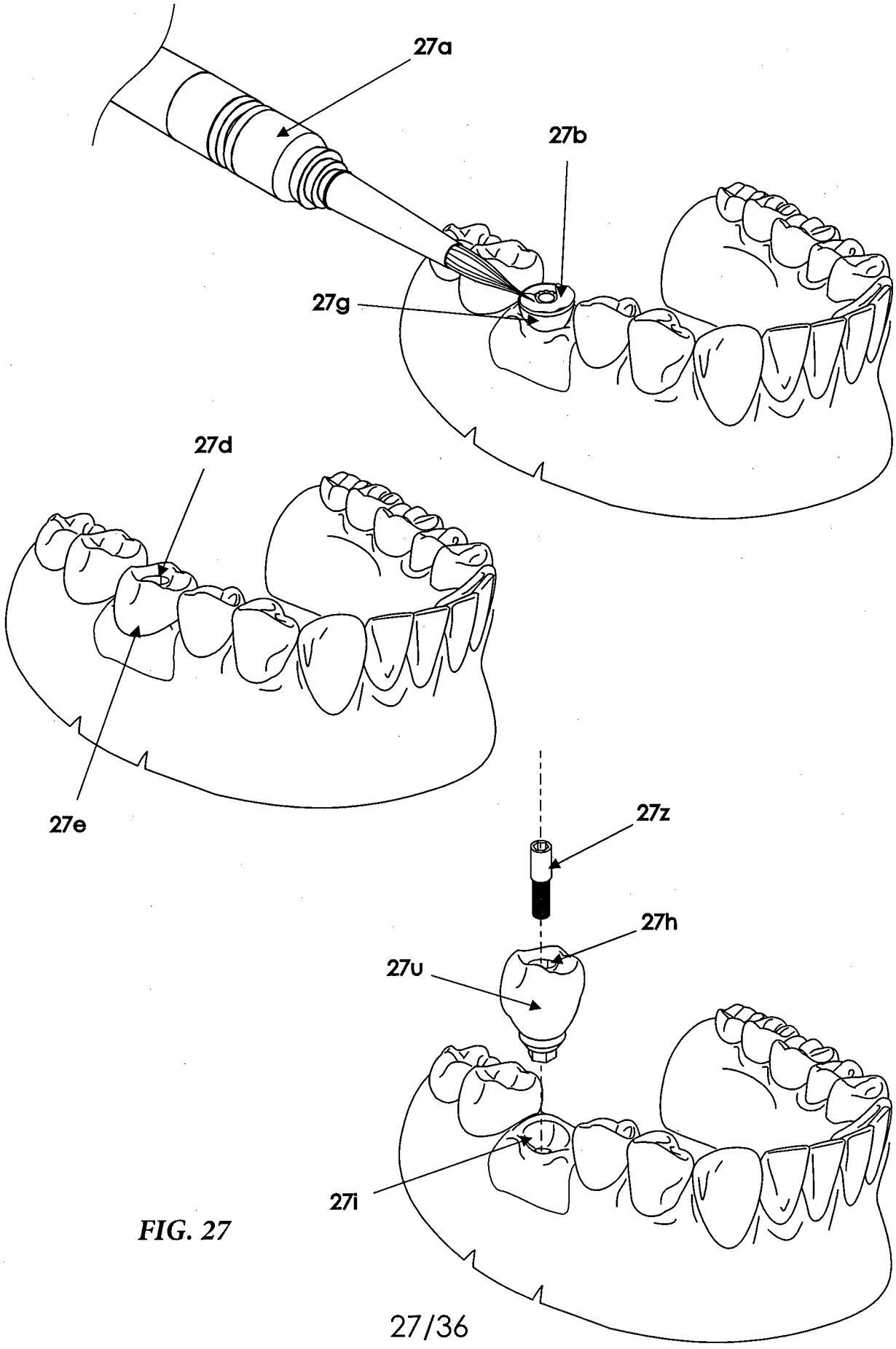
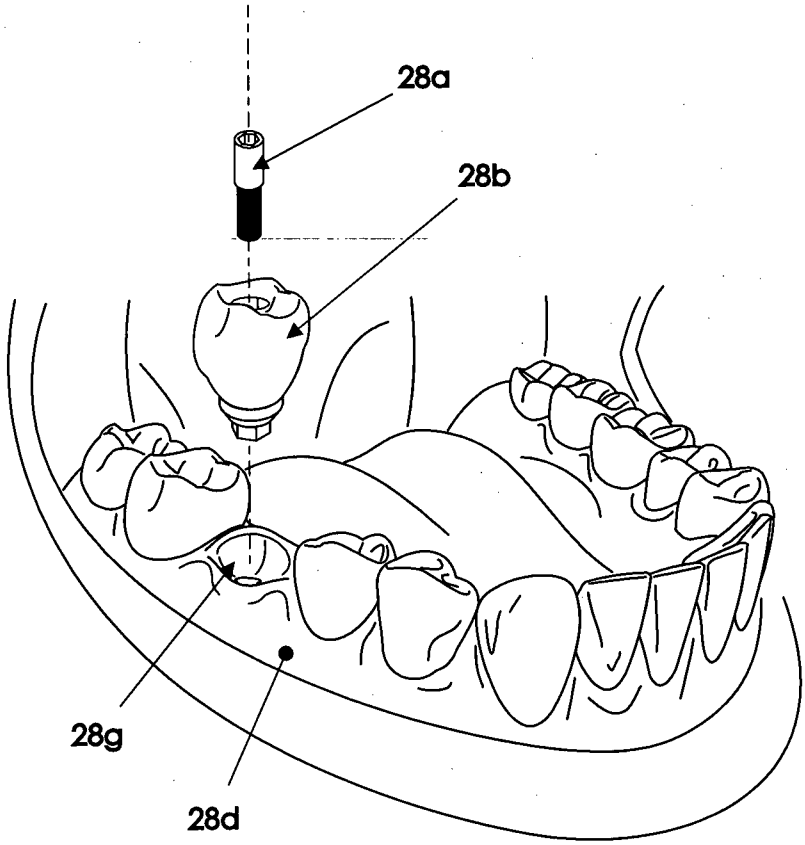


FIG. 27



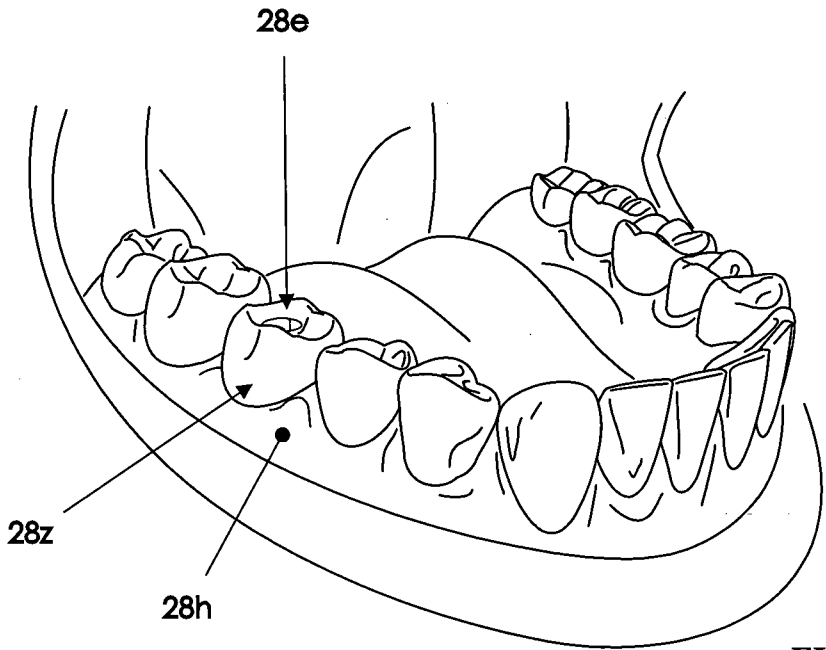


FIG. 28

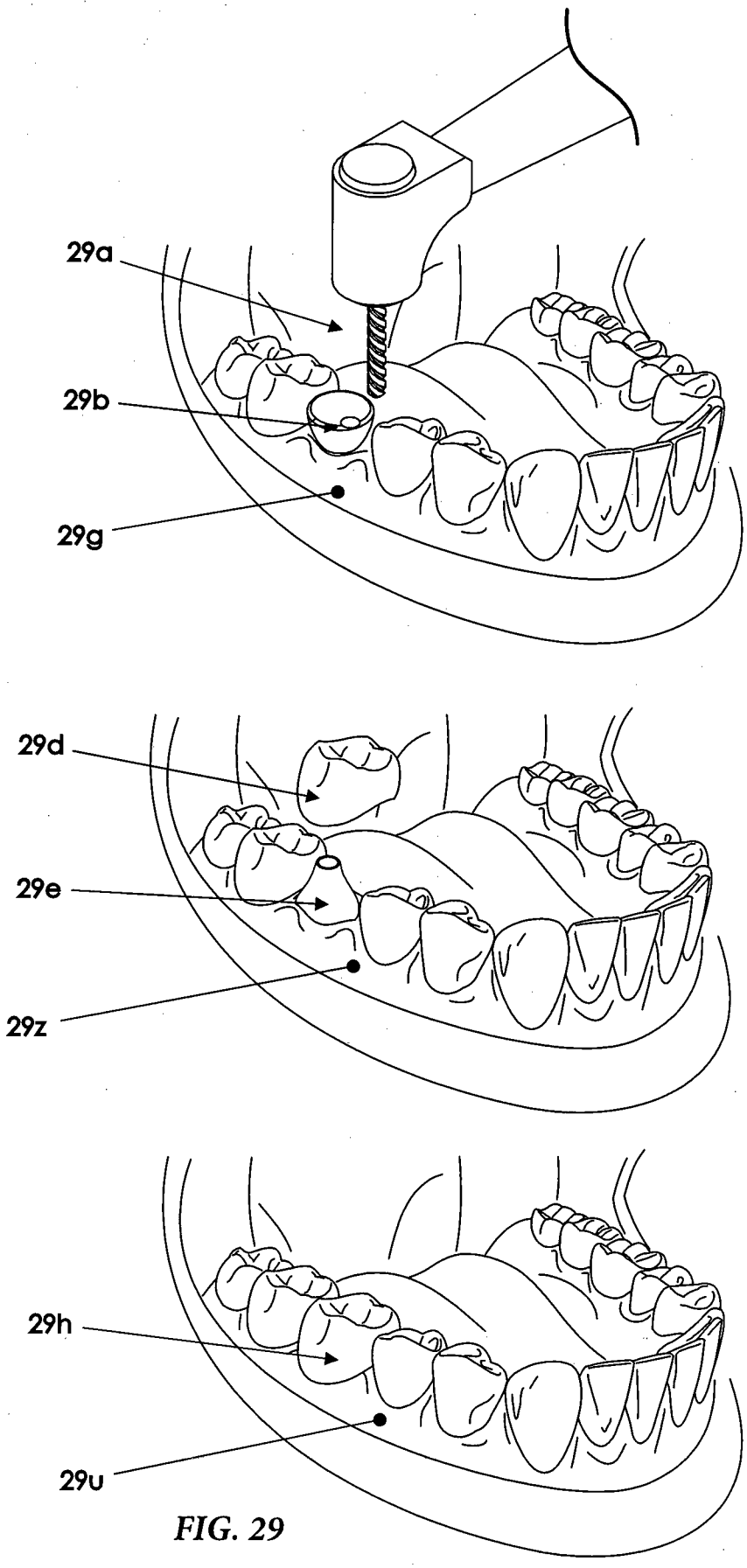


FIG. 29

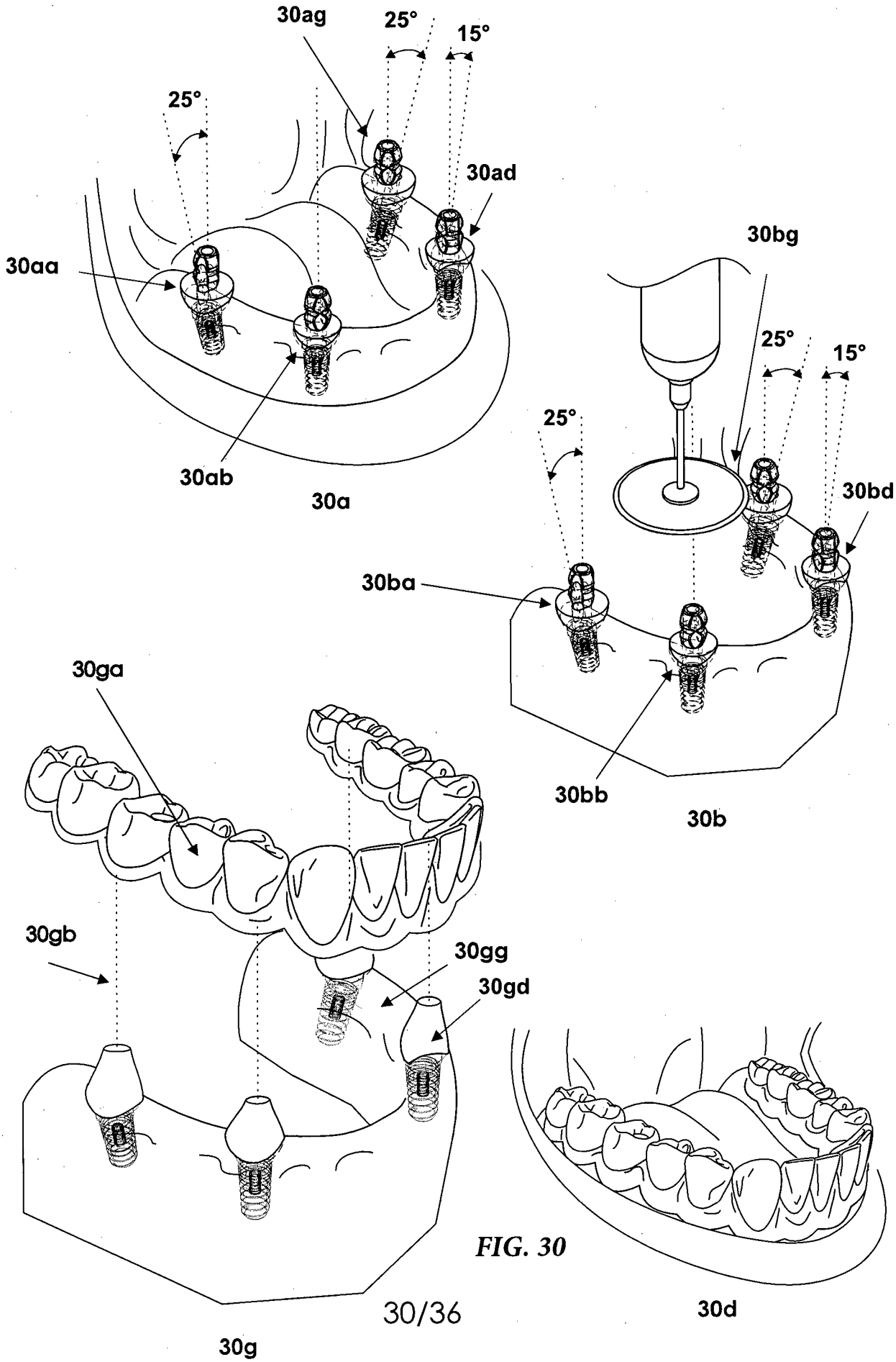

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FIG. 30

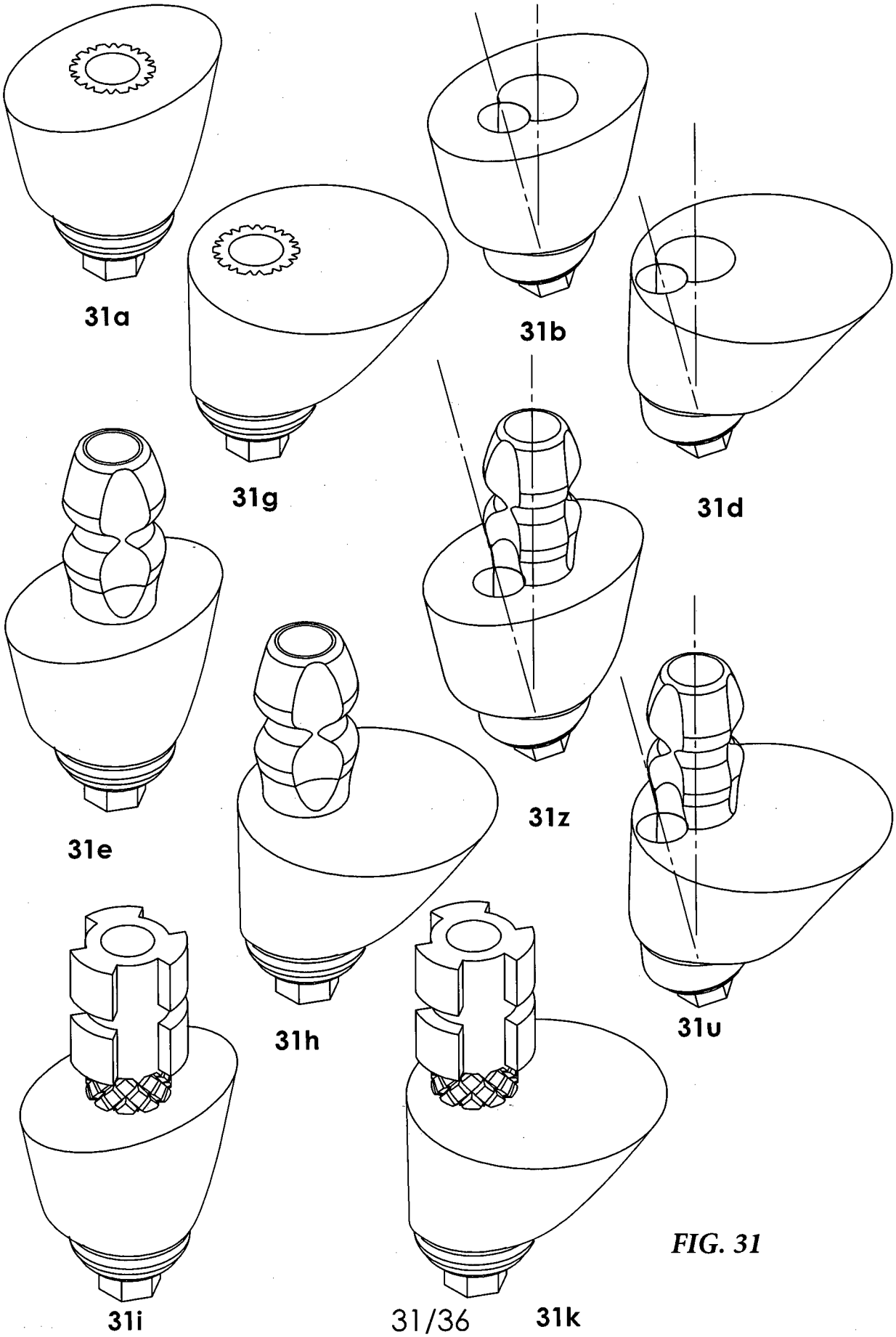
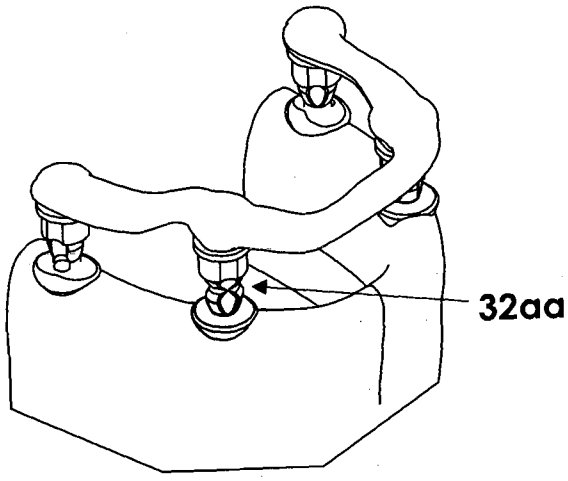
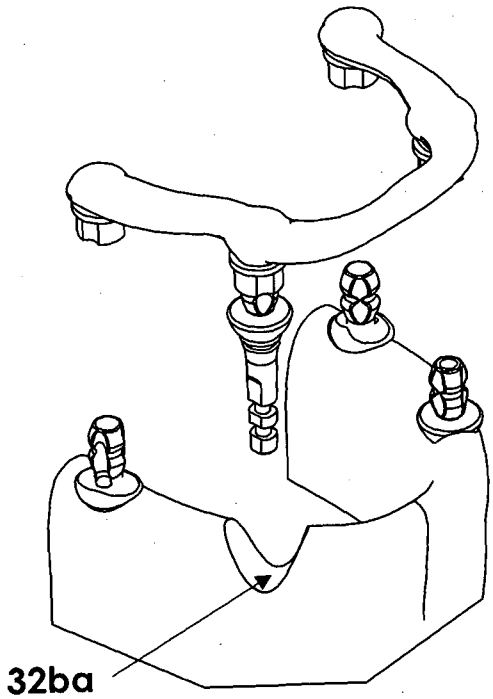


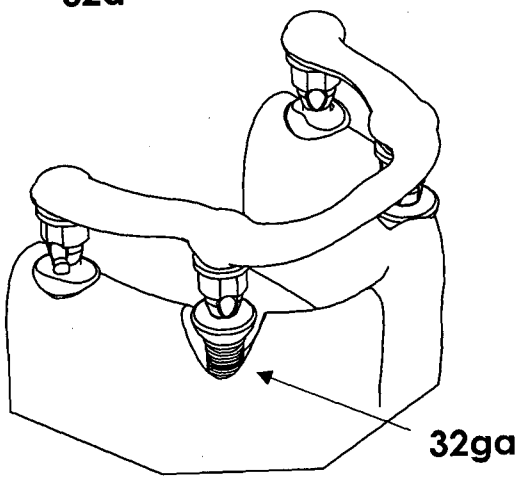
FIG. 31



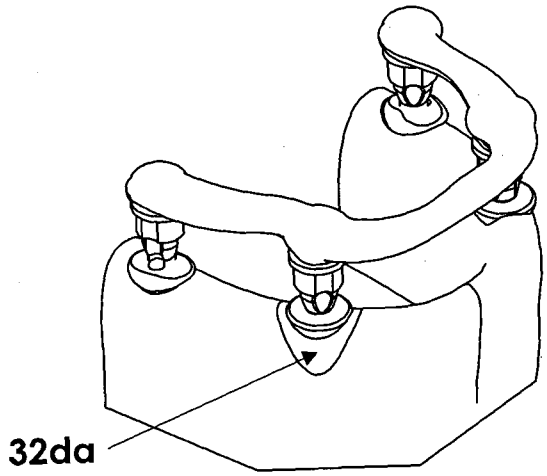
32a



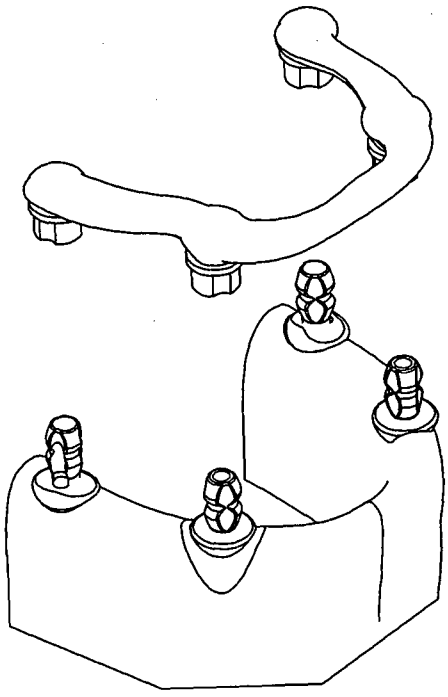
32b



32g



32d



32e

FIG. 32

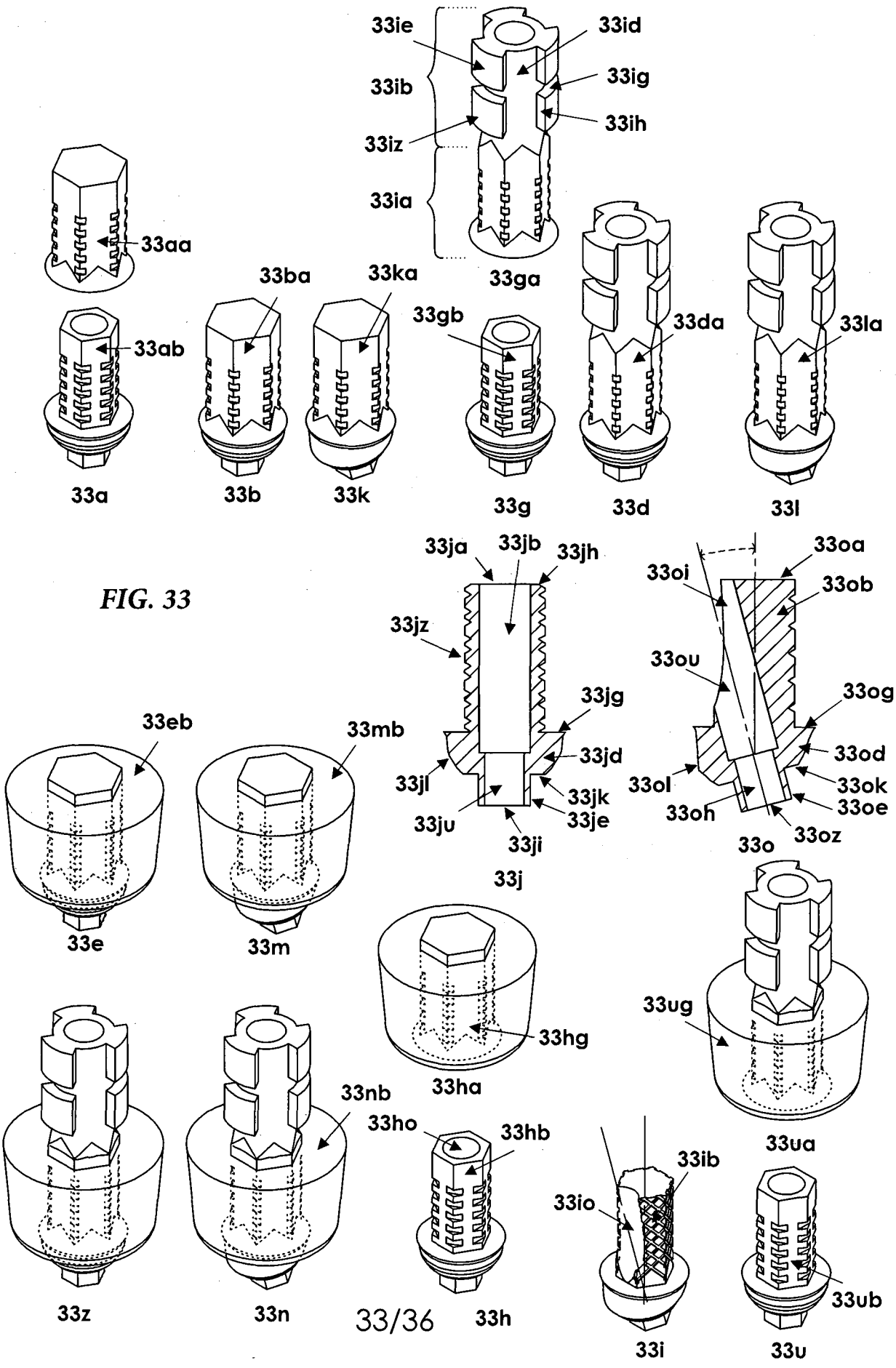

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FIG. 33

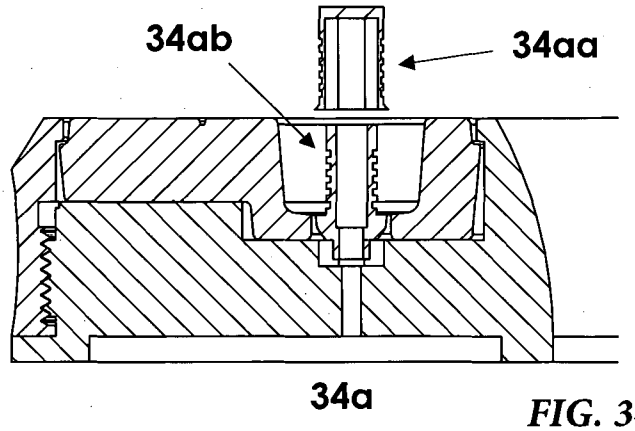


FIG. 34A

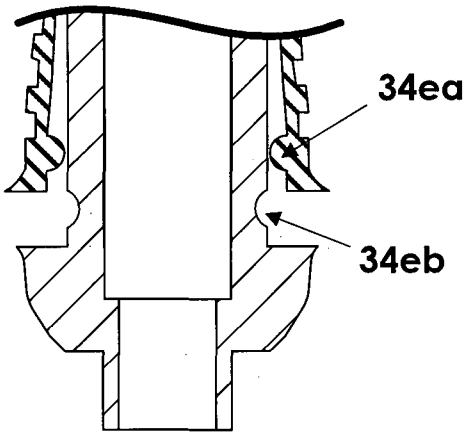


FIG. 34B

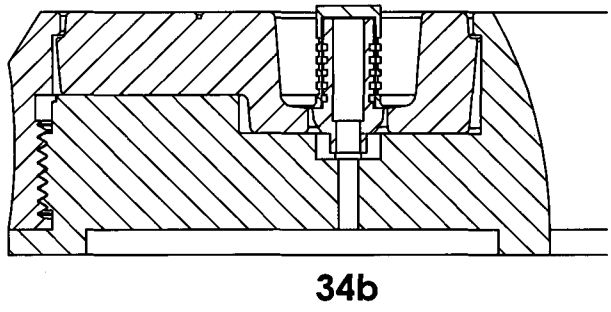


FIG. 34C

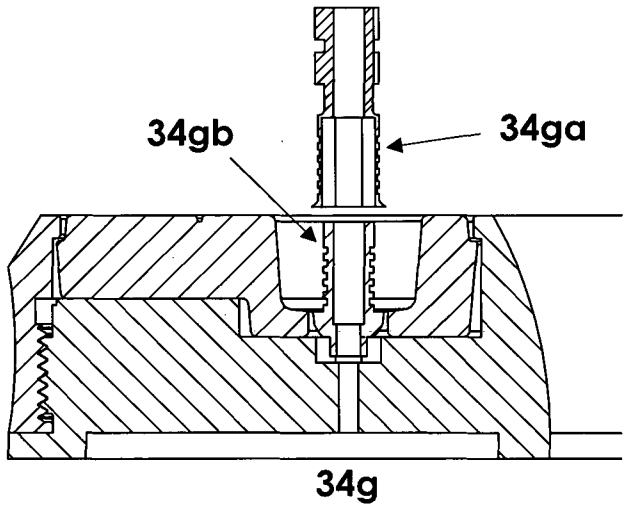


FIG. 34D

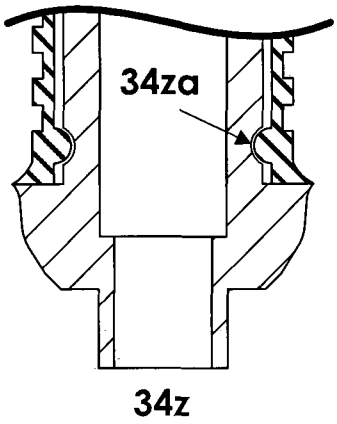


FIG. 34E

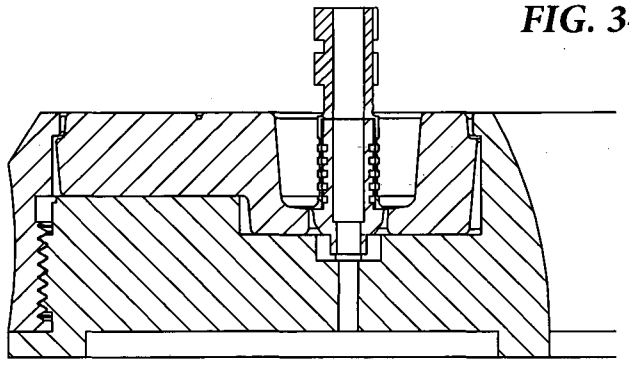


FIG. 34F

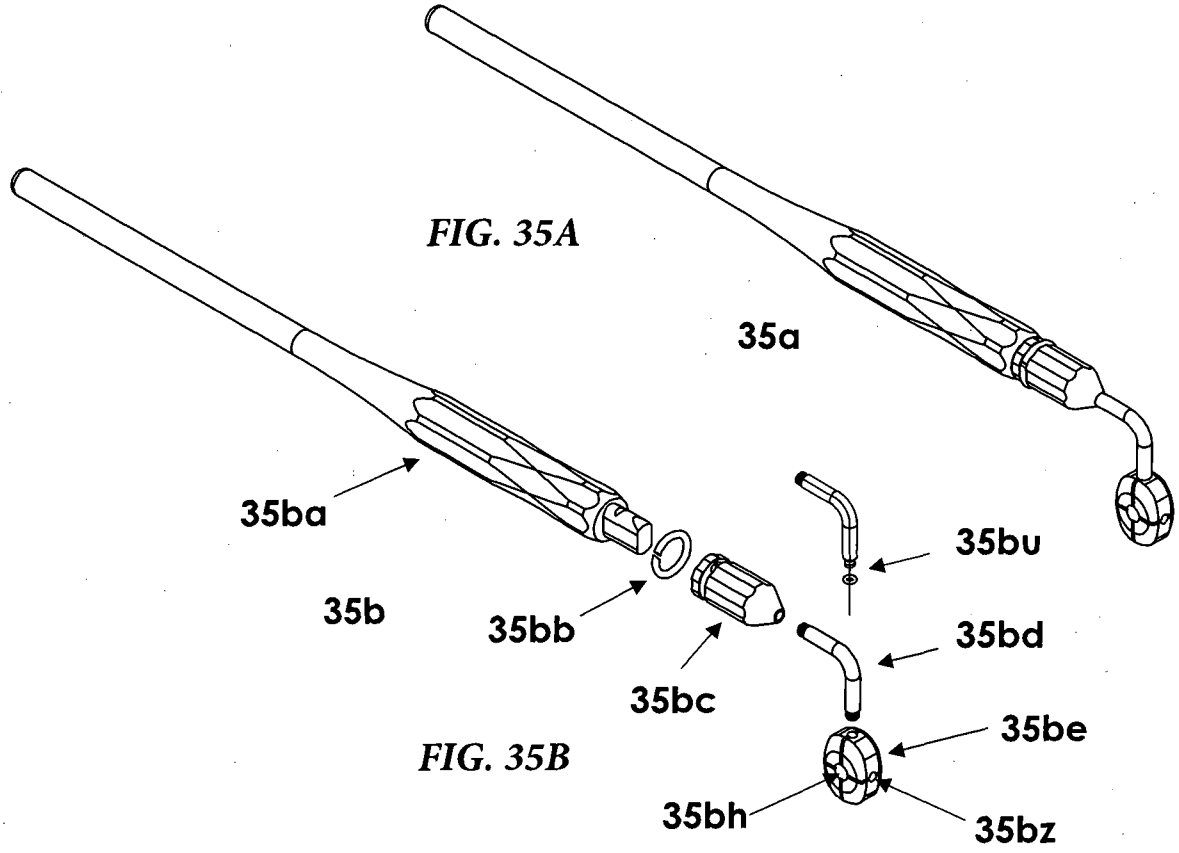


FIG. 35A

FIG. 35B

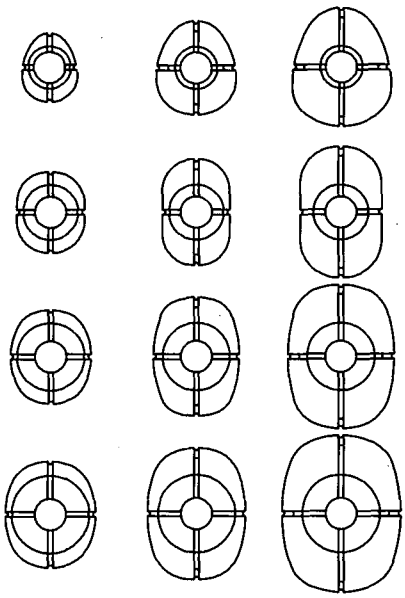
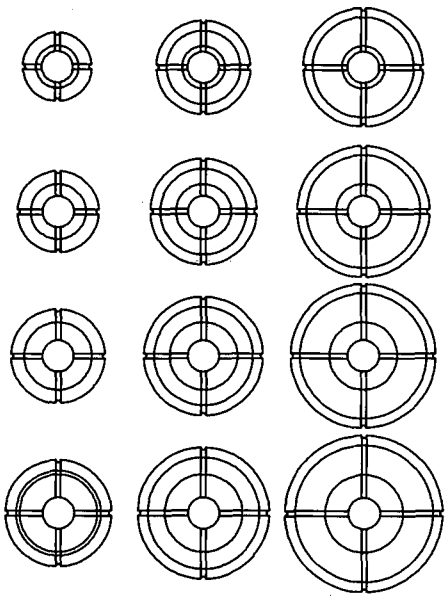


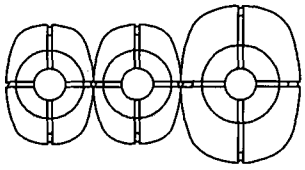
FIG. 35C

35g



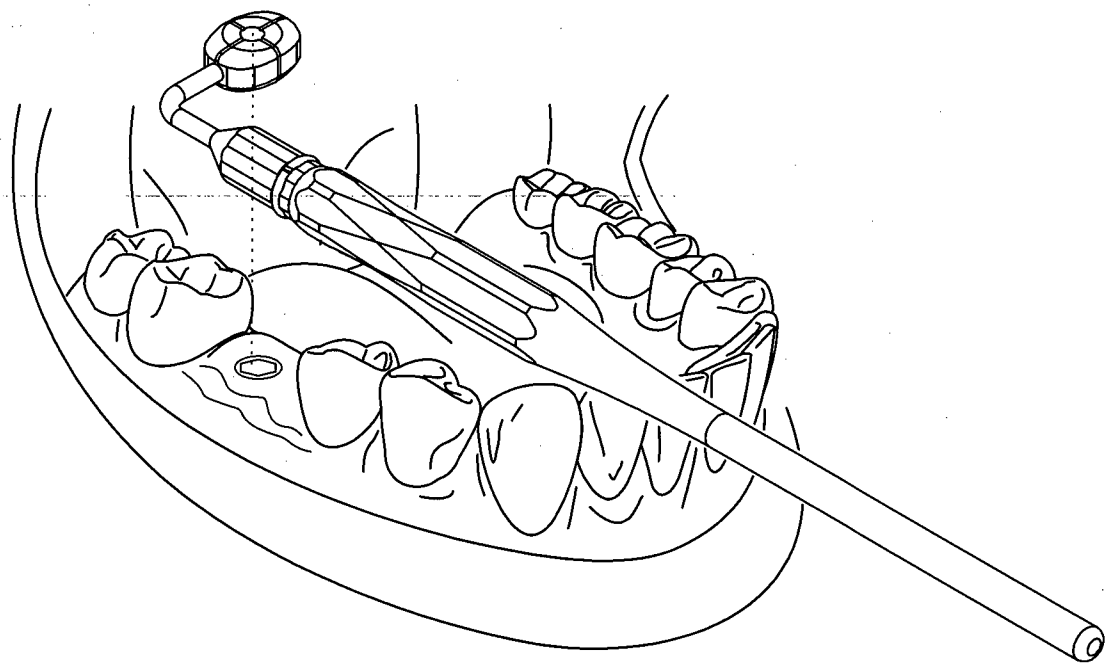
35d

FIG. 35D

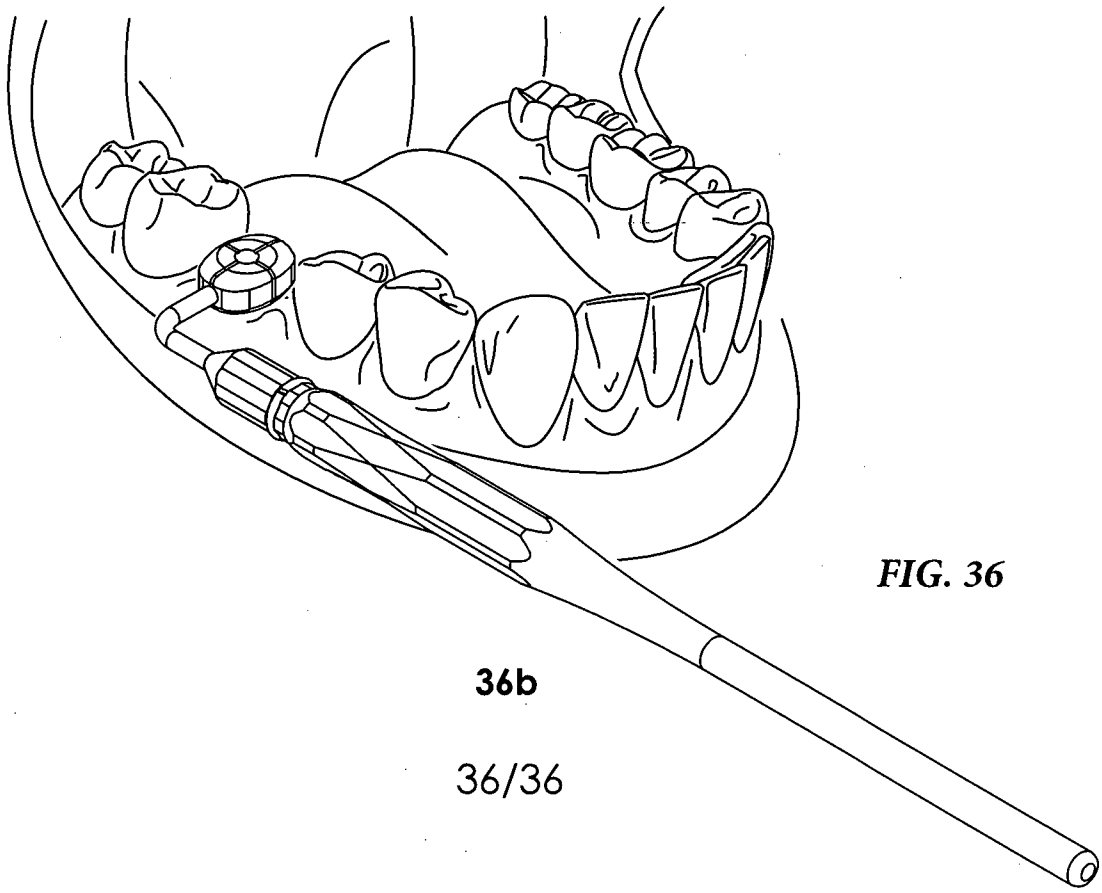


35e

FIG. 35E



36a



36b

FIG. 36