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US 4657509 A US 3990458 A  
US 20170340422 A1

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(54) Title of the Invention: **A tube of surgical mesh for preparation of a bite registration and a method of forming a bite registration**

Abstract Title: **Bite registration device for edentulous region**

(57) The device comprises a tube 2 formed of surgical mesh with a closed end 4 and a filling end 5 including an opening 6. In use the tube is packed with impression material forming a package. The package is located in an edentulous region of a patients jaw and teeth (figs 3 & 4) particularly where two or more adjacent teeth are missing. Further impression material may be dispensed from a conventional dispensing gun onto the upper surface of the package and the occlusal surfaces of the subject's remaining teeth. When the material has set the resulting bite registration (9, fig 6) is removed.

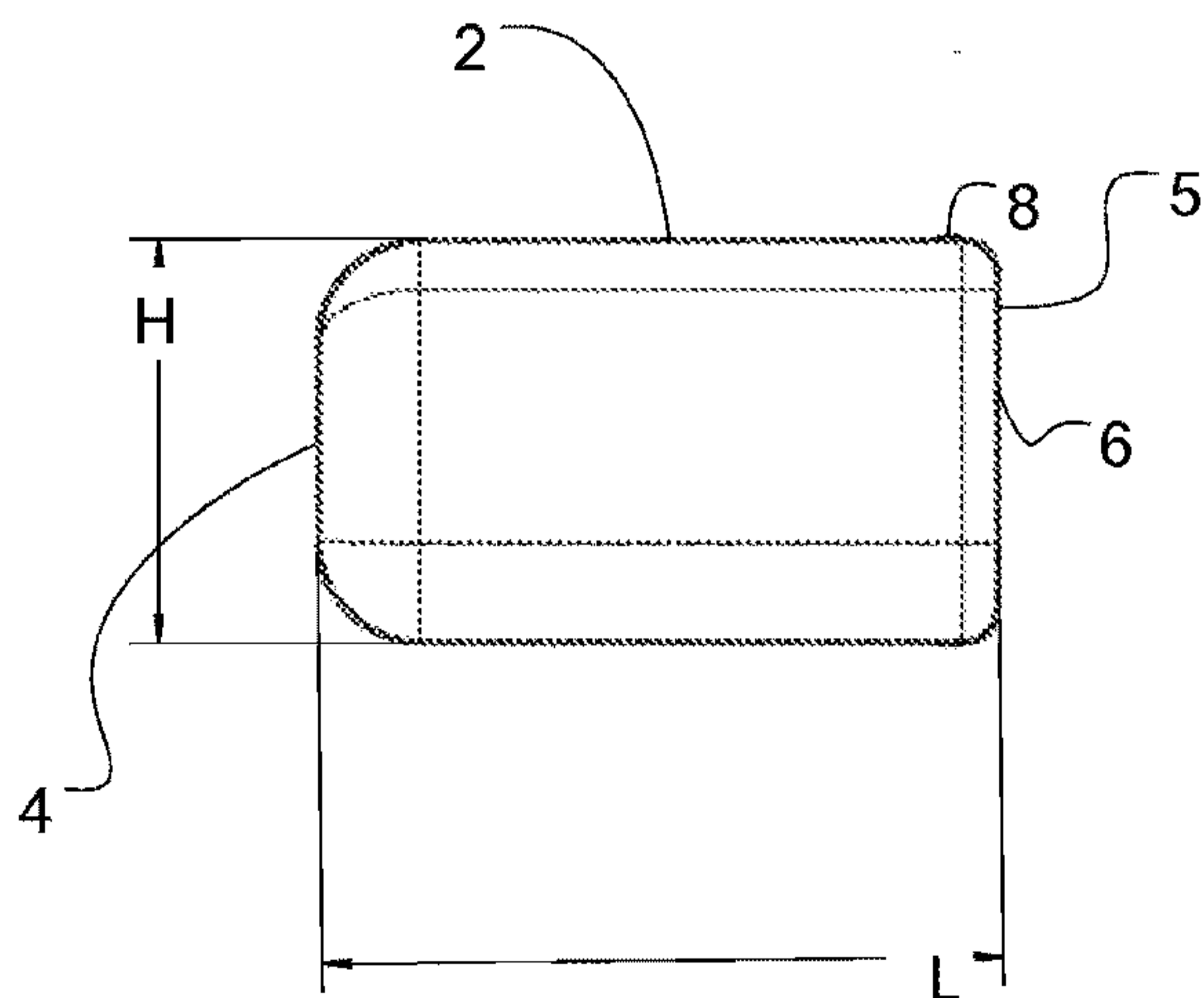


Fig 9

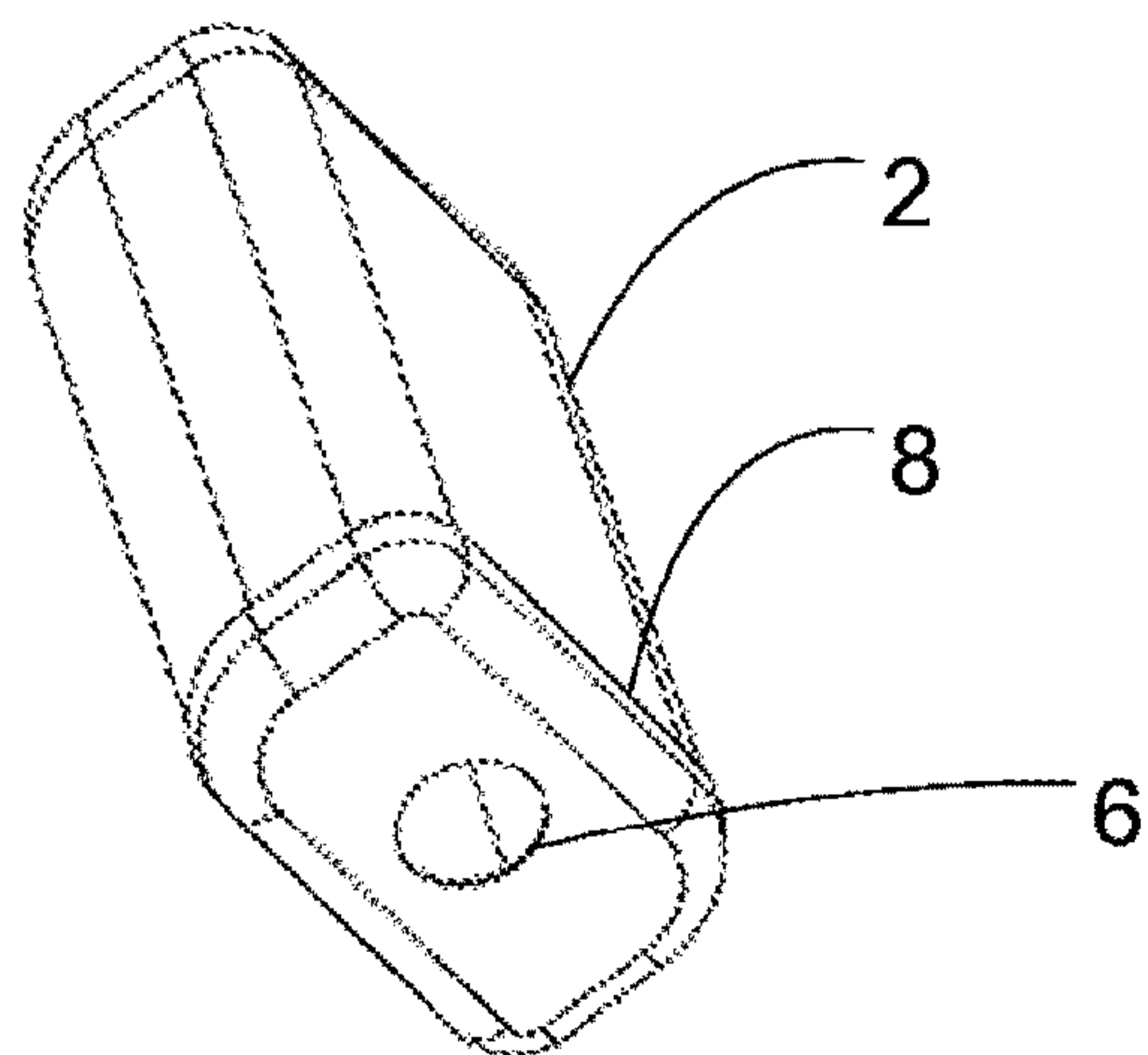


Fig 10

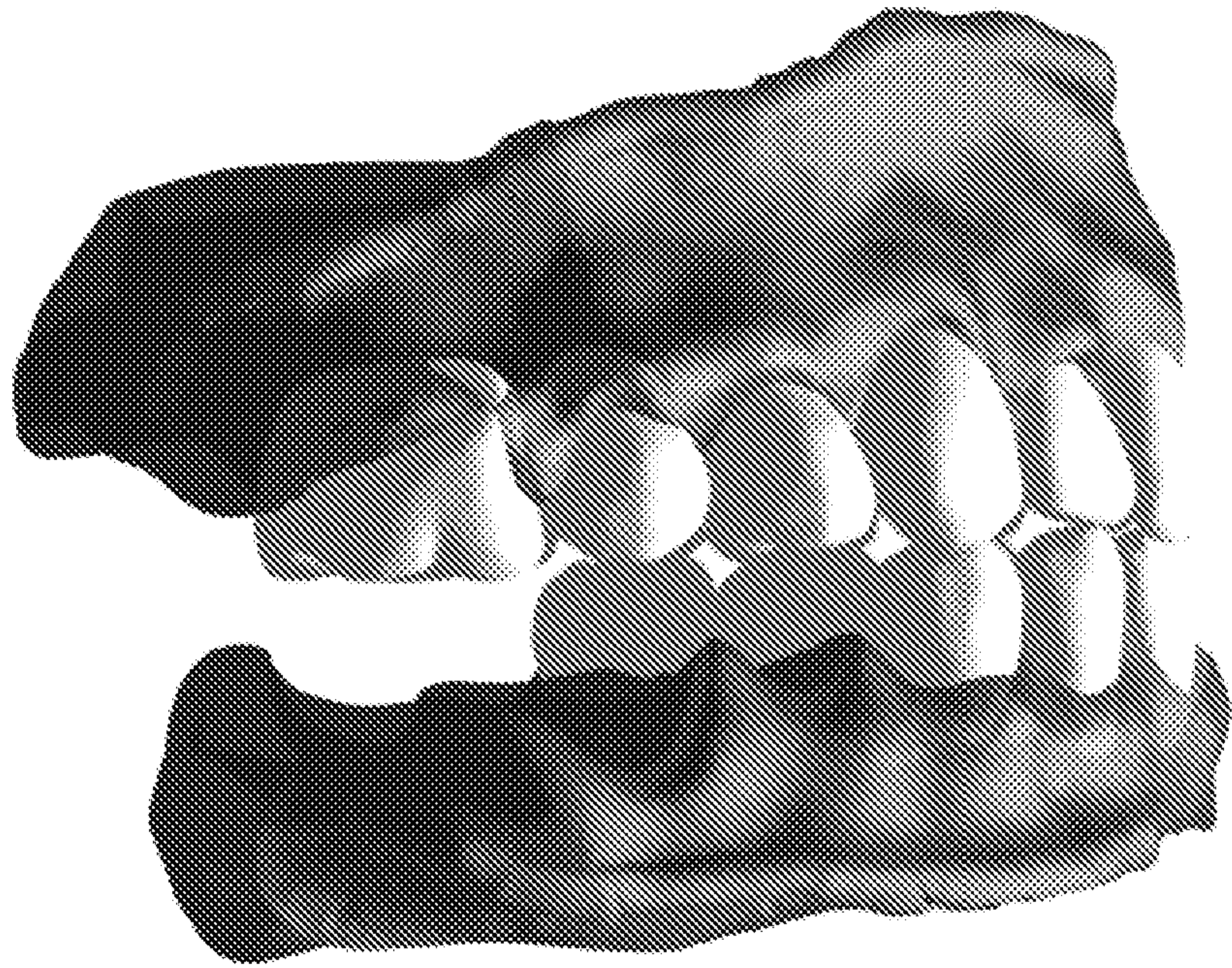


Fig 1

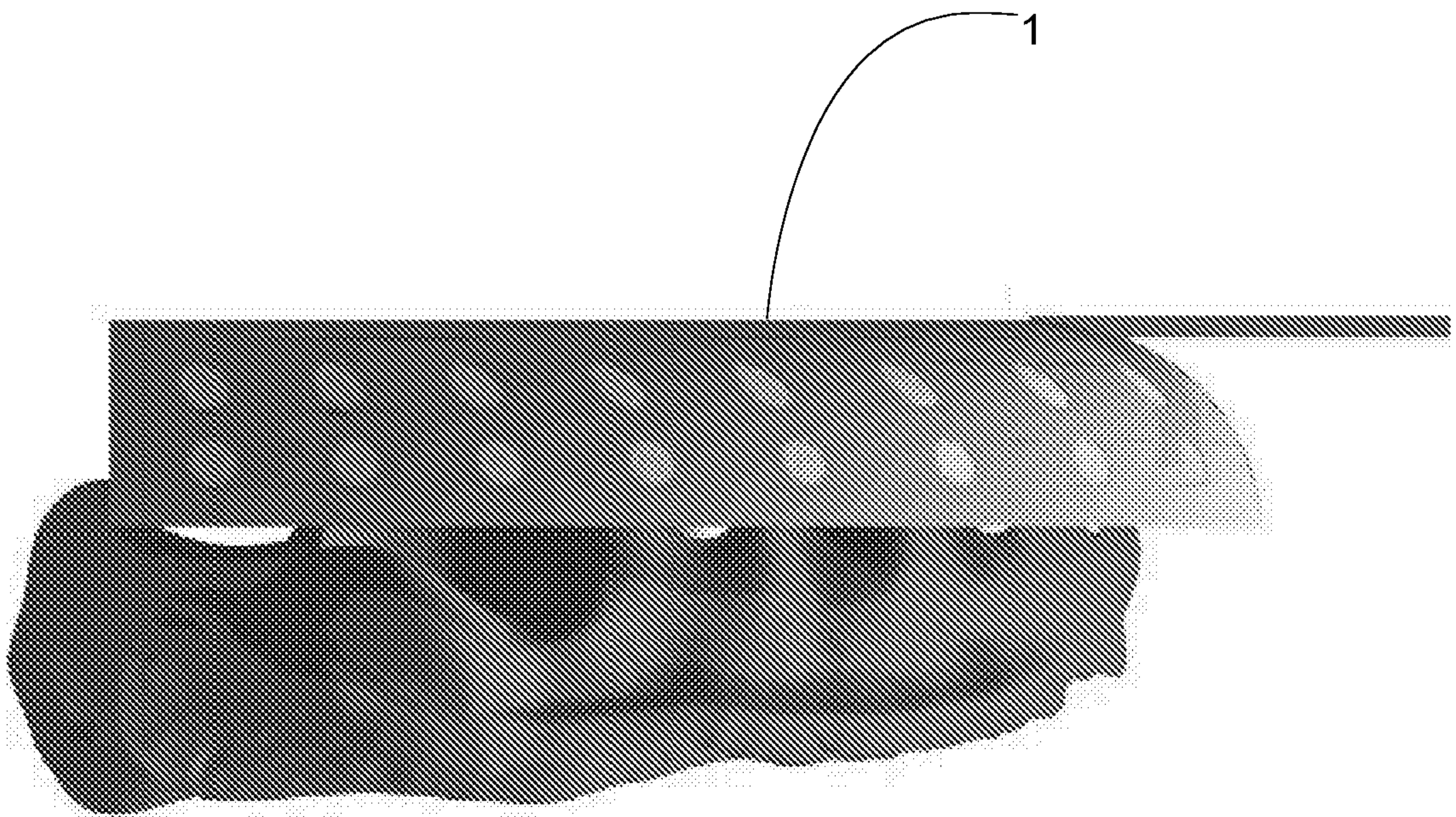


Fig 2

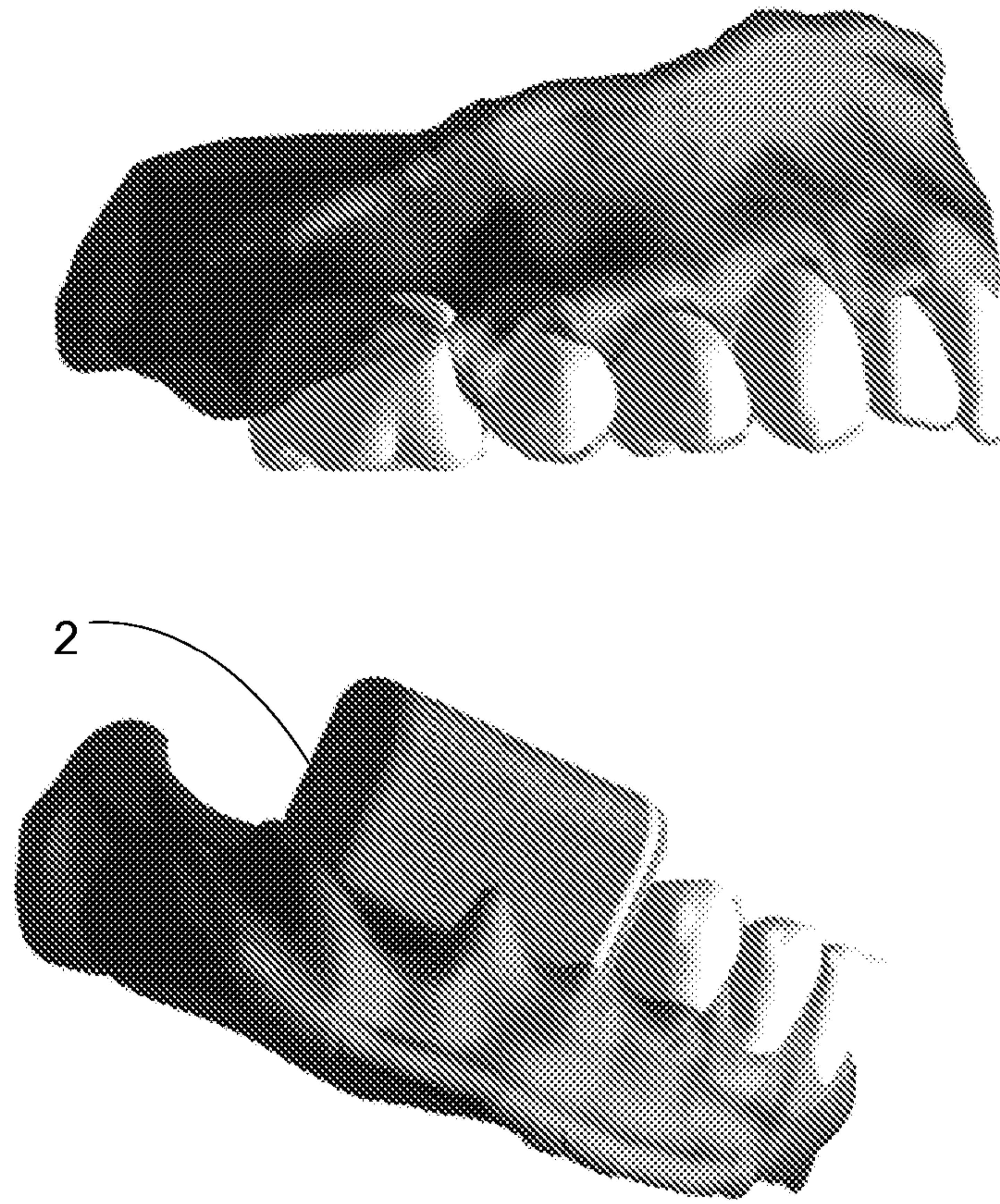


Fig 3

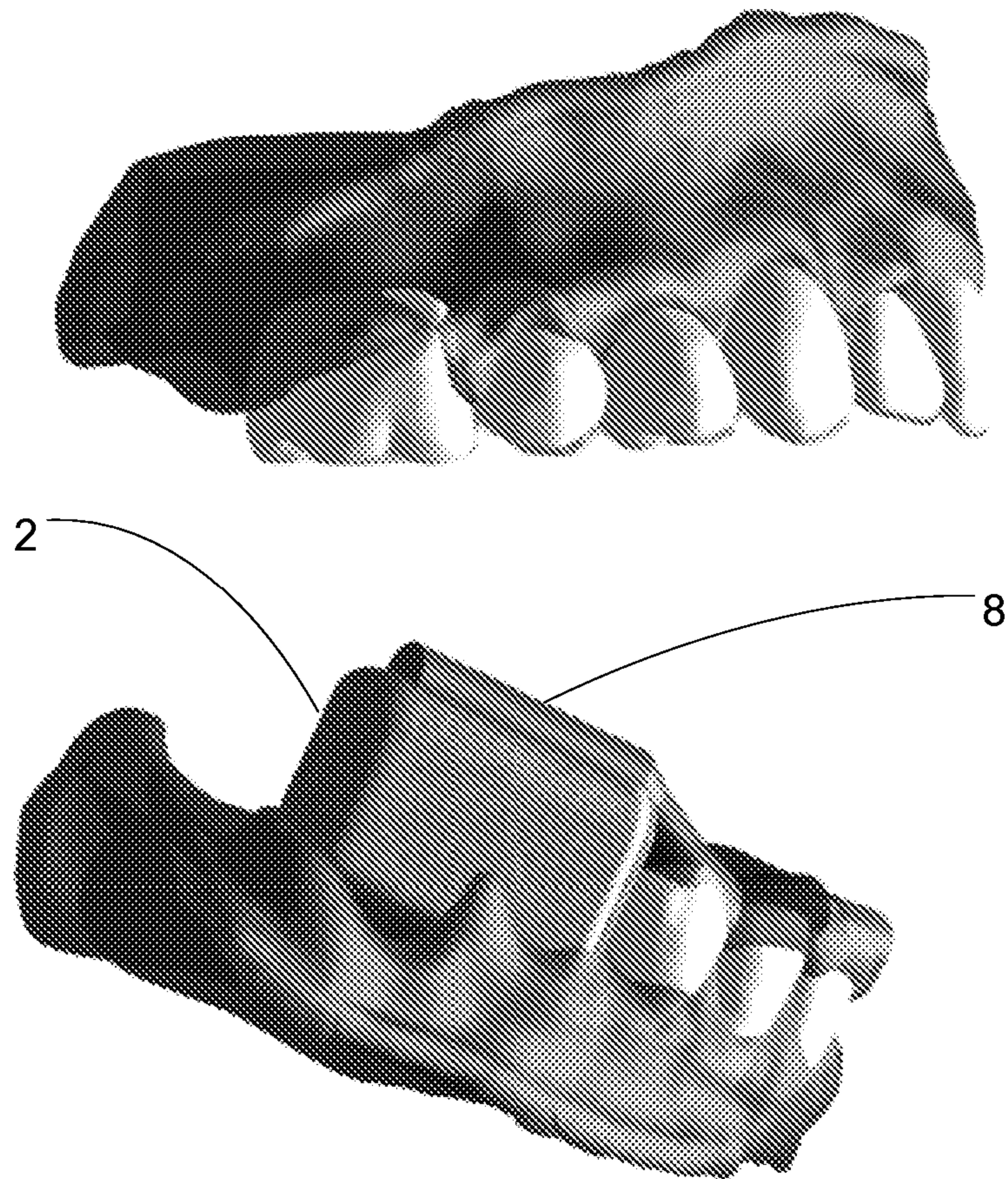


Fig 4

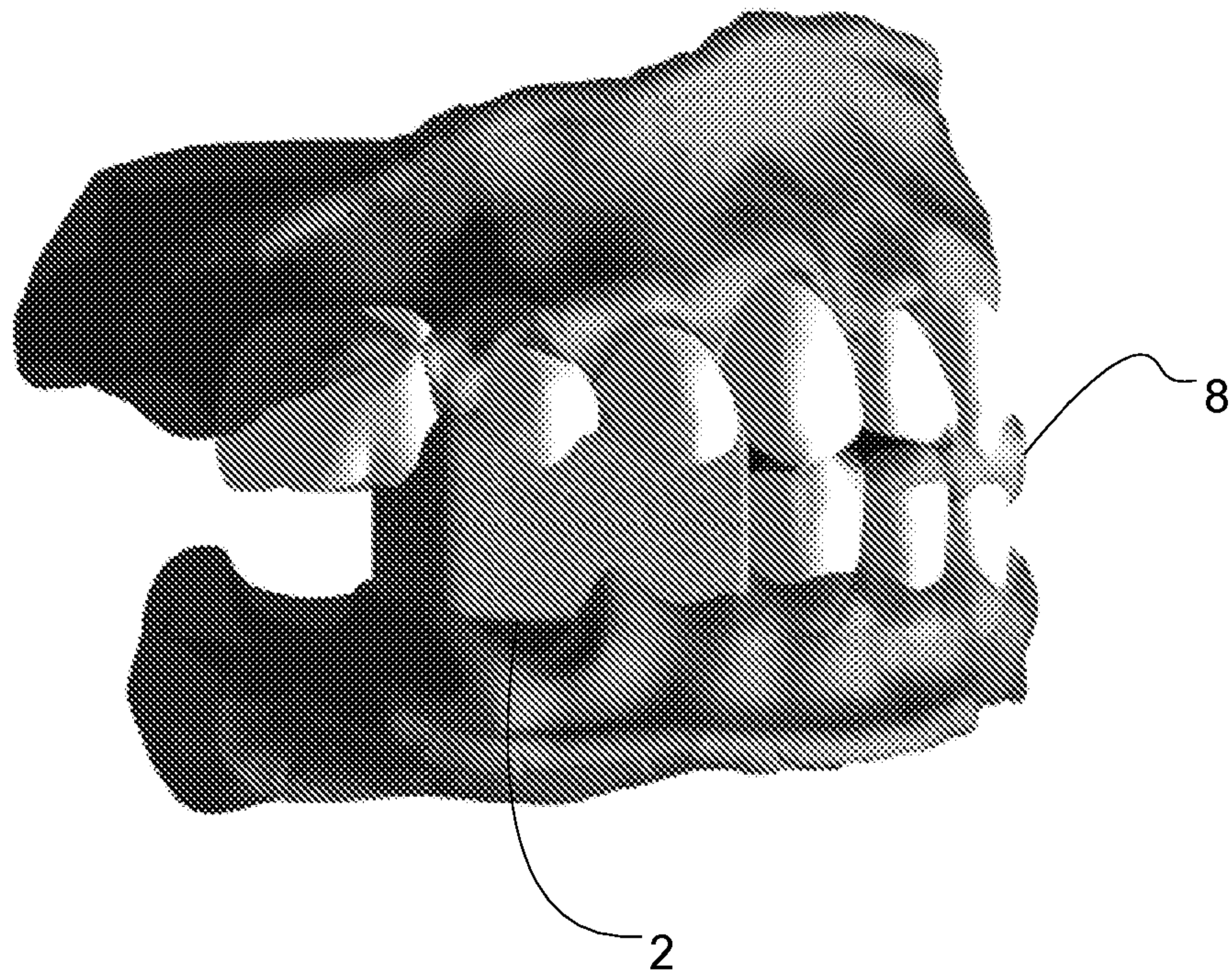


Fig 5

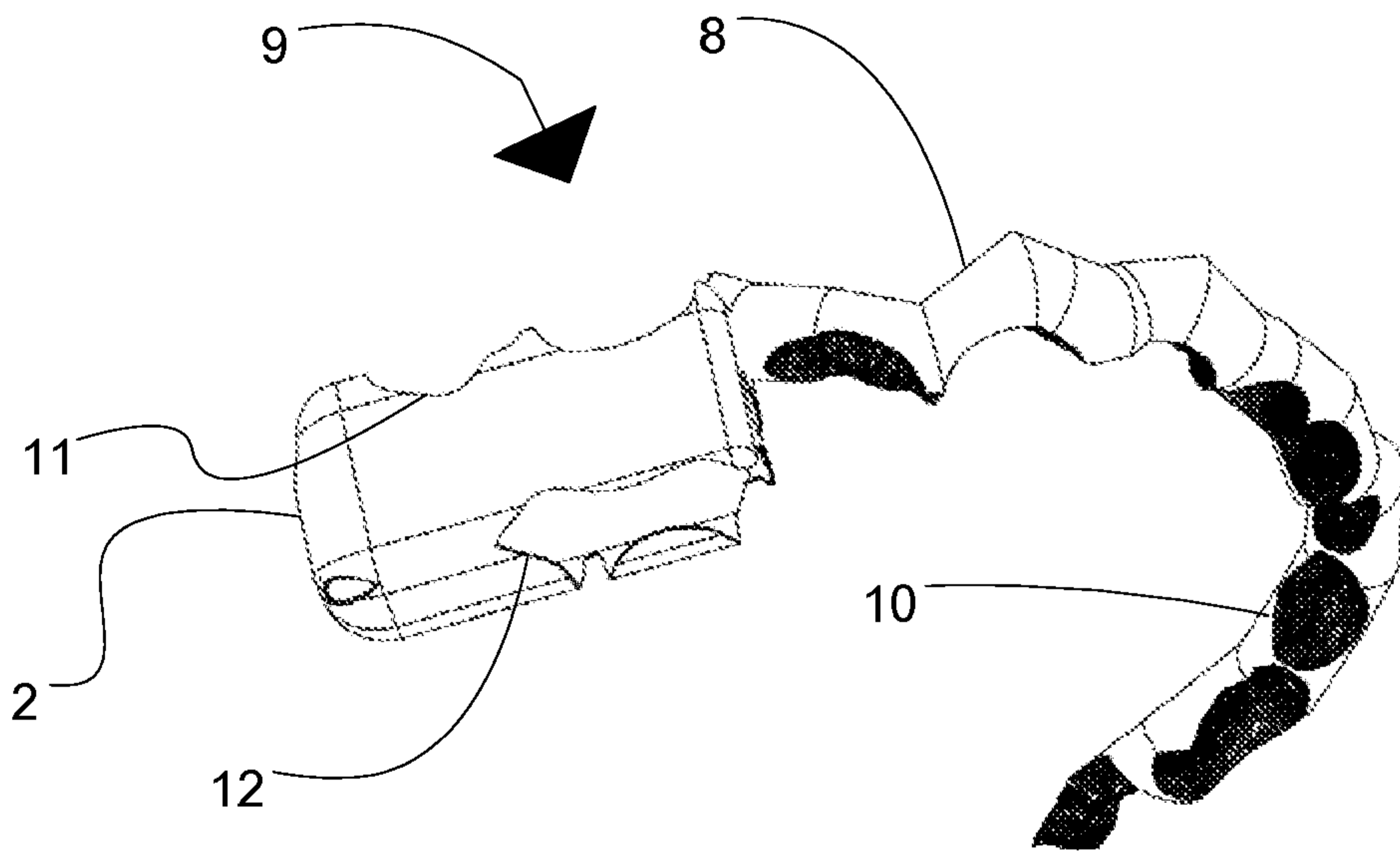


Fig 6

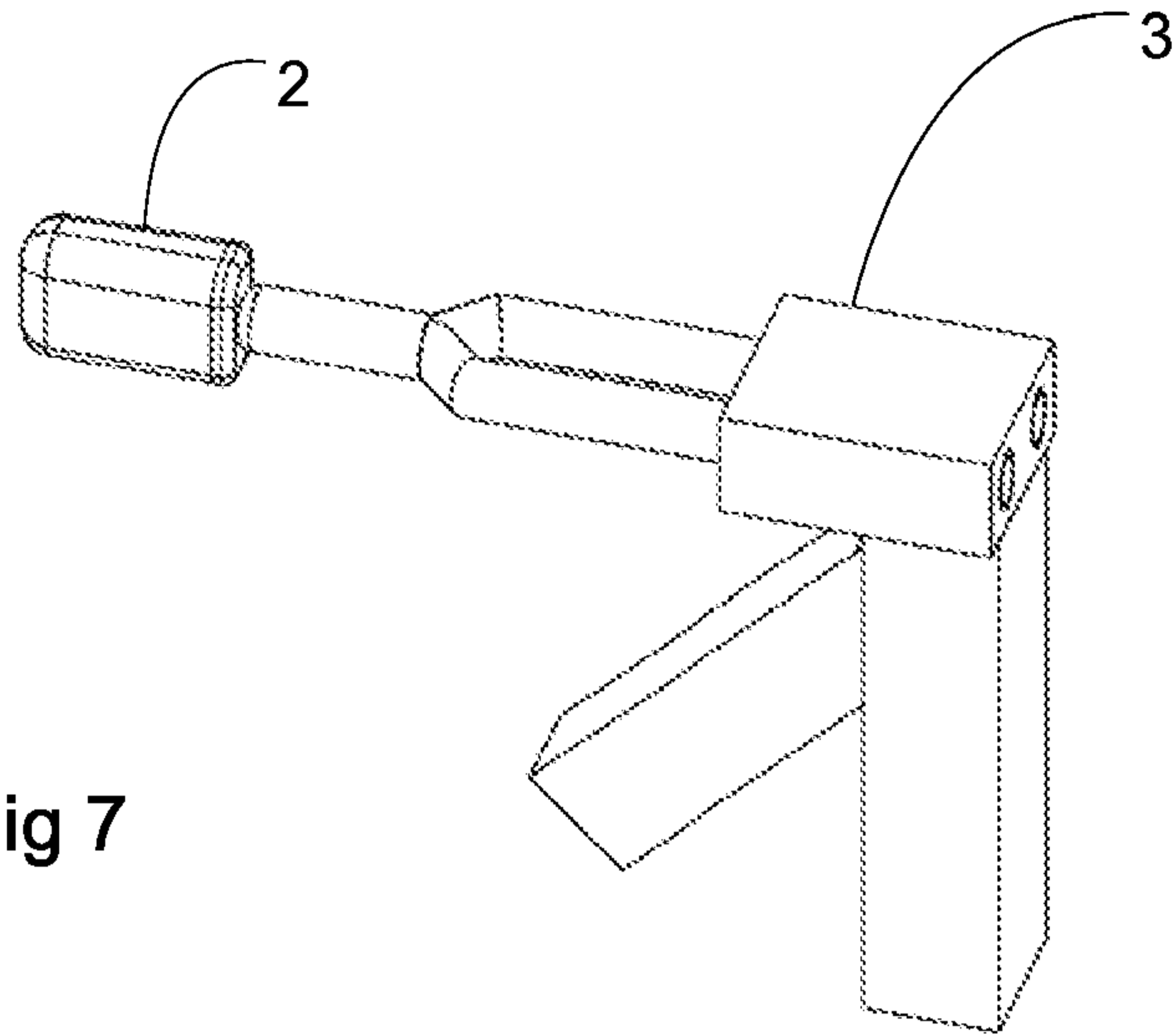


Fig 7

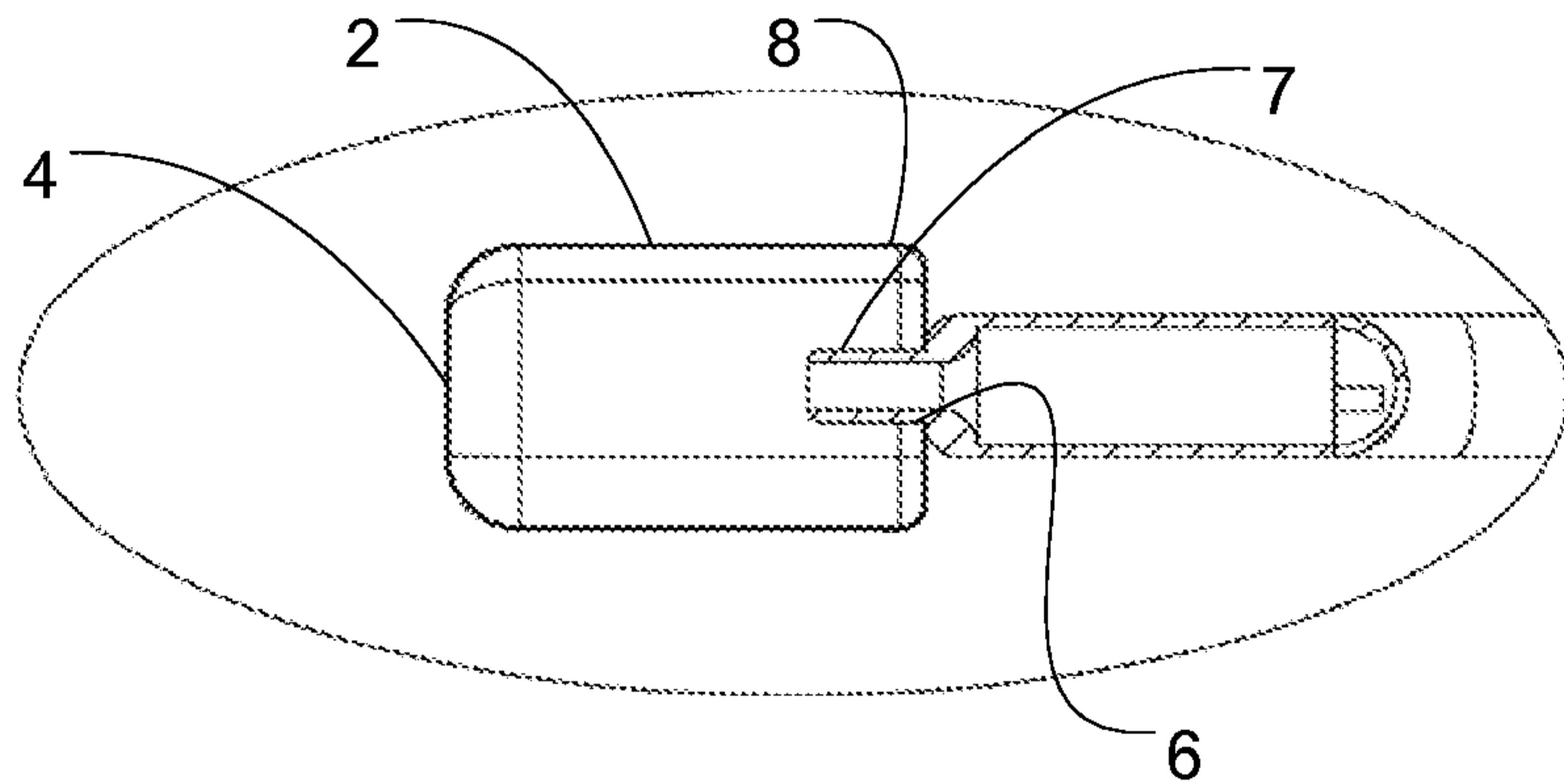


Fig 8

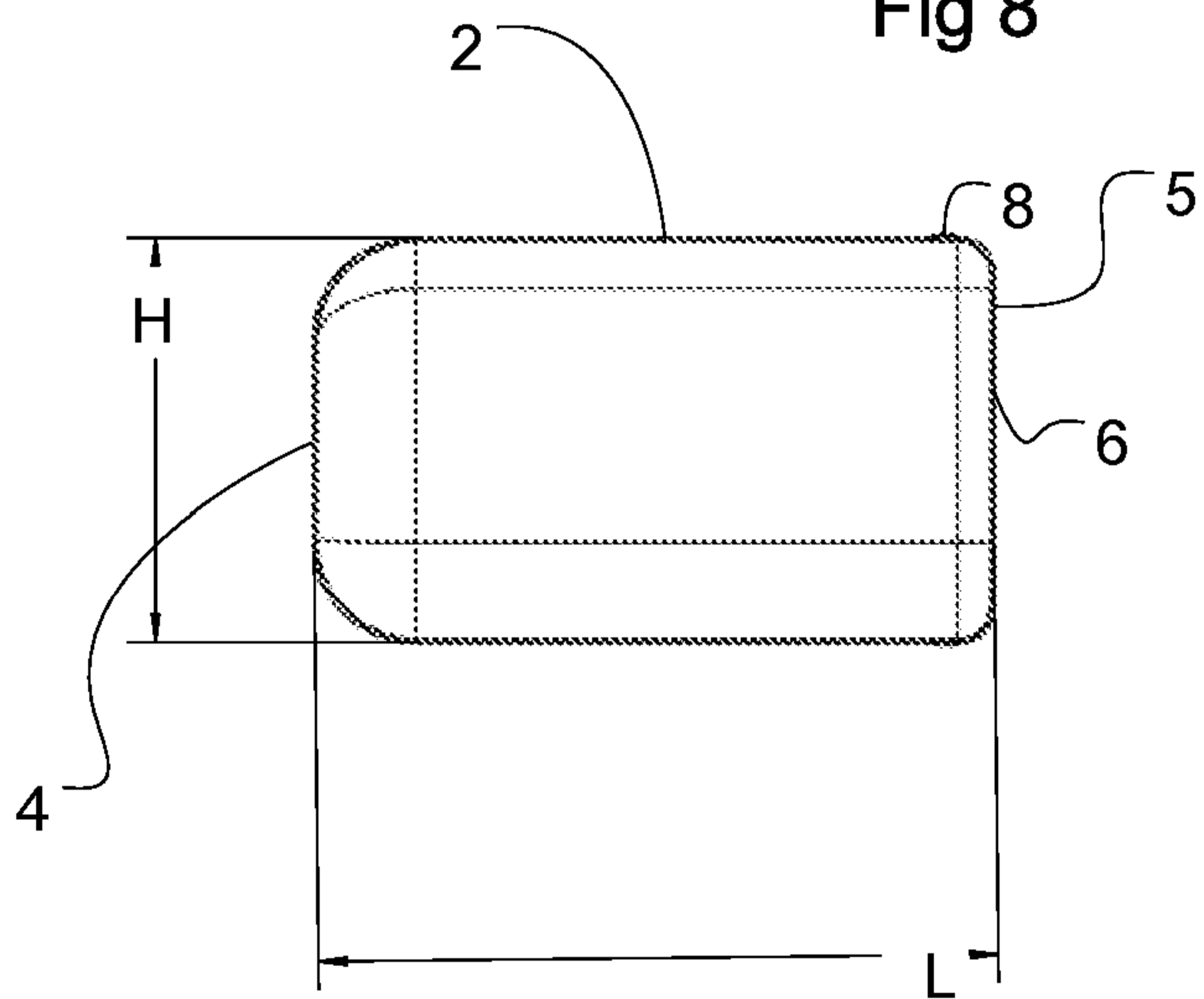


Fig 9

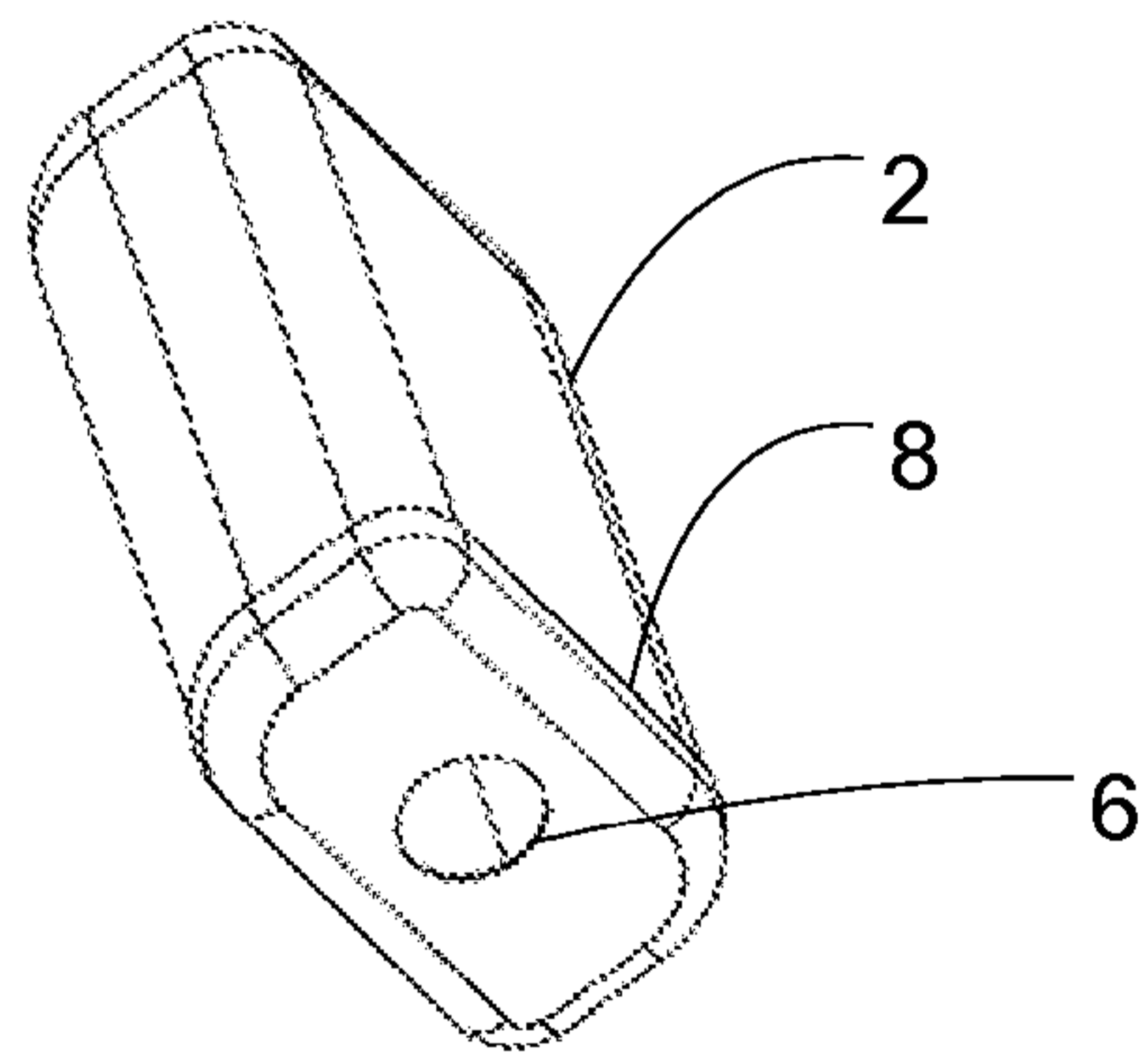


Fig 10



## A TUBE OF SURGICAL MESH FOR PREPARATION OF A BITE REGISTRATION AND A METHOD OF FORMING A BITE REGISTRATION

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### **Technical Field**

*[001]* The present invention relates to the field of dentistry for an already partially edentulous patient, in particular to help obtaining an accurate bite registration during the first appointment. Dental models are needed in many types of dental procedures, including; making dentures, crowns, bridges, study models, implant crowns and bridges, etc. Obtaining articulated upper and lower models of a patient's dentition is essential to proceed with the proposed dental treatment, this means that the upper and the lower models should be related to each other in the same way the upper and the lower teeth are related to each other in the mouth.

### **Prior art**

*[002]* The conventional method of modelling is to prepare an impression of each of the upper and lower jaw dentition. To achieve this an impression material is loaded into an impression tray. A loaded impression tray is then pressed against one of the upper teeth or lower teeth. The impression material sets to a resilient state over a period of around one to three minutes. The tray is then removed carrying the impressed material with it and forming a dentition impression. The process is repeated for the other of the upper or lower teeth.

*[003]* The contact of the occlusal surfaces of the teeth (articulation or registration) of the upper and lower jaws also needs to be captured. To achieve this on the same visit a

jaw registration is taken using one of the dental impression materials available on the market. The impression material is extruded over the occlusal surfaces of the lower jaw teeth and the patient encouraged to bite normally onto the impression material. The impression material sets, capturing the bite registration. The set material is removed from the patient's teeth and is known as the "bite registration". The resulting bite registration and dental impressions are passed to a dental technician who uses the bite registration and dental impressions to fabricate models of the patient's upper and lower dentition. The technician will use the bite registration to articulate the upper and the lower models together.

*[004]* Where the patient is missing two or more adjacent rearmost teeth in any side and in either or both the upper or lower jaw, accurate bite registration is not conventionally possible because of a lack of posterior stability. Conventionally this requires an inconvenient additional wax block procedure at a second dental session.

*[005]* Where the patient is missing two or more rearmost teeth the dental technician will fabricate a device called a wax block which will then be sent to the dentist. The patient is called to a second appointment to register his/her bite with the aid of the wax block. The bite registration on the wax block is

*[006]* returned to the dental technician to articulate the patient's dentition model.

*[007]* A third (procedure) dental visit is then required by the patient to implement the desired procedure based on the articulated dental model.

[008] It is desirable to reduce the number of treatment sessions in order to reduce patient inconvenience and dental costs.

[009] A method of achieving the impression stage is known involving optically 3D modelling the teeth and jaw structure and contours from the patient in situ. A 3D model of the patient's maxilla and mandible can then be fabricated, usually 3D printed. While virtual 3D models can be related to each other on the computer, this still is not possible on the printed models without going through the 'wax block' step. The equipment for virtual 3D imaging and virtual modelling is currently very expensive and does not fully eliminate the extra session of the wax block if a printed and articulated model is required.

[010] The present invention seeks to provide an inexpensive and reliable alternative solution to the aforesaid technical problem.

### **Summary of Invention**

[011] According to a first aspect of the present invention there is provided a tube of surgical mesh, closed at one end and open at the opposite end, such that the tube can be packed with a registration material.

[012] According to a second aspect of the present invention there is provided a method of forming a bite registration for an edentulous patient missing more than one rearmost teeth comprising the steps of:  
  
packing a tube of surgical mesh with an impression material;  
  
locating the packed tube to the edentulous region;

delivering a continuous layer of impression material, on to the tube and covering the occlusal surfaces of all of the teeth remaining in the jaw;

encouraging the patient to bite onto the impression material and tube until the impression material sets;

removing the resulting bite registration from the patient's mouth.

[013] The surgical mesh tube has a mesh size sufficiently small to provide posterior stabilising resistance to the impression material when receiving the bite. At the same time the surgical mesh is sufficiently deformable to conform to the patient's bite. This enables an accurate bite impression to be made against the unset impression material. Once the impression material sets the mesh is embedded into the set material.

[014] The surgical mesh may be flexible, or may have sufficient resilience at least around the open end of the tube to hold the tube open. One or more resilient bands may extend wholly or partially around the open end of the tube to hold the end open in order to facilitate the introduction of impression material. The tube may be injected with impression material from a conventional automatic mixing gun. An automatic mixing gun consist of two storage chambers containing components to form and harden a registration material. In use the material is simultaneously discharged from each chamber by the actuation of a single plunger to be mixed before expulsion from a nozzle. The opening of the tube may be tailored to match the common size of a gun nozzle.

- [015] Once the tube is packed with impression material it is plastic and forms a package which is moved to be located at the edentulous region. The tube may be manipulated by the dentist to hold it in place, for example by moulding to the shape of the edentulous jaw. When the step of locating is completed the nozzle of the gun is applied to the upper surface of the package and a continuous layer of impression material is discharged from the gun nozzle over the occlusal surfaces of the remaining teeth. The patient is encouraged to bite normally into the impression material and package and to hold the bite until the impression material sets. When the impression material sets the tube, contained impression material and material covering the occlusal surfaces forms a single integral bite registration.
- [016] Models are formed from conventional tray impressions of the patient's upper and lower teeth. The bite registration is then used in conjunction with conventional impressions of the upper and lower jaw dentition to relate (articulate) the models of the upper and lower teeth accurately. This eliminates the need for a "second" wax block visit procedure.
- [017] Where edentulous regions of both upper and lower jaw are in opposition, two packages may be deployed or a singled double sized package in order to register the dentition and jaw shape and configuration from the both jaws and adjacent remaining teeth.
- [018] The tube may be cylindrical or cuboid. The tube preferably has an asymmetric cross section so that the height is different to the width. Preferably the length is greater than the height which is greater than the width. Preferred nominal dimensions are 12 mm

long by 7 mm high by 5 mm wide. However, tubes may be provided in a range of sizes.

[019] The mesh tube may be provided in each of a range of lengths and diameters so that the practitioner can select the size of tube appropriate to the patient's edentulous space.

### **Brief Description of the Figures**

[020] A tube of surgical mesh and a method of taking the jaw registration of a patient's dentition where the patient is partially edentulous using a tube of surgical mesh, will now be described, by way of example only, with reference to the accompanying figures in which:

Figure 1 is a right side elevation of a patient's jaw;

Figure 2 is a right side elevation impression of a patient's lower jaw taking an impression using a conventional impression tray;

Figure 3 is a right side elevation illustrating a first step in the use of the surgical mesh tube;

Figure 4 is a right side elevation illustrating a second step in the use of the surgical mesh tube;

Figure 5 is a right side elevation illustrating a third step in the use of the surgical mesh tube;

Figure 6 is an isometric view of the underside of a bite registration formed by the process;

Figure 7 is an isometric view of an impression material gun in use to inject impression

material into a tube;

Figure 8 is an enlarged sectional view of the empty tube and gun;

Figure 9 is a further enlarged sectional view of the tube; and

Figure 10 is an enlarged isometric view showing the filling wall of the tube.

### **Detailed Description**

[021] Figure 1 shows a model of a patient's jaw and dentition where the first and the second molar teeth, are missing from the right side of the lower jaw. A model is used for illustration purposes because in a real patient much would be obscured by the surrounding facial tissue.

[022] In the process of the invention the dentist takes a substantially conventional impression of the lower teeth and upper teeth. As illustrated in figure 2 a conventional impression tray 1 is filled with a conventional impression material and pressed down onto the patient's lower dentition. This is then left in place until the material sets and is removed. An impression of the upper jaw dentition is also taken using a new tray and similar conventional technique.

[023] In order to securely take a bite registration utilising the edentulous area of the lower left first and second molars a tube 2 formed of surgical mesh is first filled with an impression material dispensed from a conventional gun 3.

[024] The tube of the embodiment is configured to have a length (L) of 12mm height (H) of 5 mm and width (W) of 7mm and is nominally cuboid, although the flexibility of the mesh and plasticity of the impression material prior to setting means that the package formed

by the mesh tube and impression material can be significantly deformed. One end wall 4 is closed off by the surgical mesh. An opposite filling end wall 5 is partially closed off by but incorporates a filling hole 6. Filling hole 6 is tailored to closely accommodate a nozzle 7 fitted to the gun 3. To facilitate handling and filling a resilient band 8 extends around the edge of the filling end wall 5.

[025] With the impression material still unset the subject is encouraged to open their mouth and the package formed by the tube and impression material is located in the vacancy and secured in place. The plasticity of the package facilitates manipulation to allow the tube to be secured.

[026] The surgical mesh is flexible and will contain the impression material while deforming to conform to the shape of teeth and jaw pressed into it. The tube 2 is closed at one end and deployed in the vacancy so that the open end faces out of the patient's mouth. With the tube 2 secured in place the practitioner uses the impression material dispensing gun 3 to eject impression material onto the package. Further impression material 8 is then extruded from the gun to overlie the occlusal surfaces of the remaining teeth as shown in figure 4.

[027] The patient is then encouraged to bite normally onto the package and the further extrusion material overlying the teeth as shown in figure 5. This action plastically deforms the package 2 and extrusion material to 8 reflect the position and shape of the subject's remaining teeth from each of the upper and lower jaw. The bite is held for a period sufficient to allow the impression material to set in each of the package and the



further extrusion material. This setting process step will also bond the package and further material together.

[028] Once set the subject is encouraged to open their mouth and the resulting bite registration 9 is removed by the dentist. The bite registration 9 now contains indentations 10 forming a record of how the subject's remaining lower teeth and indentations 11 formed by the subject's upper teeth relate to each other in a normal bite. Indentations 12 can also record the shape of the subject's edentulous gum.

[029] The tray impressions of the patient's upper and lower dentition are used to fabricate models of each of the patient's upper jaw dentition and lower jaw dentition.

[030] The bite registration 9 can then be used in conjunction with the models constructed from the conventional dental tray impressions to accurately relate the upper and the lower models together. The practitioner and patient can then directly move on to the proposed dental procedure at a second visit. The conventional requirement for a wax block procedure (made in the dental lab) at a second visit is obviated and the required number of patient visits to produce an articulated model of the patient's dentition is reduced from two to one.

[031] In a variant of the tube the filling end wall may be shaped to be concave in order to better engage the gun nozzle. The concavity of the filling end wall may be conical.

**Claims**

1.  
A tube of surgical mesh for preparation of a bite registration, closed at one end and open at the opposite end, whereby the tube can be packed with an impression material, forming a package and, in use can be located in an edentulous region of a patient's lower or upper jaw to take the bite registration of the edentulous region of the jaw and the respective opposing jaw or teeth, to facilitate the formation of a bite registration without a wax block procedure.
2.  
A tube of surgical mesh according to claim 1 wherein the mesh, when packed with impression material, is sufficiently flexible to conform to the surface of teeth.
3.  
A tube of surgical mesh according to claim 1 or claim 2 wherein the mesh is sufficiently porous to bond with a dental bite impression material and form a resilient record of the subject's bite when the impression material sets.
4.  
A tube of surgical mesh having at least a side wall and two opposing end walls, wherein a first end wall closes of the package to substantially resist the passage of unset impression material and a filling end wall includes a hole to receive the nozzle of a filling gun whereby the tube can be filled with impression material.
5.  
A tube of surgical mesh according to claim 4 wherein the hole is tailored to closely fit a standard sized nozzle of an impression material gun.

6. A tube of surgical mesh including a resilient band extending around the filling end wall, wherein the resilient band encourages the filling end wall to an expanded condition to facilitate handling the tube.
7. A method of forming a bite registration of a patient's dentition where the patient is partially edentulous, comprising the steps of:
  - packing a tube of surgical mesh with an impression material forming a package;
  - locating the package in the edentulous region of a patient's jaw;
  - dispensing a line of impression material across the top of the package and the occlusal surfaces of the subject's remaining teeth;
  - causing the subject to bite onto the package for a period sufficient to allow the impression material to set;
  - removing the resulting bite registration.
8. A method according to claim 7 comprising packing the tube before locating the tube in the edentulous region.
9. A method according to one of claims 7 or 8 comprising the step of forming tray impressions of the patient's upper and lower jaw dentition during the same dental session;
  - fabricating models of the subject's upper and lower jaw dentition from the tray impressions;

using the bite registration to articulate the subject's dentition models without the need for a wax block step.

Amendments to the claims have been filed as follows

### Claims

1. A tube of surgical mesh for preparation of a bite registration, closed at one end and open at the opposite end, whereby the tube can be packed with an impression material, forming a package and, in use can be located in an edentulous region of a patient's lower or upper jaw to take the bite registration of the edentulous region of the jaw and the respective opposing jaw or teeth, to facilitate the formation of a bite registration without a wax block procedure.
2. A tube of surgical mesh according to claim 1 wherein the mesh, when packed with impression material, is sufficiently flexible to conform to the surface of teeth.
3. A tube of surgical mesh according to claim 1 or claim 2 wherein the mesh is sufficiently porous to bond with a dental bite impression material and form a resilient record of the subject's bite when the impression material sets.
4. A tube of surgical mesh according to any one of the preceding claims having at least a side wall and two opposing end walls, wherein a first end wall closes of the package to substantially resist the passage of unset impression material and a filling end wall includes a hole to receive the nozzle of a filling gun whereby the tube can be filled with impression material.
5. A tube of surgical mesh according to claim 4 wherein the hole is tailored to closely fit a standard sized nozzle of an impression material gun.

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6. A tube of surgical mesh according to claim 4 including a resilient band extending around the filling end wall, wherein the resilient band encourages the filling end wall to an expanded condition to facilitate handling the tube.
7. A method of forming a bite registration of a patient's dentition where the patient is partially edentulous, comprising the steps of:  
packing a tube of surgical mesh with an impression material forming a package;  
locating the package in the edentulous region of a patient's jaw;  
dispensing a line of impression material across the top of the package and the occlusal surfaces of the subject's remaining teeth;  
causing the subject to bite onto the package for a period sufficient to allow the impression material to set;  
removing the resulting bite registration.
8. A method according to claim 7 comprising packing the tube before locating the tube in the edentulous region.
9. A method according to one of claims 7 or 8 comprising the step of forming tray impressions of the patient's upper and lower jaw dentition during the same dental session;  
fabricating models of the subject's upper and lower jaw dentition from the tray impressions;

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using the bite registration to articulate the subject's dentition models without the need for a wax block step.

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**Application No:** GB1915219.8

**Examiner:** Paul Jenkins

**Claims searched:** 1-9

**Date of search:** 6 November 2019

**Patents Act 1977: Search Report under Section 17**

**Documents considered to be relevant:**

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1-9	US3990458 A (LYTTON) see especially figures 1-6
X	1-9	US4657509 A (MORRIS) see especially figure 8
X	1-9	US2017/0340422 A1 (AL TAWHEEL) see all figures

**Categories:**

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

**Field of Search:**

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC<sup>X</sup> :

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Worldwide search of patent documents classified in the following areas of the IPC

A61C
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The following online and other databases have been used in the preparation of this search report

WPI, EPODOC, Patent Fulltext, INTERNET
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**International Classification:**

Subclass	Subgroup	Valid From
A61C	0009/00	01/01/2006