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CA 2663729 C 2014/04/22

(11)(21) 2 663 729

(12) BREVET CANADIEN
CANADIAN PATENT

(13) C

(86) Date de dépôt PCT/PCT Filing Date: 2007/07/06
(87) Date publication PCT/PCT Publication Date: 2008/03/27
(45) Date de délivrance/Issue Date: 2014/04/22
(85) Entrée phase nationale/National Entry: 2009/03/18
(86) N° demande PCT/PCT Application No.: CH 2007/000329
(87) N° publication PCT/PCT Publication No.: 2008/034267
(30) Priorités/Priorities: 2006/09/21 (CH1507/06);
2007/04/04 (CH540/07)

(51) Cl.Int./Int.Cl. *A61C 13/265* (2006.01),
A61C 13/275 (2006.01)

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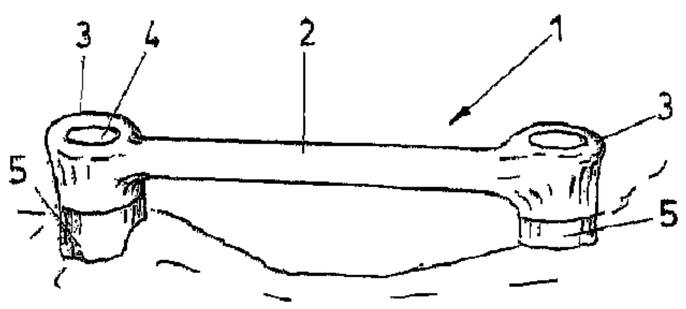
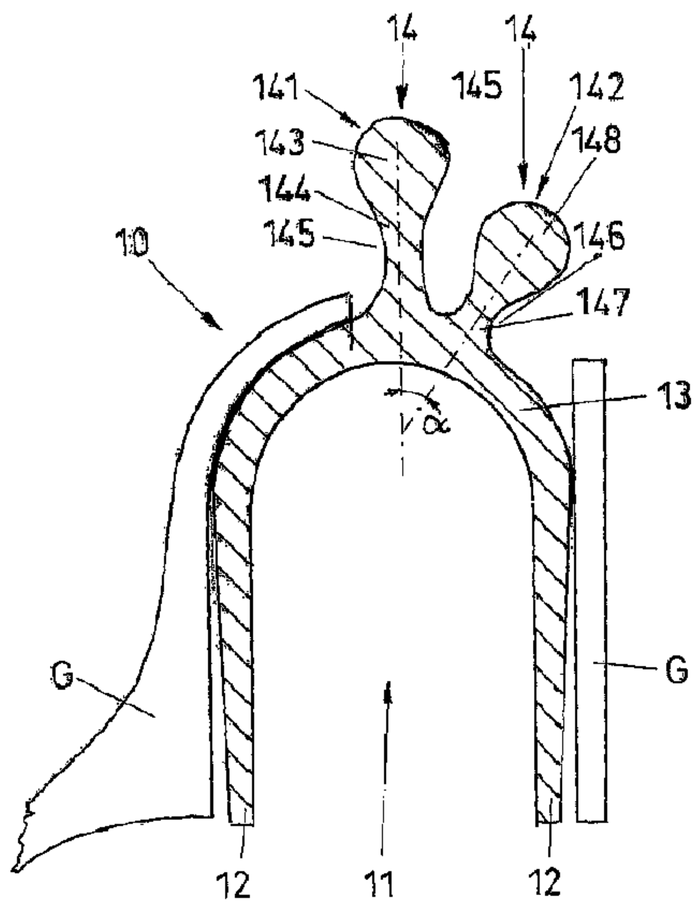
(54) Titre : MATRICE A ETAIS
(54) Title: SPIDER DIE





(57) Abrégé/Abstract:
For the resilient mounting of a spider die (10) onto a dental prosthetic suprastructure on a male spider mold (1), it is proposed to mold at least one retention element (14, 141, 142) onto a sleeve (11), the retention element having a substantially occlusal alignment. The at least one retention element (14, 141, 142) extends across the entire length of the sleeve (11) and has a head (143, 148) having a connecting neck (144, 147) in its cross-section. In this manner, retention undercuts (145, 146) are formed on both sides of the connecting neck. The connecting neck of the at least one retention element is molded at an offset as opposed to the crown line of the sleeve. A spider die is created in this manner, which has an improved retention with an increased retention force at a smaller installation height.

(12) NACH DEM VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES PATENTWESENS (PCT) VERÖFFENTLICHTE INTERNATIONALE ANMELDUNG

BERICHTIGTE FASSUNG

(19) Weltorganisation für geistiges Eigentum
Internationales Büro

(43) Internationales Veröffentlichungsdatum
27. März 2008 (27.03.2008)

PCT

(10) Internationale Veröffentlichungsnummer
WO 2008/034267 A1

(51) Internationale Patentklassifikation:
A61C 13/265 (2006.01) *A61C 13/275* (2006.01)

(21) Internationales Aktenzeichen: PCT/CH2007/000329

(22) Internationales Anmeldedatum:
6. Juli 2007 (06.07.2007)

(25) Einreichungssprache: Deutsch

(26) Veröffentlichungssprache: Deutsch

(30) Angaben zur Priorität:
1507/06 21. September 2006 (21.09.2006) CH
540/07 4. April 2007 (04.04.2007) CH

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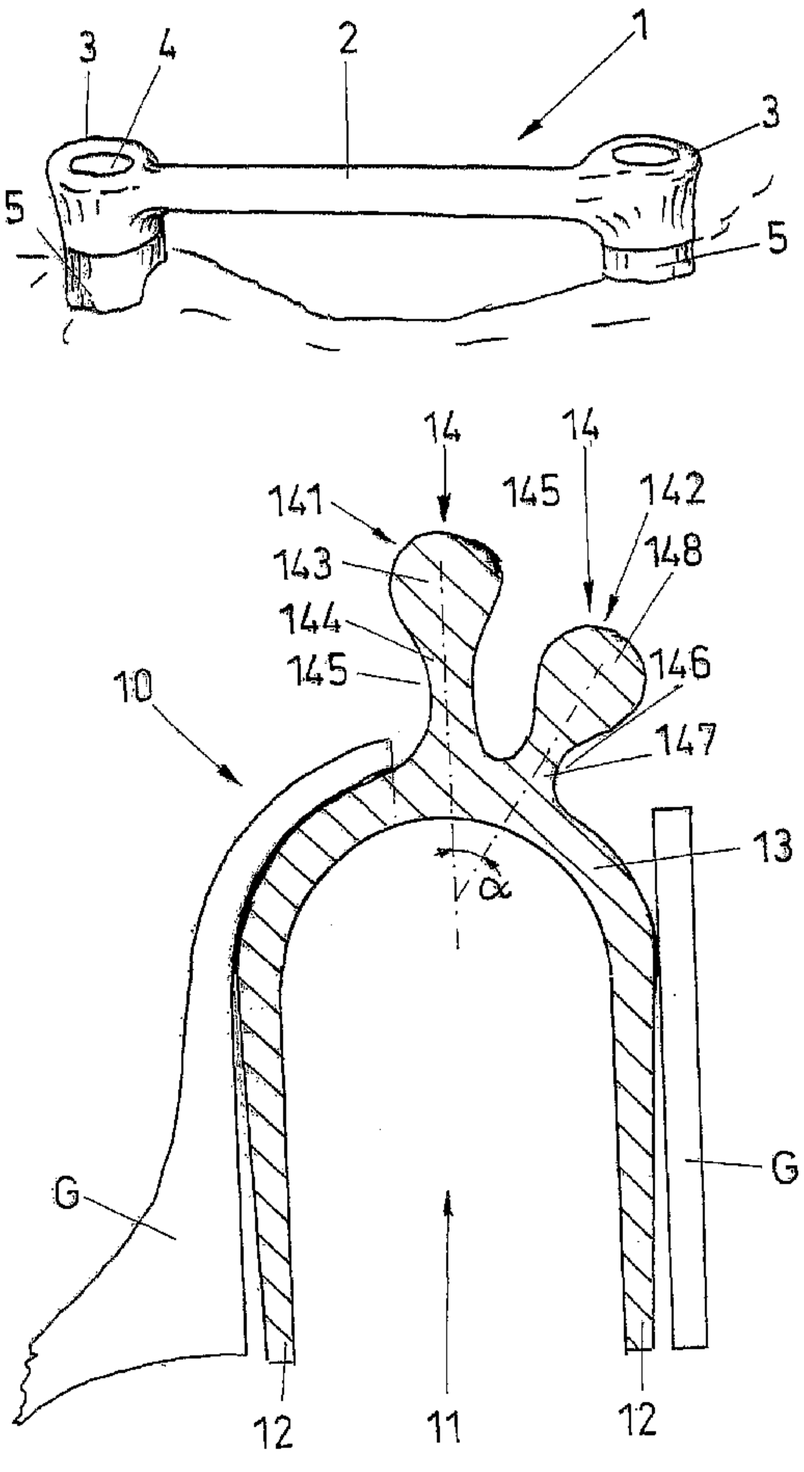
[Fortsetzung auf der nächsten Seite]

(54) Title: SPIDER DIE

(54) Bezeichnung: STEGMATRIZE



(57) Abstract: For the resilient mounting of a spider die (10) onto a dental prosthetic suprastructure on a male spider mold (1), it is proposed to mold at least one retention element (14, 141, 142) onto a sleeve (11), the retention element having a substantially occlusal alignment. The at least one retention element (14, 141, 142) extends across the entire length of the sleeve (11) and has a head (143, 148) having a connecting neck (144, 147) in its cross-section. In this manner, retention undercuts (145, 146) are formed on both sides of the connecting neck. The connecting neck of the at least one retention element is molded at an offset as opposed to the crown line of the sleeve. A spider die is created in this manner, which has an improved retention with an increased retention force at a smaller installation height.

(57) Zusammenfassung: Zur resilienten Befestigung einer Stegmatrize (10) auf einer dentalprothetischen Suprakonstruktion auf einer Stegpatrize (1) wird vorgeschlagen an einer Hülse (11) mindestens ein Retentionselement (14, 141, 142) anzuformen, welches im Wesentlichen eine occlusale Ausrichtung hat. Das mindestens eine Retentionselement (14, 141, 142) erstreckt sich über die gesamte Länge der Hülse (11) und hat im Querschnitt einen Kopf (143, 148) mit Verbindungshals (144, 147). So bildet sich beidseitig des Verbindungshalses Retentionshinterschnitte (145, 146). Der Verbindungshals des mindestens einen Retentionselementes ist gegenüber der Scheitellinie der Hülse versetzt angeformt. Hierdurch wird eine Stegmatrize geschaffen, die bei geringerer Einbauhöhe eine verbesserte Halterung mit erhöhter Retentionskraft hat.

WO 2008/034267 A1

WO 2008/034267 A1

RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Bestimmungsstaaten *(soweit nicht anders angegeben, für jede verfügbare regionale Schutzrechtsart)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), eurasisches (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), europäisches (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Erklärung gemäß Regel 4.17:

— *Erfindererklärung (Regel 4.17 Ziffer iv)*

Veröffentlicht:

— *mit internationalem Recherchenbericht*

(48) Datum der Veröffentlichung dieser berichtigten Fassung: 22. Mai 2008

(15) Informationen zur Berichtigung:
siehe Mitteilung vom 22. Mai 2008

SPIDER DIE

The present invention relates to a bar matrix for the fastening of a dental- prosthetic supra-construction on a bar projection.

Bar matrices are part of a bar attachment, with which part prostheses or total prostheses are held in the lower jaw or upper jaw, in an implant-retained manner. Such bar attachments consist of a bar projection and a bar matrix. The bar projection is a fine-mechanical anchoring element, which comprises a crosspiece which runs between implants and orally blocks these with one another. The complete crosspiece with the fastening means for fastening on the implants is called a bar projection.

A bar matrix is integrated into the removable part of the tooth prosthesis. The bar matrix, often also called bar rider, consists of a sleeve which is provided with suitable retention elements, in order to effect an anchoring in the dental-prosthetic supra-construction.

With modern supra-constructions, a metallic support construction should be present, on which the actual supra-construction of plastic is held. The support construction is called the cast model. The cast model comprises openings for connecting the cast model to the plastic construction, which are indicated as so-called polymerisation windows.

Whilst the development, which is often made by dentists, has concerned itself primarily with the releasable connection between the bar matrix and the bar projection, the problem of the anchoring of the bar matrix in the dental-prosthetic supra-construction has been neglected, since this problem essentially occurs only in dental laboratories, which concern themselves with the manufacture of the dental-prosthetic supra-construction. Indeed, on manufacture of the dental-prosthetic supra-construction, it has however been found that the retention elements are capable of accommodating only an insufficient retention force on the sleeve of the bar matrix, since the retention elements could only be kept extremely small on account of the design. The constructions of the bar matrices common today envisage a sleeve which is at least approximately u-shaped in cross section and which practically along the apex line in each case has a longitudinal surface running buccally and lingually, said longitudinal surfaces having a maximal extension in the lingual and buccal direction, so that they do not exceed the sleeve width. This is necessary, since otherwise the wall thickness of the dental-prosthetic supra-construction or of the tooth construction would be too thin-walled or would project out of this.

The bar attachment is a development by Dr. Hans Dolder and represents a solution for holding dental prostheses which are supported not only in a purely gingival manner. As already

mentioned, the Dolder bar has proven its worth over many years. A further development of the Dolder bar is shown for example in EP 1 192 916, with which the fastening of the matrix onto the projection functioning as a bar, does not function with a resilient mechanical retention, but with a permanent magnet which is adapted in shape to the bar, and is surrounded by a sleeve. With this solution too, the retention elements are integrally formed in a lingual and buccal manner and form the shape of an elongate, laterally integrally formed lug. Here too, the anchoring of the dental-prosthetic supra-construction is only rudimentarily realised.

A bar matrix is known from DE-3009758A, which consists of a sleeve with pins which are integrally formed thereon and running in the occlusal direction. The retention forces which may be achieved with these are minimal.

In contrast to this is the conventional solution according to DE-29609304 U, with which the bar matrix is formed as a sleeve with wings which are integrally formed in a buccal and lingual manner.

A bar projection which is practically integrally formed on the patient, and with which accordingly also the bar matrix which is formed as a U-shaped sleeve rectangular in cross section, and the matrix and projection are moulded to one another, is completely unusual. The solution according to US-2003/0211 444 may thus not be combined with a Dolder bar.

Finally, a bar matrix is known from US 4,209,904, which is formed from a number of riders which may be placed on the Dolder bar, wherein the riders have a sleeve section, on which a tab bent in the occlusal direction is integrally formed. The solution *per se* is only suitable for supra-constructions without a cast model, thus without metal reinforcement. If the tabs are located at a location where the pallatinal surface of the teeth runs very close to the bar, then the retention tabs must be ground away, and the retention is greatly weakened.

As a consequence, it is an object of the present invention to improve a bar matrix of the initially mentioned type, in a manner such that the retention forces

from the bar matrix to the dental-prosthetic supra-construction may be increased, without at the same time weakening the dental-prosthetic supra-construction attached thereon, or having to accept other disadvantages of the state of the art.

The present invention provides a bar matrix for fastening of a dental-prosthetic supra-construction onto a bar projection, wherein the bar matrix has a sleeve which in cross section is bent at least approximately in a U-shaped manner, which may be held onto the bar projection and on which at least one retention element is arranged for the retention of the dental-prosthetic supra-construction, wherein the at least one retention element is a part integrally formed on the sleeve and with an occlusal alignment, wherein the at least one retention element extends over the whole length of the sleeve and in cross section has the shape of a head with a connection neck, so that the connection neck forms a retention undercut on both sides, and wherein the connection neck of the at least one retention element is integrally formed offset to the apex line of the sleeve. The continuous design of the retention elements permits the dental technician to adapt the retention element at any location, to the given circumstances, by way of grinding, without the sleeve becoming damaged, a weakening of the construction occurring or other negative effects occurring.

The at least one retention element can additionally have a buccal or lingual inclination, deviating from the occlusal direction. The inclination of the at least one retention element, as a deviation from the occlusal direction, can be between 0° and 45°, preferably between 10° and 30°.

The bar matrix can comprise two parallel retention elements which extend over the whole length of the sleeve, which both essentially have an occlusal alignment and enclose an angle (α) amongst one another. The angel (α) which the two retention elements enclose amongst one another, is maximally 90°, wherein this angel is preferably between 10° and 45°. Both retention elements in cross section can have the shape of a head with a connection neck. The length of the connection necks can be different.

The head of the bar element can have a flattening extending over the whole length. The flattening can run perpendicular to the occlusal direction.

The at least one retention element extending over the whole length of the sleeve, at one or more locations, can be provided with undercut edges transversely to the longitudinal direction of the retention element.

In most cases, significantly more space is available in the occlusal direction, for the dental laboratory technician who creates a dental-prosthetic supra-construction. Since the forces which occur on use act essentially in an occlusal manner, it is however necessary for the retention elements or the at least one retention element to be undercut, deviating from the occlusal direction.

Preferred embodiments of the subject matter of the invention are represented in a simplified manner in the drawing, and are explained by way of the subsequent description

There are shown in:

Figure 1 the view of a Dolder bar fastened on two implants, in a perspective representation.

Figure 2 represents a section through a first embodiment of a bar matrix, perpendicular to its longitudinal alignment, whilst

Figure 3 shows the same representation of a second embodiment.

Figure 4 shows a part view of a bar matrix from the side, which is used in a special manner. Finally

Figure 5 shows a particularly preferred embodiment of a bar matrix with a differently designed cross-sectional shape, in a lateral view and

Figure 6 in a perspective representation. In

Figure 7 a bar matrix of the conventional type is shown in a reduced scale.

Firstly Figure 7 is dealt with, in which a conventional bar matrix is represented in cross section. The bar matrix forms the clamping part, with which a complete prostheses or part prosthesis is resiliently held on a bar projection. In the inserted condition therefore, the part-prosthesis or complete prosthesis completely covers the Dolder bar, according to Figure 1. The length of the bar matrix thereby corresponds maximally to the length of the crosspiece or bar 2. The actual bar matrix is indicated here at A. It consists of an elongate sleeve B which is arch-like in cross section. This sleeve is often also called a rider sleeve, since accordingly, as mentioned, it is placed on the crosspiece 2 of a bar projection 1. The rider sleeve B is delimited in the longitudinal direction on both sides by clamping walls C. These merge into a bearing bow. Retention elements E are integrally formed in the regions of the bearing bow. The course of

these retention elements runs precisely in a buccal-lingual manner. Since the forces of the dental-prosthetic supra-construction run essentially in the occlusal direction, then per se it is not the direction so much, but the size of the retention elements which is of significance. An enlargement of the retention elements was not possible with the previous design, since they would lead beyond the width of the two clamping walls.

One preferred embodiment of the matrix according to the invention is represented in a cross section along the alignment of the bar matrix in Figure 2. The bar matrix as a whole is indicated at 10. It comprises the sleeve or the rider sleeve 11, which here too, again comprises two clamping walls 12 running longitudinally and arranged roughly in parallel. The two clamping walls 12 here too again merge into a bearing bow 13. At least one retention element 14 which is aligned essentially in the occlusal direction must be present on the bearing bow 13. Thereby, the shaping of the retention element 14 must be such that at least one undercut deviating from the occlusal direction rises. Since, with chewing movements, it is not only forces in the occlusal direction which occur on the dental supra-construction, but also force components differing from this direction and occurring essentially in the buccal or lingual direction, the arrangement of the at least one retention element 14 running essentially in the occlusal direction is particularly advantageous, since these force components may also be accommodated in an optimal manner.

Two retention elements are represented in the embodiment according to Figure 2. A first retention element is practically only aligned in the occlusal direction and is indicated at 141. This first retention element 141 runs over the whole length of the bar matrix 10, or over the whole length of the sleeve 11. It has essentially a cross sectional shape which forms a head 143 and which is connected as one piece on a neck 144 to the bearing bow 13. Undercuts 145 which are capable of accommodating forces essentially occurring in the occlusal direction with a positive fit, arise on both sides thanks to the neck 144 of the first retention element. However, in order to better anchor the anchoring of the cast material of the dental-prosthetic supra-construction which is to be deposited over this, in this embodiment, a second retention element 142 is provided, which is integrally formed inclined at an angle α with respect to the first retention element. This second retention element in the same manner runs parallel to the longitudinal direction of the bar matrix 10, and likewise parallel to the first retention element 141. Thanks to this inclined shape, here an even greater undercut 146 results below the second retention element 142.

The whole sleeve 11 is a premanufactured element which dental laboratories purchase and process further by way of incorporating the sleeve 11 into a cast model G, and the prostheses teeth are formed thereabove. The retention elements 14 project through the cast model F, and, as mentioned, serve for retention of the dental-prosthetic supra-construction with a positive fit. With

this, a gap which permits a certain spring movement of the clamping walls 12, remains between the clamping walls 12 of the sleeve 11 and the cast model G.

The continuous design of retention elements permits the dental technician to adapt the retention element to the conditions at any location, by way of grinding, without the sleeve getting damaged, a weakening of the construction occurring or other negative effects occurring.

A second preferred embodiment of the subject-matter of the invention is shown in Figure 3 in the same representation as Figure 2. Again the bar matrix 10 consisting of the sleeve 11 is shown embedded in the cast model G, and the sleeve 11 again has clamping walls 12, which run parallel to one another and whose wall thicknesses, just as with the embodiment according to Figure 2, slightly taper conically from the bearing bow 13 towards the ends, in order in this manner to increase the spring effect of the clamping walls 12. This time, a single retention element 14 is integrally formed on the bearing bow 13. This single retention element 14 again extends over the whole length of the sleeve 11 and here too has a head 14' and a neck 14". The retention element 14 is aligned essentially in the occlusal direction, but as with the previous embodiment, has an inclination in the buccal or lingual direction with respect to the second retention element 142. The inclination in the buccal or lingual direction is dependent on the installation position and is determined by the dental laboratory. Usually, the installation position is such that the retention element 14 in the installed condition tends to be directed buccally outwards. If a single retention element is present, then this may of course be designed larger than with the variant with which two retention elements are present running parallel to one another in the same manner. The inclination essentially serves for realising an enlarged undercut 14'". The inclination of the retention element is usually selected between 0° and 45°, more preferably however between 10° and 30°. If two retention elements are however present, as with the previously described embodiment, then of course one may be provided with a buccal inclination and the other with a lingual inclination, or also only one of the two may have an inclination. Accordingly, the angle α is of course variable to a large extent. However, most preferably it is not more than maximally 90° and preferably the angle α is between 10° and 45°. It is indeed with the design of the solution with two retention elements running in the longitudinal direction, as shown in Figure 2, that one would make the length of the connection necks 144 and 147 differently long, in order, by way of this, to be able to design the heads of the retention elements adequately large and simultaneously to ensure a perfect flowing-in of the mass for forming the dental-prosthetic supra-construction.

The dental laboratory technician, with regard to the embodiment according to Figure 2 as well as the embodiment according to Figure 3, may himself take further measures, in order to increase the retention and simultaneously also to make certain shape adaptations in the course of the sleeve. This is represented symbolically in Figure 6, in which a sleeve 11 with single

retention element 14 is shown from the side. The retention element here is interrupted by way of a suitable sawing-in, milling-away or filing, so that it is severed with an undercut. This application, with which the undercut edges are formed running inclined in a distal and medial manner, emanates from sleeves with retention elements extending continuously over their whole length. If one manufactures the sleeve 11 in a mould casting procedure, then the undercut edges 16 on the retention element 14 may also be ideally formed directly from the beginning. Since however the dental laboratory may carry out adaptations anyway in the normal case, a solution with which the dental laboratory incorporates the undercut edges itself is preferred.

A preferred embodiment of the bar matrix 10 is represented in Figure 5 and 6. This again has a continuous extension adapted to the length of the bar projection. The sleeve 11 here consists of two clamping walls 12, which are connected to one another via the bearing bow 13. The clamping walls 12 are provided with step-like thickenings, the clamping strips 121 incorporated on their inner side, for increasing the retention force of the sleeve 11 out of the bar 2

The sleeve 11 is mirror-symmetrical with respect to the longitudinal axis or with respect to the apex line S of the bearing bow. The neck 14" of the single retention element 14 here is integrally formed eccentrically to this apex line S. The neck 14" represents the connection to the head 14' of the retention element 14. This head has a different cross-sectional shape compared to the examples described earlier. Basically, the cross-sectional shape of the head 14' may have any shape.

In the shape represented here, the head has a widening running transversely to the longitudinal direction, which thus runs in the buccal-lingual direction. What is conspicuous here is a flattening 140 of the head 14'. This flattening 140 is preferred, in order to avoid a notch effect below the forces in the supra-construction which occur in the occlusal direction. This flattening more preferably runs perpendicular to the occlusal direction.

The eccentric alignment of the neck 14" of the retention element 14 is associated with the different course of the pallatinal surfaces of the teeth. The eccentric arrangement of the head 14' should however be such that the head does not project beyond the extension of the clamping walls on any side. The outer, buccal tooth surfaces if anything, run perpendicularly, whilst pallatinally, the tooth surfaces run inclined towards the buccal direction. Thus in the installation position, the retention element 14 is displaced away from the pallatinal side. Thus the pallatinal surface would be located on the left in Figure 5.

This arrangement leads to the undercut between the sleeve and head 14' on the one side, normally the buccal side, being smaller than on the pallatinal side, where one mostly has more space.

The bar matrix according to the invention permits the best possible utilisation of space with an optimal anchoring even with restricted spatial conditions, thanks to its special shaping which may be correctly adapted to each supra-construction

List of reference numerals

1	bar projection
2	crosspiece or bars
3	fastening heads
4	screw hole
5	implant
A	web matrix
B	sleeve or rider sleeve
C	clamping walls
D	bearing bow
E	retention element
G	cast model
S	apex line of the sleeve
10	bar matrix
11	sleeve
12	clamping walls
13	bearing bow
14	retention element
14'	head of the single retention element
14"	neck of the single retention element
14"'	undercut
15	undercut, on the pallatinal side
16	undercut edges
121	clamping strips
140	flattening
141	first retention element
142	second retention element
143	head of the first retention element
144	neck of the first retention element
145	undercut of the first retention element
146	undercut of the second retention element
147	neck of the second retention element
148	head of the second retention element

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A bar matrix for fastening of a dental-prosthetic supra-construction onto a bar projection, wherein the bar matrix has a sleeve which in cross section is bent at least approximately in a U-shaped manner, which may be held onto the bar projection and on which at least one retention element is arranged for the retention of the dental-prosthetic supra-construction, wherein the at least one retention element is a part integrally formed on the sleeve and with an occlusal alignment, wherein the at least one retention element extends over the whole length of the sleeve and in cross section has the shape of a head with a connection neck, so that the connection neck forms a retention undercut on both sides, and wherein the connection neck of the at least one retention element is integrally formed offset to the apex line of the sleeve.

2. A bar matrix according to claim 1, wherein the at least one retention element additionally has a buccal or lingual inclination, deviating from the occlusal direction.

3. A bar matrix according to claim 2, wherein the inclination of the at least one retention element, as a deviation from the occlusal direction, is between 0° and 45°.

4. A bar matrix according to claim 2, wherein the inclination of the at least one retention element, as a deviation from the occlusal direction, is between 10° and 30°.

5. A bar matrix according to any one of claims 1 to 4, wherein the bar matrix comprises two parallel retention elements which extend over the whole length of the sleeve, which both essentially have an occlusal alignment and enclose an angle (α) amongst one another.

6. A bar matrix according to claim 5, wherein the angle (α) which the two retention elements enclose amongst one another, is maximally 90°.

7. A bar matrix according to claim 5, wherein the angle (α) which the two retention elements enclose amongst one another, is between 10° and 45°.

8. A bar matrix according to claim 5, 6 or 7, wherein both retention elements in cross section have the shape of a head with a connection neck.

9. A bar matrix according to claim 8, wherein the length of the connection necks is different.

10. A bar matrix according to any one of claims 1 to 9, wherein the head of the bar element has a flattening extending over the whole length.

11. A bar matrix according to claim 10, wherein the flattening runs perpendicular to the occlusal direction.

12. A bar matrix according to any one of claims 1 to 11, wherein the at least one retention element extending over the whole length of the sleeve, at one or more locations, is provided with undercut edges transversely to the longitudinal direction of the retention element.

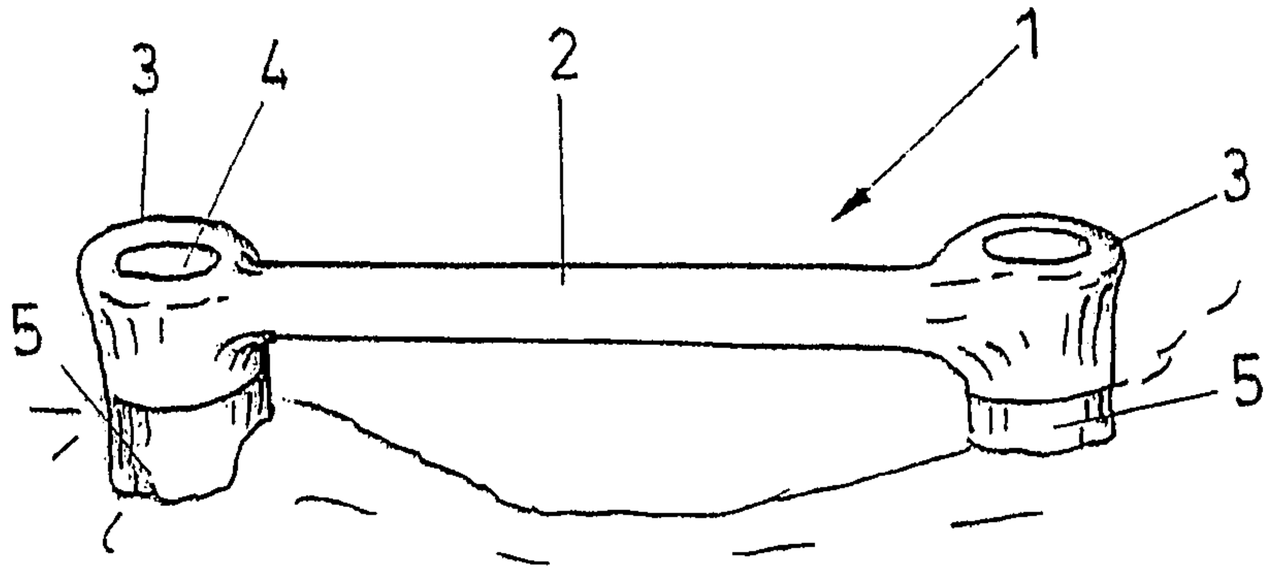

3
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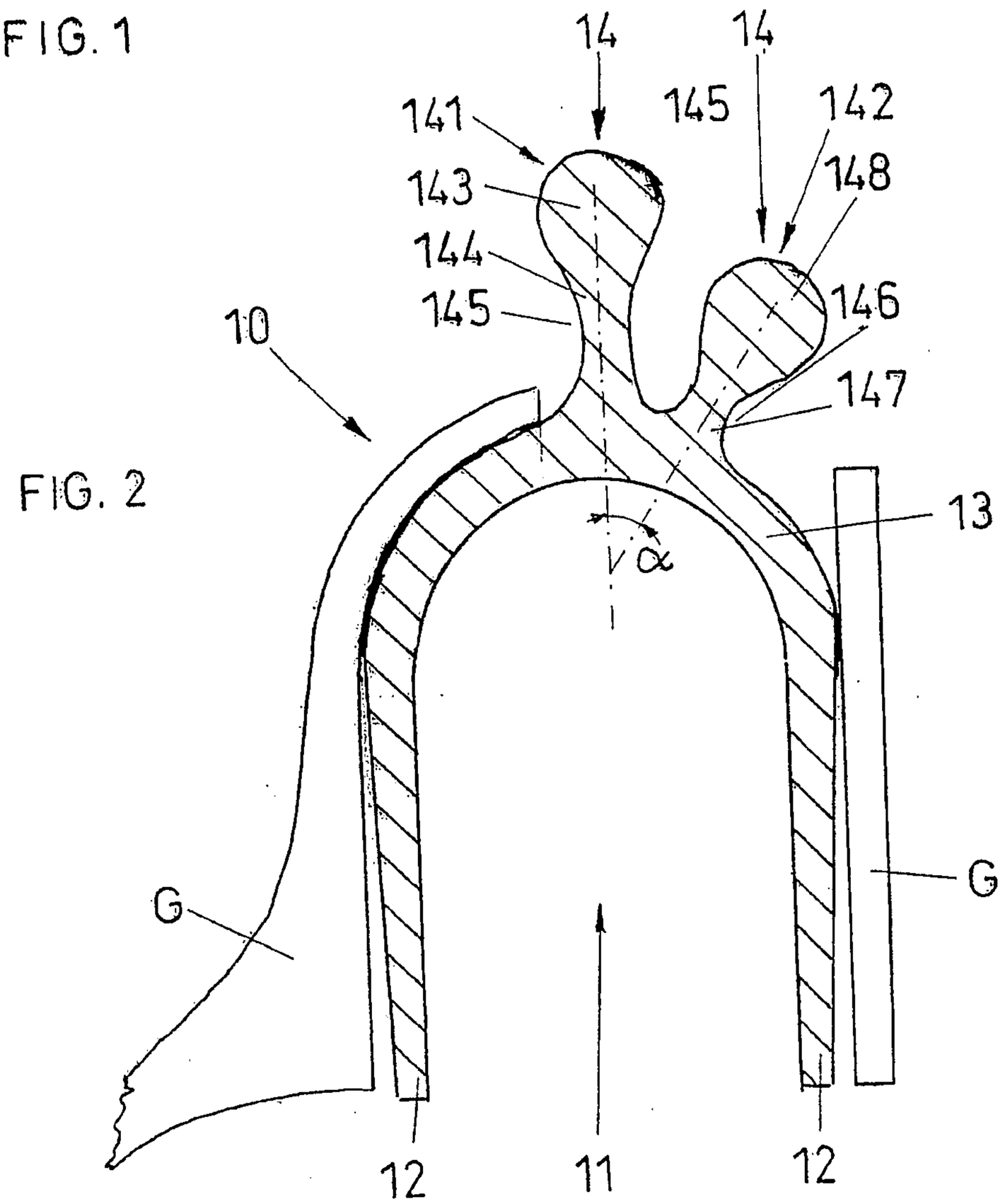
FIG. 1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143
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146
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12

FIG. 2

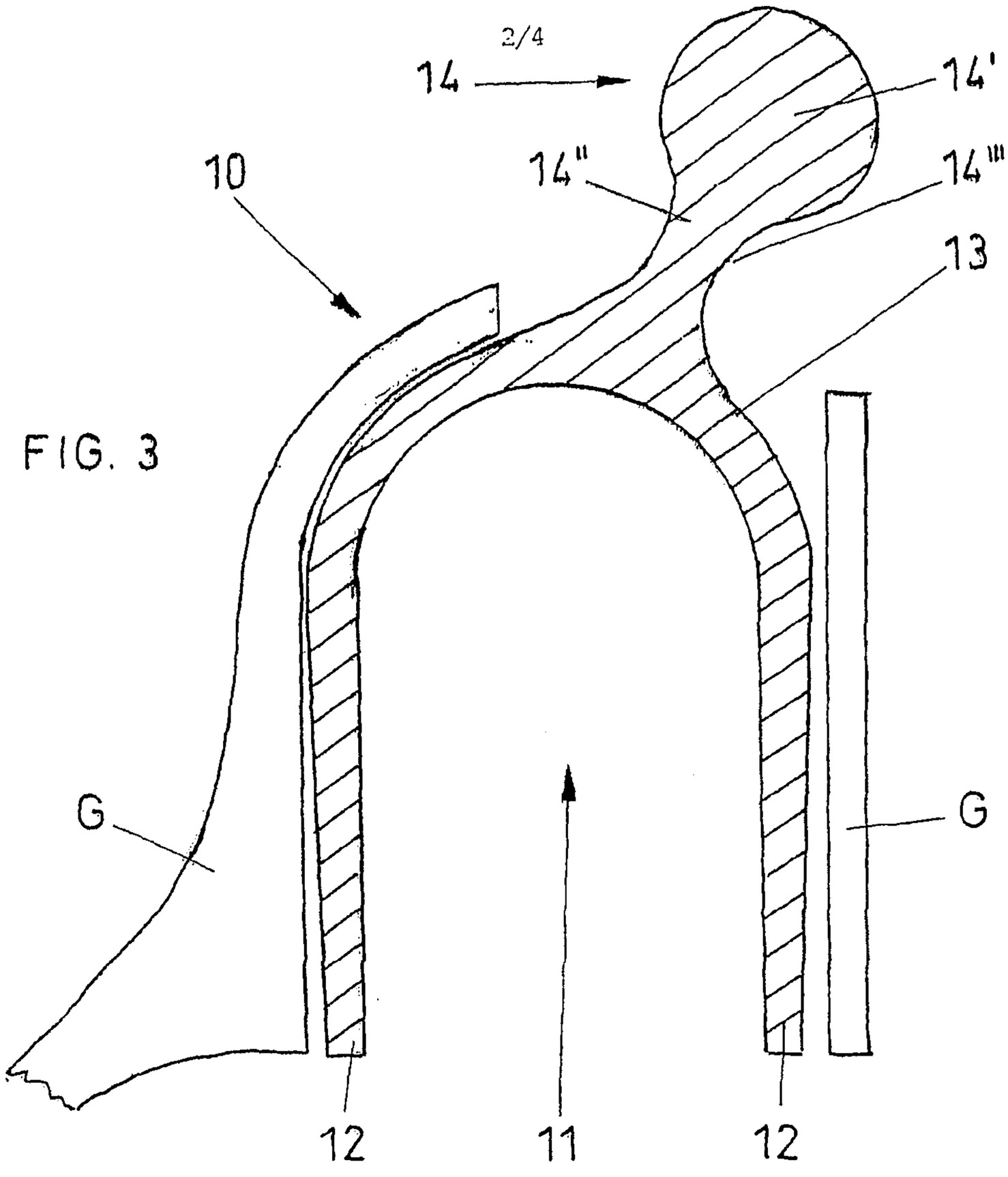


FIG. 3

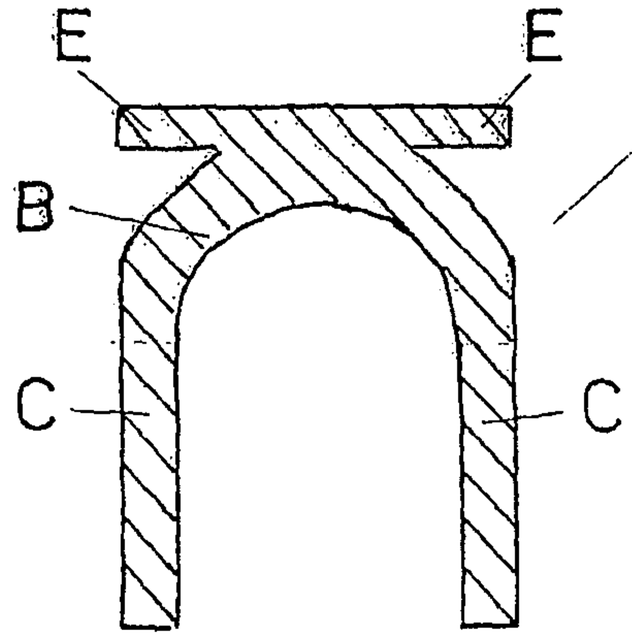


FIG. 7

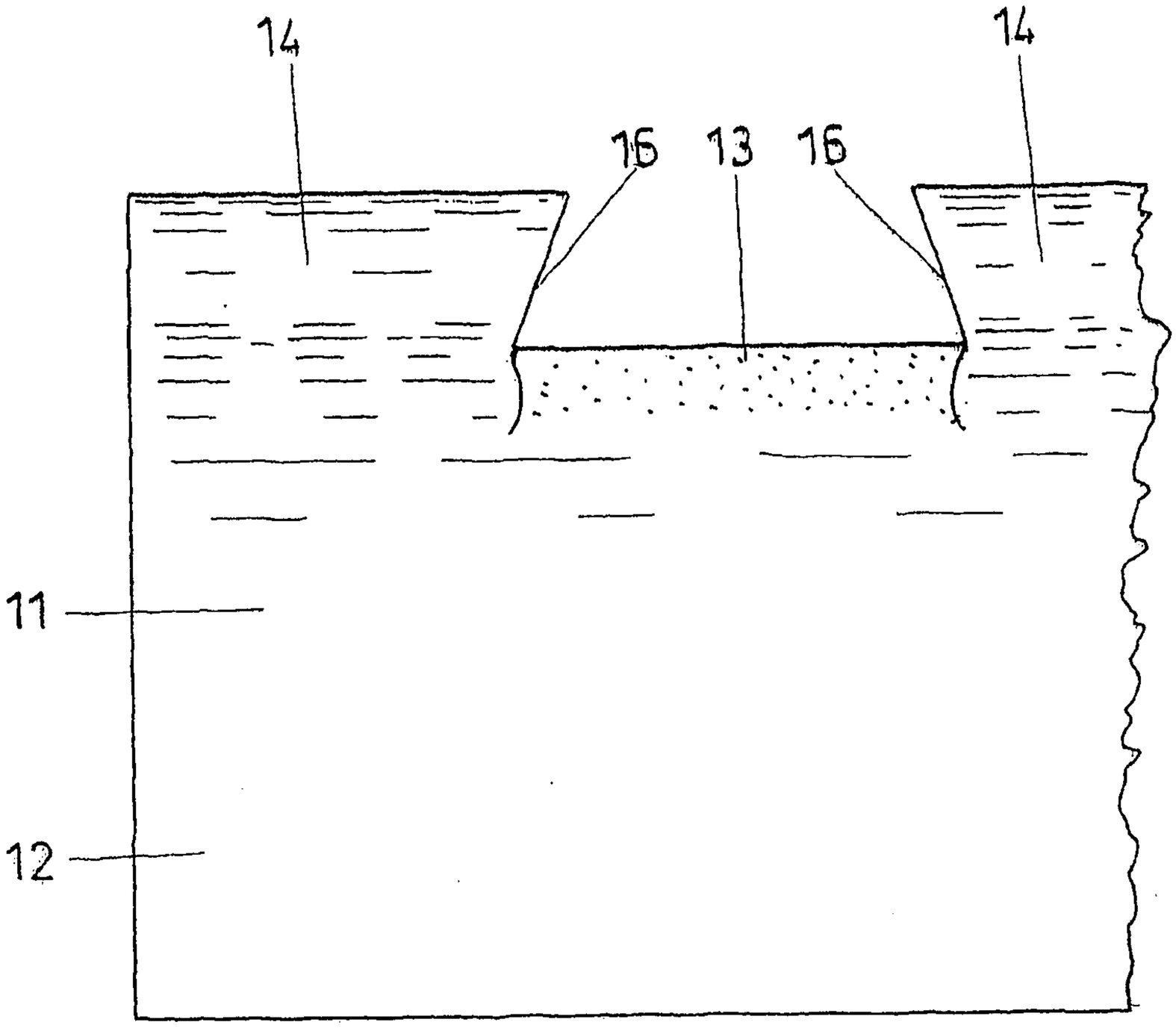


FIG. 4

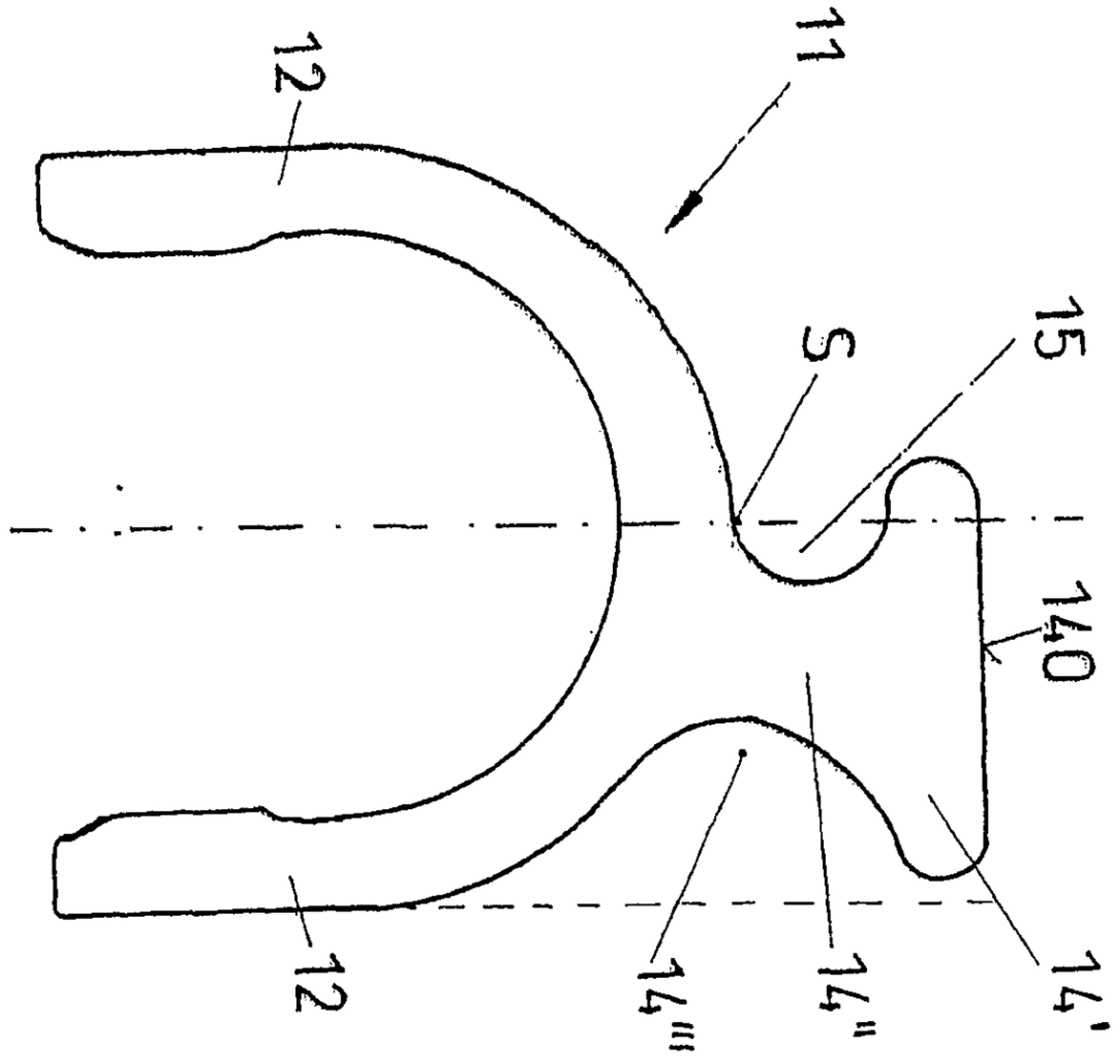


FIG. 5

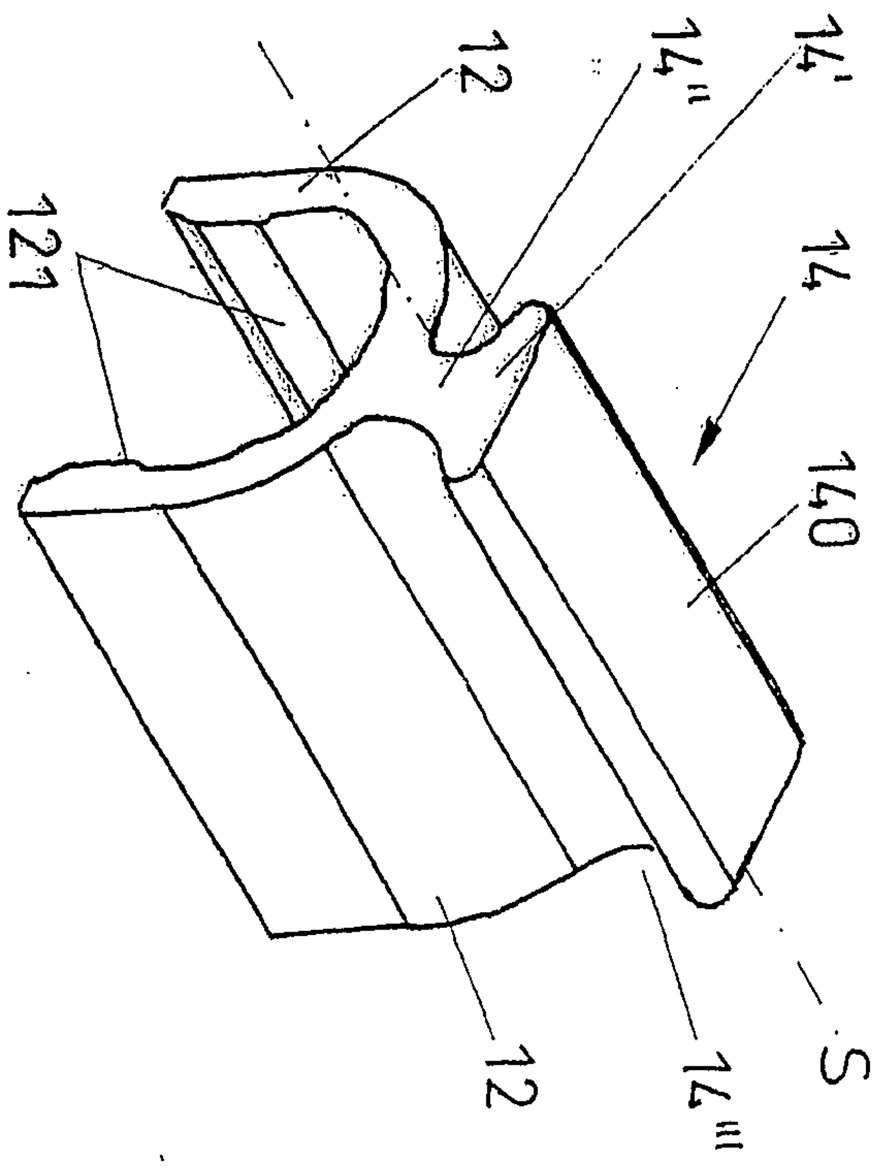
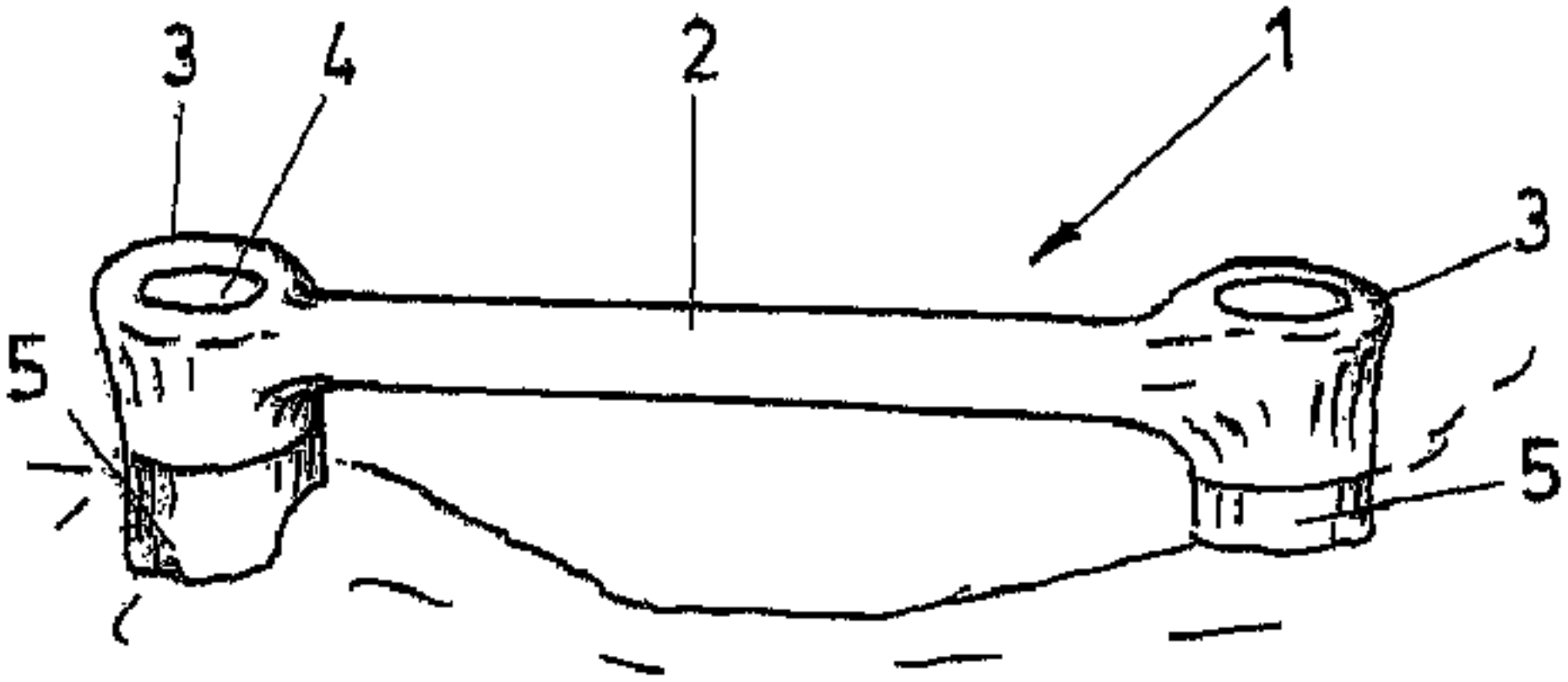


FIG. 6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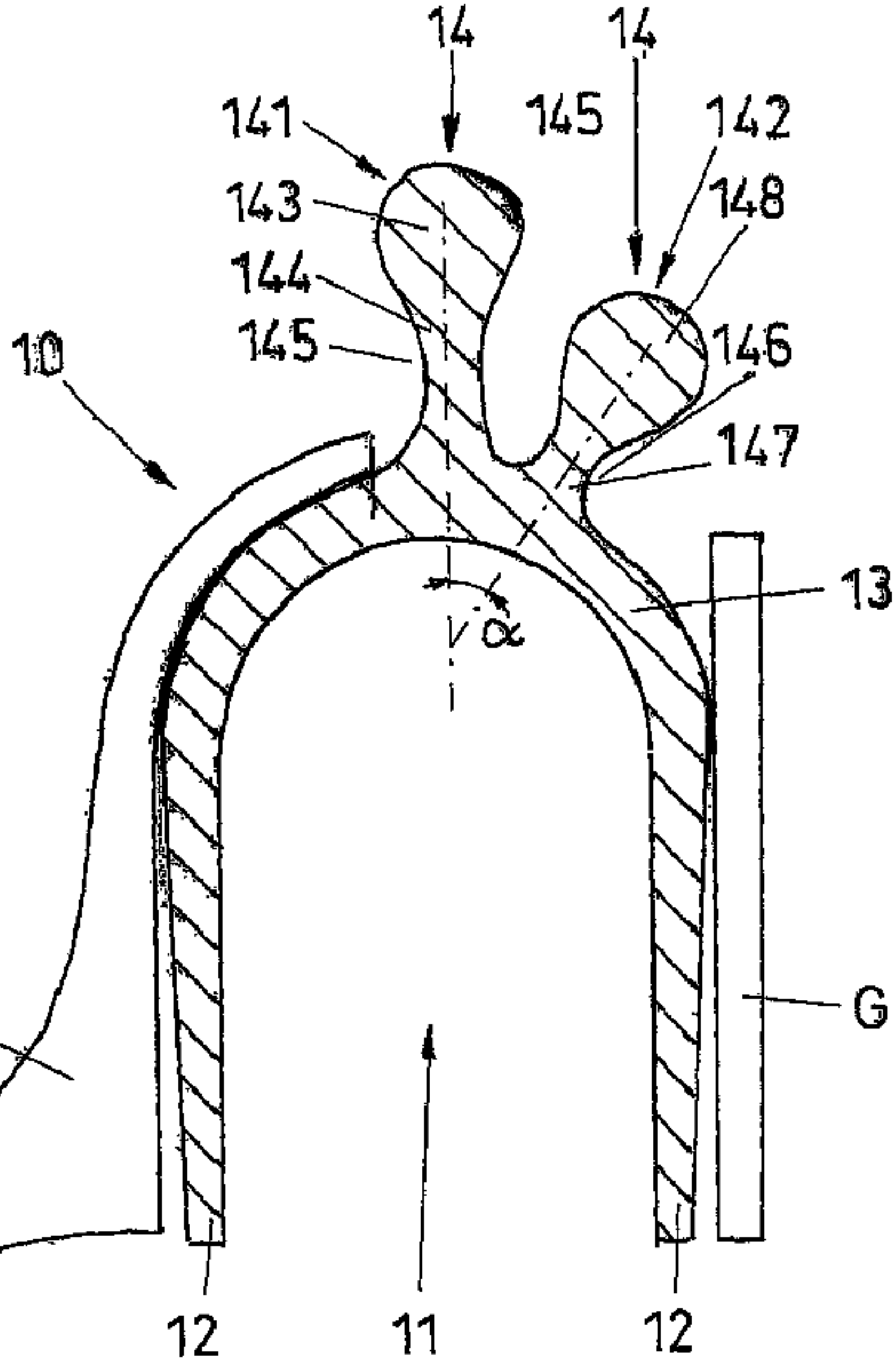
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