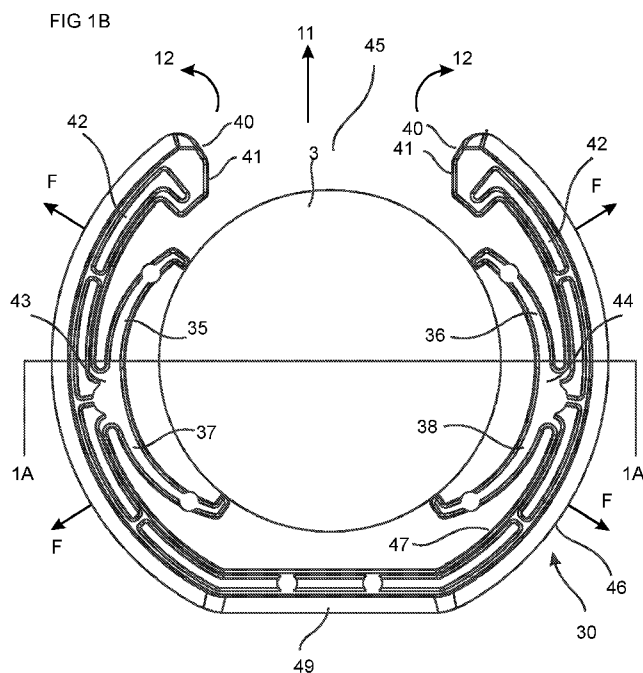




- (51) International Patent Classification:
F16B 12/42 (2006.01) *F16B 9/02* (2006.01)
- (21) International Application Number:
PCT/SE2018/050492
- (22) International Filing Date:
14 May 2018 (14.05.2018)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
1750593-4 15 May 2017 (15.05.2017) SE
- (71) Applicant: VÄLINGE INNOVATION AB [SE/SE];
Prästavägen 513, SE-263 65 VIKEN (SE).
- (72) Inventors: FRANSSON, Jonas; Allerumsvägen 317,
SE-254 76 ALLERUM (SE). HÅKANSSON, Niclas; Syll-
stengatan 19, SE-263 65 VIKEN (SE).
- (72) Inventor: PÅLSSON, Agne (deceased).
- (74) Agent: ENGSTRAND, Ola; Välinge Innovation AB, Prä-
stavägen 513, SE-263 65 VIKEN (SE).
- (81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO,
DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN,
HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP,
KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME,
MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ,
OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA,

(54) Title: ELEMENTS AND A LOCKING DEVICE FOR AN ASSEMBLED PRODUCT



(57) Abstract: A set including a first element (1) with a cylindrical shaped part (3), a second element (2) having a cylindrical shaped groove (4) with a circular opening (75) in an outer surface (74) of the second element, and a mechanical locking device. The mechanical locking device includes a tongue groove (10), a displacement groove (20) and a flexible tongue (30) in the displacement groove (20), and is configured to lock the cylindrical shaped part (3) to the cylindrical shaped groove (4). The flexible tongue (30) is configured to cooperate with the tongue groove (10) for locking the cylindrical shaped part (3) to the cylindrical shaped groove (4). The flexible tongue (30) is configured to be reshaped and displaced in the displacement groove (20) during locking, and spring back to a locked position. The flexible tongue is configured to exert a spring force on the tongue groove (10) in the locked position.



WO 2018/212701 A1

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

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

ELEMENTS AND A LOCKING DEVICE FOR AN ASSEMBLED PRODUCT

Field of the Invention

The present invention relates to element for assembled products, such as elements for a furniture component. More particularly, embodiments of the invention relate to a set of elements for an assembled product such as a furniture component which is locked together with a mechanical locking device.

Background of the Invention

A conventional furniture product is provided with a mechanical locking system as shown, for example, in WO2012/154113. The furniture product comprises a first panel connected perpendicularly to a second panel by a mechanical locking system comprising a flexible tongue in an insertion groove.

The present invention addresses a widely recognized need to provide a mechanical locking device for cylindrical parts of an assembled product, such as a furniture product, with improved locking.

Summary of the Invention

It is an object of at least certain embodiments of the present invention to provide an improvement over the above described techniques and known art.

A further object of at least certain embodiments of the present invention is to increase the locking strength of a mechanical locking device for cylindrical parts.

At least some of these and other objects and advantages that may be apparent from the description have been achieved by a first aspect of the invention comprising set comprising a first element with a cylindrical shaped part, a second element having a cylindrical shaped groove with a circular opening in an outer surface of the second element, and a mechanical locking device. The mechanical locking device comprises a tongue groove, a displacement groove and a flexible tongue in the displacement groove. The mechanical locking device is configured to lock the cylindrical shaped part to the cylindrical shaped groove. The flexible tongue is configured to cooperate with the tongue groove for locking the cylindrical shaped part to the cylindrical shaped groove. The flexible tongue is configured to be reshaped and displaced in the displacement groove during a locking of the cylindrical shaped part to the cylindrical shaped groove and spring back to a locked position. The flexible tongue is configured to exert a spring force on the tongue groove in the locked position. The flexible tongue

comprises a main body, which has an at least partly essentially circular shape in a plane parallel to the circular opening.

The main body with the essentially at least partly circular shape may have the advantage that an increase spring force is achieved. A further advantage may be that a spring force is achieved with
5 several directions, such as perpendicular to each other and/or opposite to each other. This may have the effect that the cylindrical shaped part is firmly locked to the cylindrical shaped groove.

The flexible tongue comprises a first edge which is at least partly circular, said first edge comprising a locking surface which is configured to cooperate with a locking surface of the tongue groove.

The locking surface of the flexible tongue may have an enclosing angle which is more than about
10 90°, preferably in the range of about 100° to about 300°, preferably about 240°.

The flexible tongue may comprise a second edge which is at least partly circular, said second edge may comprise three or more flexible elements for positioning of the flexible tongue relative the cylindrical shaped part and/or the cylindrical shaped groove. A correct position of the flexible tongue may facilitate the assembling of the first element to the second element.

15 Each of the flexible elements may protrude towards a bottom of the displacement groove.

The spring force may originate at least partly from a reshape of the flexible elements from a first shape in an unlocked position to a second shape in the locked position.

The flexible tongue may enclose completely or at least partly the cylindrical shaped part. An increased enclosure may have the effect of an increased spring force and an increased locking force.

20 The flexible tongue may enclose the cylindrical shaped part with an enclosing angle which is more than about 90°, or more than about 180°, or in the range of about 330° to about 360°, or about 345° to about 355°.

The spring force may originate at least partly from a reshape of the main body from a first shape in an unlocked position to a second shape in the locked position.

25 The reshape of the main body may contribute to about more than 50%, or about 80% to about 95% of the spring force.

The main body comprises a central groove which extends through the main body.

The main body may comprise a split groove which extends from an envelope surface of the main body to the central groove of the main body, wherein the split groove is configured for facilitating assembling of the flexible tongue in the displacement groove.

5 The flexible tongue may be configured such that a first part of the flexible tongue at a first side of the split groove and second part of the flexible tongue may be pushed away from each other, such that the split groove is enlarged. The enlarged split groove may facilitate an attachment of the flexible tongue in the displacement groove of the cylindrical part.

10 The flexible tongue may be configured such that a first part of the flexible tongue at a first side of the split groove and second part of the flexible tongue may be pushed towards each other, such that the split groove is decreased, and for some embodiment the first part may overlap the second part. This may facilitate an attachment of the flexible tongue in the displacement groove of the cylindrical groove.

15 The main body may comprise one or more guiding surfaces at the split groove, wherein the guiding surfaces are configured to cooperate with the cylindrical shaped part for facilitating assembling of the flexible tongue on the cylindrical shaped part.

An envelope surface of the cylindrical shaped groove may comprise the displacement groove or an envelope surface of the cylindrical shaped part may comprise the displacement groove.

An end surface of the first element may be configured to cooperate with the outer surface of the second element in a locked position of the first element and the second element.

20 An envelope surface of the cylindrical shaped groove and an envelope surface of the cylindrical shaped part may be configured to cooperate in a locked position of the first element and the second element.

25 The flexible tongue and the tongue groove may be configured to cooperate for a locking of the first element and the second element in a first direction. The envelope surface of the cylindrical shaped groove and the envelope surface of the cylindrical shaped part may be configured to cooperate for a locking of the first element and the second element in a second direction which is perpendicular to the first direction.

30 The main body may comprise a straight or an essentially straight part which is configured to decrease the bending resistance of the main body. The straight part preferably has an enclosing angle which is in the range of about 5° to about 45°, preferably about 20°. The straight part may have the

advantage that the attachment of the flexible tongue in the displacement groove is facilitated and/or that the main body does not break during the attachment.

The main body may comprise one or more grooves which is/are configured to decrease the bending resistance of the main body. The grooves may have the advantage that the attachment of the flexible tongue in the displacement groove is facilitated and/or that the main body does not break during the attachment.

The first element may be configured to be assembled to the second element by a relative displacement of the cylindrical shaped part through the circular opening and into the cylindrical shaped groove to a locked position of the first element and the second element, wherein the flexible tongue is configured to be reshaped and displaced in the displacement groove during said relative displacement.

The flexible tongue may be configured to be attached to the circular part or configured to be attached in the circular groove before the first element is assembled to the second element.

The flexible tongue may be configured to exert a spring force, in the locked position, on the tongue groove at least at two opposite positions of the circular part.

Brief Description of the Drawings

These and other aspects, features and advantages of which embodiments of the invention are capable of, will be apparent and elucidated from the following description of embodiments of the present invention, reference being made to the accompanying drawings, in which

FIG 1A is a crosscut view of an embodiment of a flexible tongue shown in FIG 1B;

FIG 1B is a bottom view of an embodiment of flexible tongue attached to a cylindrical part;

FIG 2A is a 3D-view of the flexible tongue shown in FIG 1A-B;

FIG 2B is a side view of the flexible tongue shown in FIG 1A-2A;

FIGS 2C-D are bottom views of the flexible tongue shown in FIG 1A-2B;

FIGS 3A-3C show a 3D-view, a crosscut view, a top view and a side view, respectively, of an embodiment of the flexible tongue;

FIGS 4A-4C show a 3D-view, a crosscut view, a top view and a side view, respectively, of an embodiment of the flexible tongue;

FIGS 5A-5D show a 3D-view, a crosscut view, a side view and a bottom view, respectively, of an embodiment of the flexible tongue;

FIGS 6A-6C show a 3D-view, a crosscut view, a top view and a side view, respectively, of an embodiment of the flexible tongue;

- 5 FIG 7A is a crosscut view of an embodiment of the first element and an embodiment of the second element which are locked together by a locking device comprising an embodiment of the flexible tongue;

FIG 7B is an enlargement of the encircled area in FIG 7A;

- 10 FIG 8A is a 3D-view of an embodiment of the first element and an embodiment of the second elements in a locked position.

FIG 8B is a 3D-view of an embodiment of the second element;

FIG 8C is a crosscut view of an enlargement of parts of embodiments of the first element the second element, the flexible tongue and a disassemble tool, respectively, during disassembling;

- 15 FIG 9A is a crosscut view of a first element and a second element which are locked together by a locking device comprising an embodiment of the flexible tongue;

FIG 9B is an enlargement of the encircled area in FIG 9A;

FIG 10A is a 3D-view of embodiments of the first element and the second elements, respectively in a locked position.

FIG 10B is a 3D-view of an embodiment of the first element;

- 20 FIG 10C is a crosscut view of an enlargement of parts of an embodiment of the first element the second element, the flexible tongue and a disassemble tool, respectively, during disassembling

FIGS 11A-11D are a crosscut view, a top view, a crosscut view and a side view, respectively, of an embodiment of the first element, the second element and the flexible tongue, respectively, in a locked position;

- 25 FIG 12A is a 3D-view of an embodiment of a first element and an embodiment of a second element in a locked position;

FIG 12B is a 3D-view of the second element in FIG 12A;

FIG 13A is a top view of an embodiment of the second element;

FIG 13B is a side view of an embodiment of the first element;

FIG 13C is a 3D-view of the embodiment of the second element in FIG 13A;

FIG 13D is a top view of the embodiment of the first element in FIG 13B;

- 5 FIG 14A is a 3D-view of an embodiment of the first element and an embodiment of the second element in a locked position;

FIG 14B is a 3D-view the embodiment of the first element in FIG 14A;

FIG 14C is a 3D-view the embodiment of the second element in FIG 14A;

- 10 FIG 15A is a crosscut view of an embodiment of the first element and an embodiment of the second element in a locked position;

FIG 15B is a top view of the first element and the second element in FIG 15A;

FIG 15C is a crosscut view of the first element and the second element in FIG 15B;

FIG 16A is a top view of the second element in FIG 15B;

FIG 16B is a 3D-view of the second element in FIG 15B; and

- 15 FIG 16C is a 3D-view of the first element in FIG 15B;

Description of embodiments

- Specific embodiments of the invention now will be described with reference to the accompanying drawings. This invention may, however, be embodied in many different forms and should not be
20 construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. The terminology used in the detailed description of the embodiments illustrated in the accompanying drawings is not intended to be limiting of the invention. In the drawings, like numbers refer to like elements.

- 25 The invention concerns a set of elements for an assembled product, such as illustrated in FIG 7A in a crosscut side view. The embodiment of the set comprises a first element 1 with a cylindrical shaped part 3, a second element 2 having a cylindrical shaped groove 4 with a circular opening 75 in an outer

surface 74 of the second element, and a mechanical locking device. The mechanical locking device comprises a tongue groove 10, a displacement groove 20 and a flexible tongue 30 in the displacement groove 20. The mechanical locking device is configured to lock the cylindrical shaped part 3 to the cylindrical shaped groove 4. The flexible tongue 30 is configured to cooperate with the tongue groove 10 for locking the cylindrical shaped part 3 to the cylindrical shaped groove 4, wherein the flexible tongue 30 is configured to be reshaped and displaced in the displacement groove 20 during a locking of the cylindrical shaped part 3 to the cylindrical shaped groove 4 and spring back to a locked position. The flexible tongue is configured to exert a spring force on the tongue groove 10 in the locked position. The flexible tongue comprises a main body which has an at least partly circular shape in a plane parallel to the circular opening 75.

An envelope surface 72 of the cylindrical shaped groove 4 and an envelope surface 71 of the cylindrical shaped part 3 are configured to cooperate in a locked position of the first element 1 and the second element 2. The flexible tongue and the tongue groove may be configured to cooperate for a locking of the first element and the second element in a first direction. The envelope surface of the cylindrical shaped groove and the envelope surface of the cylindrical shaped part may be configured to cooperate for a locking of the first element and the second element in a second direction which is perpendicular to the first direction.

The first element in this and other embodiment may comprise one or several of said cylindrical shaped part 3 and the second element 2 may comprise corresponding numbers or more of said cylindrical shaped groove 4.

The first element is configured to be assembled to the second element 2 by a relative displacement of the cylindrical shaped part 3 through the circular opening 75 and into the cylindrical shaped groove 4 to a locked position of the first element 1 and the second element 2, wherein the flexible tongue 30 is configured to be reshaped and displaced in the displacement groove during said relative displacement.

An envelope surface 71 of the cylindrical shaped part 3 comprises in this embodiment the displacement groove 20, and an envelope surface 72 of the cylindrical shaped groove 4 comprises the tongue groove 10.

The flexible tongue 30 of this embodiment is configured to be attached to the circular part 3 before the first element 1 is assembled to the second element 2.

The flexible tongue 30 comprises a first edge 46 which is at least partly circular, see e.g. FIGS 1A-2D and FIGS 5A-D. Said first edge comprises a locking surface 33 which is configured to cooperate with a locking surface 11 of the tongue groove 10. This is shown in FIG 7B, which is an enlargement of the encircled are in FIG 7A. The second edge 47 is in this embodiment closer to a centre of the cylindrical shaped part 3 than the first edge 46.

The locking surface 11 preferably angled in relation to a displacement direction 21 of the displaceable tongue 30 in the displacement groove 20.

An end surface 73 of the first element 1 may be configured to cooperate with the outer surface 74 of the second element 2 in a locked position of the first element 1 and the second element 2.

FIG 8A shows a 3D-view an embodiment of the set shown in FIGS 7A-7B. FIG 8B shows an embodiment of the second element 8 of the set shown in FIGS 7A-7B. The embodiment comprises one or more dismantling grooves 90 in the outer surface 74 of the second element 2. A tool 95 with a longitudinal part 91 is configured to be inserted into the dismantling groove 90 and to unlock the mechanical locking device. The longitudinal part 91 may be bendable such that, when the longitudinal part 91 is inserted into dismantling groove 90 and the tongue groove 10, the shape of longitudinal part 91 adapts to the shape of the dismantling groove 90 and the tongue groove 10. The dismantling groove extends into the tongue groove 10. FIG 9C shows, in an enlarged crosscut, the mechanical locking device during in an unlocked position. A cross section of the longitudinal part 91 of the tool has unlocked the mechanical locking device by pushing the flexible tongue into the displacement groove 20. The tool 95 may have a handle 92.

The first element may be panel shaped or rod shaped with a rectangular or circular cross-section.

The second element may be panel shaped or rod shaped with a rectangular or circular cross-section.

The first element may be e.g. a leg or rod for a furniture, such as a table, a desk, a chair or a cabinet.

The second element may be a panel for a furniture, such as a table, a desk, a chair or a cabinet.

An embodiment of the flexible tongue 30 is shown in a bottom view in FIG 1B and a cross section, along a line indicated by 1A-1A in FIG 1B, is shown in FIG 1A. The embodiment is shown in a 3D-view in FIG 2A, in a side view in FIG 2B an in a bottom view in FIGS 2C-2D. The embodiment comprises a first edge 46 which is at least partly circular and comprises a locking surface 33 which is configured to cooperate with the locking surface 11 of the tongue groove 10.

The embodiment of the locking surface 33 of the flexible tongue 30 has a first enclosing angle 61 and a second enclosing angle 62. Each of the first and the second enclosing angle is about 120° , i.e. the total enclosing angle is about 240° . Embodiments of the flexible tongue may have one continuous locking surface or several locking surfaces. An enclosing angle of the locking surface may be more than about 90° , preferably in the range of about 100° to about 300° , preferably about 240° .

The embodiment of the flexible tongue 30 comprises a second edge 47 which is at least partly circular, said second edge comprises three or more flexible elements 35,36,37,38 for positioning of the flexible tongue 30 relative the cylindrical shaped part 3 and/or the cylindrical shaped groove 4. The flexible elements 35,36,37,38 protrude towards a bottom of the displacement groove 20. The spring force may originate at least partly from a reshape of flexible elements 35,36,37,38 from a first shape in an unlocked position to a second shape in the locked position

The main body of the embodiment comprises a first protruding part 43 at a first position and a second protruding part 44 at a second position. A first flexible element 35 and a second flexible element 37 are extending from the first protruding part 43. The first flexible element 35 may extend in a different or essentially opposite direction to the second flexible element 37. A third flexible element 36 and a fourth flexible element 38 are extending from the second protruding part 44. The third flexible element 37 may extend in a different or essentially opposite direction to the fourth flexible element 38. The first protruding part 43 may be positioned opposite or essentially opposite to the second protruding part 44.

The embodiment of flexible tongue 30 may enclose completely or at least partly the cylindrical shaped part 3. The embodiment may enclose the cylindrical shaped part 3 with an enclosing angle 65 which is more than about 180° , or in the range of about 330° to about 360° , or about 345° to about 355° .

The displacement groove may comprise one or several of said flexible tongue with an enclosing angle 65 which is in the range of about 90° to about 180° .

The spring force may originate at least partly from a reshape of the main body from a first shape in an unlocked position to a second shape in the locked position. The reshape of the main body may contribute to about more than 50% or about 80% to about 95% of the spring force.

The main body of the embodiment of the flexible tongue 30 comprises a central groove 48, which extends through the main body. The main body comprises a split groove 45 which extends from an

envelope surface of the main body to the central groove 48 of the main body. The split groove 45 is configured for facilitating assembling of the flexible tongue 30 in the displacement groove 20.

The embodiment of the flexible tongue 30 is during the assembling in the displacement groove displaced 11 relative the cylindrical part 3. During said assembling a first part of the flexible tongue at
5 a first side of the split groove and second part of the flexible tongue may be pushed away from each other, such that the split groove is enlarged. The enlarged split groove may facilitate an attachment of the flexible tongue in the displacement groove of the cylindrical part.

The main body may comprise one or more guiding surfaces 40, 41 at the split groove. The guiding surfaces 40, 41 are configured for facilitating assembling of the flexible tongue on the cylindrical
10 shaped part 3. A first guiding surface 40 may extend in a different direction than a second guiding surface 41, such that the first guiding surface cooperate, during said assembling, with the cylindrical part 3 before the second guiding surface cooperate with the cylindrical part 3.

The main body of the embodiment of the flexible tongue 30 may comprise a straight part 49 which is configured to decrease the bending resistance of the main body. The straight part 48 may have an
15 enclosing angle 63 which is in the range of about 5° to about 45° , preferably about 55° . The straight part may have the advantage that the attachment of the flexible tongue in the displacement groove is facilitated and/or that the main body does not break during the attachment.

The main body of the embodiment of the flexible tongue 30 may comprise one or more grooves 42 which is/are configured to decrease the bending resistance of the main body. The grooves 42 may
20 have the advantage that the attachment of the flexible tongue in the displacement groove is facilitated and/or that the main body does not break during the attachment.

The flexible tongue may be configured to exert a spring force F , in the locked position, on the tongue groove at least at two opposite positions of the circular part.

The flexible tongue may be configured to exert a spring force F with several directions, such as
25 perpendicular to each other and/or opposite to each other. This may have the effect that the cylindrical shaped part is firmly locked to the cylindrical shaped groove.

The embodiment of the flexible tongue 30 is configured to exert a spring force, in the locked position, on the tongue groove at least at two opposite positions of the circular part 3.

An embodiment of the flexible tongue 30 is shown in a 3D view in FIG 5A, a cross section, along a
30 line indicated by 5A-A in FIG 5D, in FIG 5B. The embodiment is shown in side view in FIG 5C and in

a bottom view in FIG 5D. The embodiment comprises a catch device 31, such as a groove. The catch device is configured to be caught by a second tool, such as pliers. The second tool is configured to displace, as shown by arrows 14 in FIG 5D, a first part of the flexible tongue towards a second part of the flexible tongue, such that the mechanical locking device is unlocked and the first element may be
5 disassembled from the second element.

The flexible tongue may be unlocked by inserting the tool in an embodiment of the dismantling grooves 90 that is shown in FIG 12A in a 3D-view. The embodiment of the set comprises a first element 1, a second element 2. An outer surface of the second element comprises the dismantling groove 90; FIG 12B is a 3D-view of the second element in FIG 12A.

10 An embodiment of the set is shown in FIG 9A. The embodiment comprises a first element 1 with a cylindrical shaped part 3, a second element 2 having a cylindrical shaped groove 3 with a circular opening 75 in an outer surface 74 of the second element, and a mechanical locking device. The mechanical locking device comprises a tongue groove 10, a displacement groove 20 and a flexible
15 tongue 3 in the displacement groove 20. The mechanical locking device is configured to lock the cylindrical shaped part 3 to the cylindrical shaped groove 4. The flexible tongue 30 is configured to cooperate with the tongue groove 10 for locking the cylindrical shaped part 3 to the cylindrical shaped groove 4, wherein the flexible tongue 30 is configured to be reshaped and displaced in the displacement groove 20 during a locking of the cylindrical shaped part 3 to the cylindrical shaped
20 groove 4 and spring back to a locked position. The flexible tongue is configured to exert a spring force on the tongue groove 10 in the locked position. The flexible tongue comprises a main body which has an at least partly circular shape in a plane parallel to the circular opening 75.

An envelope surface 72 of the cylindrical shaped groove 4 and an envelope surface 71 of the cylindrical shaped part 3 are configured to cooperate in a locked position of the first element 1 and the second element 2. The flexible tongue and the tongue groove may be configured to cooperate for
25 a locking of the first element and the second element in a first direction. The envelope surface of the cylindrical shaped groove and the envelope surface of the cylindrical shaped part may be configured to cooperate for a locking of the first element and the second element in a second direction which is perpendicular to the first direction.

The first element in this and other embodiment may comprise one or several of said cylindrical
30 shaped part 3 and the second element 2 may comprise corresponding numbers or more of said cylindrical shaped groove 4.

The first element is configured to be assembled to the second element 2 by a relative displacement of the cylindrical shaped part 3 through the circular opening 75 and into the cylindrical shaped groove 4 to a locked position of the first element 1 and the second element 2, wherein the flexible tongue 30 is configured to be reshaped and displaced in the displacement groove during said relative displacement.

An envelope surface 72 of the cylindrical shaped groove 4 comprises in this embodiment the displacement groove 20, and an envelope surface 72 of the cylindrical shaped part 3 comprises the tongue groove 10.

The flexible tongue may be configured to exert a spring force F , in the locked position, on the tongue groove at least at two opposite positions of the circular part.

The flexible tongue 30 of this embodiment is configured to be attached to the cylindrical groove 4 before the first element 1 is assembled to the second element 2.

The flexible tongue 30 comprises a first edge 46 which is at least partly circular; see e.g. FIGS 3A-4D and FIGS 6A-D. Said first edge comprises a locking surface 33 which is configured to cooperate with a locking surface 11 of the tongue groove 10. This is shown in FIG 9B, which is an enlargement of the encircled are in FIG 9A. The first edge 46 is in these embodiments closer to a centre of the cylindrical shaped groove 4 than second edge 47.

FIGS 3A-3D show an embodiment of the flexible tongue 30 configured for the embodiment of the set shown in FIGS 9A-9B. The embodiment comprises a catch device 31, such as a groove. The catch device is configured to be caught by a second tool, such as pliers. The second tool is configured to displace, as shown by arrows 12 in FIG 3C, a first part of the flexible tongue towards a second part of the flexible tongue, such that the flexible tongue may be inserted in the displacement groove 20. The first part may be displaced to a position in which it overlaps the second part when the flexible tongue is inserted in the displacement groove. The second tool is configured to displace, as shown by arrows 14 in FIG 3C, a first part of the flexible tongue away from a second part of the flexible tongue, such that the mechanical locking device is unlocked. The second tool may be inserted into an embodiment of the dismantling groove 90 shown in FIGS 12A-12B.

FIGS 4A-4D show an embodiment of the flexible tongue 30 configured for the embodiment of the set shown in FIGS 9A-9B. The embodiment comprises a catch device 31, such as a groove. The catch device is configured to be caught by a second tool, such as pliers. The second tool is configured to

displace, as shown by arrows 12 in FIG 4C, a first part of the flexible tongue towards a second part of the flexible tongue, such that the flexible tongue may be inserted in the displacement groove 20. The first part may be in this embodiment positioned at a larger distance from the second part. The distance will decrease when the flexible tongue is inserted in the displacement groove. The second tool is
5 configured to displace, as shown by arrows 14 in FIG 4C, a first part of the flexible tongue away from a second part of the flexible tongue, such that the mechanical locking device is unlocked. The second tool may be inserted into an embodiment of the dismantling groove 90 shown in FIGS 12A-12B.

The flexible tongue may be configured to exert a spring force F with several directions, such as perpendicular to each other and/or opposite to each other. This may have the effect that the
10 cylindrical shaped part is firmly locked to the cylindrical shaped groove.

FIGS 6A-6D show an embodiment of the flexible tongue 30 configured for the embodiment of the set shown in FIGS 9A-9B. This embodiment does not comprise a catch device. An embodiment of the mechanical locking device comprising this embodiment of the flexible tongue may be unlocked with an embodiment of the tool 95 with the longitudinal part 91, as shown in FIG 8A and described above,
15 which is configured to be inserted into the dismantling groove 90.

The locking surface 11 preferably angled in relation to a displacement direction 21 of the displaceable tongue 30 in the displacement groove 20.

FIG 10A shows a 3D-view an embodiment of the set shown in FIGS 9A-9B. FIG 9B shows an embodiment of the second element 2 of the set shown in FIGS 9A-9B. The embodiment comprises
20 one or more dismantling grooves 90 in a surface 76 of the element 1. The tool with the longitudinal part 91 is configured to be inserted into the dismantling groove 90 and to unlock the mechanical locking device. The dismantling groove extends into the tongue groove 10. FIG 10C shows in an enlarged crosscut the mechanical locking device during in an unlocked position. A cross section of the longitudinal part 91 of the tool has unlocked the mechanical locking device by pushing the flexible
25 tongue into the displacement groove 20.

The set shown in FIGS 9A-9B is shown in a locked position in a first crosscut view in FIG 11A, the cross section is indicated by the line 11A-11A in the top view of the set shown in FIG 11B. A second crosscut view is shown in FIG 11C, the cross section is indicated by the line 11C-11C in the top view of the set shown in FIG 11B. A side view of the set is shown in FIG 11D. FIG 11C shows a first
30 of said dismantling groove 90 at a first side of the first element 1 and a second of said dismantling groove 90 at a second side of the first element 1.

FIGS 13A-16C show embodiments of the set comprising a lock 81 for preventing a rotation of the first element 1 relative the second element. The lock 81 may comprise e.g. a groove on the first element 1 and a protruding part on the second element 2 or a protruding part on the first element 1 and a groove on the second element.

- 5 An embodiment of the lock 81 is shown in FIGS 13A-13D comprising a groove on a bottom surface 6 of the cylindrical shaped groove 4 and a protruding part on a bottom surface 5 of the cylindrical shaped part 3. The protruding part is configured to cooperate with the groove for preventing a rotation of the first element 1 relative the second element 2 in a locked position of the first element and the second element. The embodiment is shown in a top view in FIG 13A, in a side view in FIG 13B, an in
10 a 3D- view in FIG 13C-13D.

- An embodiment of the lock 81 is shown in FIGS 14A-14D comprising a groove on the outer surface 74 of the second element 2 and protruding part on a bottom surface 73 of the first element. The protruding part is configured to cooperate with the groove for preventing a rotation of the first element 1 relative the second element 2 in a locked position of the first element and the second element. The
15 embodiment is shown in a 3D view in FIGS 14A-C.

- An embodiment of the lock 81 is shown in FIGS 15A-16C comprising a longitudinal shaped groove on a bottom surface 6 of the cylindrical shaped groove 4 and a longitudinal shaped protruding part on a bottom surface 5 of the cylindrical shaped part 3. The protruding part is configured to cooperate with the groove for preventing a rotation of the first element 1 relative the second element 2 in a locked
20 position of the first element and the second element. The embodiment is shown in a top view in FIG 15B with lines 15A-15A and 15C-15C which indicate the cross sections shown in FIGS 15A and 15C, respectively.

The first element 1 may comprise a wood based material, a polymer material or a metal.

The second element 2 a wood based material or a polymer material.

- 25 The locking device may be essentially formed by the mechanical cutting, such as milling, in the material of the first element and the second element.

The flexible tongue may comprise a polymer material, preferably with an enforcement, such as glass fibre. The flexible tongue may be produced by injection moulding.

- The second element may comprise a reinforcement plate comprising the circular opening 75. The
30 reinforcement plate may comprise the locking surface 11.

The first element 1 may be an integral part of a furniture, i.e. formed in a furniture element, or a separate part attached to the furniture.

The second element 2 may be an integral part of a furniture, i.e. formed in a furniture element, or a separate part attached to the furniture.

- 5 It should also be appreciated that features disclosed in the foregoing description, and/or in the foregoing drawings and/or following claims both separately and in any combination thereof, be material for realizing the present invention in diverse forms thereof. When used in the following claims, the terms “comprise”, “include”, “have” and their conjugates mean, “including but not limited to”.
- 10 The present invention has been described above with reference to specific embodiments. However, other embodiments than the above described are equally possible within the scope of the invention. Different method steps than those described above may be provided within the scope of the invention. The different features and steps of the invention may be combined in other combinations than those described. The scope of the invention is only limited by the appended patent claims.

Claims

1. A set comprising:

a first element (1) with a cylindrical shaped part (3);

5 a second element (2) having a cylindrical shaped groove (4) with a circular opening (75) in an outer surface (74) of the second element; and

a mechanical locking device comprising a tongue groove (10), a displacement groove (20) and a flexible tongue (30) in the displacement groove (20), wherein the mechanical locking device is configured to lock the cylindrical shaped part (3) to the cylindrical shaped groove (4), **characterised in**

10 that the flexible tongue (30) is configured to cooperate with the tongue groove (10) for locking the cylindrical shaped part (3) to the cylindrical shaped groove (4),

that the flexible tongue (30) is configured to be reshaped and displaced in the displacement groove (20) during a locking of the cylindrical shaped part (3) to the cylindrical shaped groove (4) and spring back to a locked position,

15 that the flexible tongue is configured to exert a spring force on the tongue groove (10) in the locked position, and

that the flexible tongue comprises a main body which has an at least partly circular shape in a plane parallel to the circular opening (75).

20 2. The set as claimed in claim 1, wherein the flexible tongue (30) comprises a first edge (46) which is at least partly circular, and wherein said first edge comprises a locking surface (33) which is configured to cooperate with a locking surface (11) of the tongue groove (10).

3. The set as claimed in claim 2, wherein the locking surface (33) of the flexible tongue (30) has an enclosing angle (65) which is more than about 90°, preferably in the range of about 100° to about 300°, preferably about 240°.

25 4. The set as claimed in any one of the claims 1-3, wherein the flexible tongue (30) comprises a second edge (47) which is at least partly circular, said second edge comprises three or more flexible elements (35,36,37,38) for positioning of the flexible tongue (30) relative the cylindrical shaped part (3) and/or the cylindrical shaped groove (4).

5. The set as claimed in claim 4, wherein each of the flexible elements (35,36,37,38) protrudes towards a bottom of the displacement groove (20).
6. The set as claimed in any one of the claims 4-5, wherein the spring force originates at least partly from a reshape of flexible elements (35,36,37,38) from a first shape in an unlocked position to a second shape in the locked position.
7. The set as claimed in any one of the claims 1-6, wherein the flexible tongue (30) encloses completely or at least partly the cylindrical shaped part (3).
8. The set as claimed in claim 7, wherein the flexible tongue (30) encloses the cylindrical shaped part with an enclosing angle (65) which is more than about 90° , or more than about 180° , or in the range of about 330° to about 360° , or about 345° to about 355° .
9. The set as claimed in any one of the claims 1-8, wherein the spring force originates at least partly from a reshape of the main body from a first shape in an unlocked position to a second shape in the locked position.
10. The set as claimed in claim 9, wherein the reshape of the main body contributes to about more than 50% or about 80% to about 95% of the spring force.
11. The set as claimed in any one of the claims 1-10, wherein the main body comprises a central groove (48), which extends through the main body.
12. The set as claimed in claim 11, wherein the main body comprises a split groove (45) which extends from an envelope surface of the main body to the central groove of the main body, wherein the split groove (45) is configured for facilitating assembling of the flexible tongue (30) in the displacement groove (20).
13. The set as claimed in claim 12, wherein the main body comprises one or more guiding surfaces (40, 41) at the split groove, wherein the guiding surfaces (40, 41) are configured for facilitating assembling of the flexible tongue on the cylindrical shaped part.
14. The set as claimed in any one of the claims 1-13, wherein an envelope surface (72) of the cylindrical shaped groove (4) comprises the displacement groove (20).
15. The set as claimed in any one of the claims 1-13, wherein an envelope surface (71) of the cylindrical shaped part (3) comprises the displacement groove (20).

16. The set as claimed in any one of the claims 1-15, wherein an end surface (73) of the first element (1) is configured to cooperate with the outer surface (74) of the second element (2) in a locked position of the first element (1) and the second element (2).

5 17. The set as claimed in any one of the claims 1-16, wherein an envelope surface (72) of the cylindrical shaped groove (4) and an envelope surface (71) of the cylindrical shaped part (3) are configured to cooperate in a locked position of the first element (1) and the second element (2).

18. The set as claimed in any one of the claims 1-17, wherein the main body comprises a straight part (49) which is configured to decrease the bending resistance of the main body, the straight part (49) preferably having an enclosing angle (63) which is in the range of about 5° to about 45°,
10 preferably about 20°.

19. The set as claimed in any one of the claims 1-18, wherein the main body comprises one or more grooves (42) which is/are configured to decrease the bending resistance of the main body.

20. The set as claimed in any one of the claims 1-19, wherein the first element (1) is configured to be assembled to the second element (2) by a relative displacement of the cylindrical shaped part (3)
15 through the circular opening (75) and into the cylindrical shaped groove (4) to a locked position of the first element and the second element, wherein the flexible tongue (30) is configured to be reshaped and displaced in the displacement groove during said relative displacement.

21. The set as claimed in claim 20, wherein the flexible tongue (30) is configured to be attached to the circular part (3) before the first element (1) is assembled to the second element (2).

20 22. The set as claimed in claim 20, wherein the flexible tongue (30) is configured to be attached in the circular groove (4) before the first element (1) is assembled to the second element (2).

23. The set as claimed in any one of the claims 1-21, wherein the flexible tongue (30) is configured to exert a spring force, in the locked position, on the tongue groove at least at two opposite positions of the circular part (3).

25

FIG 1A

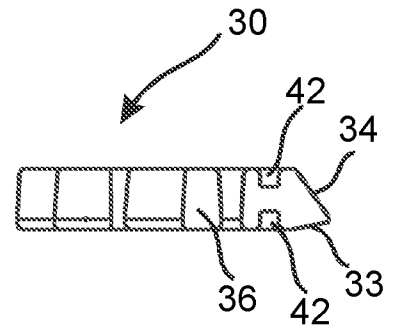
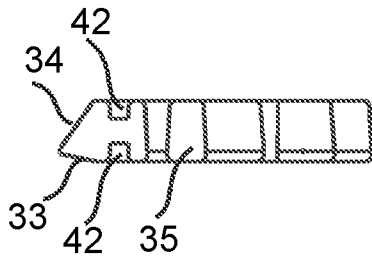


FIG 1B

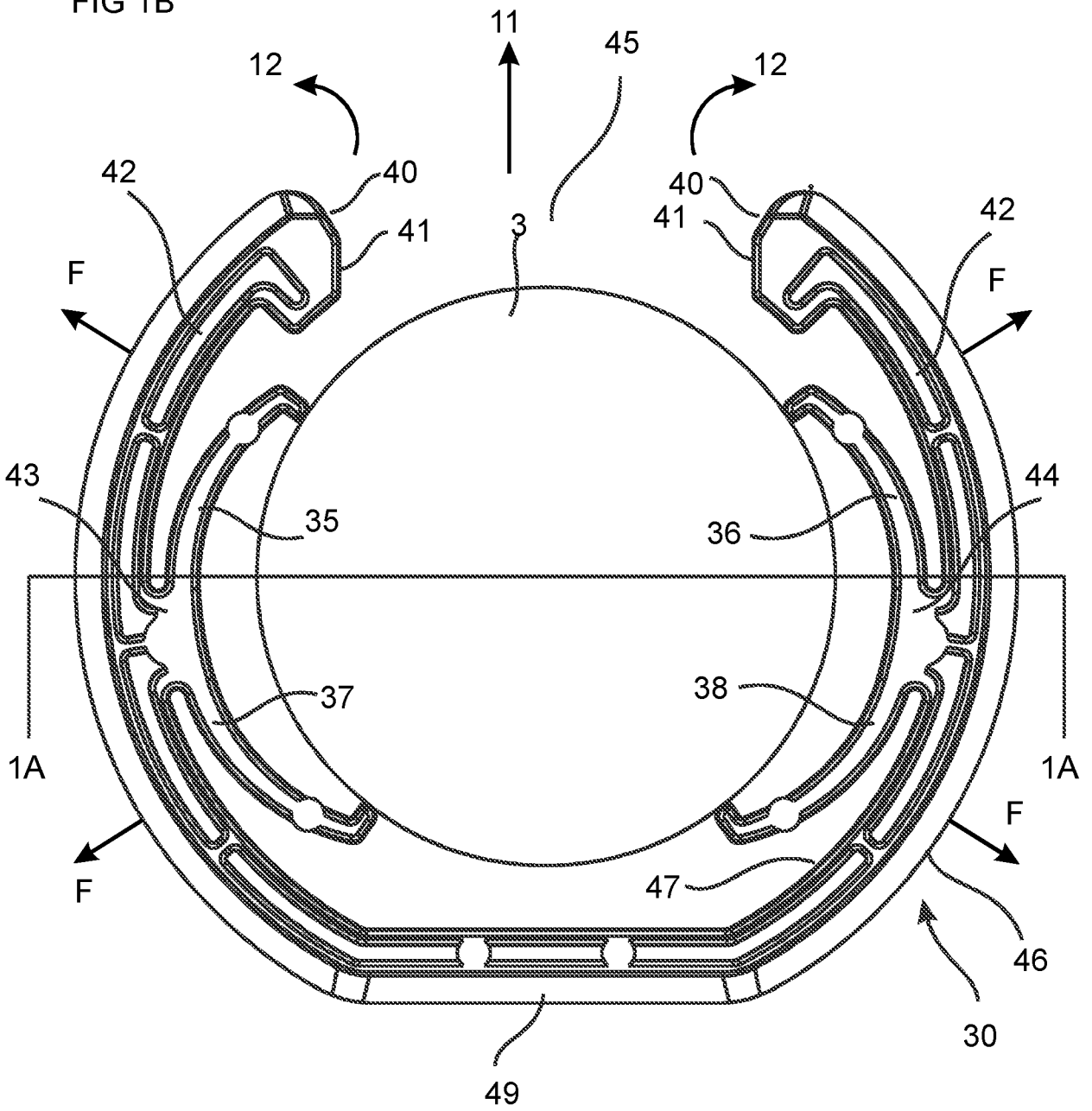


FIG 2A

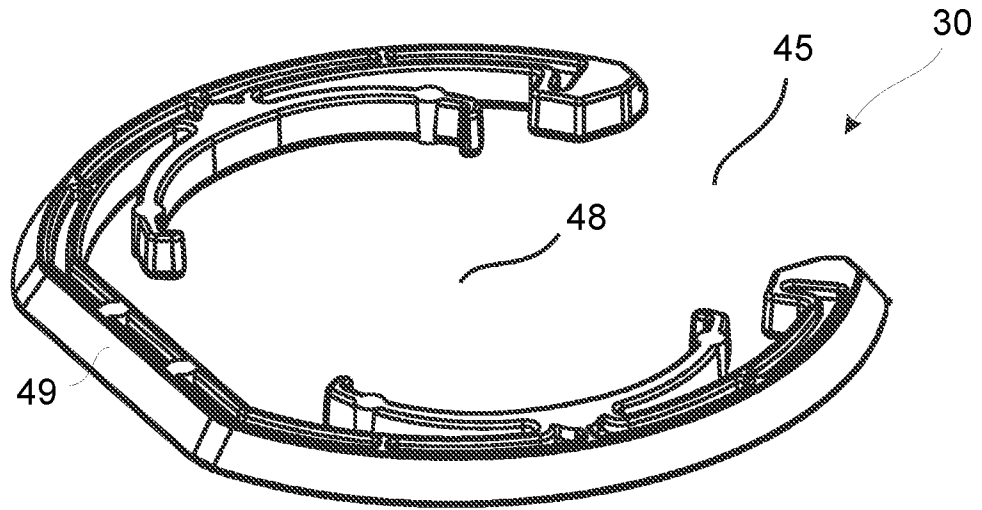


FIG 2B

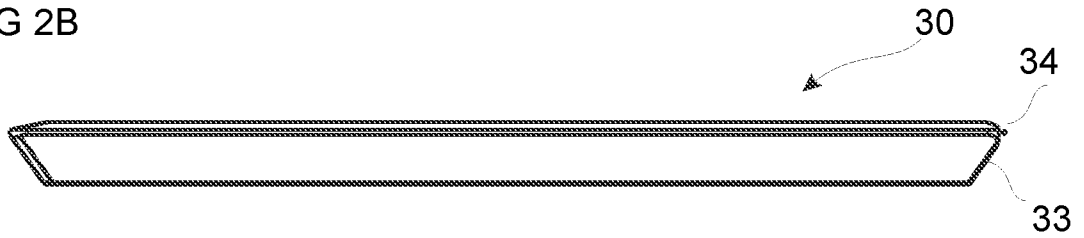


FIG 2C

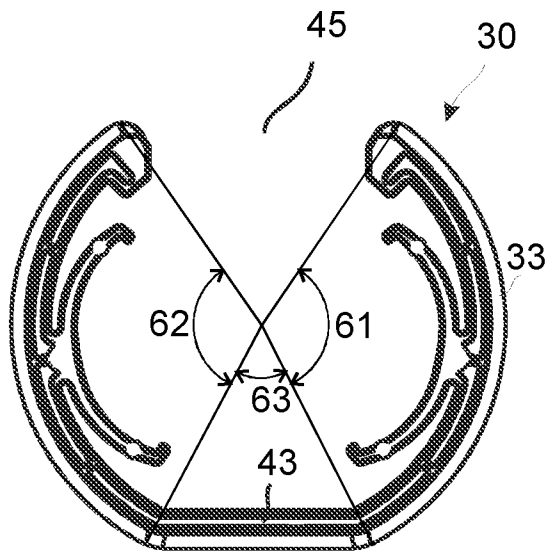


FIG 2D

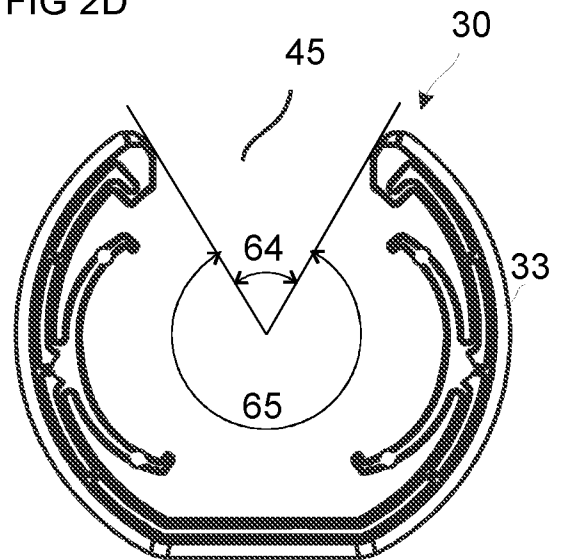


FIG 3A

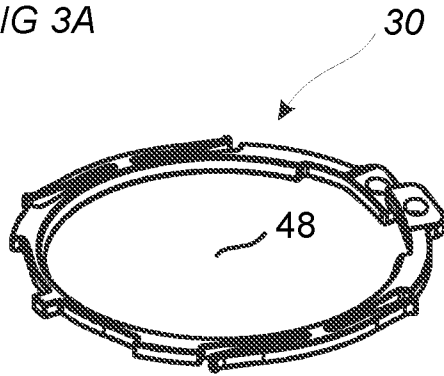


FIG 3B

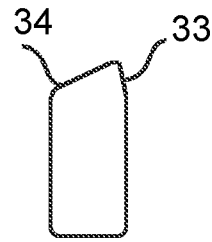


FIG 3C

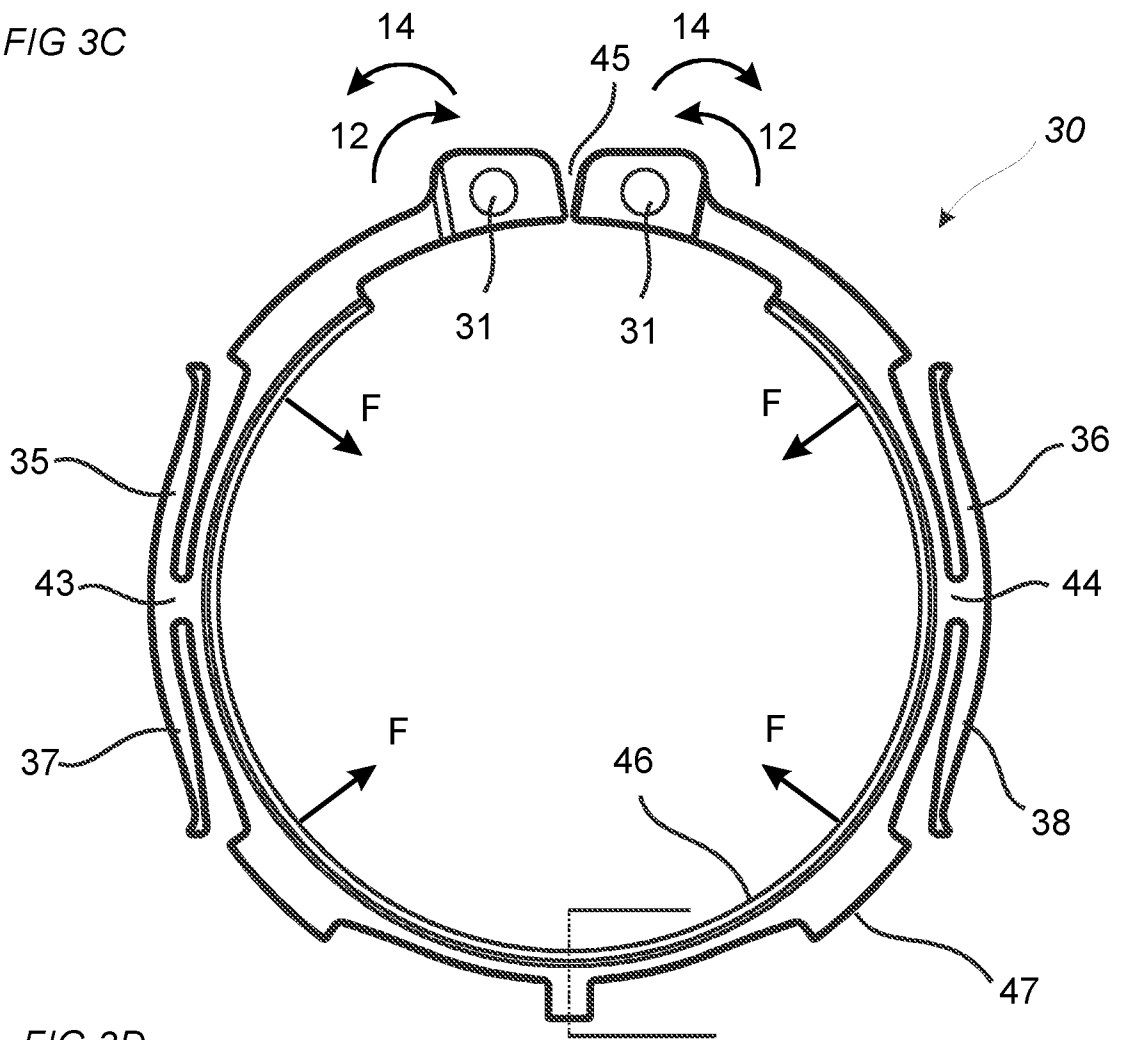


FIG 3D

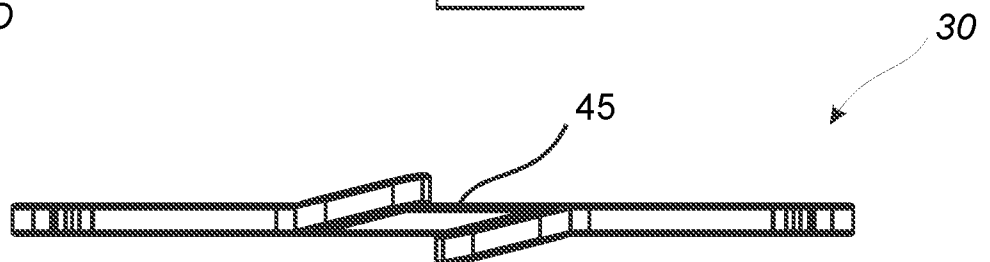


FIG 4A

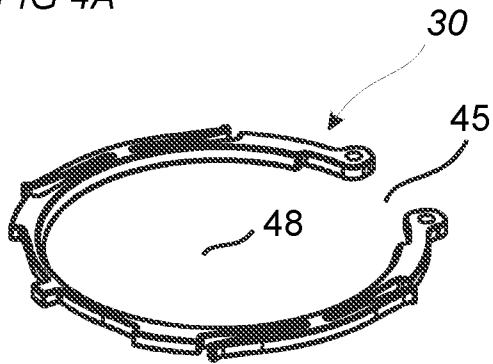


FIG 4B

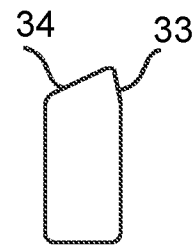


FIG 4C

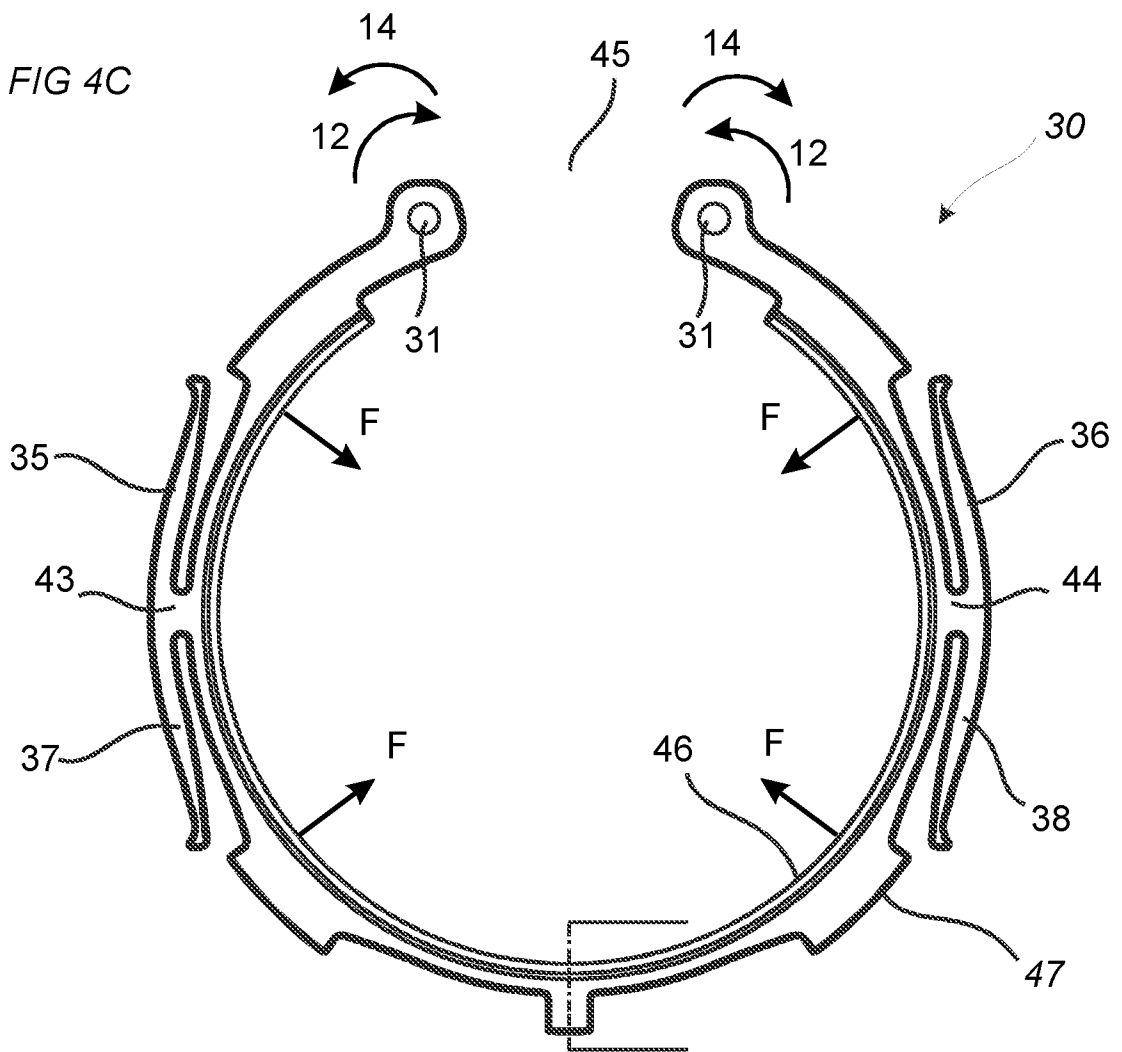


FIG 4D



FIG 5A

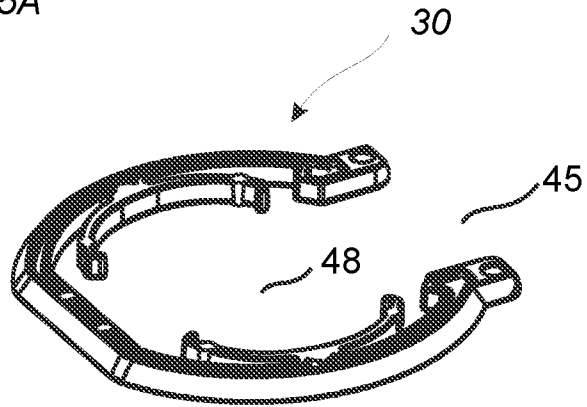


FIG 5B

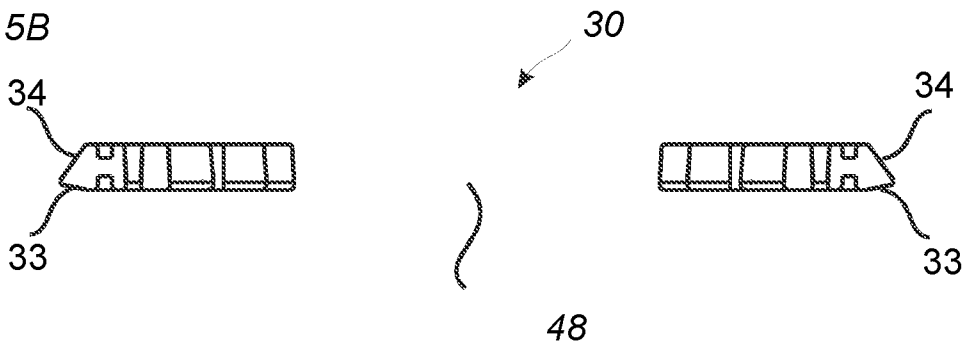


FIG 5C

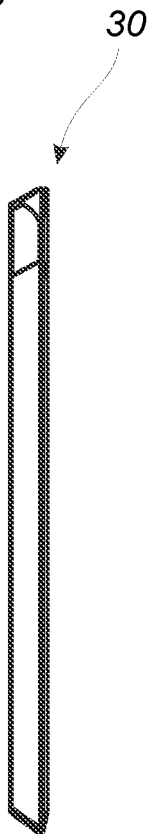


FIG 5D

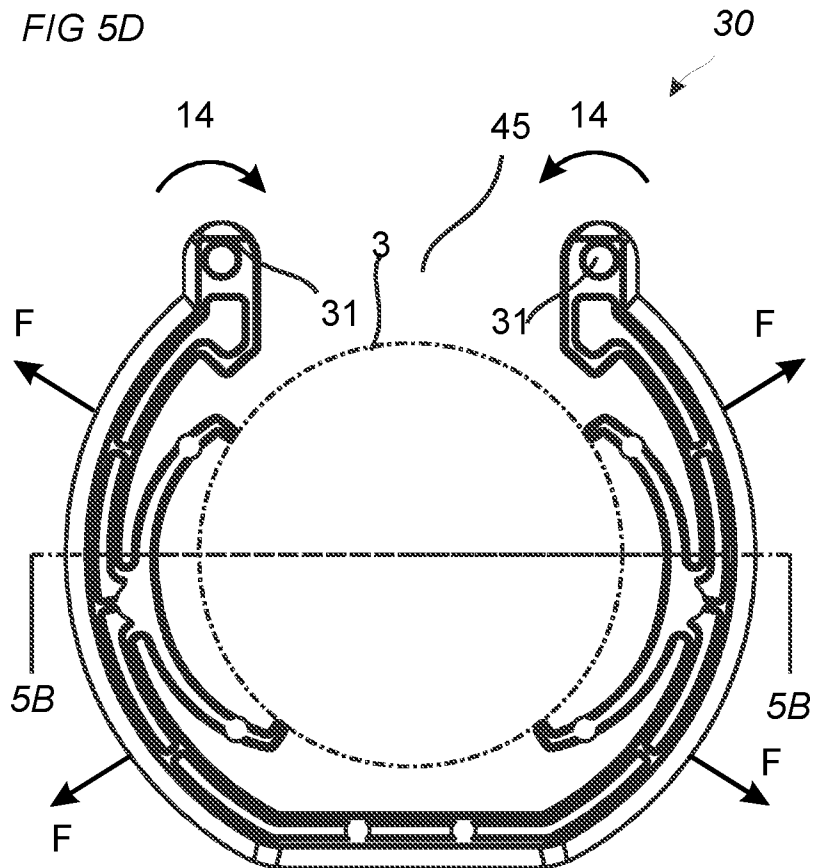


FIG 6A

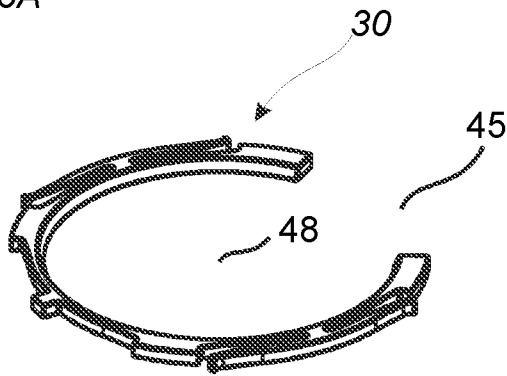


FIG 6B

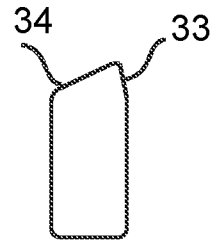


FIG 6C

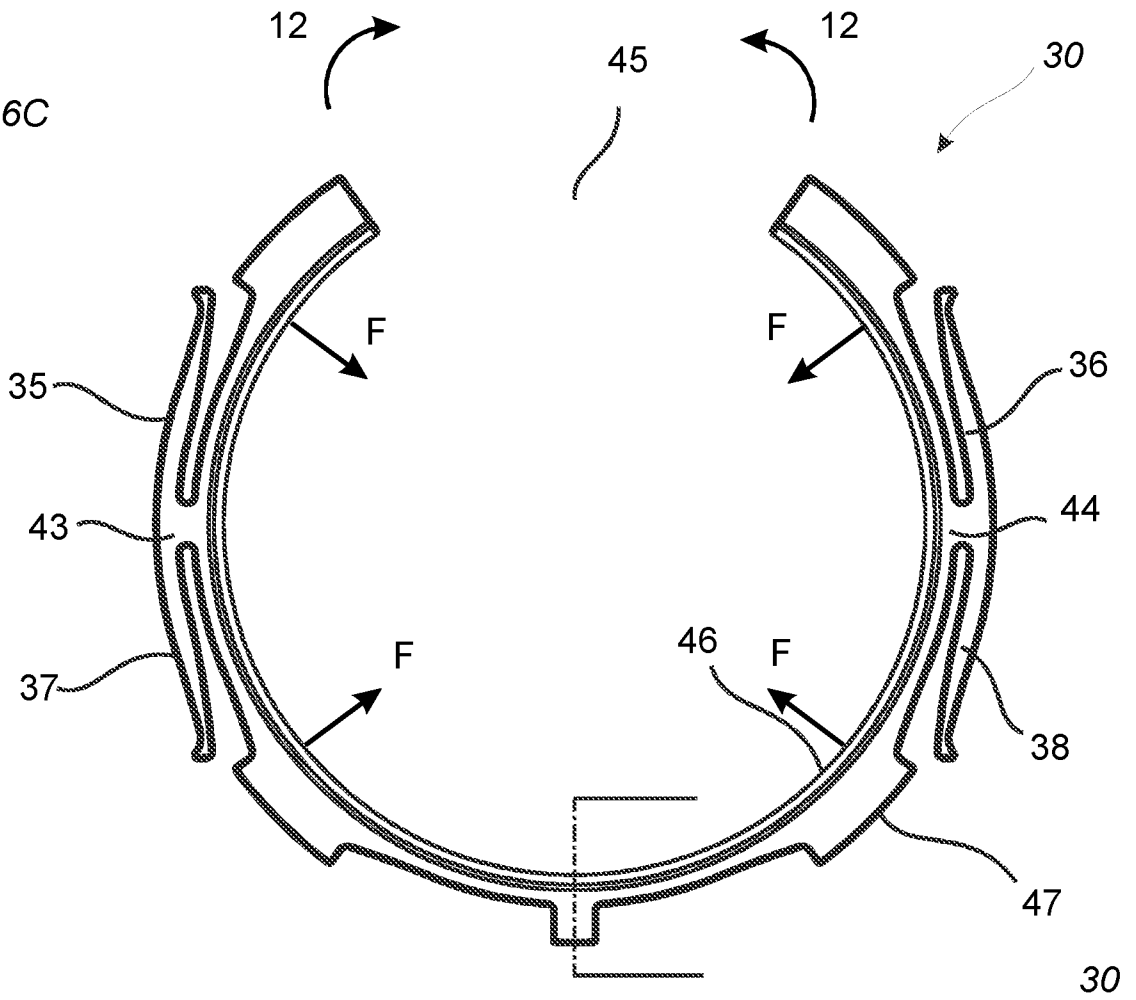


FIG 6D



FIG 7A

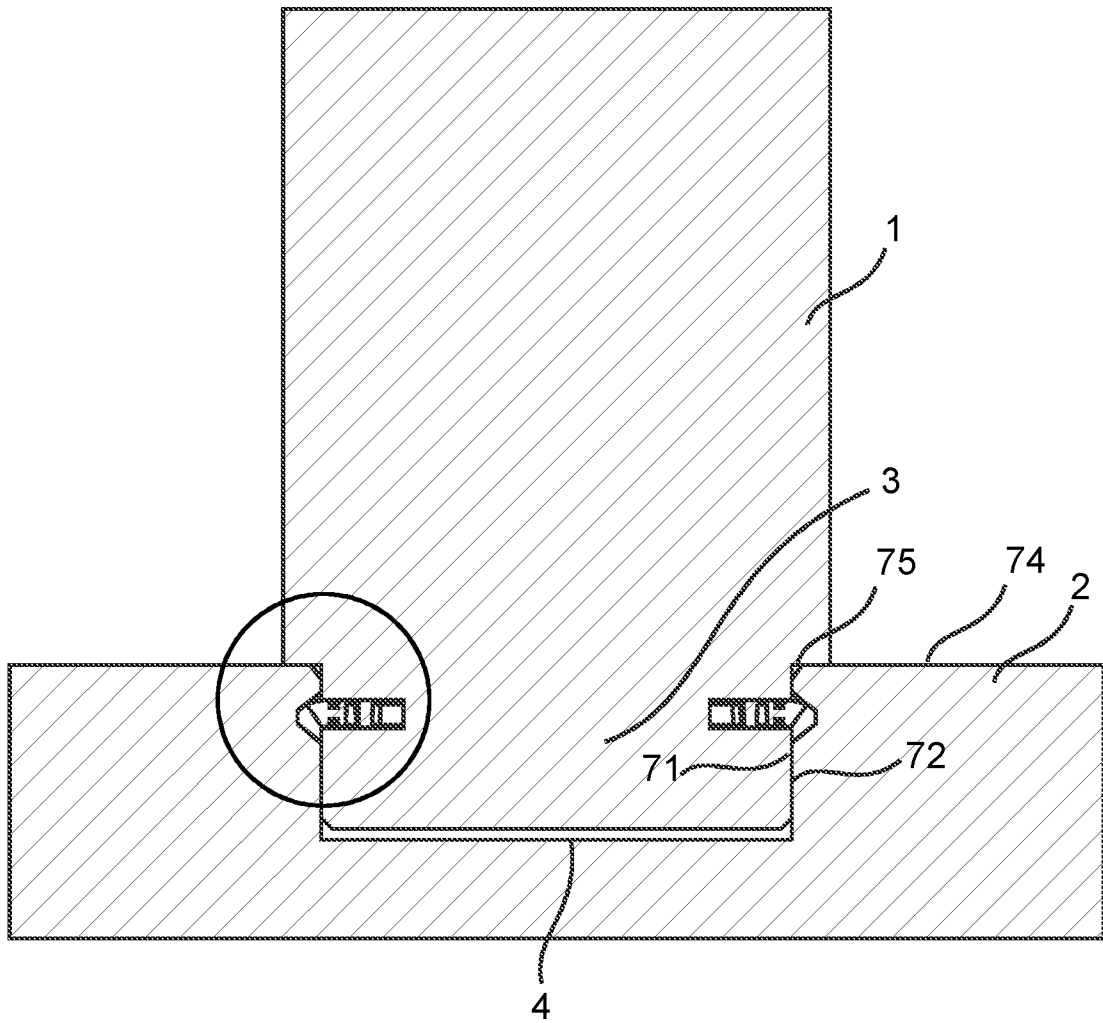


FIG 7B

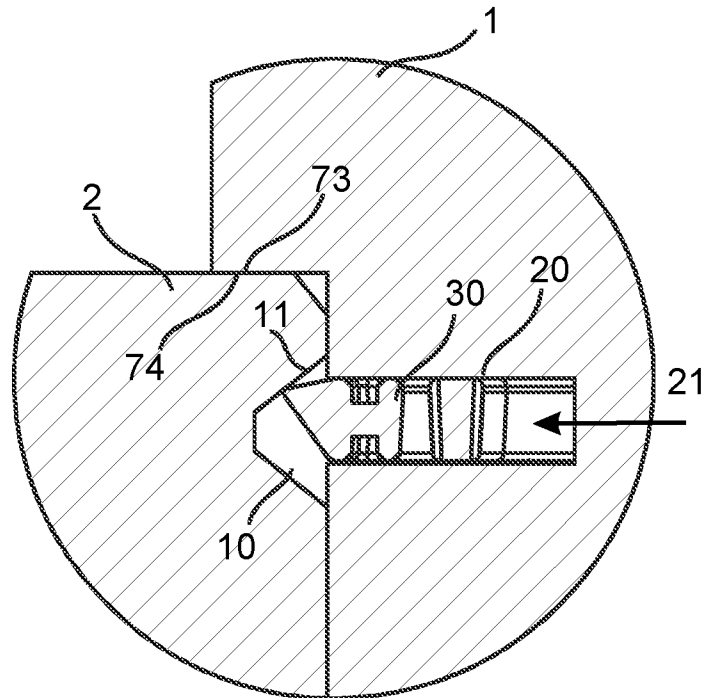


FIG 8A

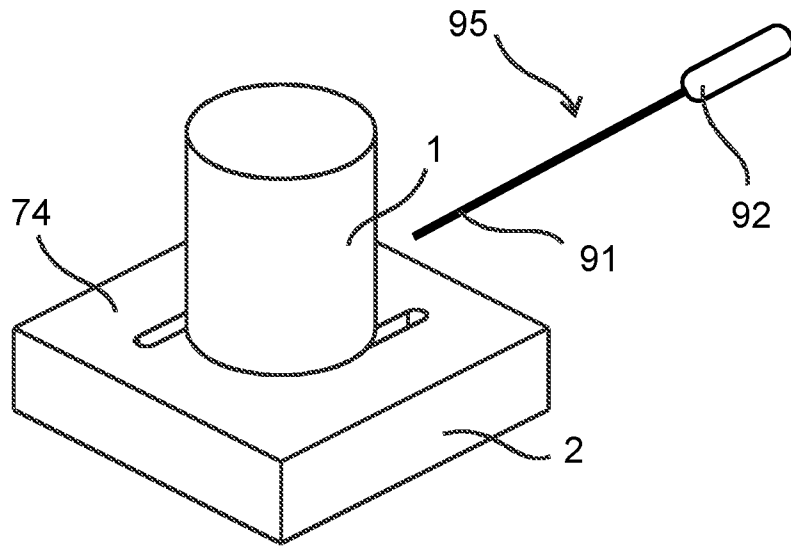


FIG 8B

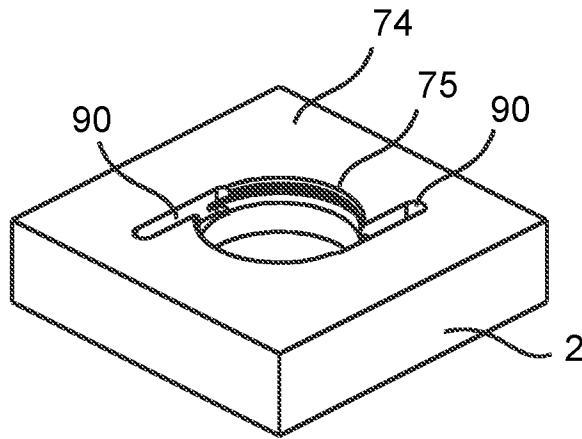


FIG 8C

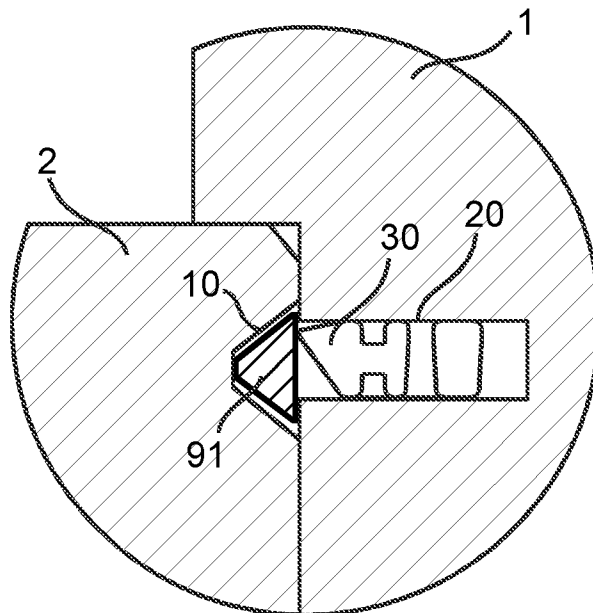


FIG 9A

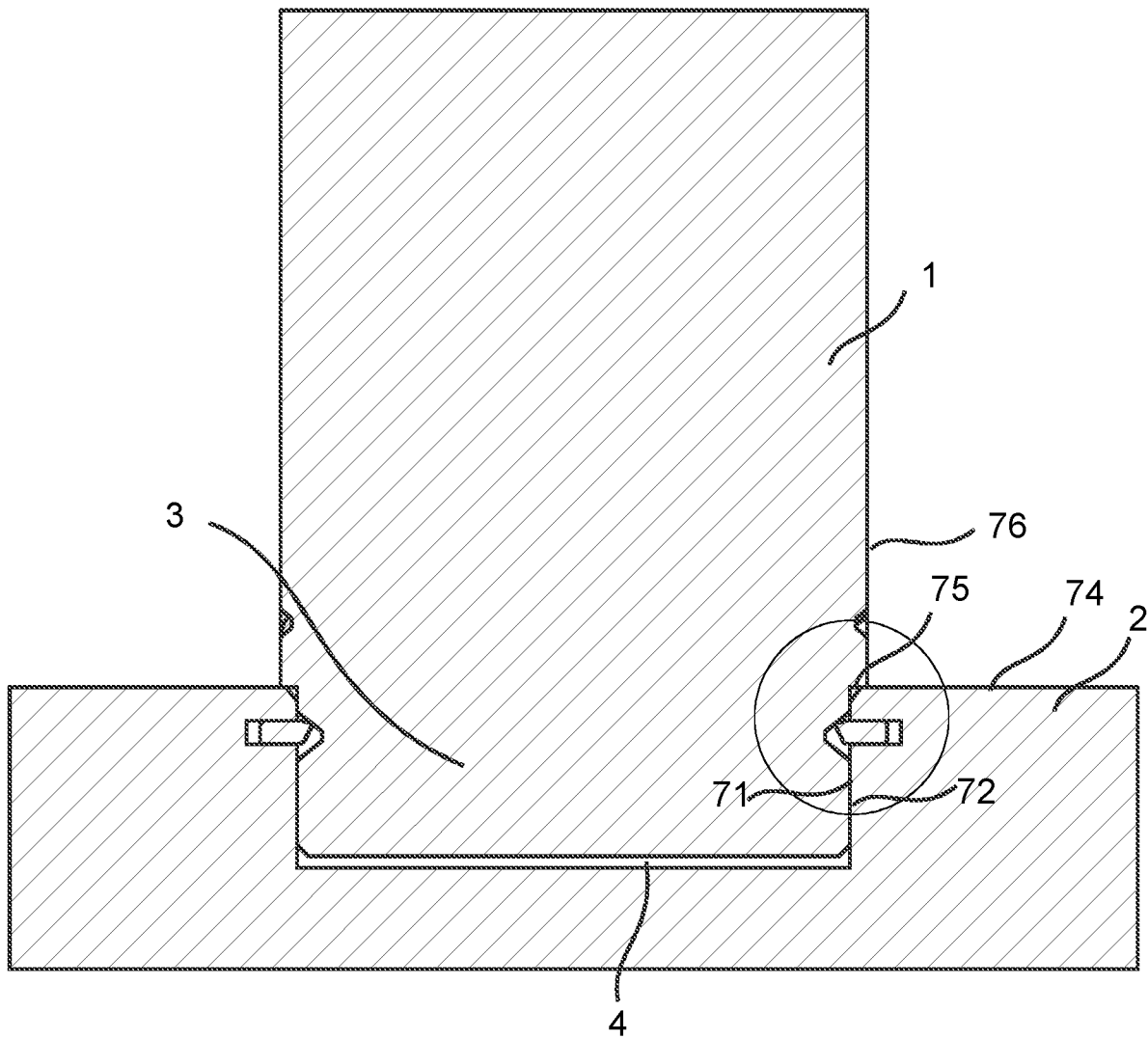


FIG 9B

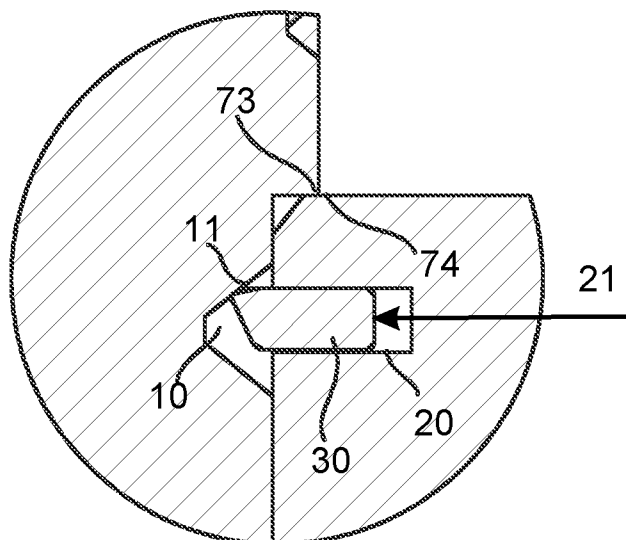


FIG 10A

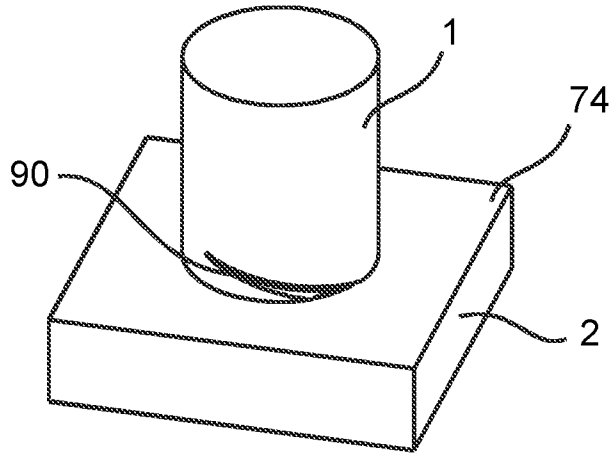


FIG 10B

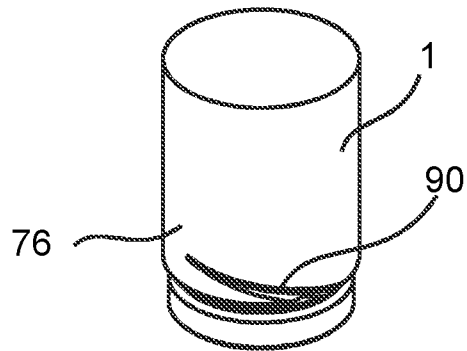
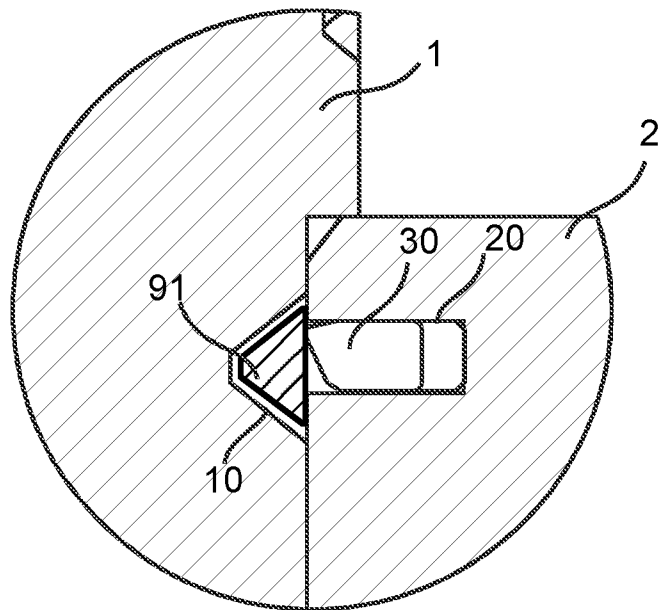


FIG 10C



11/16

FIG 11A

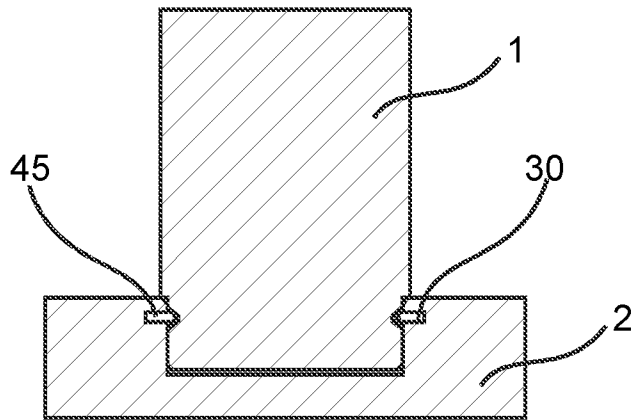


FIG 11B

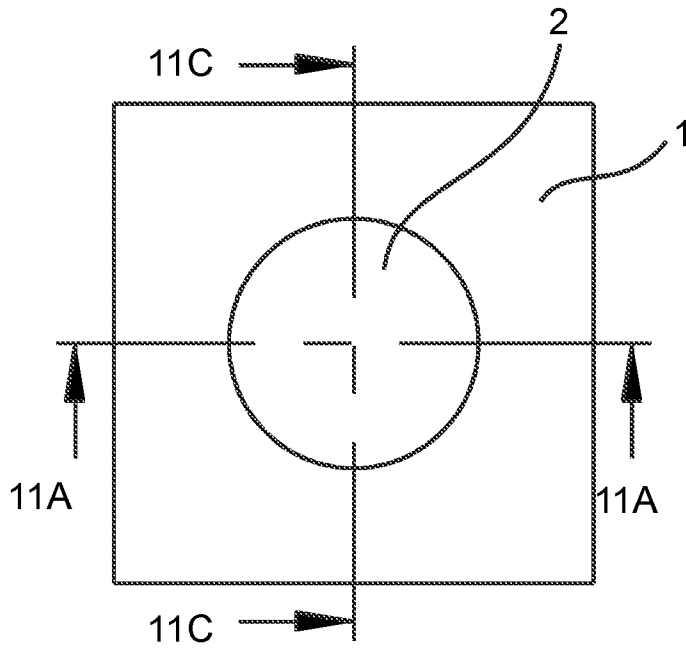


FIG 11C

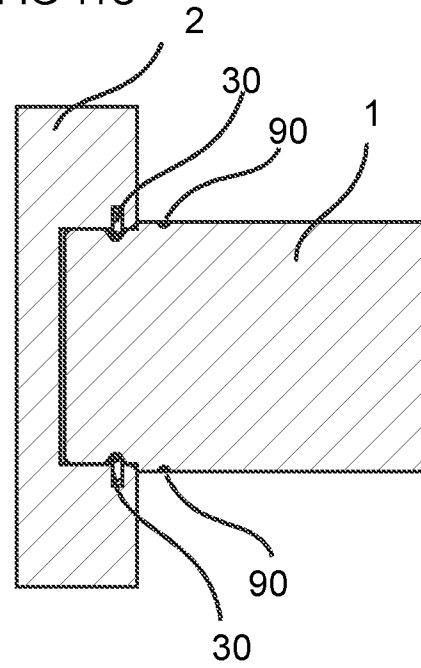


FIG 11D

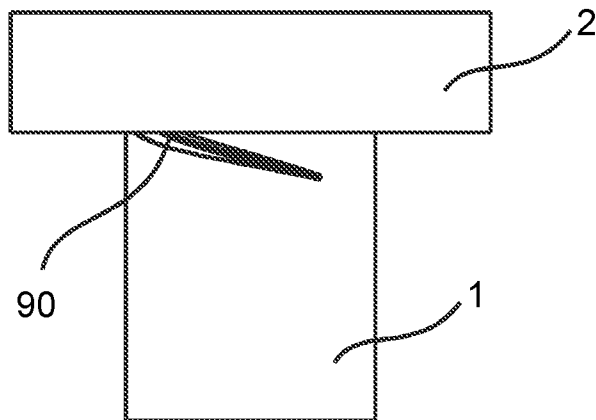


FIG 12A

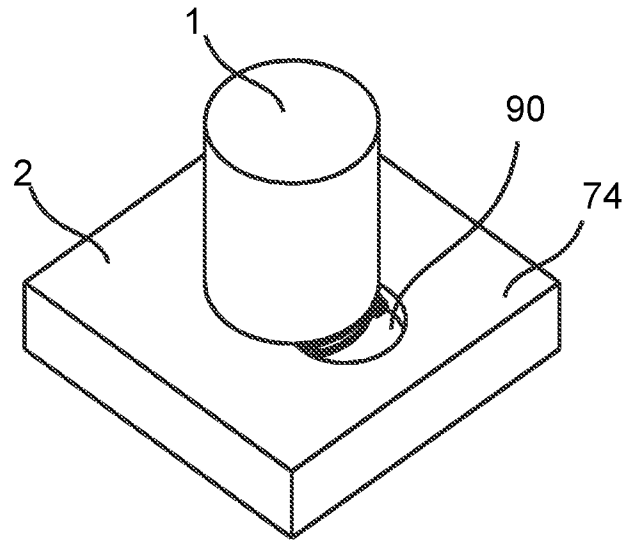


FIG 12B

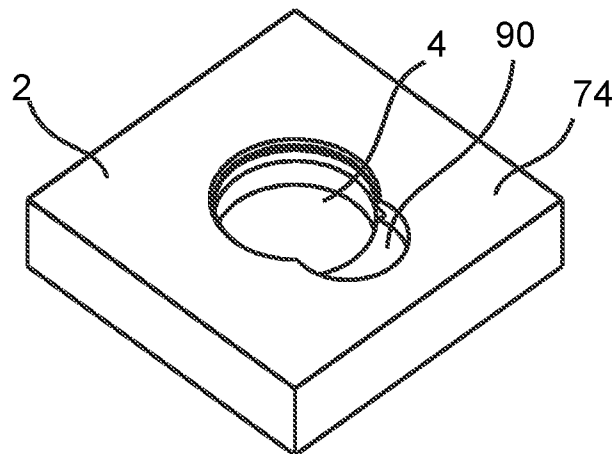


FIG 13A

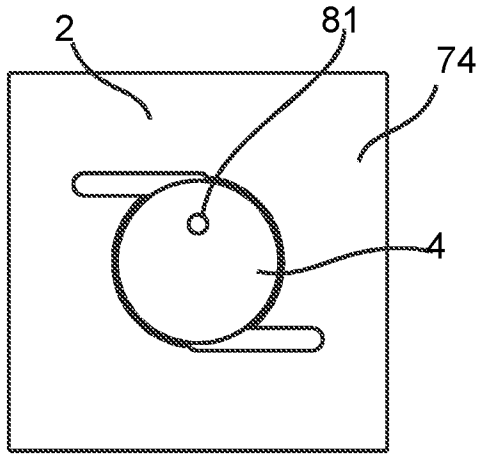


FIG 13B

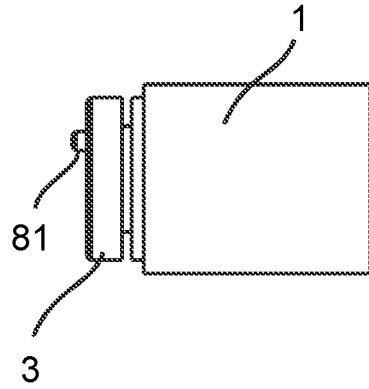


FIG 13C

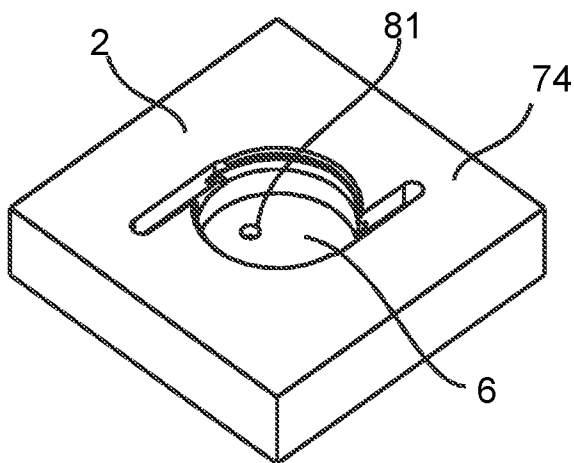


FIG 13D

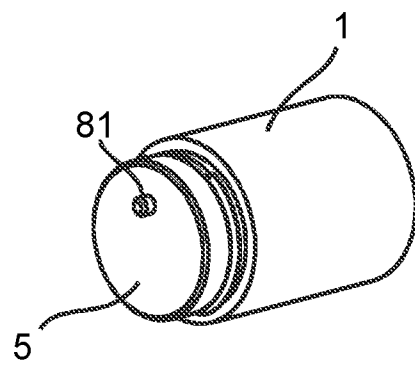


FIG 14A

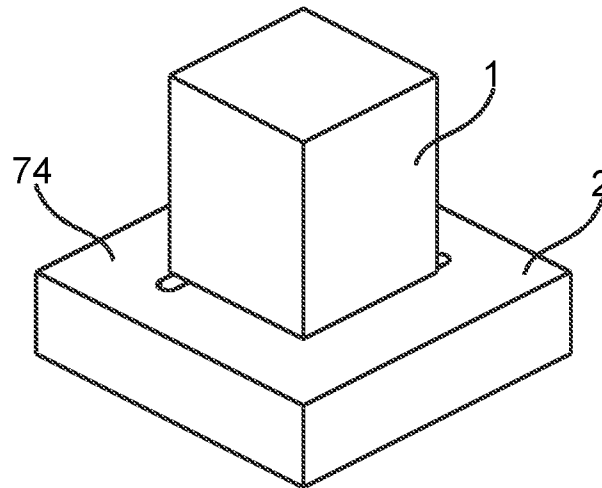


FIG 14B

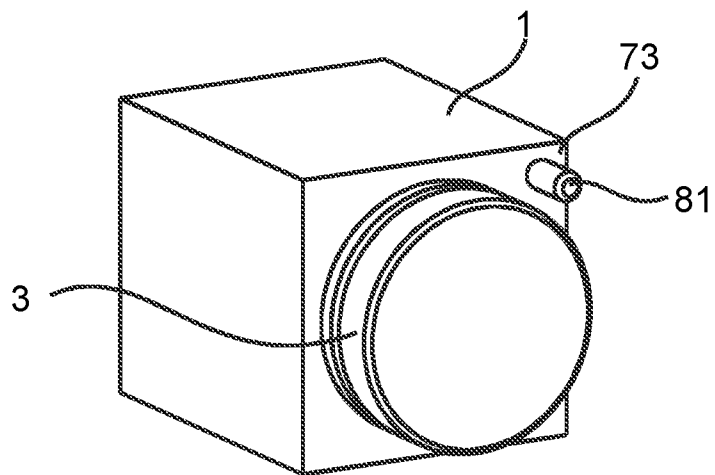


FIG 14C

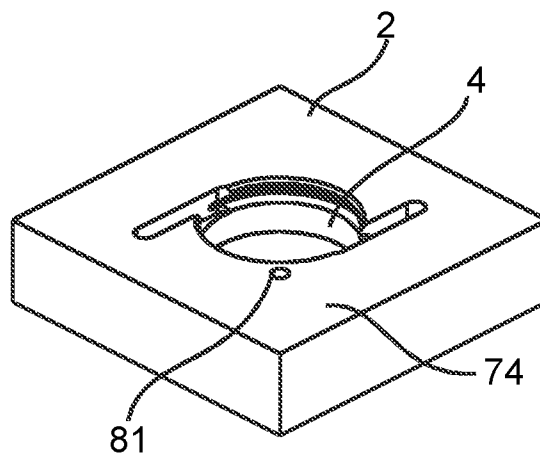


FIG 15A

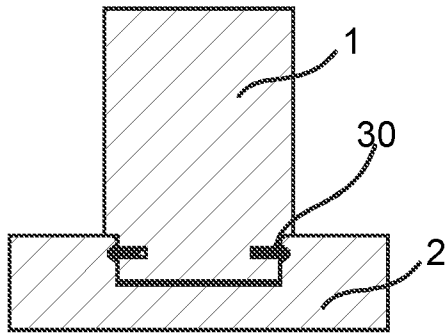


FIG 15B

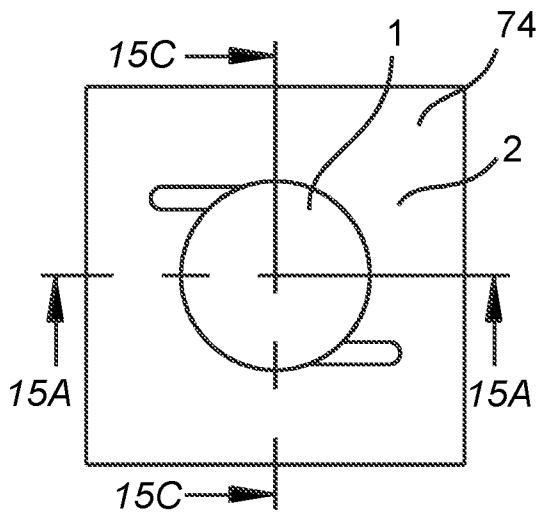


FIG 15C

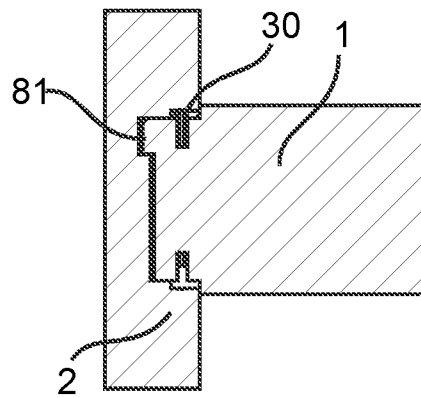


FIG 16A

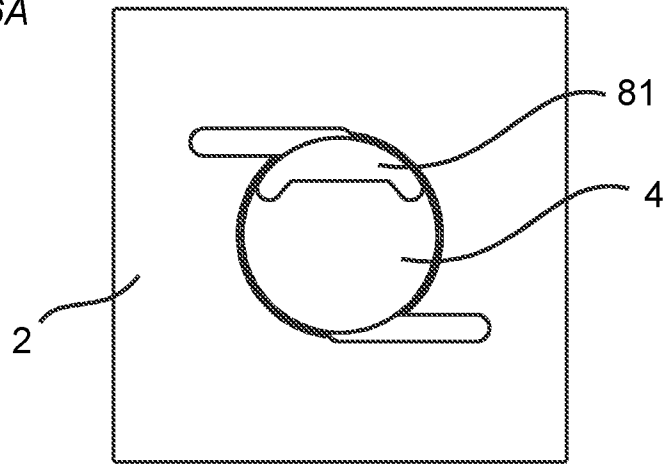


FIG 16B

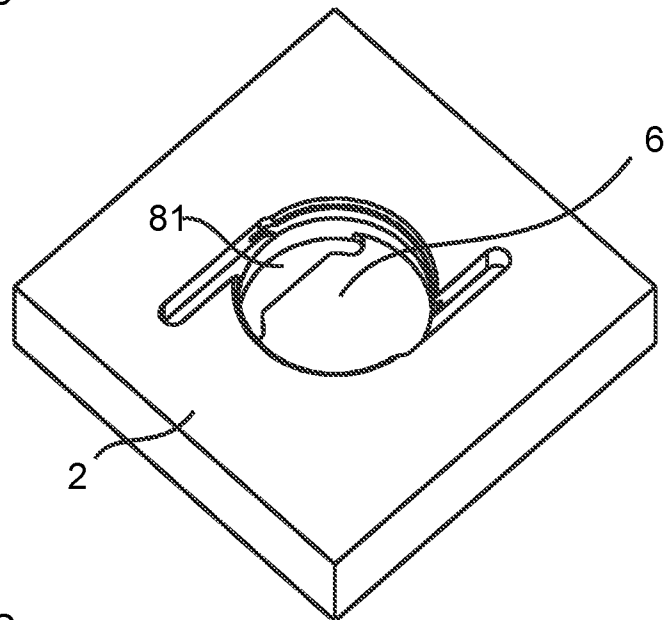
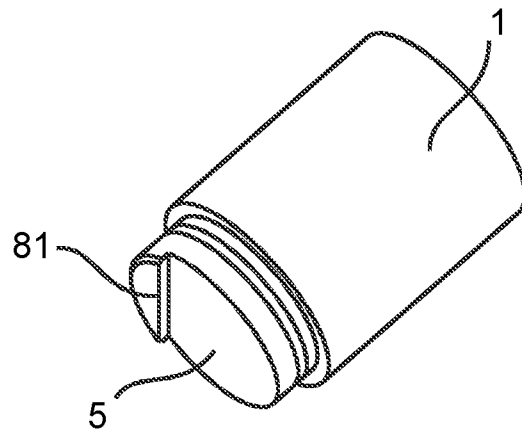


FIG 16C



INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2018/050492

A. CLASSIFICATION OF SUBJECT MATTER IPC: see extra sheet According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC: F16B Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched SE, DK, FI, NO classes as above Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, PAJ, WPI data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5658086 A1 (BROKAW PAUL E ET AL), 19 August 1997 (1997-08-19); abstract; figures --	1-23
A	US 4815908 A1 (DURAN JOHN A ET AL), 28 March 1989 (1989-03-28); abstract; column 3, line 53 - column 4, line 41; column 7, line 12 - column 8, line 3; figures --	1-23
A	EP 0042170 A1 (SPS TECHNOLOGIES), 23 December 1981 (1981-12-23); abstract; figures --	1-23
A	US 3765465 A1 (GULISTAN B), 16 October 1973 (1973-10-16); abstract; figures --	1-23
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
<p>* Special categories of cited documents:</p> <p>“A” document defining the general state of the art which is not considered to be of particular relevance</p> <p>“E” earlier application or patent but published on or after the international filing date</p> <p>“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>“O” document referring to an oral disclosure, use, exhibition or other means</p> <p>“P” document published prior to the international filing date but later than the priority date claimed</p> <p>“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>“&” document member of the same patent family</p>		
Date of the actual completion of the international search 04-07-2018		Date of mailing of the international search report 04-07-2018
Name and mailing address of the ISA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. + 46 8 666 02 86		Authorized officer Cecilia Forslund Telephone No. + 46 8 782 28 00

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2018/050492

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 20060101769 A1 (PERVAN DARKO ET AL), 18 May 2006 (2006-05-18); abstract; figures 7c,7d --	1-23
A	US 20120279161 A1 (HAKANSSON NICLAS ET AL), 8 November 2012 (2012-11-08); abstract; figures -- -----	1-23

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/SE2018/050492

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			FR	2605066 A1	15/04/1988
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			US	20130318906 A1	05/12/2013
			US	20120174515 A1	12/07/2012
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International Patent Classification (IPC)

F16B 12/42 (2006.01)

F16B 9/02 (2006.01)