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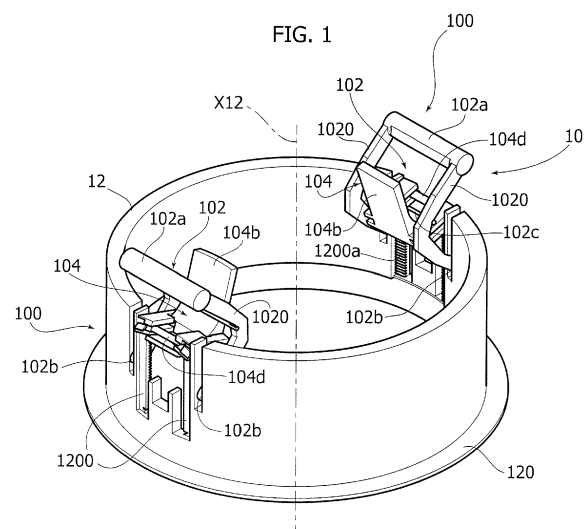
(54) **A MOUNTING DEVICE FOR LIGHTING SOURCES AND CORRESPONDING METHOD**

(57) A device for mounting lighting sources (L) includes:

- a frame (12) insertable into an opening (O) in a mounting surface (S) and coupleable with at least one electrically-powered light radiation source (L), and
- at least one retain mechanism (100) for retaining the frame (12) at said opening (O).

The retain mechanism (100) includes:

- an arm member (102) mounted on the frame (12) tiltable between an insertion condition, wherein the arm member (102) is retracted within the frame (12) to facilitate the insertion thereof into said opening (O), and a retain condition, wherein the arm member (102) protrudes radially outwardly of the frame (12) to abut against the rim of opening (O) to retain the frame (12) at the opening (O), and
- an actuator member (104) coupled cam-like with the arm member (102) to maintain the arm member (102) in abutment against the rim of opening (O) in the retain condition, the actuator member (104) being slidable with respect to the frame (12), whereby the retain condition is made adjustable by varying the position of the actuator member (104) with respect to the frame (12).



Description

Technical Field

[0001] The description relates to mounting devices for lighting sources.

[0002] One or more embodiments may be used for mounting electrically-powered light radiation sources (such as solid-state sources, e.g. LED sources) into mounting structures such as e.g. drywall ceilings.

Technological Background

[0003] In the current mounting conditions, a lighting source may be mounted into a support structure, such as e.g. a countertop (e.g. drywall) ceiling, so as to project light downwards ("down light").

[0004] These mounting arrangements may be used for lighting devices having different features, e.g. depending on the characteristics of the support structures. Referring for simplicity to countertop ceilings (as this issue may equally arise with mounting surfaces of other kinds), these ceilings may have thicknesses varying in a rather wide range (e.g. from 1 mm to 40 mm). Also the available space above the support structure (e.g. the space between the drywall and the ceiling) may vary depending on the application situation.

[0005] The adjustment to such varying conditions may not be easy for the installer and/or the user, and this may impose solutions which are not particularly advantageous from the point of view of cost; the situation may be even more complex in the case of tiltable and/or turnable lighting sources.

[0006] A possible solution involves the use of annular (plastic or metal) structures, adapted to accommodate a lighting module therein and provided on the external side with lever and/or spring systems, enabling the fixation on a ceiling.

[0007] Such solutions may be inconvenient or even dangerous: this may be the case of systems featuring elastically biased levers in situations requiring different solutions depending on the thickness of the mounting surface.

[0008] The use has also been proposed of mounting rings (again of a plastic or metal material) adapted to accommodate the lighting source therein and provided on the outside with various possible fixing mechanisms. Beside exhibiting less user-friendly features, such solutions may require a specific shaping of the openings in the mounting surface.

Object and Summary

[0009] One or more embodiments aim at overcoming the previously outlined drawbacks.

[0010] According to one or more embodiments, said object may be achieved thanks to a mounting device for lighting sources having the features specifically set forth

in the claims that follow.

[0011] One or more embodiments may also concern a corresponding method.

[0012] The claims are an integral part of the technical teaching provided herein with reference to the embodiments.

[0013] One or more embodiments comprise a kit adapted to be installed easily and conveniently in different mounting conditions, without the use of specific tools.

Brief Description of the Figures

[0014] One or more embodiments will now be described, by way of non-limiting example only, with reference to the annexed Figures, wherein:

- Figures 1 to 4 are perspective views exemplifying various application features of embodiments,
- Figure 5 is a partial cross-sectional view of a device according to embodiments,
- Figures 6 to 13 show various possible steps and/or application features of embodiments, and
- Figure 14 exemplifies further possible embodiments.

[0015] It will be appreciated that, for clarity and simplicity of illustration, the various Figures may not be drawn to the same scale.

Detailed Description

[0016] In the following description, numerous specific details are given in order to provide a thorough understanding of various exemplary embodiments. The embodiments may be practiced without one or several of the specific details, or with other methods, components, materials, etc. In other instances, well-known structures, materials, or operations are not shown or described in detail to avoid obscuring the various aspects of the embodiments.

[0017] Reference throughout this specification to "one embodiment" or "an embodiment" means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment. Thus, the possible appearances of the phrases "in one embodiment" or "in an embodiment" in various places throughout this specification are not necessarily all referring exactly to the same embodiment. Furthermore, particular features, structures, or characteristics may be combined in any suitable manner in one or more embodiments.

[0018] The headings provided herein are given for convenience only, and therefore do not interpret the extent of protection or the scope of the embodiments.

[0019] In the Figures, reference 10 denotes on the whole a device adapted to be used for mounting lighting sources into an opening O provided in a mounting surface (structure) S.

[0020] Said surface S may include, e.g., a countertop

(e.g. drywall) ceiling.

[0021] This provision, however, must not be construed, even indirectly, as a limitation of the embodiments.

[0022] As a matter of fact, one or more embodiments may find application e.g. in mounting lighting sources into support structures comprising e.g. walls, furniture, lighting device arrangements etc.

[0023] It will be appreciated, moreover, that in Figures such as Figures 2 to 13 surface S is shown as a disk-shaped element; such an exemplary representation has the only purpose of highlighting the fact that one or more embodiments may be mounted onto surfaces S the thickness whereof may vary greatly; the surface S may either be very thin (see e.g. Figures 3 and 10) or rather thick (see e.g. Figures 4 and 13), in a wide range of possible thicknesses. By way of example only, and without limiting the embodiments, the mounting surface S may have a thickness ranging between 1 mm and 40 mm.

[0024] As regards other features, surface S may generally have any extension and shape.

[0025] Moreover, while Figures 1 to 13 refer by way of example to openings O having a circular shape, the embodiments may apply to openings O having any shape: for example, Figure 14 shows one or more possible embodiments adapted to mount one or more lighting sources at an opening O having a rectangular shape.

[0026] It will be appreciated, moreover, that one or more embodiments may refer to a mounting device for lighting sources which in itself does not include the lighting source; for instance, the latter may be mounted into device 10 only after device 10 has been applied at mounting opening O.

[0027] The profile of a lighting source L, e.g. a spotlight, being associated to a housing R which may also act as a reflector, is shown in dashed lines only in Figures 10 to 13.

[0028] Lighting source L may be any electrically-powered light radiation source, such as a solid-state light radiation source, e.g. a LED source. Such lighting sources are widely known in the state of the art, which makes it unnecessary to provide a more detailed description herein.

[0029] The same applies to the procedure for mounting lighting source L into device 10. The lighting source L may be adapted to be fitted into device 10 e.g. by screws, bayonet fitting, coupling of the power supply electrodes, hook via collar elements, etc.: the wide range of implementations is known in the art, which again makes it unnecessary to provide a more detailed description herein.

[0030] One or more embodiments may refer mainly to device 10 and the features thereof, without a specific and limiting reference to the use of a given kind of lighting source L and/or to a particular method for mounting source L into device 10.

[0031] In one or more embodiments, device 10 may include an annular frame 12 adapted to accommodate and mount an electrically-powered lighting source L therein, e.g. a solid-state lighting source, such as a LED

source, schematically shown in combination with a possible housing R only in Figures 10 to 13. Once again, it will be appreciated that the methods of mounting source L within annular frame 12 are to be considered as known in themselves, and therefore they are not essential for understanding and implementing the embodiments.

[0032] In one or more embodiments, frame 12 may have a tubular, e.g. cylindrical, shape around a main axis X12. In one or more embodiments, the annular shape may be open or closed. In one or more embodiments, as exemplified in Figure 14, frame 12 may have an annular shape other than circular, e.g. quadrilateral, such as the rectangular shape exemplified in Figure 14.

[0033] In one or more embodiments, frame 12 may have any shape which enables the insertion thereof into opening O.

[0034] For simplicity, Figures 1 to 13 refer to a circular opening O, but said opening may be implemented in a wide range of different shapes and geometries, e.g. a rectangular shape as exemplified in Figure 14.

[0035] In one or more embodiments, frame 12 may have, at one of its ends, a peripheral flange 120 which, when device 10 is inserted into opening O, may abut against the rim of opening O (see e.g. Figures 8 to 13).

[0036] In one or more embodiments, in order to retain device 10 (and source L, adapted to be mounted into device 10) on support structure S, one or more retain mechanisms 100 may be provided, which at least grossly resemble clamps and which cooperate with the flange formation 120, in order to clamp the rim of opening O therein.

[0037] Figures 1 to 4 and 6 to 13 refer, by way of example only, to the presence of two mechanisms 100, which are arranged at mutually opposed positions with respect to annular frame 12.

[0038] Figure 14 shows the possibility of employing a different number of mechanisms 100, e.g. six mechanisms 100 arranged three by three on the opposed sides (which are longer, in the example of Figure 14) of frame 12, or respectively arranged in three pairs, each pair including two retain mechanisms 100 arranged in diametrically opposed positions with respect to frame 12, each of the mechanisms 100 facing, in a position diametrically opposed across frame 12, another corresponding mechanism 100. This diametrically opposed arrangement may ease the achievement of a symmetric and balanced mounting condition.

[0039] In one or more embodiments only one mechanism 100 may be provided, e.g. by envisaging, in a diametrically opposed position, a hook formation adapted to establish a coupling between the rim of frame 12, e.g. in the vicinity of flange 120, and the rim of opening O.

[0040] In one or more embodiments, mechanism 100 may comprise an arm 102 mounted on annular frame 12 and being adapted to tilt between:

- an insertion condition (see e.g. Figure 1 and Figures 6, 7 and 8), wherein arm 12 is (radially) retracted

within frame 12, in such conditions as to ease the insertion of device 10 into opening O, and

- a retain operating condition (see e.g. Figures 2 to 5 and 8 to 13), wherein arm 102 protrudes radially outwardly of annular frame 12, being adapted to abut, with its distal end 102a, against mounting surface S, e.g. at the rim of opening O, so as to retain frame 12 (and device 10 in general, together with source L which may be mounted therein) on surface S.

[0041] In one or more embodiments, as exemplified herein, arm 102 is fork-shaped and includes two branches 1020 each of which is proximally coupled (hinged) (see reference 102b) to frame 12, while the distal ends of both branches 1020 are connected with each other, e.g. via a bar defining the distal end 102a of arm 102b, optionally with a further formation 102c (which will be detailed in the following) extending bridge-like between the central portions of both branches 1020.

[0042] Reference 104 denotes an actuator member which, in one or more embodiments, may comprise an L-shaped element which may be mounted on frame 12 and is adapted to perform (in addition to an optional tilting movement inwardly of frame 12, which will be better detailed in the following), a general translation movement, sliding axially with respect to frame 12 (e.g. in the direction of axis X12).

[0043] As exemplified in the Figures, actuator member 104 may thus be adapted to slide with respect to frame 12 and to reach a position adjustable between:

- a "retracted" position in the vicinity of the terminal rim of frame 12 opposed to flange 120 (see for example Figure 13),
- an "advanced" position towards the end of the frame, where flange 120 is located (see e.g. Figure 10).

[0044] For this purpose, in one or more embodiments, frame 12 and actuator member 104 may have complementary sliding formations, such as e.g. channel-shaped formations 1040 located on opposed sides of actuator member 104 (such channel-shaped formations are more clearly visible and specifically shown in Figures 2 and 4) adapted to slidably cooperate with axial ribs 1200 (the latter being more clearly visible and specifically shown in Figures 1, 2 and 4) which extend axially with respect to frame 12, so as to allow actuator member 14 to perform said axial translation movement with respect to frame 12 in the direction of axis X12.

[0045] In one or more embodiments, the position reached through said sliding movement may be made selectively adjustable by providing, for example at the face of ribs 1200 facing inwardly of frame 12, a toothed formation 1200a adapted to brake the sliding movement of actuator member 104 along guides 1200.

[0046] For example, in one or more embodiments, toothed formation 1200a may have an e.g. asymmetric sawtooth profile, which may exert a strong braking (al-

most blocking) action on the movement of actuator member 104 in the direction away from the end of frame 12 where flange 102 is located.

[0047] As can be better appreciated in the partial cross-sectional view of Figure 5, in one or more embodiments actuator member 104 may comprise, e.g. in a generally L-shaped configuration:

- a "proximal" or body branch 104a, adapted to achieve, e.g. via the grooves 1040 described in the foregoing, the axial sliding coupling (guides 1200) with respect to frame 12,
- a "distal" branch 104b, adapted to protrude outwardly of frame 12 and to cooperate cam-like with arm 102, so as to retain arm 102 itself in said retain condition, wherein the distal end 102a of arm 12 abuts against the rim of opening O and retains device 10 on mounting surface S.

[0048] In one or more embodiments, the axial mobility of actuator member 104 with respect to frame 12, with the possibility (e.g. due to the cooperation with toothed formations 1200a) to adjust the position reached through such axial movement, enables to position actuator member 104 in an axial position which is selectively determined with respect to frame 12 and is therefore adjustable in such a way as to correspondingly adjust the retain condition of arm 102, i.e. the tilting condition of arm 102 with respect to frame 12.

[0049] In one or more embodiments, such a result may be obtained thanks to a cooperating cam-like mechanism which may include e.g. the presence of a pin on arm 102 (which may include, in one or more embodiments as exemplified herein, a bar formation 102c extending bridge-like between both branches 1020 of arm 102, in a middle position with respect to branches 1020).

[0050] The pin/bar 102c supported by arm 102 (e.g. with the branches 1020 which, in one or more embodiments, may have an arched shape, the concavity generally facing outwardly of frame 12) may therefore operate as a cam-follower, e.g. slidably, with respect to a sliding surface 104c of actuator member 104: for simplicity of illustration, surface 104c is denoted as such only in the cross-sectional view of Figure 5. In this way, distal portion 104b of actuator member 104, radially protruding outwardly of frame 12, is adapted to exert an urging action onto arm 102, which brings (and keeps) distal end 102a of arm 102 in abutment against the rim of opening O in mounting surface S.

[0051] In one or more embodiments, arm 102 may therefore be configured so as to act as a lever, the fulcrum whereof is located at the proximal end 102b.

[0052] This takes place irrespective of the tilting position of arm 102, therefore imparting thereto the capability, depending on the thickness of surface S (and therefore adapting to the thickness of surface S) of taking a retain condition which may be selected between, e.g.

- a retain condition as exemplified in Figures 3 and 10 (very thin surface S), wherein arm 102 is rotated almost completely towards surface S, with its proximal branch radially protruding outwardly of frame 12 in an approximately orthogonal direction with respect to axis X12, and with its distal branch (carrying end 102a) extending practically parallel to axis X12 of frame 12; and
- a retain condition as exemplified in Figures 4 and 13 (very thick surface S), wherein the proximal portion of arm 102 is approximately co-extensive with the wall of frame 12, and its distal branch (carrying end 102a) extends radially outwardly of frame 12, in an approximately orthogonal direction with respect to axis X12 of frame 12 itself.

[0053] In one or more embodiments, as visible e.g. in Figure 1 or in Figures 6 to 8, actuator member 104 may be mounted on frame 12 with the possibility of tilting (e.g. at pins 104d: see e.g. Figure 5), so that it may be brought to a respective insertion condition (see e.g. Figure 1 and Figures 6 to 8), wherein actuator member 104 is tilted inwardly of frame 12, so as to facilitate the movement of insertion of device 10 into opening O.

[0054] In one or more embodiments (see e.g. Figure 5) pins 104d may be located near the ends of toothed formations 1200a more outwardly of frame 12, so that they enable the tilting movement of actuator member 104 when member 104 is nearly completely extracted from the coupling condition with frame 12 (with the ribs 1200 engaging the grooves 1040, with reference to the examples herein).

[0055] Without prejudice to the basic principles, the implementation details and the embodiments may vary, even appreciably, with respect to what has been described herein by way of non-limiting example only, without departing from the extent of protection.

[0056] Said extent of protection is defined by the annexed claims.

Claims

1. A device for mounting lighting sources (L), the device (10) including:

- a frame (12) insertable into an opening (O) provided in a mounting surface (S) and couplable with at least one electrically-powered light radiation source (L), and
- at least one retain mechanism (100) for retaining the frame (12) at said opening (O),

wherein the retain mechanism (100) includes:

- an arm member (102) mounted on the frame (12) tiltable between an insertion condition, wherein the arm member (102) is retracted with-

in the frame (12) to facilitate insertion thereof into said opening (O), and a retain condition, wherein the arm member (102) protrudes outwardly of the frame (12) to abut against the rim of said opening (O) to retain the frame (12) at said opening (O), and

- an actuator member (104) coupled cam-like with the arm member (102) to maintain the arm member in abutment against the rim of said opening (O) in said retain condition, the actuator member (104) slidable with respect to the frame (12), whereby said retain condition is adjustable by varying the position of the actuator member (104) with respect to the frame (12).

2. The device of claim 1, wherein the arm member (102) includes two side branches (1020) proximally hinged (102b) to the annular frame (12) and mutually coupled at their distal ends (102a).

3. The device of claim 1 or claim 2, wherein the cam-like coupling of the actuator member (104) with the arm member (102) includes:

- at least one cam-follower pin (102c) carried by one (102) of the arm member (102) and the actuator member (104), and
- at least one cam surface (104c) for said cam-follower pin (102c) to slide thereon on the other (104) of said arm member (102) and said actuator member (104).

4. The device of any of the previous claims, wherein the actuator member (104) includes:

- a body portion (104a) slidable with respect to the frame (12), and
- a distal protrusion (104b) of said body portion (104a) cam-like coupled with the arm member (102) to urge the arm member (102) in abutment against the rim of said opening (O).

5. The device of any of the previous claims, wherein the actuator member (104) is mounted on the frame (12) selectively tiltable to a respective insertion condition, wherein the actuator member (104) is retracted within the frame (12).

6. The device of any of the previous claims, including at least one toothed formation (1200a) acting between the frame (12) and the actuator member (104) for selectively adjusting the position of the actuator member (104) with respect to the frame (12).

7. The device of any of the previous claims, wherein the said frame includes an annular frame (12) with said actuator member (104) axially slideable (X12), preferably via complementary slide formations

(1200, 1040), with respect to the annular frame (12).

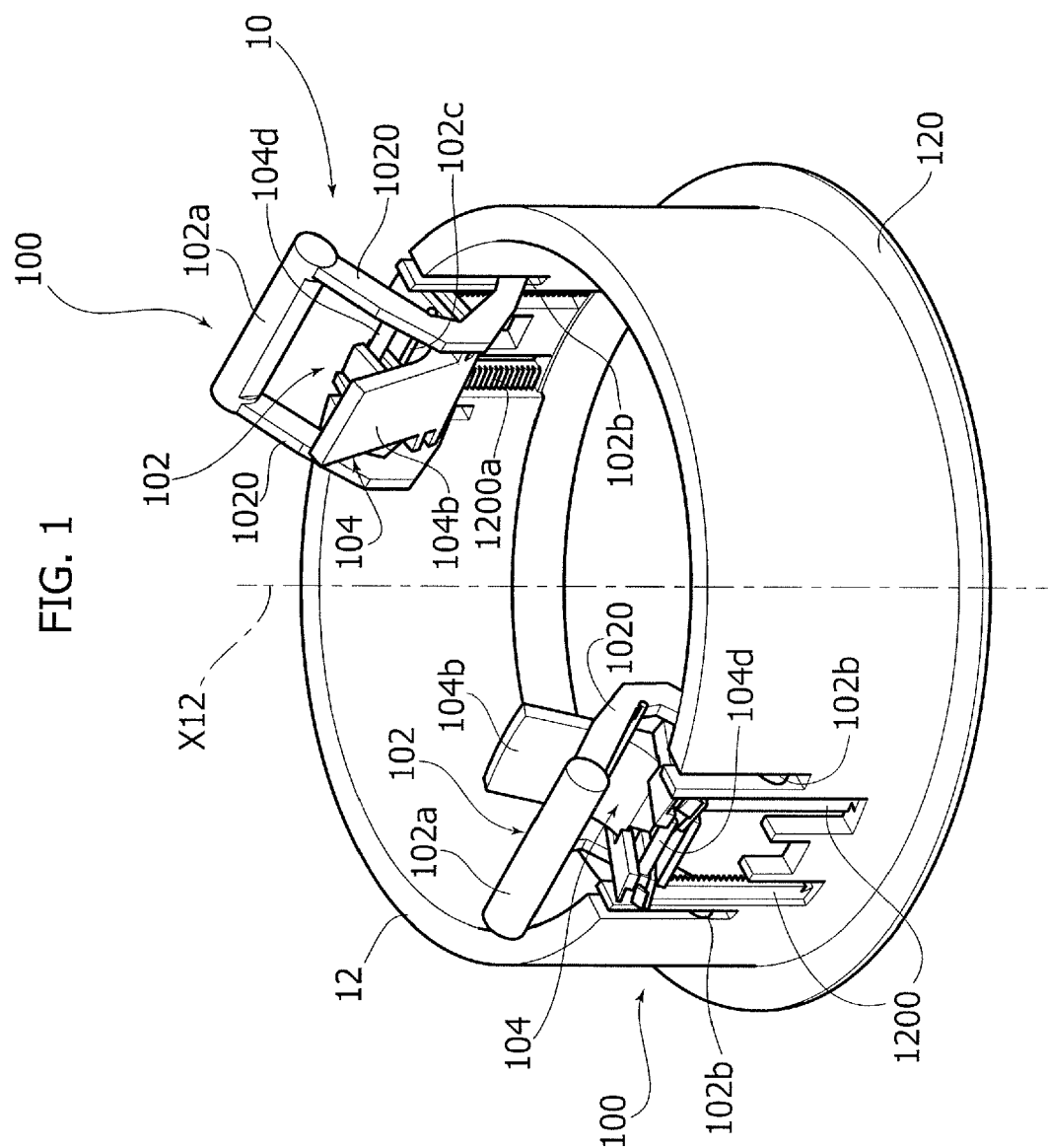
8. The device of any of the previous claims, wherein:

- the arm member (102) has an arched shape with a concavity facing outwardly of the frame (12), and/or
- the actuator member (104) includes an L-shaped member with a proximal arm (104a) slideably coupled with the frame (12) and a distal arm (104b) for acting on the arm member (102).

9. The device of any of the previous claims, including a plurality of said retain mechanisms (100) distributed along the periphery of the frame (12), said retain mechanisms (100) in said plurality of retain mechanisms being preferably arranged in pairs of retain mechanisms (100) arranged at diametrically opposed position with respect to said frame (12).

10. A method of providing a mounting location for at least one electrically-powered light radiation source (L) at an opening (O) provided in a mounting surface (S), the method including:

- providing a mounting device (10) according to any of claims 1 to 9,
- inserting the mounting device (10) into said opening (O) with said at least one retain mechanism (100) having said arm member (102) in said insertion condition, and
- sliding the actuator member (104) of said at least one retain mechanism (100) with respect to the frame (12) to urge the arm member (102) into abutment against the rim of said opening (O), whereby the mounting device (10) is retained at said opening (O).



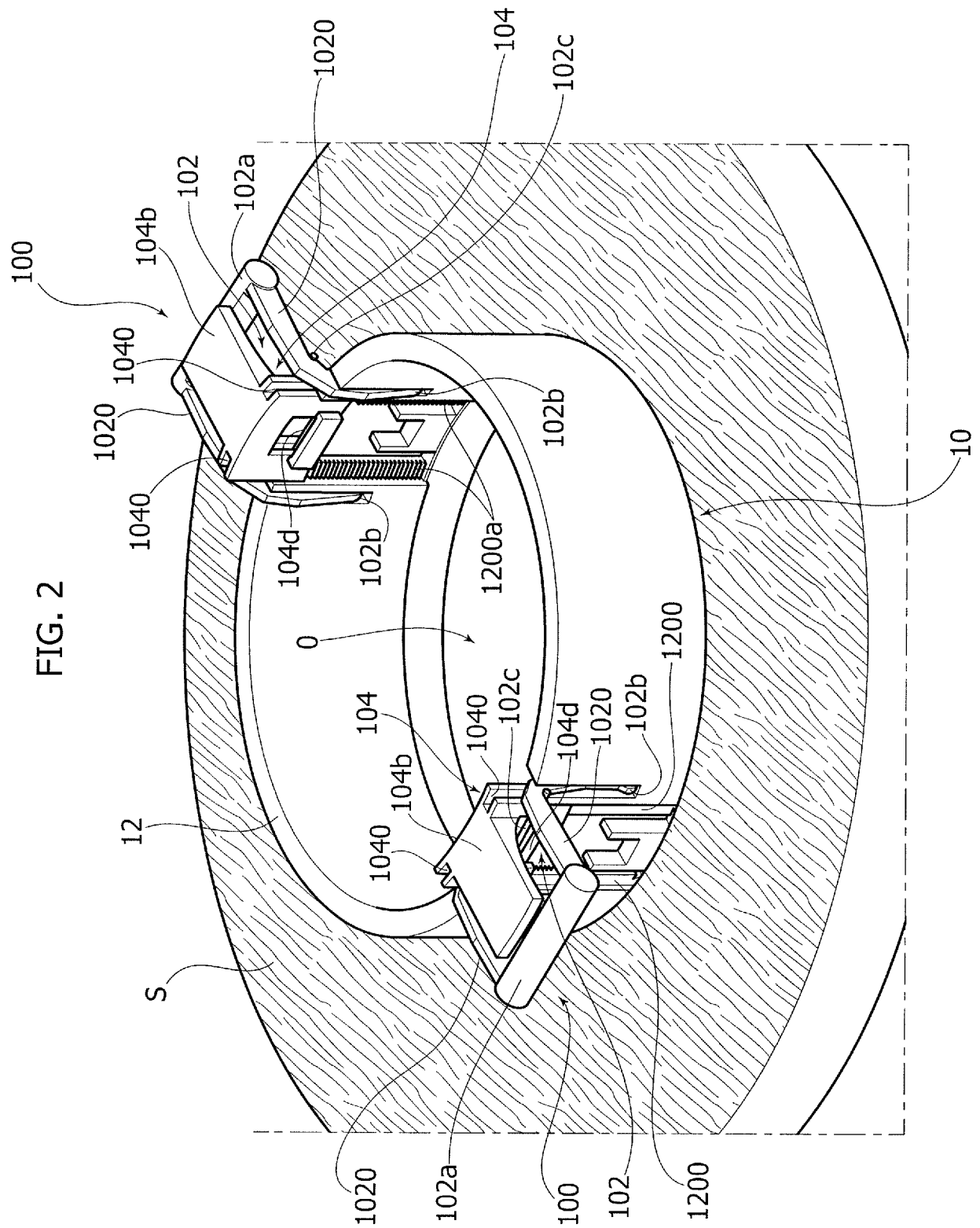


FIG. 3

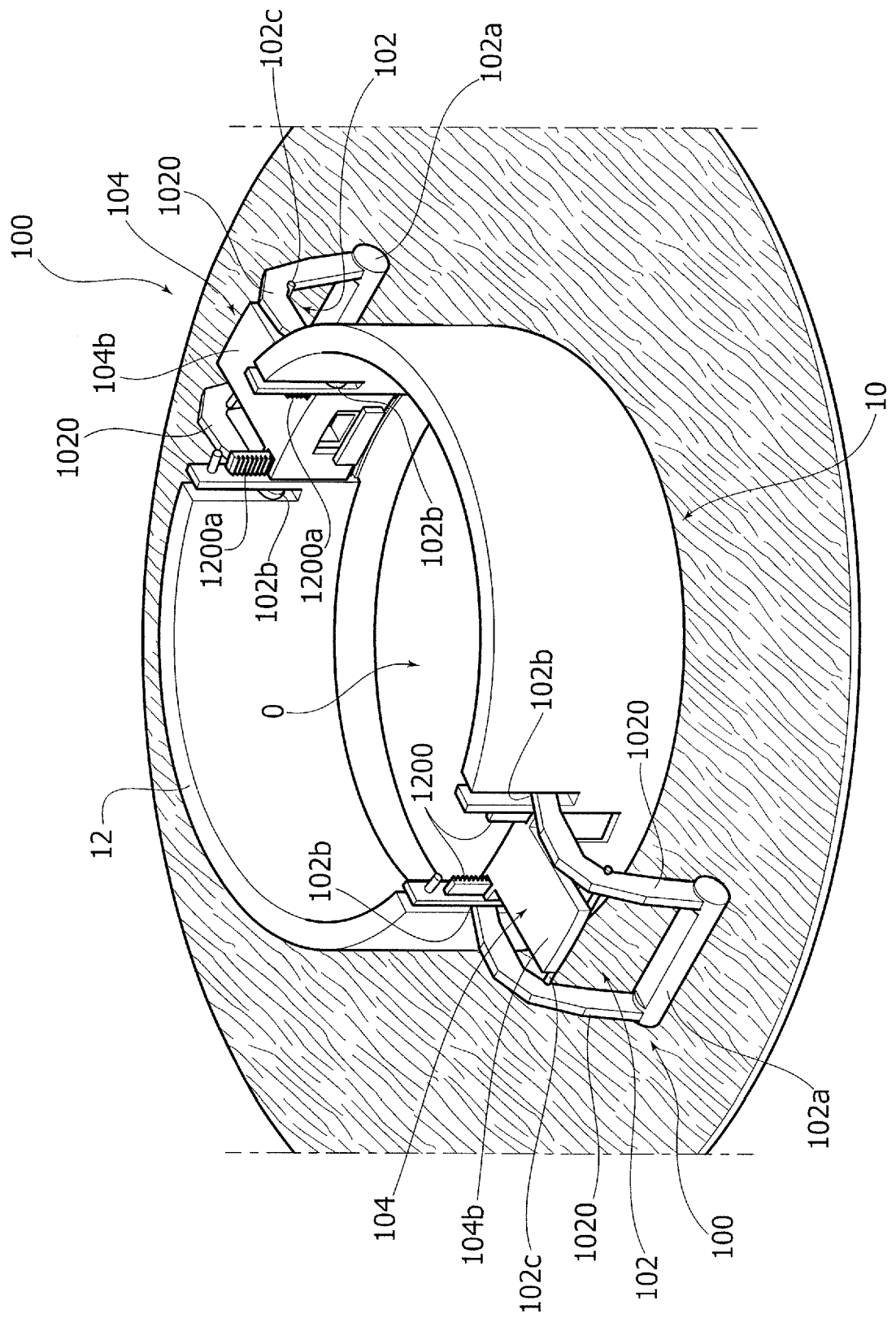


FIG. 4

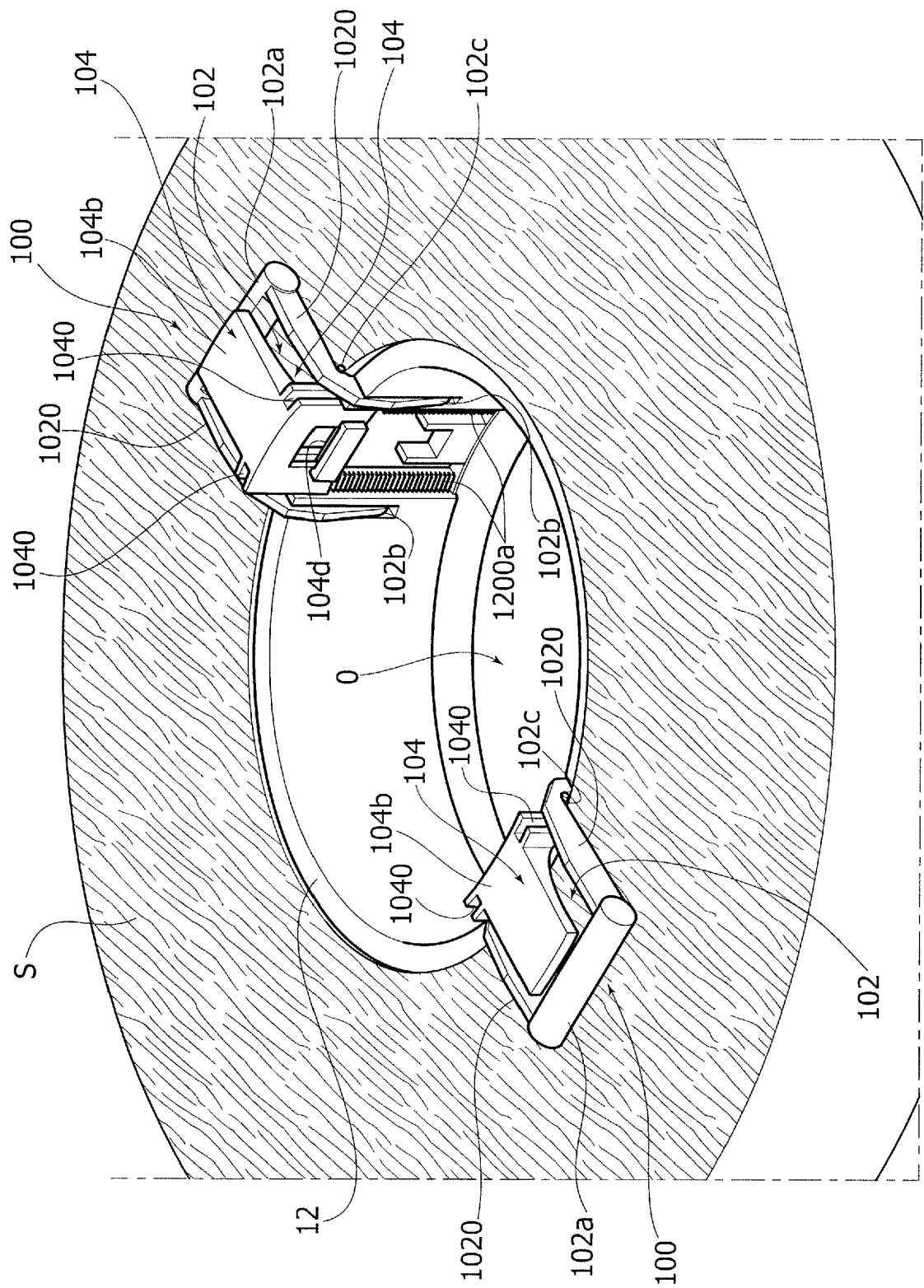
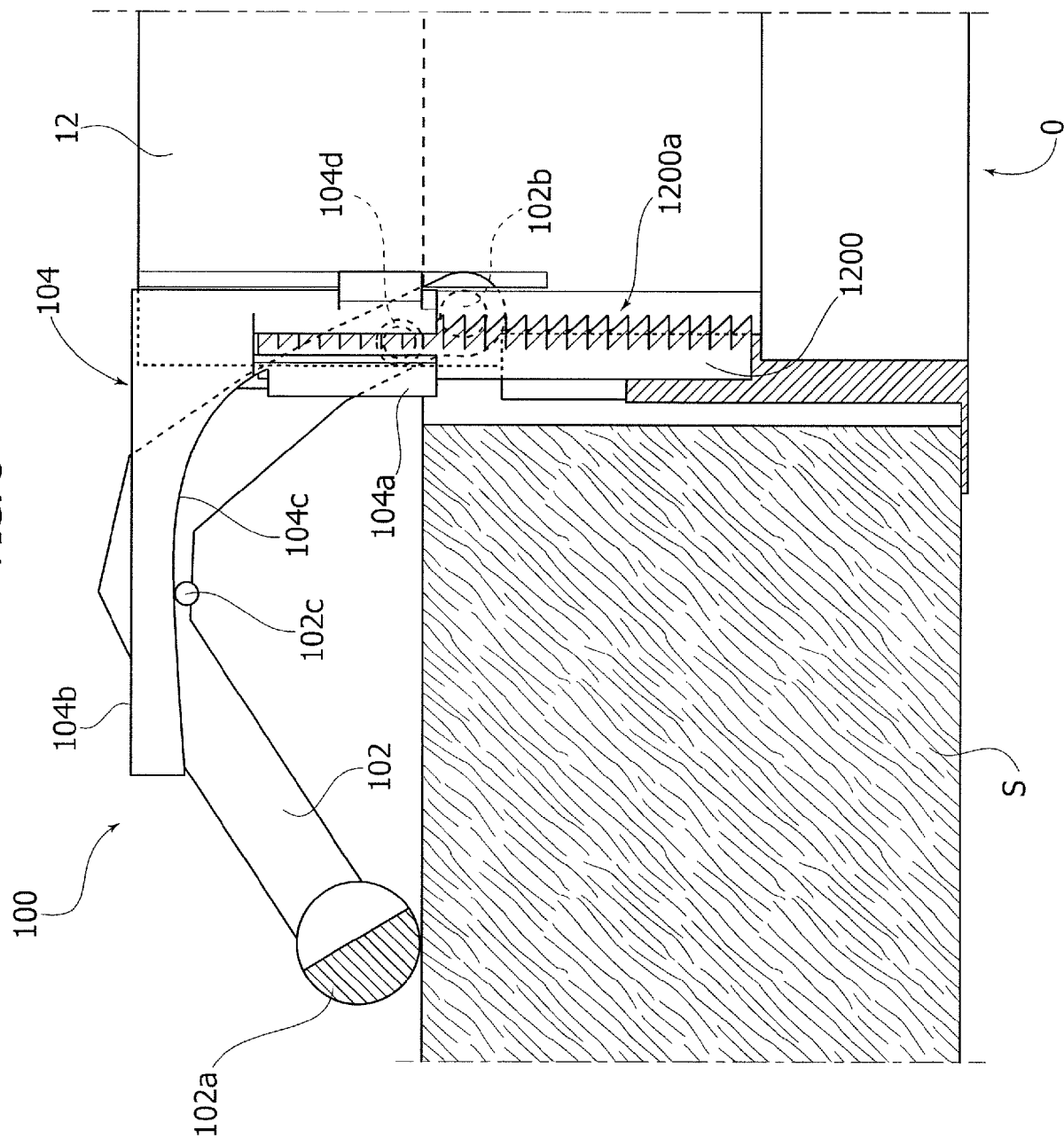
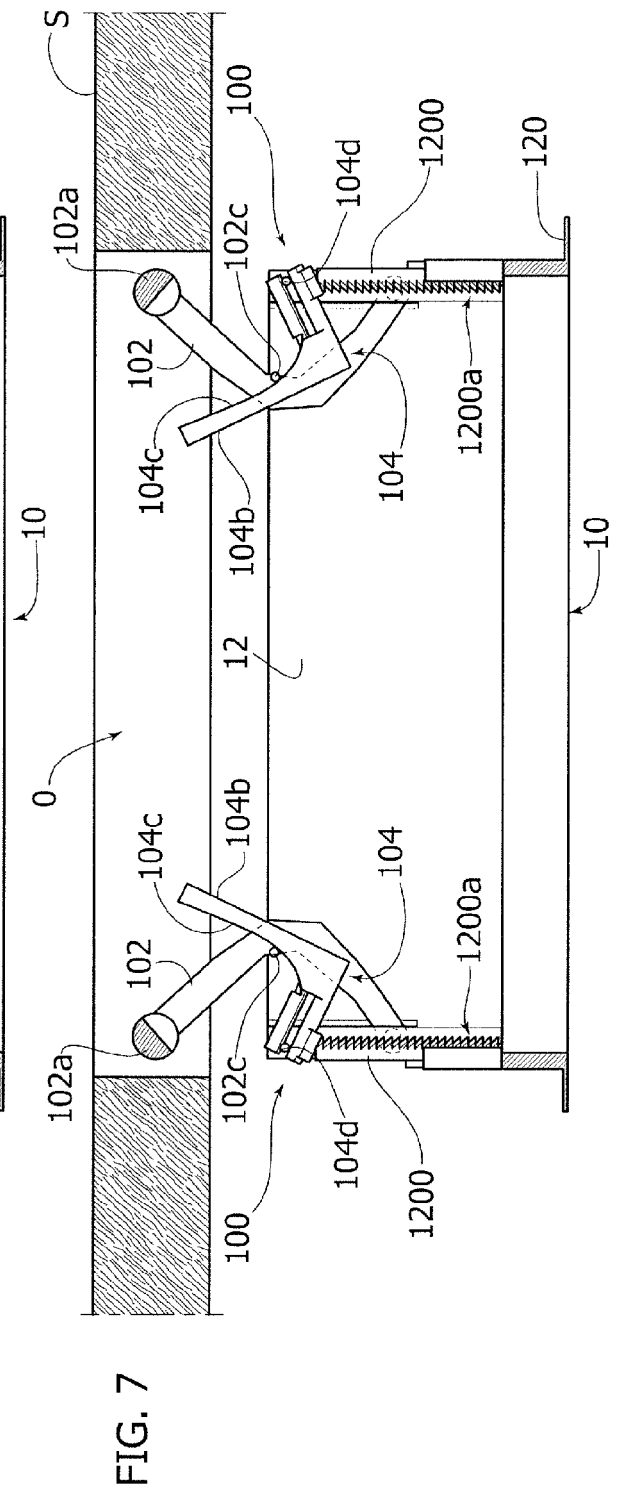
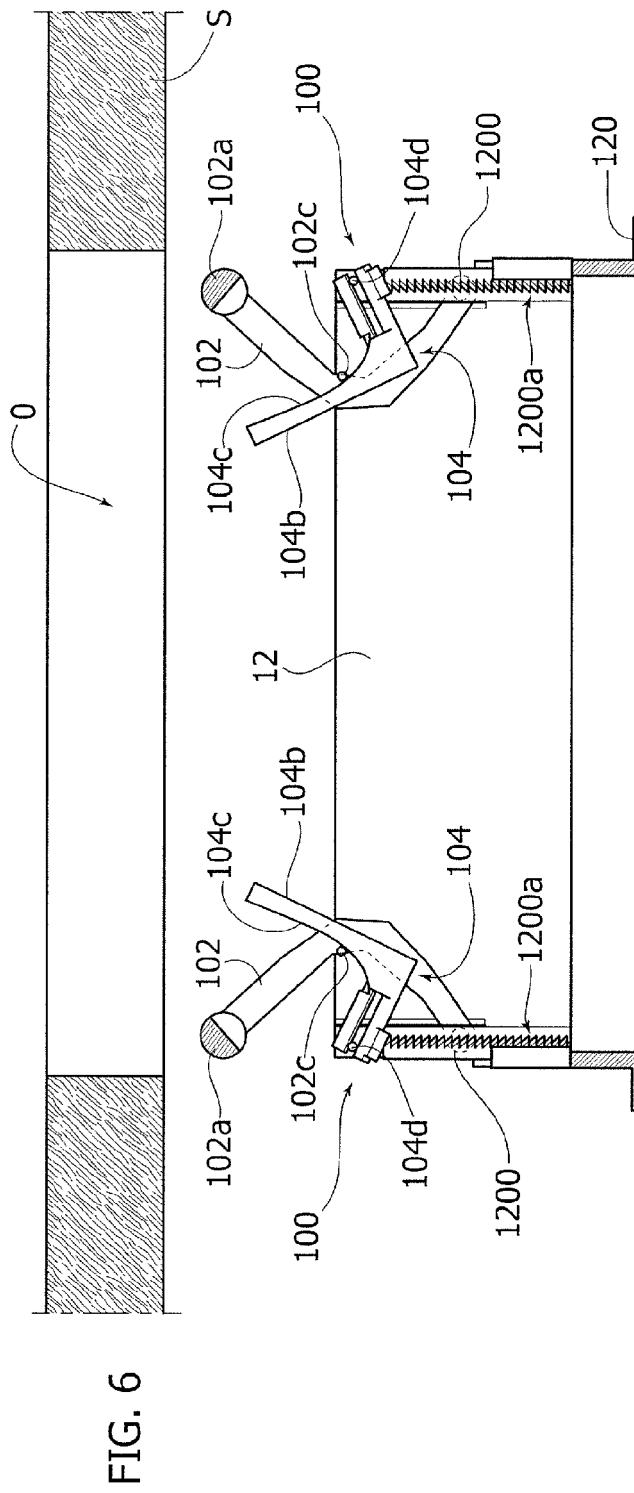


FIG. 5





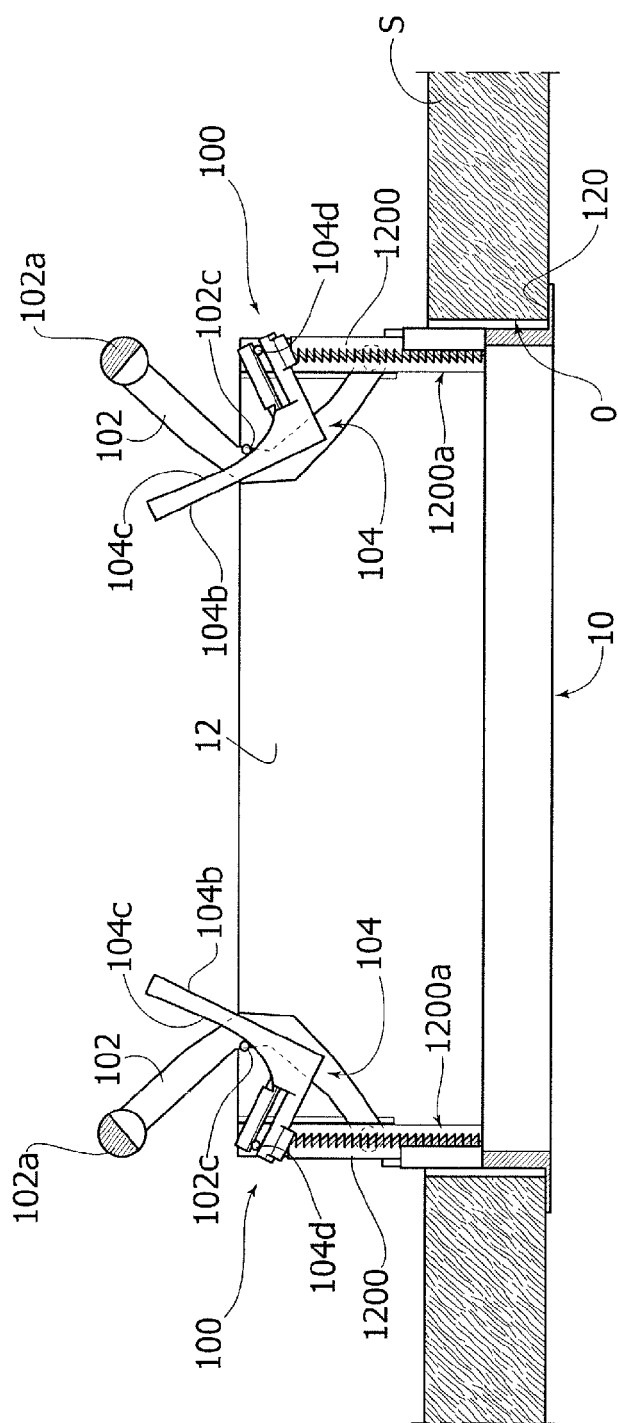


FIG. 8

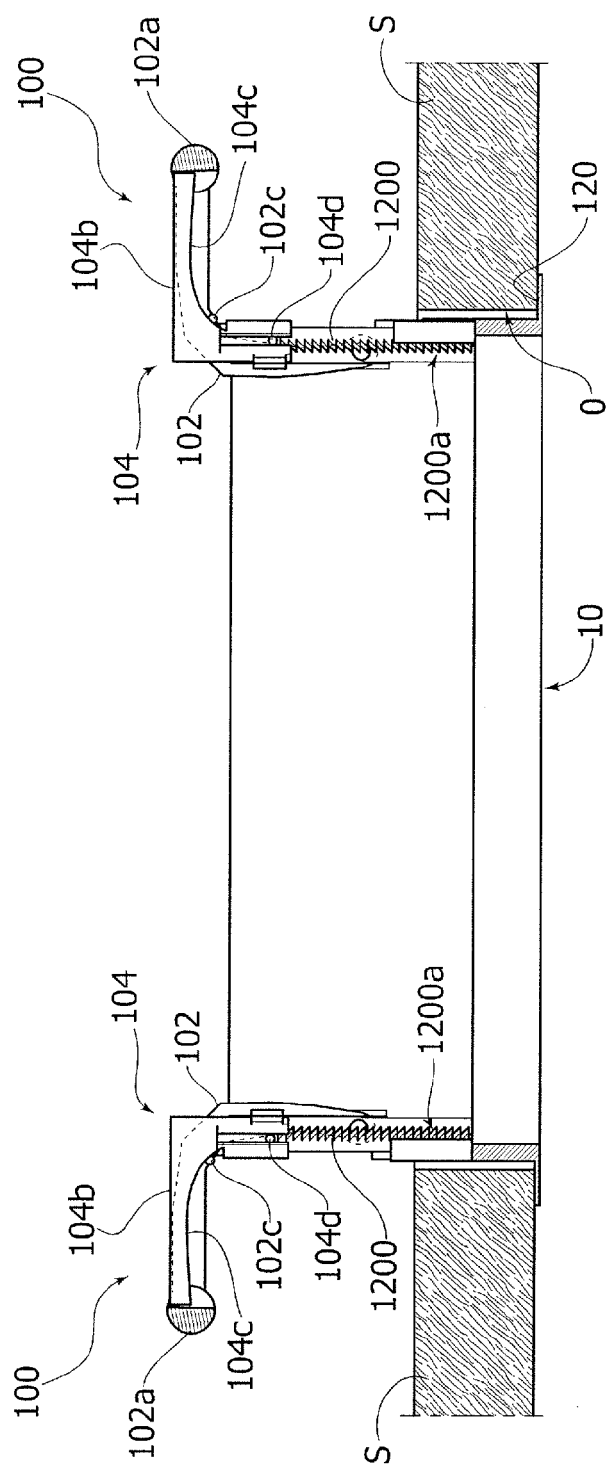
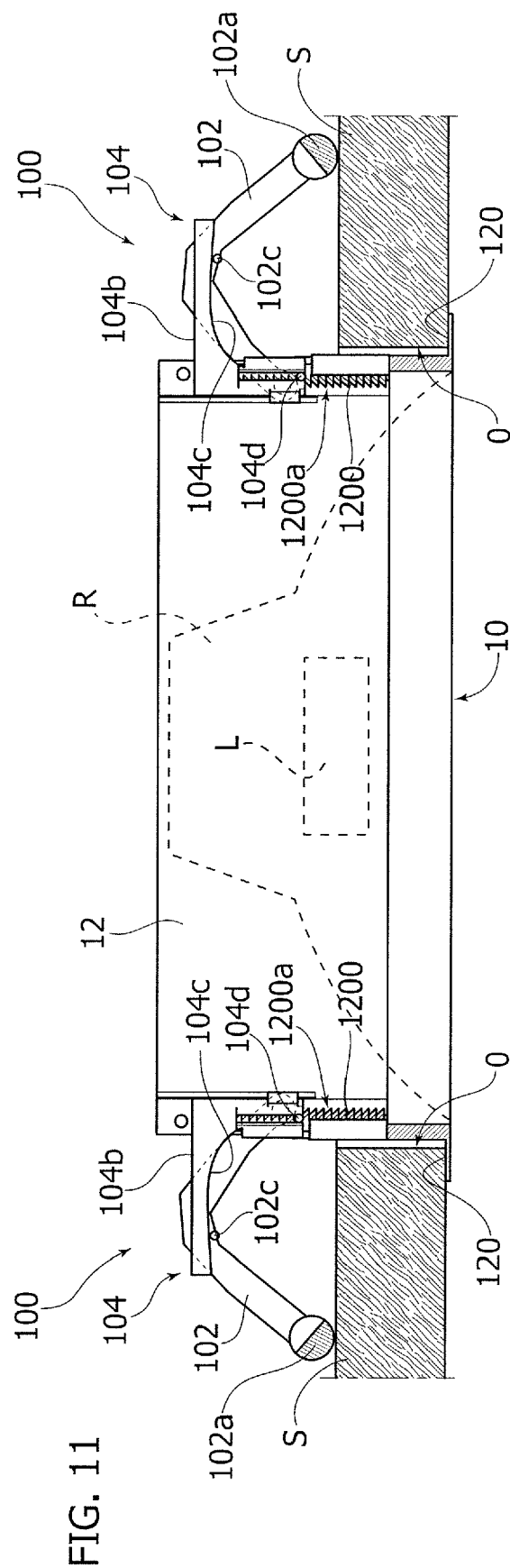
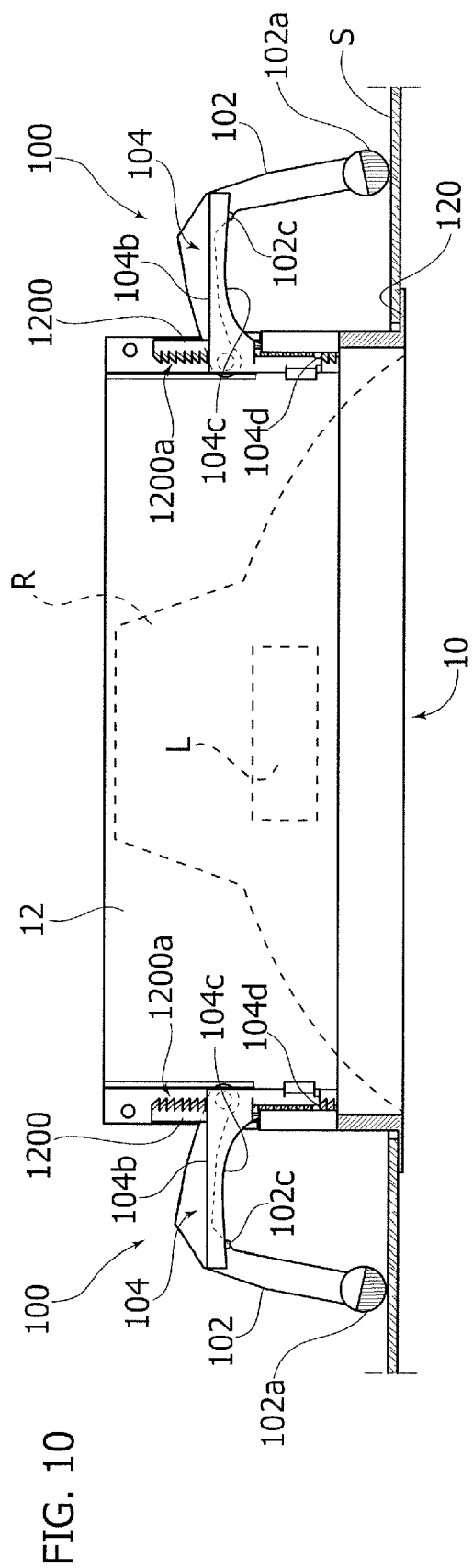


FIG. 9



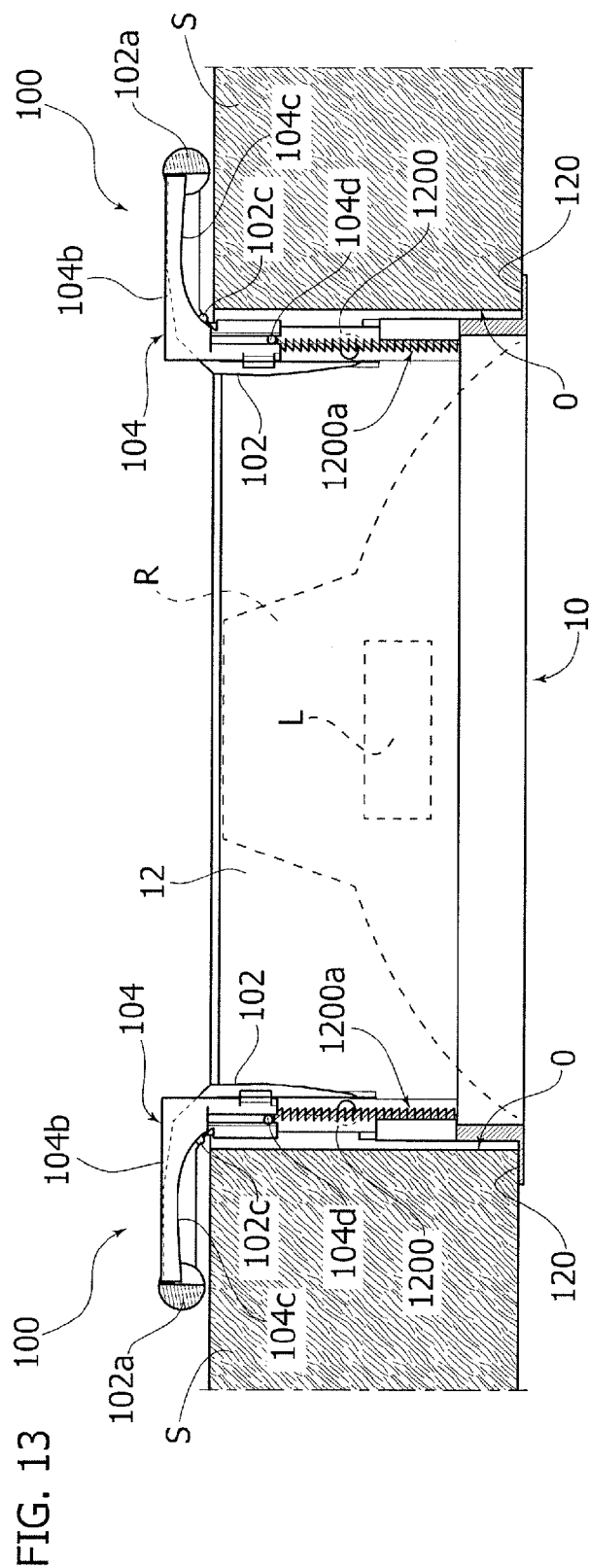
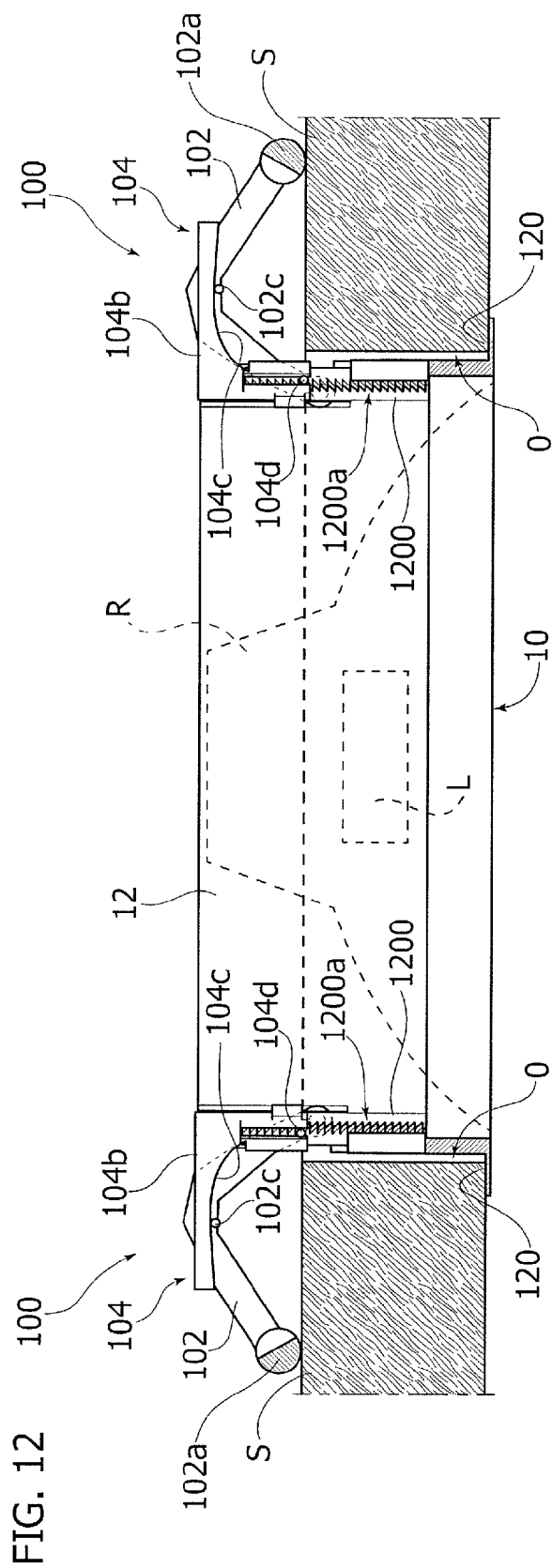
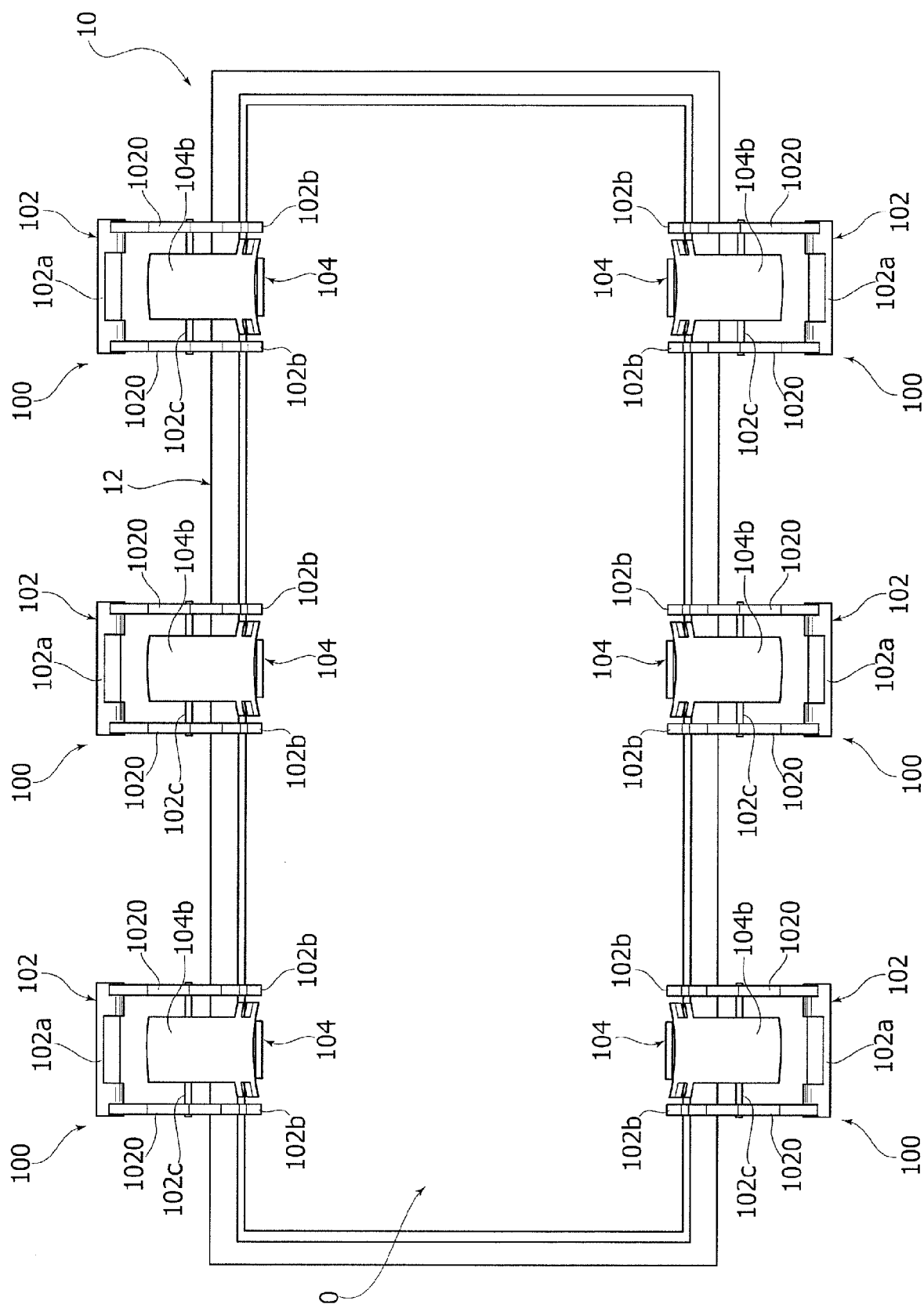


FIG. 14





EUROPEAN SEARCH REPORT

Application Number
EP 17 15 0618

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