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Description

[0001] The present invention relates to a treatment apparatus according to the preamble of claim 1, for treating receptacles in various formats.

[0002] In particular, the present invention relates to a treatment apparatus for at least filling the receptacles with a pourable product, more particularly a pourable food product.

[0003] Advantageously, the invention also relates to a method for format change of such a treatment apparatus.

[0004] There are known machines adapted to fill, label, and close receptacles and/or subject them to other packaging treatment before the distribution of the receptacles to points of sale.

[0005] Conventionally, these machines comprise a plurality of treatment apparatuses for carrying out various treatments on receptacles, for example conveying, sterilizing, rinsing, filling, labelling and closing the receptacles.

[0006] At the present time, commonly used treatment apparatuses are of the carousel type. Such a treatment apparatus comprises at least:

- a carousel conveyor adapted to rotate around a central axis to advance the receptacles along a predetermined path, particularly a curved path; and
- a plurality of retaining elements adapted to retain the receptacles while they are being conveyed along the aforesaid path.

[0007] Typically, the retaining elements are configured to retain the receptacles at their necks.

[0008] Typically, a treatment apparatus further comprises a plurality of treatment units, each adapted to carry out a treatment operation, for example filling the receptacles with a pourable product or fixing corresponding caps to the receptacles, while the latter are being conveyed along said path.

[0009] Additionally, some types of treatment apparatus further comprise a plurality of support units mounted on the carousel conveyor and adapted to support the receptacles while they are being conveyed.

[0010] Each support unit comprises a respective pedestal on which a respective receptacle bears while being conveyed. It is known that each pedestal interacts with the bottom wall and the side walls of the corresponding receptacle (in other words, the bottom wall of the receptacle bears on the respective pedestal), to centre the receptacle on the pedestal.

[0011] Typically, each support unit, in particular the respective pedestal, is mounted on a supporting base of the carousel conveyor.

[0012] It is known that there are different types and/or formats of receptacles which may be treated by the treatment apparatus. Typically, operations for changing the format of the treatment apparatus are required to prepare the treatment apparatus for operation with a receptacle type and/or format other than the previous receptacle type and/or format.

[0013] In particular, the positions of the pedestals and of the retaining elements must be adapted to the different heights of the receptacles.

[0014] It is also necessary to adapt the pedestals to allow for the different radii of the bottoms of the receptacles, these bottoms bearing on the respective pedestals in use. The latter aim is achieved by the costly removal of the pedestals and their replacement with pedestals of a new type adapted to support and centre the new receptacle type and/or format.

[0015] There are various known strategies for adapting the position of the pedestals.

[0016] A first strategy is to use spacers. In practice, each support unit comprises a respective spacer, adapted to space the respective pedestal apart from the supporting base.

[0017] In particular, each spacer is interposed between the supporting base and the respective pedestal.

[0018] During a format change, each spacer is replaced with a new spacer.

[0019] A drawback of this strategy is that different spacers must be produced and supplied for each support unit, so that the respective treatment apparatus can be adapted to receptacles of various types and/or formats.

[0020] Another strategy, described for example in EP-A-1264771, provides for a treatment apparatus having an actuating device for moving the supporting base from or towards the retaining elements in such a way that all the support units, particularly the pedestals, are moved simultaneously from or towards the retaining elements, thereby varying the relative distance between the retaining elements and the pedestals.

[0021] However, the presence of the actuating device increases the complexity and cost of the treatment apparatus. Furthermore, differences in tolerance between the various support units cannot be compensated by the actuating device.

[0022] Also known from WO2011/018807 is a treatment apparatus for treating receptacles as defined in the preamble of claim 1.

[0023] In this field, therefore, it has been considered necessary to improve treatment apparatus for receptacles, particularly in order to overcome at least one of the aforementioned drawbacks.

[0024] The object of the present invention is to provide a treatment apparatus for receptacles which enables at least one of the aforementioned drawbacks to be overcome in a simple and economical way.

[0025] The aforesaid object is achieved by the present invention in that it relates to a treatment apparatus for receptacles as defined in claim 1.

[0026] All parts of the following description not forming part of the invention as defined in the appended claims are included for better understanding but do not form part of the invention.

[0027] To enable the present invention to be under-

stood more readily, a preferred embodiment of it is described below, purely by way of non-limiting example and with reference to the attached drawings, in which:

- Figure 1 shows schematically, in a top view, a treatment apparatus according to the invention, with parts removed for clarity;
- Figure 2 shows, in a perspective view, a detail of the treatment apparatus of Figure 1, with parts removed for clarity;
- Figure 3 shows, in a perspective view, a portion of the detail of Figure 2, with parts removed for clarity;
- Figure 4 shows, in a side view, the portion of Figure 3, with parts removed for clarity;
- Figures 5 and 6 show, in a side view and in a section taken along the plane III-III of Figure 3, two different configurations of the portion of Figure 3, with parts removed for clarity;
- Figure 7 shows, in an exploded view, the portion of Figure 3, with parts removed for clarity;
- Figure 8 shows a first embodiment of a detail of the portion of Figure 3, with parts removed for clarity; and
- Figure 9 shows an alternative to the first embodiment of a detail of the portion of figure 3, which however does not form part of the present invention, with parts removed for clarity.

[0028] With reference to Figure 1, the number 1 indicates the whole of a treatment apparatus for treating receptacles 2 such as bottles, containers or the like.

[0029] The following description refers, without limiting intent, to an apparatus 1 adapted to at least fill the receptacles 2 with a pourable product, particularly a pourable food product, for example carbonated liquids (sparkling water, alcohol-free drinks, beer, etc.), non-carbonated liquids (natural water, fruit juices, wine, etc.), emulsions, suspensions, high-viscosity liquids and beverages containing pulp.

[0030] In a non-limiting embodiment, the apparatus 1 is also adapted to affix labels to the receptacles 2.

[0031] The following description will also refer, without any limiting intent, to bottles 2, particularly those made of a thermoplastic polymer such as polyethylene terephthalate. However, the bottles 2 may also be made of a different material such as glass, aluminium, etc.

[0032] Each bottle 2 extends along a longitudinal axis A and comprises a hollow body 3 delimiting an internal space of the bottle 2.

[0033] The hollow body 3 is delimited by a bottom wall 4, particularly a wall substantially perpendicular to the axis A, and by a neck 5 opposed to the bottom wall 4 and, in particular, extending coaxially with the axis A. The neck 5 delimits a pouring aperture opposed to the bottom wall 4 to allow the entry and exit of the pourable product. The hollow body 3 further comprises a side wall 6 connecting the bottom wall 4 and the neck 5 to one another.

[0034] With particular reference to Figures 1 and 2, the apparatus 1 comprises a carousel conveyor 10 adapted to advance the bottles 2 along a predetermined path P from an entry station 11 to an exit station 12.

[0035] The carousel 10 is adapted to rotate around a central axis B, having a substantially vertical orientation in the illustrated example, to advance the bottles 2 along the path P, which in this case has a curved shape.

[0036] The apparatus 1 further comprises a plurality of support units 13 (see also Figures 3 to 6) positioned on the carousel 10 at a peripheral portion thereof, and adapted to support the bottles 2 while they are being conveyed along the path P.

[0037] In particular, each support unit 13 is adapted to interact at least with the respective bottom wall 4, and preferably also with at least a portion of the side walls, of the respective bottle 2.

[0038] In greater detail, the support units 13 are spaced at equal angular intervals along the peripheral portion of the carousel 10 around the axis B.

[0039] Therefore, during the rotation of the carousel 10 around the axis B, the support units 13 advance along a respective predetermined path (not specifically indicated, and having a circular shape in particular) parallel to the path P between the entry station 11 and the exit station 12.

[0040] Preferably, the apparatus 1 further comprises a plurality of retaining elements 14, particularly a plurality of clamps, positioned on the peripheral portion of the carousel 10 and adapted to support the bottles 2, particularly at their necks 5, while they are being conveyed along the path P.

[0041] In greater detail, the retaining elements 14 are spaced at equal angular intervals along the peripheral portion of the carousel 10 around the axis B.

[0042] Preferably, each retaining element 14 faces a respective support unit 13, and in particular each retaining element 14 is positioned above the respective support unit 13 and at a certain distance therefrom.

[0043] In particular, each retaining element 14 is adapted to interact with the respective support unit 13 to place the respective bottle 2 in an orientation parallel to the axis B, particularly a vertical orientation, during its advance along the path P (in other words, the axis A has an orientation parallel to the axis B, in particular with a vertical orientation).

[0044] More preferably, each bottle 2 is retained and supported by the respective retaining element 14 and by the respective support unit 13 so as to be rotatable around the axis A.

[0045] Additionally, in use, the retaining elements 14 advance along a respective predetermined path (not specifically indicated, and having a circular shape in particular) parallel to the path P of the support units 13.

[0046] The apparatus 1 is also provided with a treatment device, which in the example illustrated in Figures 1 and 2 is a filling device 15, adapted to treat, particularly to fill, the bottles 2 while they are being conveyed along the path P.

[0047] In greater detail, the treatment device compris-

es a plurality of treatment units 16, each adapted to carry out a treatment on a respective bottle 2 while it is being conveyed along the path P.

[0048] In the specific example shown in Figures 1 and 2, each treatment unit 16 comprises at least one respective filling head 17, each adapted to fill a respective bottle 2 while it is being conveyed along the path P.

[0049] In particular, each treatment unit 16, in particular each filling head 17, is positioned on the peripheral portion of the carousel 10 and is adapted to carry out a treatment operation, in particular a filling operation, on the respective bottle 2 while it is being conveyed along the path P.

[0050] In greater detail, the treatment units 16, particularly the filling heads 17, are spaced at equal angular intervals along the peripheral portion of the carousel 10 around the axis B.

[0051] In use, the treatment units 16, particularly the filling heads 17, advance along a respective predetermined path (not specifically indicated, and having a circular shape in particular) parallel to the path P of the support units 13.

[0052] More specifically, each treatment unit 16, in particular each filling head 17, faces, and is spaced apart from, a respective support unit 13. In greater detail, each treatment unit 16, in particular each filling head 17, is positioned above the respective support unit 13.

[0053] Preferably, each treatment unit 16 further comprises an actuating device 18 adapted to cause the respective bottle 2 to rotate around the respective axis A within at least one portion of the path P.

[0054] In a non-limiting embodiment, the apparatus 1 further comprises at least one labelling device 19 adapted to affix at least one label to each bottle 2 at a labelling station 20, particularly during the advance of the bottle along the path P. In other words, the labelling station 20 is interposed between the entry station 11 and the exit station 12 along the path P.

[0055] With particular reference to Figure 2, the carousel 10 comprises a fixed main support 22 and a rotating body 23 connected to the main support 22 (in particular, mounted rotatably on the main support 22) and adapted to rotate around the axis B.

[0056] Preferably, the main support 22 is configured to be placed on the floor of the production site, and/or on a horizontal surface of the production site.

[0057] In a non-limiting embodiment, the rotating body 23 carries, at a peripheral portion, at least the support units 13, preferably also the retaining elements 14, and even more preferably the treatment units 16 as well.

[0058] Advantageously but no necessarily, the carousel 10, particularly the rotating body 23, comprises a lower supporting base 24 which at least partially carries the support units 13.

[0059] Preferably, the carousel 10, particularly the rotating body 23, further comprises an upper support 25 which, in particular, is positioned above the supporting base 24, and carries at least the retaining elements 14 and preferably also the treatment units 16.

[0060] More specifically, the supporting base 24 is placed in a lower portion of the rotating body 23 and the support 25 is placed in an upper portion of the rotating body 23.

[0061] Advantageously but not necessarily, the supporting base 24 has an upper surface extending in a plane H perpendicular to the axis B, in particular having a horizontal orientation.

[0062] Preferably, the supporting base 24 is ring-shaped. Even more preferably, the supporting base 24 is a ring-shaped plate.

[0063] With particular reference to Figures 3 to 7, each support unit 13 comprises a pedestal 13 adapted to support and centre a respective bottle 2 during its advance along the path P.

[0064] In greater detail, each pedestal 26 comprises a main body 27, which, in use, is in contact with the bottom wall 4 of the receptacle, and a centring ring 28, connected to the respective main body 27 and adapted to interact with (contact) the side walls 6 of the respective receptacle 2 to centre the bottle 2 on the respective pedestal 26, particularly in such a way that the aforesaid bottle 2 is positioned coaxially relative to the pedestal 26 which supports it.

[0065] Preferably, each main body 27 has a support surface 29 adapted to interact with the bottom wall 4 of the respective bottle 2.

[0066] In particular, in use, each bottle 2 bears on the respective bearing surface 29.

[0067] Advantageously, each centring ring 28 is connected to the respective main body 27 in a removable and interchangeable manner.

[0068] In particular, each centring ring 28 is adapted to interact with the side walls 6 of a respective bottle 2. More particularly, each centring ring 28 has an inner interaction surface 30 adapted to contact the side wall 6 of the respective bottle 2 (particularly the respective outer surface), particularly in the lower portion of the bottle 2.

[0069] Preferably, each centring ring 28 is made of a polymeric material, particularly polyoxymethylene (POM).

[0070] Preferably, the inside radius (or the inside diameter) of the centring ring 28 is substantially equal to the outside radius (that is to say the outside diameter) of the respective bottle 2, particularly in the lower portion of the respective bottle 2.

[0071] Preferably, each pedestal 26 comprises a locking device 31 adapted to lock the respective centring ring 28 on the respective main body 27.

[0072] In particular, each locking device 31 is configured to prevent the respective centring ring 28 from being detached, in use, from the respective main body 27. Even more particularly, each locking device 31 is configured to prevent the release of the centring ring 28 in the case of a rotation of the respective bottle 2 around the respective axis A.

[0073] In the specific example shown in Figures 3, 4

and 7, each locking device 31 comprises a plurality of slots 32 and a plurality of pins 33 (only one is shown in Figure 7), each of which is adapted to interact with a respective slot 32. Preferably, the slots 32 are provided in the respective centring ring 28 and the pins 33 are provided on the respective main body 27 and project radially from the main body 27.

[0074] It is known that there are various types and/or formats of bottles. For example, there are formats of bottles 2 which differ in respect of the internal volume delimited by the respective hollow body 3. Typically, bottles of different types and/or formats have outside radii, particularly outside radii in their respective lower portions, which differ from one another. For example, a 1 litre bottle has different outside radii from those of a half-litre bottle. Typically, bottles of different types and/or formats also have extensions along the axis A which differ from one another.

[0075] During a format change, therefore, each pedestal 26 may have to be modified. In the specific case described, it is possible to provide centring rings 28 adapted to interact with, and in particular adapted to centre, bottles 2 of different types and/or formats. In particular, centring rings 28 having different inside radii may be provided.

[0076] Advantageously, in the specific case described, each centring ring 28 is configured to be replaced by another centring ring 28 adapted to interact with a bottle 2 of a different type and/or format. This allows a simpler format change.

[0077] With particular reference to Figures 2 to 7, each support unit 13 comprises a support bar 37 carrying the respective pedestal 26 and extending parallel to the axis B. In particular, each support bar 37 has a cylindrical shape; that is to say, it has a substantially circular cross section.

[0078] Each support bar 37 is positioned so as to carry out a rectilinear movement in a predetermined linear direction D1 parallel to the axis A, to position the respective pedestal 26 in a desired position (see, for example, Figures 5 and 6).

[0079] More in detail, each support bar 37 is adapted to move in the direction D1 to position the respective pedestal 26 relative to the supporting base 24, particularly at a predetermined distance from the latter, or more precisely from the upper surface of the supporting base 24 (that is to say, at the distance between the plane H and the respective pedestal 26). More specifically, the predetermined distance depends on the type and/or format of the respective bottle 2.

[0080] Preferably, each support bar 37 is adapted to move in the direction D1 to position the respective pedestal 26 relative to the respective retaining element 14.

[0081] Each support unit 13 further comprises a support housing, in particular a hollow cylinder 38, extending parallel to the axis B and having an inner channel, in particular having a tubular shape, extending parallel to the axis B.

[0082] Each support bar 37 is housed in the respective channel of the respective support housing, in particular the channel of the respective hollow cylinder 38, and is adapted to slide in the latter in the respective direction D1.

[0083] Preferably, each support bar 37 and each channel have, respectively, a substantially smooth outer surface or inner surface.

[0084] Furthermore, each support unit 13 comprises a locking assembly 40, adapted to interact with the respective support bar 37 and the respective channel of the respective support housing, particularly the channel of the respective hollow cylinder 38, and is controllable in at least a locking configuration and in at least a release configuration to respectively lock or release the aforesaid support bar 37 and therefore to prevent or allow the sliding of the support bar 37 in the respective channel of the respective support housing, particularly the channel of the respective hollow cylinder 38.

[0085] Each locking assembly 40 is adapted to be controlled in the release configuration so as to allow the sliding of the respective support bar 37 in the respective direction D1 and the positioning of the respective pedestal 26 in the desired (specified) position.

[0086] Additionally, each locking assembly 40 is adapted to be controlled in the locking configuration so as to prevent the sliding of the respective support bar 37 in the respective channel of the respective support housing, particularly the channel of the respective hollow cylinder 38, in the respective direction D1, and therefore to lock the respective pedestal 26 in the desired position (see, for example, Figures 5 and 6).

[0087] Each support unit 13 further comprises a fixed support frame 41 connected to the carousel 10, which supports the respective support housing, particularly the respective hollow cylinder 38, in a mobile manner.

[0088] In greater detail, each support housing, in particular each hollow cylinder 38, is placed in the respective support frame 41 so as to be movable in a direction D2 parallel to the axis B; it should be noted that, when the respective locking assembly 40 is placed in the locking configuration, a movement of the respective hollow cylinder 38 in the direction D2 also results in a movement of the respective support bar in the direction D1. Additionally, during the use of the apparatus 1, each locking assembly 40 is controlled in the locking configuration.

[0089] In greater detail, each hollow cylinder 38 extends through the respective support frame 41; in particular, each hollow cylinder 38 is positioned coaxially with the respective support frame 41.

[0090] More specifically, each support frame 41 is fastened removably to the supporting base 24.

[0091] Preferably, each support unit 13 further comprises an interaction assembly 42 which is connected to the respective support housing, particularly to the respective hollow cylinder 38, and is adapted to interact with a cam (which is known and is not shown) of the apparatus 1 for actuating the movement of the respective support housing, particularly the movement of the respective hol-

low cylinder 38, in the direction D2.

[0092] More specifically, each interaction assembly 42 and the cam of the apparatus 1 are configured so that the respective pedestal 26 is positioned at a lower height at the entry station 11 and at the exit station 12, and at an upper height during the treatment, particularly during the filling, of the respective bottle 2, particularly in order to ensure the contact of the respective bottle 2 with the respective filling head 17.

[0093] Preferably, the lower height of each pedestal 26 is defined by the respective desired position.

[0094] In an alternative embodiment, the upper height of each pedestal 26 is defined by the respective desired position.

[0095] In greater detail, each interaction assembly 42 comprises a cam follower, particularly a wheel 43, and a coupling bar 44 connected to the respective cam follower and to the respective support housing, particularly to the respective hollow cylinder 38. With particular reference to Figure 8, each locking assembly 40 is at least partially positioned coaxially with the respective support bar 37 and with the respective channel of the respective support housing, particularly the channel of the respective hollow cylinder 38.

[0096] Additionally, each locking assembly 40 is adapted to interact with the respective support bar 37 and the respective channel of the respective support housing, particularly the channel of the respective hollow cylinder 38, to lock or release the respective support bar 37.

[0097] In greater detail, each locking assembly (40) comprises at least one interaction portion 45, which surrounds the respective support bar 37 at least partially, or completely in this specific case.

[0098] Additionally, each interaction portion 45 is interposed between the respective channel of the respective support housing, particularly the channel of the respective hollow cylinder 38, and the respective support bar 37. Additionally, each interaction portion 45 is in contact with the inner surface of the respective channel of the respective support housing, particularly the channel of the respective hollow cylinder 38, and with the respective support bar 37.

[0099] More specifically, each interaction portion 45 has a ring-shaped cross section. In particular, each interaction portion 45 is substantially formed by a cylindrical tube extending parallel to the axis B.

[0100] Preferably, each locking assembly 40 further comprises a head portion 46 connected to the respective interaction portion 45 and having a passage channel coaxial with the interaction portion 45 (or with the respective cylindrical tube).

[0101] Each locking assembly 40 further comprises at least one control element, particularly a screw 47, adapted to actuate an expansion or a contraction in a radial direction of the respective interaction portion 45 to respectively lock or release the support bar 37. In particular, the screw 47 is housed in a seat in the respective head portion 46.

[0102] In accordance with the present invention, each interaction portion 45 comprises an inner cavity 48 having a ring-shaped cross section, containing a liquid.

[0103] Preferably, each cavity 48 is in fluid connection with a respective channel of the respective head portion 46. In particular, each of the channels of the head portion 46 carries the seat for the respective screw 47.

[0104] Each control element, particularly each screw 47, is adapted to control the pressure acting on the liquid to expand or contract the respective interaction portion 45 in the radial direction.

[0105] More particularly, each screw 47 is adapted to execute a rotary-translational movement, particularly a movement actuated by an operator, to cause the screw 47 to penetrate into the respective channel of the respective head portion 46. Greater penetration causes an increase in the pressure acting on the liquid, with a consequent radial expansion of the respective interaction portion 45, while a lesser penetration causes a reduction in the pressure acting on the liquid, with a consequent radial contraction of the respective interaction portion 45.

[0106] In an alternative embodiment, the pressure acting on the liquid could be controlled by means of a pump.

[0107] In Figure 9, 40' indicates a locking assembly adapted to lock or release the respective support bar 37, which locking assembly is however not covered under the present invention.

[0108] Each locking assembly 40' comprises an upper ring 52 an a lower ring 53, adapted to interact with one another. In particular, at least a section of the upper ring 52 is housed movably in the lower ring 53. Each upper ring 52 is also in contact with the respective support bar 37.

[0109] Preferably, each lower ring 53 is housed in, and in contact with, the respective channel of the respective support housing, particularly the channel of the respective hollow cylinder 38.

[0110] Preferably, each upper ring 52 has a taper, particularly towards a terminal portion housed in the lower ring 53.

[0111] Preferably, each lower ring 53 has a taper complementary to the taper of the respective upper ring 52.

[0112] Advantageously but not necessarily, each upper ring 52 and each lower ring 53 have respective interaction sections 54; in particular, each ring has a respective thread.

[0113] Additionally, each locking assembly 40' comprises a control element, particularly a nut 55, adapted to interact with the respective interaction sections 54 of the respective upper ring 52 and the respective lower ring 53. By actuating the respective control element, particularly the respective nut 55, it is possible to determine the positioning of the respective section of the respective upper ring 52 which is housed in the respective lower ring 53, to cause the radial expansion or contraction of the respective section of the respective lower ring 53 in contact with the inner surface of the respective channel of the respective support housing, particularly the chan-

nel of the respective hollow cylinder 38.

[0114] In use, the apparatus 1 treats the bottles 2, and in particular the apparatus 1 fills the bottles 2 with a pourable product.

[0115] In greater detail, the carousel 10 advances the bottles 2 along the path P from the entry station 11 to the exit station 12.

[0116] More specifically, each bottle 2 is received by a respective retaining element 14 at the entry station 11, and is retained by the respective retention element 14 while being conveyed along the path PP from the entry station 11 to the exit station 12, at which point the aforesaid retaining element 14 releases the bottle 2.

[0117] Additionally, each bottle 2 bears on a respective pedestal 26 at the entry station 11, and is removed from the respective pedestal 26 at the exit station 12.

[0118] Each pedestal 26 is positioned at its lower height at the entry station 11 and at the exit station 12.

[0119] Each pedestal 26 is also positioned at its upper height while the respective bottle 2 is being conveyed between the entry station 11 and the exit station 12, to provide contact between the respective filling head 17 and the bottle 2.

[0120] In particular, the positioning of each pedestal 26 is controlled by moving the respective hollow cylinder 38 in the respective direction D2 (while simultaneously moving the respective support bar 37 which carries the respective pedestal 26 without the sliding of the support bar 37 in the respective channel of the respective support housing, particularly the channel of the respective hollow cylinder 38; in particular, during the operation of the apparatus 1, each locking assembly 40 or alternatively 40' is controlled in the respective locking configuration).

[0121] More particularly, the positioning of each pedestal 26 at the respective lower or upper height is controlled by means of the interaction between the respective interaction assembly 42 and the cam of the apparatus 1. More specifically, by means of the interaction between the respective interaction assembly 44 and the cam, the respective hollow cylinder 38, and simultaneously the respective support bar 37, are positioned.

[0122] Even more particularly, each cam follower, particularly each wheel 42, interacts with the cam to guide the movement of the respective hollow cylinder 38 and simultaneously the movement of the respective support bar 37 and of the respective pedestal 26.

[0123] Additionally, while they are being conveyed along the path P from the entry station 11 to the exit station 12, the bottles 2 are filled with the pourable product, particularly via the respective filling heads 17. Preferably, the bottles 2 are filled with the pourable product with the respective pedestals 26 positioned at their upper height, or, in other words, while the bottles 2 are in contact with the respective filling heads 17.

[0124] Preferably, each bottle 2 rotates around its own axis A, particularly by the actuation of the respective actuating device 18, while it is being conveyed along at least a portion of the path P.

[0125] Preferably, during the advance of each bottle 2, at least one respective label is affixed to the bottle 2 at the labelling station 20, particularly by the labelling device 19.

[0126] When the apparatus 1 stops, a format change operation may be carried out, particularly in case of necessity, in such a way as to prepare the apparatus 1 to treat bottles 2 of another type and/or format.

[0127] A format change operation comprises at least one adjustment of the positions of the pedestals 26 and/or at least one replacement of the centring rings 28, depending, in particular, on the variations between the bottle type and/or format that has been treated by the apparatus 1 and the new bottle type and/or format to be treated next.

[0128] The adjustment of the positions of the pedestals 26 serves to define the positioning of the pedestals 26 (see Figures 5 and 6 for example) relative to the supporting base 24, and particularly relative to the surface of the supporting base 24 (in other words, relative to the plane H) and/or relative to the retaining elements 14.

[0129] In particular, the adjustment of the positions of the pedestals 26 enables the pedestals 26 to be positioned at the respective lower or upper height.

[0130] The replacement of the centring rings 28 ensures that the bottles 2 will be centred correctly on the respective pedestals 26.

[0131] The adjustment of the positions of the pedestals 26 comprises:

- at least one release step, in which the respective locking assembly 40 is controlled in the release configuration;
- at least one positioning step, in which the respective support bar 37 is moved in the respective direction D1 so as to position the respective pedestal 26 in the desired position (see Figures 5 and 6, for example); and
- at least one release step, activated after the positioning of the respective pedestal 26 in the desired position, in which step the respective locking assembly 40 is controlled in the locking configuration so as to prevent the sliding of the respective support bar 37 in the respective channel of the respective support housing, particularly in the channel of the respective hollow cylinder 38.

[0132] Preferably, at least one repetition step is executed, during which the release, positioning and locking steps are repeated to position another pedestal 26 in the respective desired position, particularly at the desired height. More preferably, a plurality of repetition steps are executed so as to position all the pedestals 26.

[0133] In a preferred embodiment, the following sub-steps are executed during the positioning step:

- a first sub-step, in which the respective support bar 37 is moved, particularly by an operator, to generate

a distance between the supporting base 24 and the pedestal 26 that is greater than the predetermined distance, the predetermined distance being, in particular, the distance between the pedestal 26 in the desired position and the supporting base 24, particularly the surface of the supporting base 24 (that is to say, the distance between the plane H and the respective pedestal 26);

- a second sub-step, in which a spacer (not shown) is interposed, particularly by an operator, between the supporting base 24 and the respective pedestal 26; and
- a third sub-step, in which the respective support bar 37 is moved so that the respective pedestal 26 bears on the spacer.

[0134] Preferably, the locking step is executed after the third sub-step, and the spacer is removed after the locking step.

[0135] Preferably, the same spacer is used in the repetition step (s) .

[0136] Preferably, the spacer interposed between the supporting base 24 and the respective pedestal 26 has an extension in a direction parallel to the axis B that determines the distance between the supporting base 24, particularly the surface of the supporting base 24, and the respective pedestal 26.

[0137] In an alternative embodiment, the following are executed during the positioning step:

- a measuring sub-step, in which the distance between the supporting base 24, particularly the surface of the supporting base 24, and the respective pedestal 26 is measured; and
- a correction sub-step, in which the support bar 37 is moved until a measurement of the distance between the supporting base 24, particularly the surface of the supporting base 24, and the respective pedestal 26, is obtained which is equal to the desired distance (the distance between the respective pedestal 26 in the desired position and the supporting base 24, particularly the surface of the supporting base 24; that is to say, the distance between the plane H and the respective pedestal 26).

[0138] During the release step, the respective locking element 40 is actuated to obtain a contraction of the respective interaction portion 45 so as to release the respective support bar 37; during the locking step, the respective control element 47 is actuated to obtain an expansion of the respective interaction portion 45 so as to lock the respective support bar 37.

[0139] In greater detail, during the release step, the respective control element, particularly the respective screw 47, is actuated so that the pressure acting on the liquid decreases and the respective interaction portion 45 contracts in the radial direction; during the locking step, the respective control element, particularly the respective screw 47, is actuated so that the pressure acting on the liquid increases and the respective interaction portion 45 extends.

[0140] In the alternative not falling under the present invention, in which each support unit 13 comprises a locking assembly 40', the extension and contraction of the respective interaction portion take place by means of the actuation of the respective nut 55 and the insertion or exit of the respective interaction section 54 of the respective upper ring 52 into or from the respective lower ring 53 to cause the interaction section 54 of the respective lower ring 53 to expand or contract respectively.

[0141] The replacement of the centring rings 28 comprises:

- at least one detachment step, in which at least one centring ring 28, in use on a respective pedestal 26 and acting on a respective bottle 2 of a first type and/or format, is removed from the respective main body 27; and
- an attachment step, during which a new centring ring 28 adapted to centre a respective bottle 2, of a second bottle type and/or format different from the first type and/or format, is applied to the main body 27.

[0142] In a preferred embodiment, the following are also executed:

- at least one release step, in which the respective centring ring 28 is released from the respective main body 27; and
- at least one locking step, in which the new centring ring 28 is locked on the respective main body 27.

[0143] In particular, the release step is executed before the detachment step, and the locking step is executed after the attachment step.

[0144] Preferably, at least one repetition step is also executed, during which the detachment and attachment steps are repeated to replace a centring ring 28 of another pedestal 26. More preferably, a plurality of repetition steps are executed to replace the respective centring ring 28 in use on each pedestal 26.

[0145] In an alternative embodiment, a release step, a detachment step, an attachment step and a lock step are executed in each repetition step. In particular, these steps are executed in the order in which they have been mentioned.

[0146] The advantages of the apparatus 1 constructed according to the present invention will be apparent from an examination of its characteristics.

[0147] In particular, the apparatus 1 provides simple and economical control of the positioning of the pedestals 26 for adapting the apparatus 1 to a new bottle type and/or format.

[0148] Another advantage is that the apparatus 1 does not require the complex control of the movement of the supporting base of the carousel conveyor in order to con-

trol the positioning of all the pedestals simultaneously.

[0149] Furthermore, there is no need to construct spacers for each support unit 13 and for each bottle type and/or format. It may only be necessary to prepare one spacer for each bottle type and/or format.

[0150] Another advantage is that the positioning of each pedestal 26 is carried out independently of the other pedestals 26, and any imperfections may be compensated independently.

[0151] A further advantage lies in the fact that, during a format change of the apparatus 1, there is no need to replace each pedestal 26, but only the centring rings 28, thereby providing a cost saving.

[0152] Finally, the apparatus 1 described and illustrated herein may evidently be modified and varied without departure from the protective scope defined by the claims.

[0153] In an alternative embodiment which is not shown, each support unit 13 is also adapted to rotate the respective bottle 2 around the respective axis A.

[0154] In another alternative embodiment which is not shown, each treatment unit 16 comprises a fastening head adapted to fasten a respective cap on to the respective bottle 2.

Claims

1. A treatment apparatus (1) for treating receptacles (2), in particular bottles (2) comprising:

   - a carousel conveyor (10) adapted to rotate around a central axis (B) to advance the receptacles (2) along a predetermined path (P);
   - a plurality of support units (13) arranged on the carousel conveyor (10) at a peripheral portion of said carousel conveyor (10);
   wherein each support unit (13) is equipped with a pedestal (26) adapted to support a respective receptacle (2) during advancement of the respective receptacle (2) along the aforesaid path (P) and a support bar (37) carrying the respective pedestal (26);
   wherein each support unit (13) further comprises a support housing, in particular a hollow cylinder (38), having an inner channel, said channel extending parallel to the aforesaid central axis (B);
   wherein each support bar (37) is housed in the respective channel and is adapted to slide in the respective channel in a respective predetermined linear direction (D1);
   and
   wherein each support unit (13) comprises a locking 2 assembly (40, 40') adapted to interact with the respective support bar (37) and the respective channel and being controllable in at least a locking configuration and in at least a release configuration to respectively lock or release the support bar (37) and respectively prevent or allow sliding of the support bar (37) in the respective channel,
   wherein each locking assembly (40) is arranged coaxially to the respective support bar (37) and to the respective channel,
   wherein each interaction portion (45) is interposed between the respective channel and the respective support bar (37),
   wherein each locking assembly (40) comprises at least one interaction portion (45), which partially surrounds at least the respective support bar (37), **characterized in that** each locking assembly (40) comprises a control element (47, 55) adapted to carry out an expansion or contraction in a radial direction of the respective interaction portion (45) to respectively lock or release the respective support bar (37), **characterized in that** each interaction portion (45) comprises an inner cavity (48) having a ring shaped cross section containing a hydraulic liquid; and
   wherein the related control element (47) is adapted to control a pressure acting on the hydraulic liquid to expand or contract the respective interaction portion (45).

2. The treatment apparatus according to claim 1, wherein each support bar (37) and each channel have respectively a substantially smooth outer surface and inner surface.

3. The treatment apparatus according to claim 1, wherein each support unit (13) further comprises a fixed support frame (41) connected to said carousel conveyor (10), which supports the respective support housing in a mobile manner.

Patentansprüche

1. Behandlungseinrichtung (1) zum Behandeln von Behältern (2), insbesondere Flaschen (2), umfassend:

   einen Karussellförderer (10), welcher dafür angepasst ist, sich um eine zentrale Achse (B) zu drehen, um die Behälter (2) entlang eines vorgegebenen Pfades (P) vorwärts zu bewegen;
   eine Vielzahl von Halteeinheiten (13), welche auf dem Karussellförderer (10) an einem Umfangsabschnitt des Karussellförderers (10) angeordnet ist;
   wobei jede Halteeinheit (13) mit einem Sockel (26), welcher dafür angepasst ist, um einen jeweiligen Behälter (2) während der Vorwärtsbewegung des jeweiligen Behälters (2) entlang des Pfades (P) zu halten, und einer Haltestange

(37) ausgerüstet ist, welche den jeweiligen Sockel (26) trägt;
wobei jede Halteeinheit (13) ferner ein Haltegehäuse, insbesondere einen Hohlzylinder (38), umfasst, welcher einen inneren Kanal aufweist, wobei sich der Kanal parallel zu der zentralen Achse (B) erstreckt;
wobei jede Haltestange (37) in dem jeweiligen Kanal untergebracht und dafür angepasst ist, in dem jeweiligen Kanal in einer jeweiligen vorgegebenen linearen Richtung (D1) zu gleiten;
und
wobei jede Halteeinheit (13) eine Verriegelungsanordnung (40, 40') umfasst, welche dafür angepasst ist, um mit der jeweiligen Haltestange (37) und dem jeweiligen Kanal zusammenzuwirken und welche in mindestens eine Verriegelungskonfiguration und in mindestens eine Freigabekonfiguration steuerbar ist, um die Haltestange (37) jeweils zu verriegeln oder freizugeben und ein Gleiten der Haltestange (37) in dem jeweiligen Kanal jeweils zu verhindern oder zu ermöglichen, wobei jede Verriegelungsanordnung (40) koaxial zu der jeweiligen Haltestange (37) und zu dem jeweiligen Kanal angeordnet ist,
wobei jeder Wechselwirkungsabschnitt (45) zwischen dem jeweiligen Kanal und der jeweiligen Haltestange (37) eingefügt ist,
wobei jede Verriegelungsanordnung (40) mindestens einen Wechselwirkungsabschnitt (45) umfasst, welcher mindestens die jeweilige Haltestange (37) teilweise umgibt,
dadurch gekennzeichnet, dass jede Verriegelungsanordnung (40) ein Steuerelement (47, 55) umfasst, welches dafür angepasst ist, um eine Expansion oder Kontraktion des jeweiligen Wechselwirkungsabschnitts (45) in radialer Richtung durchzuführen, um die jeweilige Haltestange (37) jeweils zu verriegeln oder freizugeben, **dadurch gekennzeichnet, dass** jeder Wechselwirkungsabschnitt (45) einen inneren Hohlraum (48) umfasst, welcher einen mit einer hydraulischen Flüssigkeit gefüllten ringförmigen Querschnitt aufweist; und
wobei das zugehörige Steuerelement (47) dafür angepasst ist, einen auf die hydraulische Flüssigkeit wirkenden Druck zu steuern, um den jeweiligen Wechselwirkungsabschnitt (45) aufzublähen oder zusammenzuziehen

2. Behandlungseinrichtung nach Anspruch 1, wobei jede Haltestange (37) und jeder Kanal jeweils eine im Wesentlichen glatte äußere Oberfläche und innere Oberfläche aufweisen.

3. Behandlungseinrichtung nach Anspruch 1, wobei jedes Halteeinheit (13) ferner einen mit dem Karussellförderer (10) verbundenen, feststehenden Halterahmen (41) umfasst, welcher das jeweilige Haltegehäuse in einer beweglichen Weise hält.

Revendications

1. Appareil de traitement (1) pour le traitement de récipients (2), en particulier de bouteilles (2) comprenant :

- un convoyeur à carrousel (10) adapté pour tourner autour d'un axe central (B) afin de faire avancer les récipients (2) le long d'une trajectoire prédéterminée (P) ;
- une pluralité d'unités de support (13) agencées sur le convoyeur à carrousel (10) au niveau d'une partie périphérique dudit convoyeur à carrousel (10) ;
chaque unité de support (13) étant équipée d'un socle (26) adapté pour supporter un réceptacle respectif (2) pendant l'avancement du réceptacle respectif (2) le long du chemin susmentionné (P) et d'une barre de support (37) portant le socle respectif (26) ;
chaque unité de support (13) comprenant en outre un logement de support, en particulier un cylindre creux (38), ayant un canal intérieur, ledit canal s'étendant parallèlement à l'axe central susmentionné (B) ;
chaque barre de support (37) étant logée dans le canal respectif et étant adaptée pour coulisser dans le canal respectif dans une direction linéaire prédéterminée respective (D1) ; et
chaque unité de support (13) comprenant un ensemble de verrouillage (40, 40') adapté pour interagir avec la barre de support respective (37) et le canal respectif et pouvant être commandé dans au moins une configuration de verrouillage et dans au moins une configuration de libération pour respectivement verrouiller ou libérer la barre de support (37) et respectivement empêcher ou permettre le coulissement de la barre de support (37) dans le canal respectif,
chaque ensemble de verrouillage (40) étant agencé coaxialement à la barre de support respective (37) et au canal respectif,
chaque partie d'interaction (45) étant interposée entre le canal respectif et la barre de support respective (37),
chaque ensemble de verrouillage (40) comprenant au moins une partie d'interaction (45), qui entoure partiellement au moins la barre de support respective (37),
caractérisé en ce que
chaque ensemble de verrouillage (40) comprend un élément de commande (47, 55) adapté pour effectuer une expansion ou une contraction

dans une direction radiale de la partie d'interaction respective (45) pour respectivement verrouiller ou libérer la barre de support respective (37), **caractérisé en ce que** chaque partie d'interaction (45) comprend une cavité intérieure (48) ayant une section transversale en forme d'anneau contenant un liquide hydraulique ; et l'élément de commande correspondant (47) étant adapté pour commander une pression agissant sur le liquide hydraulique pour dilater ou contracter la partie d'interaction respective (45).

2. Appareil de traitement selon la revendication 1, chaque barre de support (37) et chaque canal ayant respectivement une surface extérieure et une surface intérieure sensiblement lisses.

3. Appareil de traitement selon la revendication 1, chaque unité de support (13) comprenant en outre un cadre de support fixe (41) relié audit convoyeur à carrousel (10), qui supporte le logement de support respectif de manière mobile.

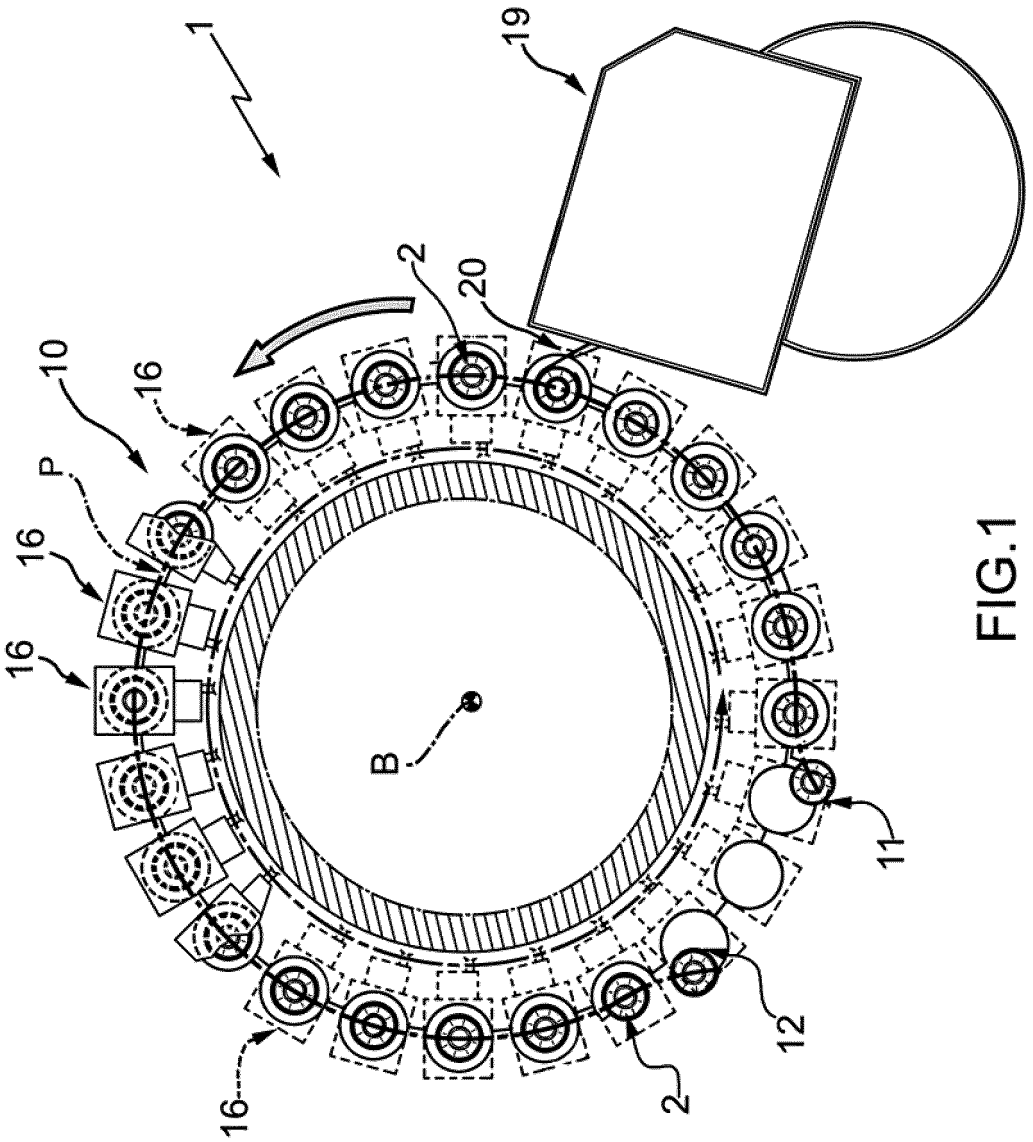

FIG.1

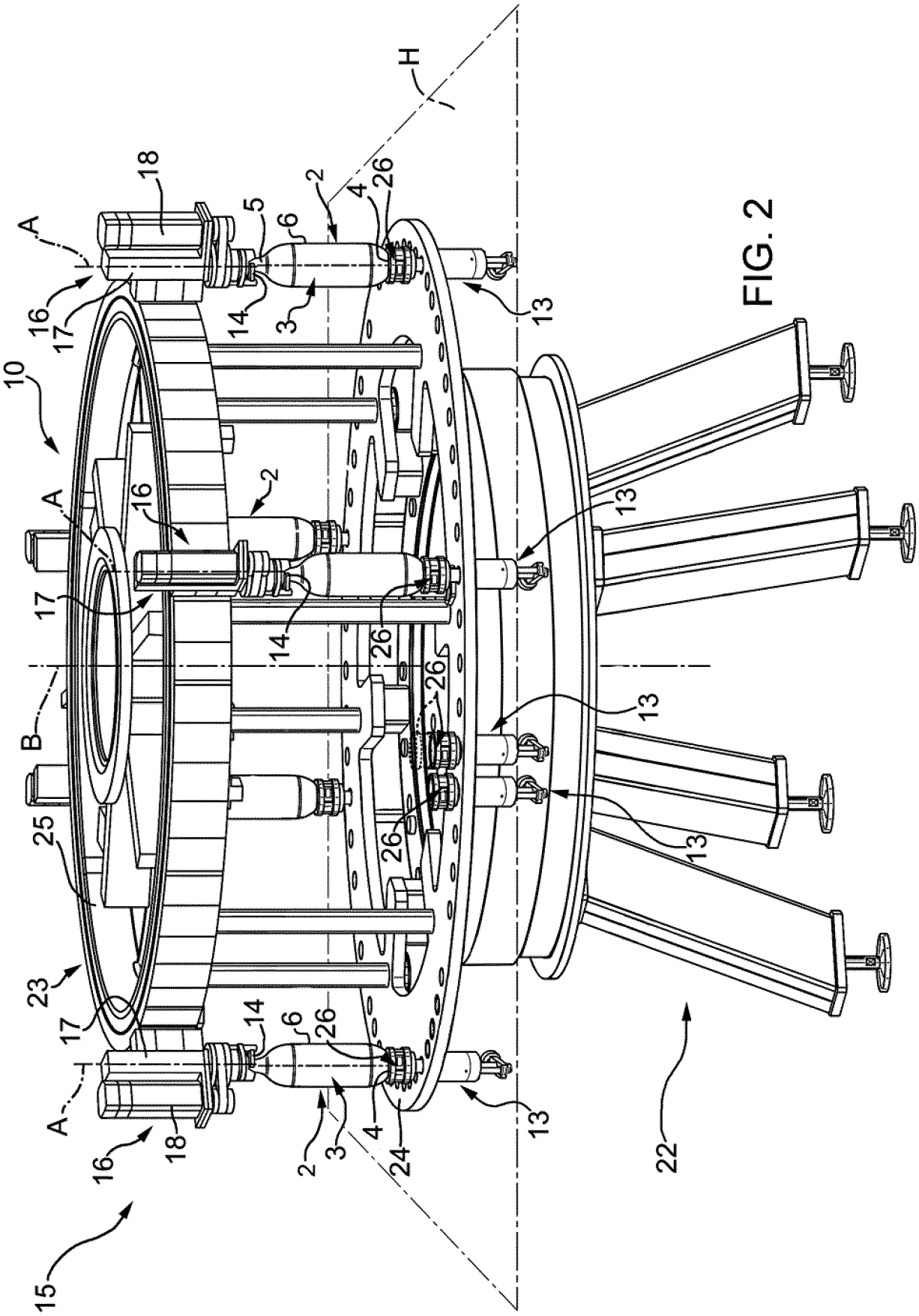

FIG. 2

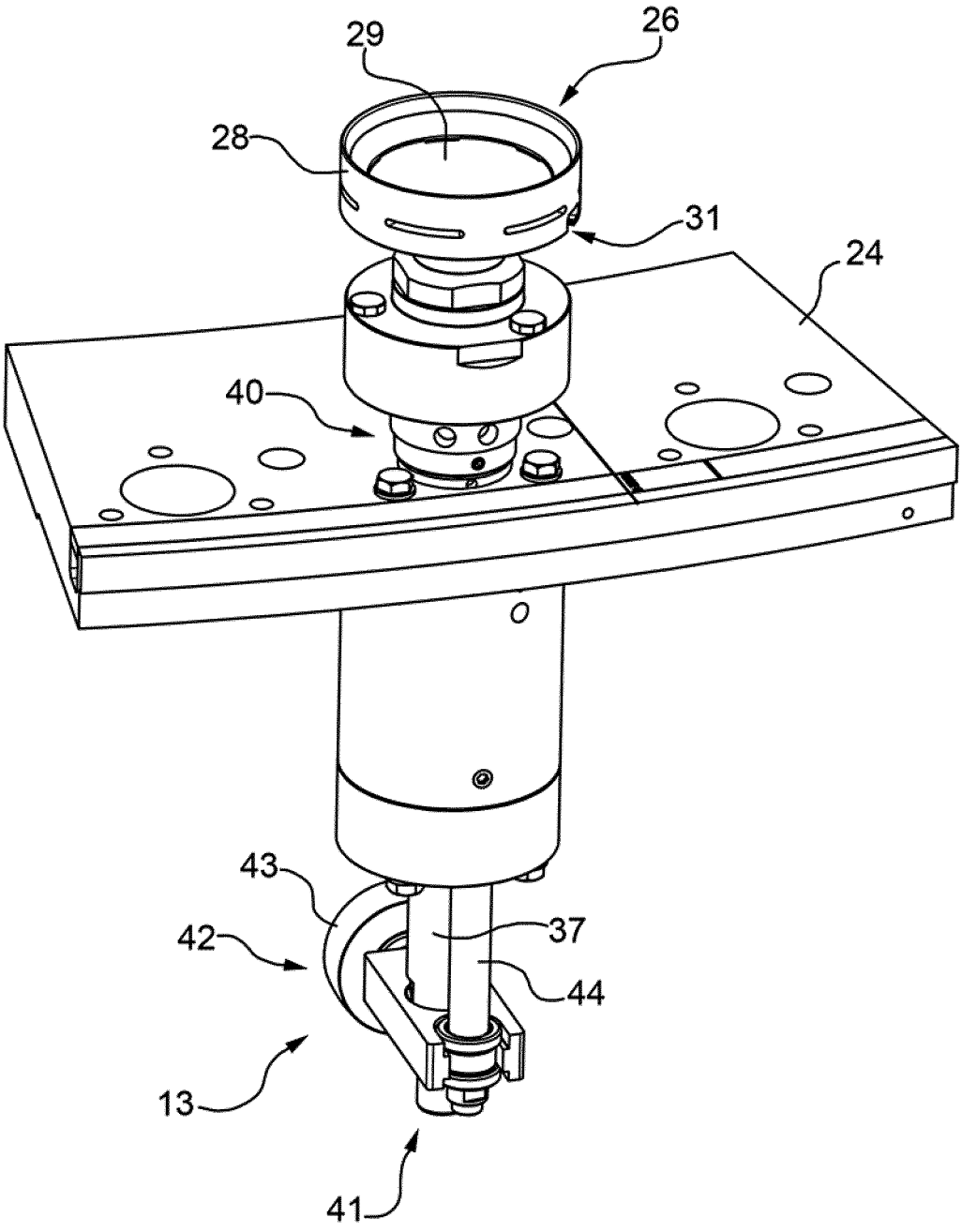

FIG.3

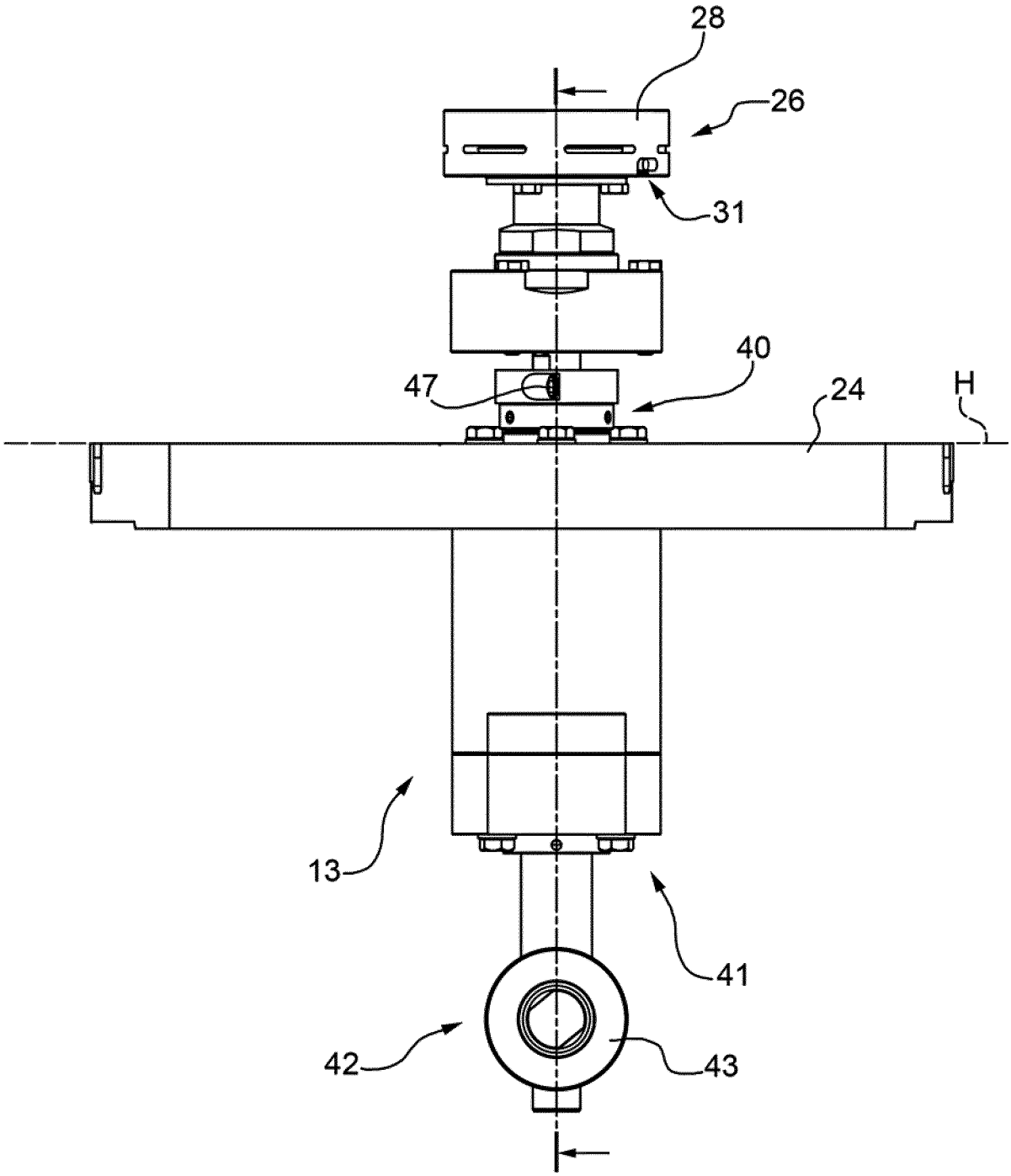

FIG.4

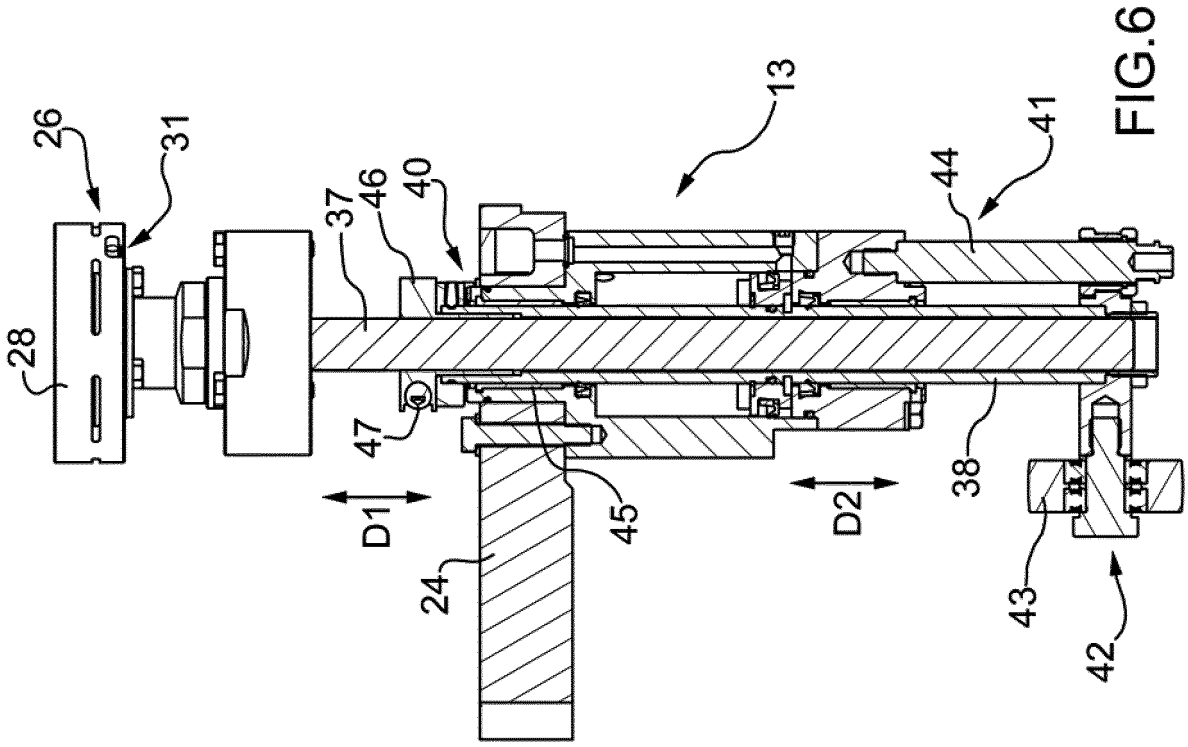
26
31
28
37
46
40
13
41
44
47
D1
24
45
D2
38
43
42

FIG.6

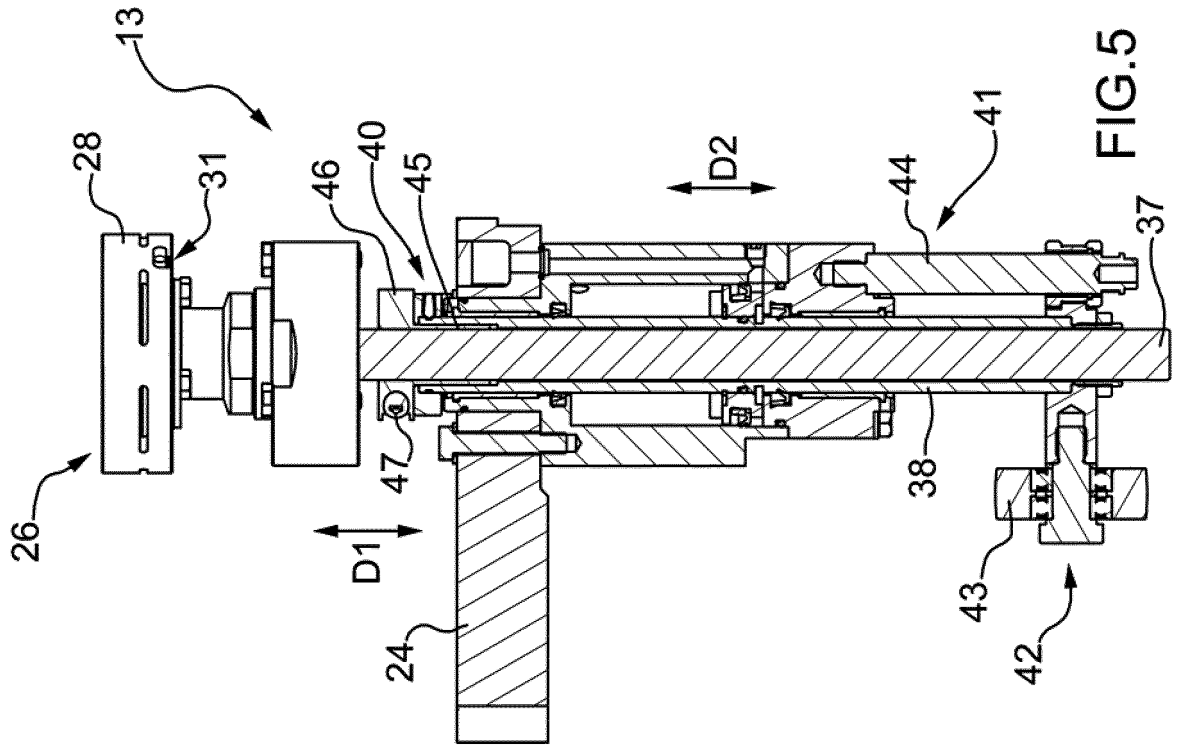
13
28
31
46
40
45
D2
41
44
37
26
47
D1
24
38
43
42

FIG.5

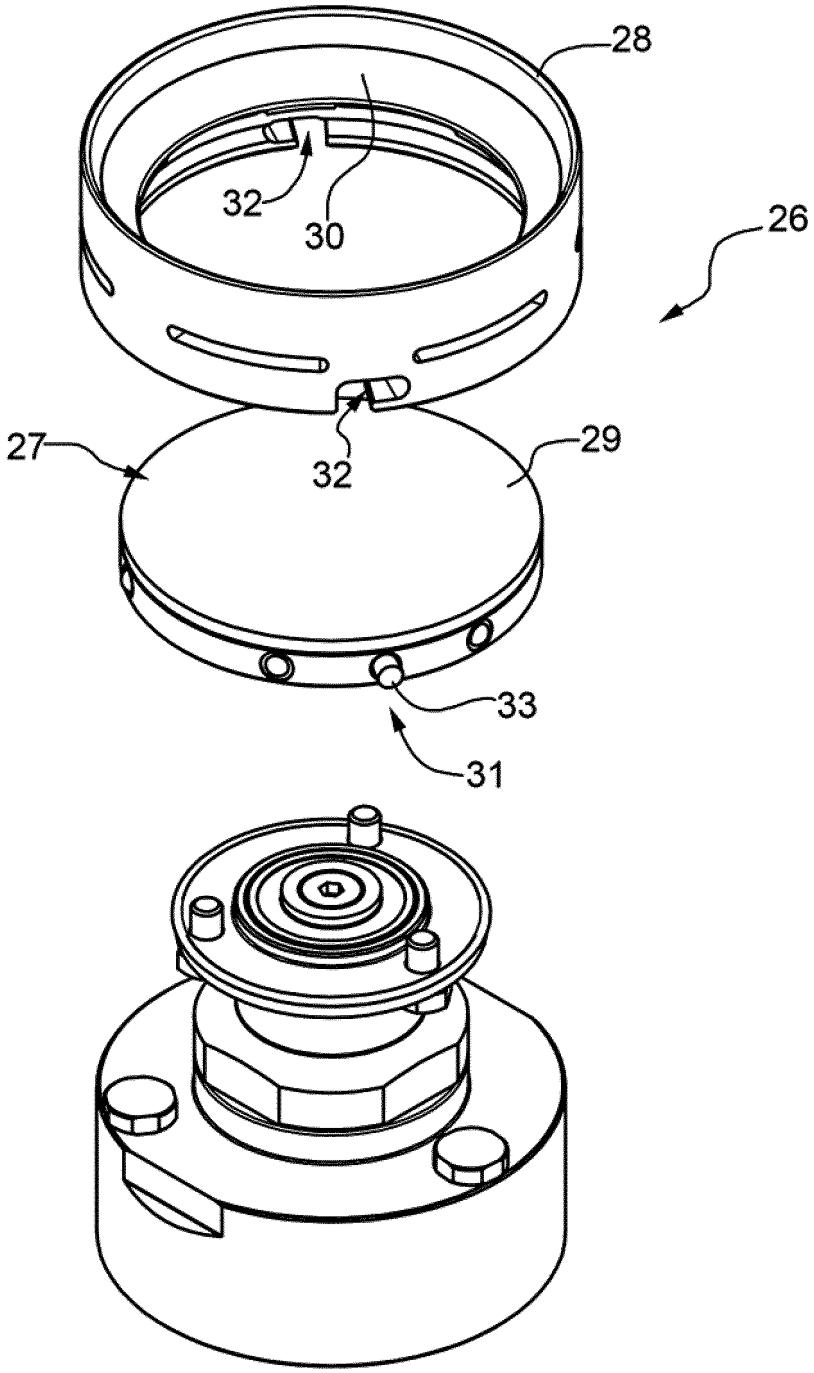

FIG.7

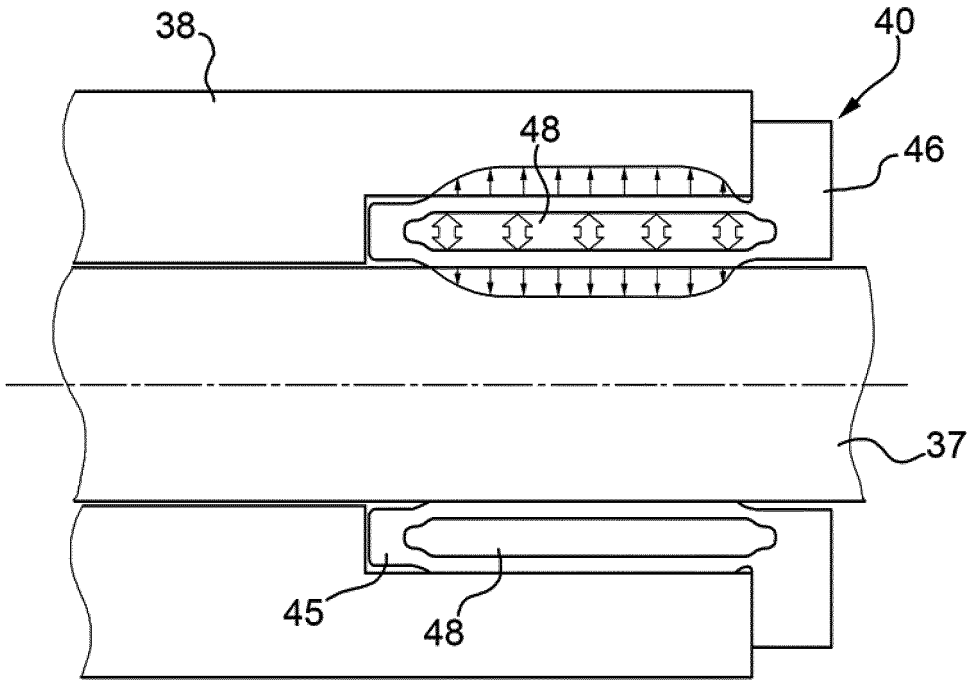

FIG.8

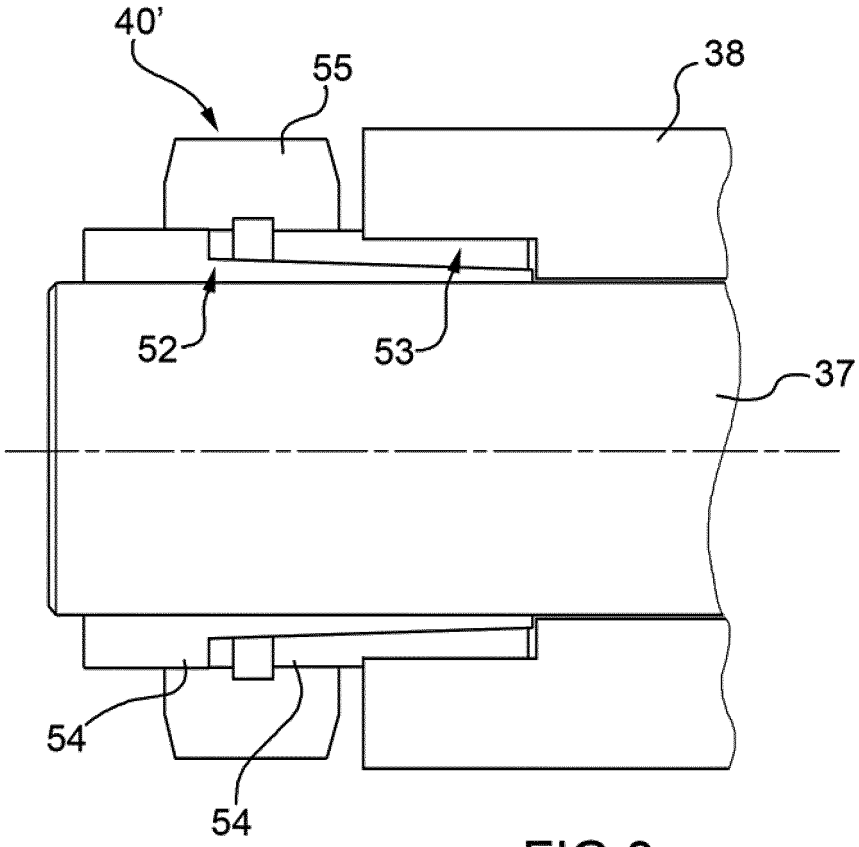

FIG.9

REFERENCES CITED IN THE DESCRIPTION

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- EP 1264771 A **[0020]**
- WO 2011018807 A **[0022]**