



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**22.06.2016 Bulletin 2016/25**

(51) Int Cl.:  
**B67B 3/20 (2006.01)**

(21) Application number: **15200879.3**

(22) Date of filing: **17.12.2015**

(84) Designated Contracting States:  
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**  
Designated Extension States:  
**BA ME**  
Designated Validation States:  
**MA MD**

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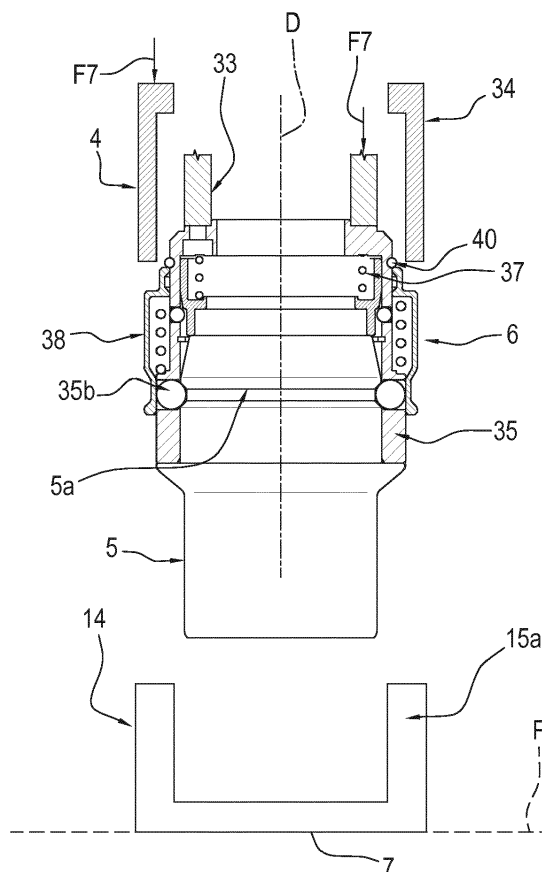
(30) Priority: **19.12.2014 IT BO20140713**

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(54) **PROCESS FOR REPLACING CAPPING HEADS AND SYSTEM FOR PACKAGING PRODUCTS**

(57) A process for replacing capping heads (5) in a packaging system (1) comprising a capping unit (3) composed of a supporting unit (4), a capping head (5) and a releasable engaging system (6) operating between the supporting unit (4) and the capping head (5) to keep it connected to the supporting unit (4), comprises a step of removing the capping head (5) from the supporting unit (4) by moving the capping unit (3) between a raised position and a lowered position.

**FIG. 10**



## Description

**[0001]** This invention relates to a process for replacing capping heads and to a product packaging system and, more specifically, to a system for filling containers with liquid products, loose materials or powders and for applying a respective cap to each container.

**[0002]** Prior art packaging systems basically comprise a container filling station equipped with a plurality of product dispensers, a capping station downstream of the filling station according to a direction of feeding the containers along a packaging path and a system for moving the containers between one working station and another.

**[0003]** An example of such a system is described in international patent application WO2014174419 in the name of the same Applicant as this application and, more specifically, relates to what is known as an in-line system

**[0004]** The capping station usually comprises a capping machine of known type which, generally speaking, comprises a plurality of capping heads, each structured to carry and apply a cap to a corresponding container and releasably engaged with a corresponding supporting unit.

**[0005]** The supporting units, and hence the capping heads, are movable relative to the container feed system between a far position and a near position for applying the cap. In practice, in the capping station, the capping heads move down towards the full containers in order to apply a cap to each container.

**[0006]** In the event of changeover to containers of a different size and hence different caps, it is necessary to replace the capping heads accordingly.

**[0007]** Generally speaking, replacing the capping heads involves bringing the capping machine to a stop and performing a series of manual operations, including positioning the capping heads in a head changeover station, removing the old heads and fitting the new heads suitable for the new containers to be processed.

**[0008]** Alternatively, as for example in the solution described in the aforementioned international application, a reservoir is provided for the capping heads and the supporting units are movable between the capping station and the reservoir to engage and/or disengage the capping heads, which are preferably equipped with a quick disconnect system to connect the corresponding supporting element.

**[0009]** This solution, too, has some disadvantages.

**[0010]** The use of a reservoir is possible only with in-line systems where the supporting units can be moved translationally into the reservoir which must, in all events, be located very near the capping machine.

**[0011]** Moreover, a large amount of space is necessary to store the capping heads to be unloaded and collected also as a function of the necessary movements of the supporting units.

**[0012]** In this context, the main technical purpose of this invention is to overcome the above mentioned disadvantages.

**[0013]** This invention has for an aim to provide a process for replacing the capping heads which is faster than prior art solutions.

**[0014]** Another aim of this invention is to provide a process for replacing the capping heads which does not require the presence of a cumbersome reservoir in the vicinity of the capping machine.

**[0015]** A further aim of the invention is to provide a packaging system which allows replacing the capping heads more quickly than prior art solutions.

**[0016]** The technical purpose and aims specified are substantially achieved by a process for replacing capping heads according to claim 1 and a packaging system according to claim 9.

**[0017]** Further features of the invention and its advantages are more apparent in the non-limiting description below, with reference to a preferred but non-exclusive embodiment of a packaging system as illustrated in the accompanying drawings, in which:

- Figure 1 illustrates a system according to this invention in a schematic block diagram;
- Figures 2 to 4 are schematic front views illustrating a detail of a system according to a first embodiment of the invention, in a sequence of steps in its operation;
- Figures 5 to 9 are schematic front views, partly in cross section, illustrating in more detail a sequence of operating steps for engaging the capping heads with the supporting units in a system of the kind shown in Figure 2;
- Figures 10 to 14 are schematic front views, partly in cross section, illustrating in more detail a sequence of operating steps for disengaging the capping heads from the supporting units in a system of the kind shown in Figure 2;
- Figure 14a illustrates a detail of an embodiment of a system according to this invention in a schematic perspective view;
- Figure 15 illustrates a further embodiment of a system according to this invention in a schematic plan view from above;
- Figures 16 to 18 are schematic front views, partly in cross section, illustrating a sequence of operating steps for engaging the capping heads with the supporting units in a system of the kind shown in Figure 15;
- Figures 19 to 21 are schematic front views, partly in cross section, illustrating in more detail a sequence of operating steps for disengaging the capping heads from the supporting units in a system of the kind shown in Figure 15.

**[0018]** With reference to Figure 1, the numeral 1 denotes a packaging system according to this invention.

**[0019]** The system 1 is designed to fill containers 100 with liquid products 101 or loose materials or powders and to apply a cap 102 to each container 100. The system

1, which is described only insofar as necessary for understanding this invention, comprises feed means for feeding a plurality of containers 100 along a packaging path P in a direction of feed V.

[0020] The system 1 comprises at least one capping station 2 arranged along the packaging path P and comprising a plurality of capping units 3. Downstream of the station 2, the system comprises further stations for subsequent processes of known type, not illustrated and not described.

[0021] Each capping unit 3 is movable relative to the feed means, in substantially known manner, between a raised position and lowered position according to a direction of movement D.

[0022] In practice, the capping unit 3 is movable relative to the containers 100 advancing along the path P between the far position and the near position for applying the cap 102 to a corresponding container 100.

[0023] Each capping unit 3 comprises a supporting unit 4 and a capping head 5 associated with the corresponding supporting unit 4.

[0024] More specifically, the capping head 5 is attached to the supporting unit 4 in substantially known manner by means of a releasable engaging system 6 of the type known as "quick-disconnect coupling".

[0025] The system 6 operates between the supporting unit 4 and the capping head 5 to keep the head 5 connected to the supporting unit 4.

[0026] As explained below, the possibility of moving the units 3 by which the caps are applied to the containers is used, according to the invention, to allow replacing the capping heads, for example in the event of a changeover to caps and/or containers of a different size during the processing thereof in the system 1.

[0027] That way, the capping heads can be replaced while the machine is in operation and without necessarily stopping it.

[0028] As illustrated for example in Figures 5-14 and 16-21, the supporting unit 4 preferably comprises the engaging system 6, that is to say, the latter is integrated in the supporting unit 4.

[0029] In the embodiment illustrated in Figures 1 to 14, the aforementioned feed means for feeding the containers 2 comprise a conveyor 7 - for example a conveyor belt - which is movable along the feed path P.

[0030] In the embodiment illustrated in Figures 15 to 21, showing what is called a "rotary" packaging system, of substantially known type, the aforementioned feed means for feeding the containers 2 comprise a conveyor 7 - for example a conveyor belt - which is movable along the feed path P and a plurality of wheels 8, 9, 10, 11 and 12, of substantially known type.

[0031] More specifically, the wheel 9 is part of a filling station 13 forming part of the system 1 and used for filling the containers 100 with the product 101.

[0032] The filling station 13 is located upstream of the capping station 2 according to the feed direction V of the containers 100 and is of a substantially known type not

described in detail herein.

[0033] The system 1 comprises a containing system 14 for containing the capping heads 5, shaped to house the capping head 5 and movable at least along the packaging path P by using the feed means, in particular using the conveyor 7 and/or the wheels 8, 9, 10, 11 and 12.

[0034] The containing system 14 comprises a supporting element 15a, 15b for the capping head 5 having a seat 16 for the capping head 5.

[0035] That way, as will become clearer as this description continues, the heads 5 are made to advance up to the capping station 2 using the movement means normally used to feed the containers 100 along the path P. Similarly, as will become clearer as this description continues, the capping heads 5 are removed from the capping station 2 using the same movement means, at least partly.

[0036] In a preferred embodiment, compatible in particular with the embodiment shown in Figures 1 to 14, the feed means comprise the conveyor 7 and a plurality of trays 200, one of which is illustrated schematically in Figure 14a and which are made to advance by the conveyor 7.

[0037] The movement means also comprise a plurality of elements 17 for supporting a corresponding container 100.

[0038] The trays 200 have a plurality of seats 18, each designed to house a respective container 100.

[0039] The means for feeding the containers 2 comprise a plurality of supporting elements 17, of which only one is illustrated, for convenience, and each of which is designed to house a corresponding container 100.

[0040] The supporting element 17 for the container 100 is shaped to fit into the seat 18 of the tray 200 and in turn has an inner seat 19 for housing the container 100.

[0041] The containers 100 are transported by means of the trays 200 which in turn mount the supporting elements 17 in which the containers 100 are inserted. The supporting elements 17 have an outside surface shaped to fit into the corresponding seat 18 on the tray 200 and an inside surface delimiting the seat 19, shaped to engage/receive the container 100.

[0042] Thus, the trays 200 are standard, irrespective of the type of container 100, whilst only the supporting elements 17 vary for each type of container 100. When changing over to a different size of containers 100, it is sufficient to place the new containers 100 with the respective supporting elements 17 on the trays 200.

[0043] In this embodiment, advantageously, the supporting elements 15a, 15b of the capping heads 5 are externally shaped to fit into the seats 18 of the trays 200, in such a way that the heads 5 can also be made to advance, at least as far as the capping station 2, using the trays 200.

[0044] In practice, the aforementioned containing system 14 for the capping heads 5 also comprises the trays 200.

[0045] The supporting elements 15a, 15b differ in

shape intended, respectively, to allow engaging the capping head 5 with the supporting unit 4 and disengaging the capping head 5 from the supporting unit 4.

**[0046]** With reference in particular to Figures 19 to 21, in the embodiment illustrated, the supporting element 15b comprises means for activating the releasable engaging system 6 at least for disengaging the capping head 5 from the respective supporting unit 4.

**[0047]** The means for activating the engaging system 6 are configured to interact with the system 6 itself upon movement of the capping unit 3 between the far and the near position for disengaging the head 5 from the supporting unit 4.

**[0048]** More specifically, in the embodiment illustrated, the supporting element 15b of the capping head 5 comprises an upper portion 20, for example in the shape of a ring or defined by ring portions, designed to engage with a part of the supporting unit 4, in particular with an element of the engaging system 6 in order to disengage the head 5 itself, as explained in more detail below.

**[0049]** With reference to Figures 16 to 21, in the embodiment illustrated, the supporting unit 4 basically comprises an actuating element 21 which is movable between the raised and lowered positions.

**[0050]** The engaging system 6, of substantially known type, as mentioned, and described only insofar as necessary for understanding this invention, comprises a first collar 22 which is integral with the element 21 designed to at least partly engage with the capping head 5.

**[0051]** The collar 22 is provided with a housing 22a for a plurality of balls 22b. The housing 22a is substantially ring-shaped and at least partly surrounds the collar 22.

**[0052]** Inside the collar 22 there is a slider 23 which is movable relative to the collar 22 between a lowered position, illustrated for example in Figure 16, and a raised position, illustrated for example in Figure 17, along the direction D.

**[0053]** The system 6 comprises a first helical spring 24 interposed between the element 21 and the slider 23 to keep the slider 23 in the lowered position and opposing the movement of the slider 23 between the lowered position and the raised position.

**[0054]** Outside the collar 22 there is a second collar 25 which is movable between a raised position, illustrated for example in Figure 16, and a lowered position, illustrated for example in Figure 17.

**[0055]** The system 6 comprises a second helical spring 26 fitted round the collar 22 and interposed between the element 21 and the outer collar 25 to urge the latter into the lowered position and oppose the movement thereof between the lowered and raised positions.

**[0056]** The capping head 5 has a ring-shaped raceway 5a and the aforementioned balls 22b are movable between a position of engagement in the raceway 5a, illustrated for example in Figure 17, where the head 5 is engaged with the supporting unit 4, and a position of disengagement from the raceway 5a, illustrated for example in Figure 16, where the head 5 is free of the supporting

unit 4.

**[0057]** The inner slider 23, the collar 22 and the outer collar 25 are structured, in substantially known manner, to allow the aforementioned movement of the balls 22b and the corresponding retaining action.

**[0058]** In use, with reference to Figures 16 to 18, considering a starting configuration where the capping unit 3 is without the capping head, the capping heads 5, housed in the corresponding supporting elements 15a, are fed, preferably along the path P, as far as the capping station 2 and positioned at the respective supporting unit 4.

**[0059]** To mount the capping head 5 to the supporting unit 4, the supporting unit 4 is lowered, in the direction indicated by the arrow F1, until the slider 23, opposed by the head 5, rises, in the direction indicated by the arrow F2, overcoming the opposing action of the spring 24 and letting the balls 22b engage the raceway 5a (Figures 16, 17).

**[0060]** That way, the outer collar 25 moves down under the pushing action of the spring 26, in the direction indicated by the arrow F3, locking the balls 22b in the raceway 5a and thereby causing the head 5 to be locked or mounted to the supporting unit 4 (Figure 17).

**[0061]** The head 5 can thus be raised, in the direction indicated by the arrow F4, and the element 15a supporting it moved away from the capping station 2 (Figure 18).

**[0062]** As illustrated in Figures 19 to 21, when the capping heads 5 have to be removed or disassembled from the capping units 3, the empty supporting elements 15b of the capping heads are fed, preferably along the path P, until reaching the capping station 2 and are then positioned at a respective capping unit 3.

**[0063]** The capping unit 3 is lowered, in the direction indicated by the arrow F1 (Figure 19), until the outer collar 25 opposed by the portion 20 of the supporting element 15b overcomes the opposing action of the spring 26, as the supporting unit 4 moves down, and rises in the direction indicated by the arrow F5 (Figure 20) relative to the collar 22.

**[0064]** The balls 22b are then free to move outwards and the slider 23, under the action of the spring 24, pushes the balls 22b, arrow F6 Figure 20, towards the outer collar 25, and in practice locks it in the raised position.

**[0065]** The head 5 is thus disengaged from the supporting unit 4 which is now unladen and free to rise (arrow F4, Figure 21) and the head 5 can be removed from the capping station 2 at least partly along the path P using the supporting element 15b.

**[0066]** Advantageously, feeding the capping heads 5 to or from the capping station 2 or feeding the supporting elements 15a, 15b to or from the capping station 2 is accomplished using the movement means of the containers 100, for example using the conveyor 7 and the wheels 8, 9, 10, 11 and 12.

**[0067]** As illustrated in Figure 15, the system 1 comprises means for collecting the containing system 14, in particular the elements 15b supporting a corresponding

capping head 5.

**[0068]** The collecting means are also suitable for collecting the empty containers 15a from the path P, as and when required.

**[0069]** The collecting means allow extracting the capping heads 5 supported by the elements 15b after the heads have been disengaged from the respective supporting units 4 and moving them along an unloading path P1.

**[0070]** This solution is advantageously applicable when downstream of, or in substantial proximity to, the capping station 2, the system is of a size such that it is difficult for the capping heads 5 to move through along the path P. In effect, the capping heads 5, supported by the elements 15b, may be greater in overall height than the containers 100 and hence unable to move along the path P where the containers 100 pass, for example in the presence of a cap feed line not illustrated.

**[0071]** In the embodiment illustrated by way of example, the collecting means comprise a unit 27 for withdrawing the elements 15a and/or 15b and movable between a first operating position where it intercepts the path P and a second operating position, shown by dashed lines in Figure 15 where it is moved away from the path P.

**[0072]** The collecting means also comprise a conveyor belt 28 movable in a direction V1 to carry the elements 15a and/or 15b away from the withdrawing unit 27 to a reservoir 29.

**[0073]** Preferably, the system 1 comprises a system 30 for access to the packaging path P which allows the withdrawing unit 27 to move between the aforementioned first and second operating positions.

**[0074]** In practice, during the movement of the containers 100, the path P is closed, that is to say, not accessible. During changeover of the heads 5, the access system 30 creates a gap 31 through which the unit 27 gains access to and intercepts the path P.

**[0075]** In a further embodiment, the system 1 comprises a system, schematically represented as a block 32, for moving the elements 15a supporting the capping heads 5 or the elements 15b in such a way as to feed elements 15a supporting the capping heads 5 or the elements 15b onto the packaging path P, in particular at the capping station 2.

**[0076]** Advantageously, in such case, where the aforementioned collecting means are provided, it is possible to place a loading reservoir and the unloading reservoir 29 close to each other, thereby simplifying the logistics of the system 1.

**[0077]** Figures 2 to 14 illustrate a machine of the type described, for example, in the aforementioned international patent application WO2014174419 in the name of the same Applicant as this application and incorporated herein by reference for completeness of description.

**[0078]** Illustrated in more detail in particular in Figures 5 to 14 are the supporting unit 4 and the releasable system 6 for engaging the capping heads 5 with the supporting unit 4, both of substantially known type and described

only insofar as necessary for understanding this invention.

**[0079]** The supporting unit 4 comprises an inner first part 33, for example tubular, and an outer second part 34 coaxial with the first part 33.

**[0080]** The first part 33 are movable relative to each other along the direction of movement D and, as described in more detail below, constitute actuating elements for activating the engaging system 6.

**[0081]** More specifically, the actuating elements 33, 34 are movable both to mount and to remove the capping heads 5 to and from the respective supporting units 4.

**[0082]** In the embodiment illustrated, the engaging system 6, of substantially known type, as mentioned, and described only insofar as necessary for understanding this invention, comprises a first collar 35 which is integral with the first part 33 of the supporting unit 4 and designed to at least partly engage with the capping head 5.

**[0083]** The collar 35 is provided with a plurality of housings 35a, each for a corresponding ball 35b forming part of a plurality of balls 35b.

**[0084]** The inner collar 35 has a plurality of second housings 35c, each for a corresponding ball 35d forming part of a plurality of balls 35d.

**[0085]** Inside the collar 35 there is a slider 36 which is movable relative to the collar 35 between a lowered position, illustrated for example in Figure 5, and a raised position, illustrated for example in Figure 7.

**[0086]** The system 6 comprises a first helical spring 37 interposed between the inner first collar 35 and the slider 36 to keep the slider 36 in the lowered position and to oppose the movement of the slider 36 between the lowered position and the raised position.

**[0087]** Outside the collar 35 there is a second collar 38 which is movable along the direction D, relative in particular to the first collar 35, between a raised position, illustrated for example in Figure 8, and a lowered position, illustrated for example in Figure 5.

**[0088]** The system 6 comprises a second helical spring 39 fitted round the collar 35 and operating between the element 35 itself and the outer collar 38 to urge the latter into the raised position and oppose the movement thereof between the raised and lowered positions.

**[0089]** The capping head 5 has the aforementioned ring-shaped raceway 5a and the balls 35b are movable between a position of engagement in the raceway 5a, illustrated for example in Figure 8, where the head 5 is engaged with the supporting unit 4, and a position of disengagement from the raceway 5a, illustrated for example in Figure 6, where the head 5 is free of the supporting unit 4.

**[0090]** The balls 35d are movable between a position of engagement with the collar 38, illustrated for example in Figure 12 and a position of disengagement from the collar 38, illustrated for example in Figure 9.

**[0091]** The inner slider 36, the collar 35 and the outer collar 38 are structured, in substantially known manner, to allow the aforementioned movement and the corre-

sponding retaining action applied to the balls 35b and the balls 35d.

**[0092]** In use, with reference in particular to Figures 2 to 9, considering a starting configuration where the capping unit 3 is without the capping head, the capping heads 5, housed in the corresponding supporting elements 15a, are fed, preferably along the path P, as far as the capping station 2 and positioned at the respective supporting unit 4.

**[0093]** The collar 38 is kept in the lowered position by the balls 35d (Figures 5, 6).

**[0094]** To mount the capping head 5 to the supporting unit 4, the supporting unit 4 is lowered - arrow F7, Figures 5, 6 - until the slider 36, opposed by the head 5, rises and overcomes the opposing action of the spring 37, letting the balls 35d disengage the collar 38 (arrow F8, Figure 6).

**[0095]** The collar 38, under the action of the spring 39, is urged into the raised position - arrow F9, Figure 7 - pushing the balls 35b into the raceway 5a and keeping them engaged therein.

**[0096]** Advantageously, there is an upper limit stop 40 for the collar 38 (Figures 8 and 9).

**[0097]** The head 5 is thus mounted to the corresponding supporting unit 4, can be raised in the direction indicated by the arrow F10, Figure 9, and the empty element 15a can be moved away from the capping station 2, preferably along the movement path P of the containers 100 and at least partly using the movement means thereof.

**[0098]** As illustrated in particular in Figures 10 to 14, when the capping heads 5 have to be removed or disassembled from the capping units 3, the empty supporting elements 15a of the capping heads 5 are fed, preferably along the path P, until reaching the capping station 2 and are then positioned at a respective capping unit 3.

**[0099]** The capping unit 3 is lowered, in the direction indicated by the arrow F7, until the head 5 is positioned in the corresponding container 15a (Figure 11). With reference to Figure 12, the first part 33 of the supporting unit 4 is raised in the direction indicated by the arrow F11, keeping the second part 34 of it still, as schematically represented by the double arrow F12.

**[0100]** The second part 34 engages with the collar 38 which is lowered relative to the inner collar 35 overcoming the opposing force of the spring 39 (arrow F13, Figure 12).

**[0101]** The balls 35b are free to come out of the raceway 5a and the balls 35d are free to engage with the collar 38 under the action of the spring 37 which urges the slider 36 downwards (arrow F14, Figure 13).

**[0102]** The head 5 is therefore free to drop into the supporting element 15a by which it can be moved away from the capping station along the container packaging path P.

**[0103]** Advantageously, feeding the capping heads 5 to or from the capping station 2 or feeding the supporting elements 15a to or from the capping station 2 is accomplished using the movement means of the containers

100, for example using the conveyor 7 and, if provided, the aforementioned trays 200 which house the supporting elements 15a.

**[0104]** A process for replacing at least one capping head 5 in the packaging system 1 comprises a step of mounting the capping head 5 on the supporting unit 4.

**[0105]** Preferably, the replacing process comprises a step of removing the capping head 5 from the supporting unit 4.

**[0106]** According to what is described in the foregoing, the step of mounting the capping head 5 comprises at least a step of moving the supporting unit 4 between the aforementioned far position and the aforementioned near position.

**[0107]** Similarly, the step of removing the capping head 5 from the capping unit 3, and more specifically, from the supporting unit 4 comprises at least a step of moving the capping unit 3 between the aforementioned far position and the aforementioned near position.

**[0108]** Advantageously, the mounting step comprises a step of positioning the capping head 5 in the capping station 2 using the means for feeding the containers 100.

**[0109]** The mounting step occurs in the capping station 2 and comprises a step of moving the supporting unit 4 between the aforementioned far and near positions.

**[0110]** The removing step comprises a step of moving the capping head 5 away from the capping station 2 using the aforementioned feed means at least partly.

**[0111]** The removing step occurs in the capping station 2 and comprises a second step of moving the supporting unit 4 between the far position and the near position.

**[0112]** More specifically, as explained above, the removing step comprises a step of feeding along the packaging path P a system 14 for containing the capping head 5, contained in particular in the element 15a or 15b, depending on the type of station 2, until reaching the capping unit 3 and a step of disengaging the capping head 5 from the containing system 15a or 15b.

**[0113]** The removing step thus comprises a step of moving the containing system 14 with the capping head 5 away from the capping station 2 preferably along at least part of the packaging path P.

**[0114]** The mounting step comprises a step of feeding along the packaging path P the capping head 5 housed in a containing system 14, in particular in the supporting element 15a, until reaching the capping unit 3, that is, until reaching the supporting unit 4.

**[0115]** The mounting step comprises a step of engaging the capping head 5 with the supporting unit 4 and, preferably, a step of moving the empty containing system 14, in particular the supporting element 15a or 15b away from the capping station 2 preferably along at least part of the packaging path P of the containers 100.

**[0116]** In practice, the mounting step comprises a step of positioning the capping head 5 in the capping station 2 using at least partly the feed means along the packaging path P.

**[0117]** The removing step comprises a step of moving

the capping head 5 away from the capping station 2 using at least partly the feed means along the packaging path P.

**[0118]** The positioning step and the moving away step comprise a step of preparing the containing system 14 for containing the capping head 5, shaped to house the capping head 5 and movable at least along part of the packaging path P by using the feed means.

**[0119]** The step of engaging the capping head 5 with the supporting unit 4 comprises a step of activating the engaging system 6 to engage the supporting unit 4 with the corresponding capping head 5.

**[0120]** With reference in particular to Figures 5 to 8 and as described above, the step of activating the engaging system 6 comprises a step of moving at least a first part of the supporting unit 4 relative to a second part of the selfsame unit 4.

**[0121]** More specifically, the step of activating the engaging system 6 comprises a step of moving the slider 36 by lowering the supporting unit 4 and a step of moving the outer collar 38 by means of the spring 39.

**[0122]** With reference in particular to Figures 16 to 18 and as described above, the step of activating the engaging system 6 comprises a step of moving at least a first part of the supporting unit 4 relative to a second part of the selfsame unit 4.

**[0123]** More specifically, the step of activating the engaging system 6 comprises a step of moving the slider 23 by lowering the supporting unit 4 in such way that the head 5 acts on the slider 23 to urge it upwards by overcoming the action of the spring 24.

**[0124]** Substantially simultaneously, the step of activating the engaging system comprises a step of lowering the outer collar 25 under the action of the spring 26.

**[0125]** The step of removing the capping head 5 from the supporting unit 4 comprises a step of disengaging the capping head 5 from the supporting unit 4 by a step of activating the engaging system 6.

**[0126]** The disengaging step comprises a step of moving a first part of the supporting unit 4 relative to a second part of the supporting unit 4.

**[0127]** More specifically, with reference to Figures 10 to 14 and as described above, the disengaging step comprises a step of moving a first part of the engaging system 6 relative to a second part of the engaging system 6.

**[0128]** As mentioned, the collar 38 moves relative to the collar 35 thanks to the lifting of the first part 33 of the supporting unit 4 relative to the second part 34 of the same, which remains still.

**[0129]** With reference to Figures 19 to 21, in the embodiment illustrated, the disengaging step comprises a step of moving a first part of the engaging system 6 relative to a second part of the engaging system 6.

**[0130]** As mentioned, the collar 25 moves relative to the collar 22 as a result of compressing the spring 26 while the slider 23 rises relative to the collar 22 on account of contact with the head 5 overcoming the opposing action of the spring 24.

**[0131]** Activating the engaging system 6 comprises,

as described earlier on, a step of interaction between the supporting unit 4 and the containing system, in particular with the upper portion 20 of the supporting element 15b when the supporting unit 4 moves down.

**[0132]** With reference in particular to Figure 15, the removing step comprises a step of moving the capping head 5, housed in the respective supporting element 15b, away from the capping station 2 along the unloading path P1 intersecting the packaging path P.

**[0133]** The invention as described above brings important advantages.

**[0134]** The use of at least part of the packaging path of the containers for feeding the capping heads to the capping station, for example during a changeover allows optimizing the logistics of the system and changeover operations. Similarly, removing the heads or the empty containers from the capping station along the packaging path or along an unloading path also greatly facilitates capping head changing procedures.

**[0135]** If the supporting units allow certain relative movements, such as for example those described above, engaging and, above all, disengaging, may be carried out easily irrespective of the support used to move the capping heads.

**[0136]** In the case of simple machines, suitably shaping the head supporting element makes it possible to activate the engaging system using the standard driving movements imparted to capping units by making the engaging system interact with the supporting element itself.

**[0137]** In the case of non-standard sizes, it is possible to feed and unload the capping heads along dedicated paths leading to the capping station where the capping heads can be quickly and easily replaced using the supporting unit drive system normally used to apply the caps to the containers being processed.

**[0138]** The capping heads can be replaced without stopping the machine which translates as considerable savings in terms of reduced process cycle times.

## Claims

1. A process for replacing capping heads (5) in a system (1) for packaging a product (101) in a corresponding container (100), the packaging system (1) being of a type comprising at least a capping station (2) and means (7, 8, 9, 10, 11, 12, 17, 18, 200) for feeding at least one container (100) in a feed direction (V) along a packaging path (P), the capping station (2) comprising at least a capping unit (3) movable relative to the feed means (7, 8, 9, 10, 11, 12, 17, 18, 200) between a far position and a near position for applying a cap (102) to the container (100), the capping unit comprising a supporting unit (4), a capping head (5) and a releasable engaging system (6) operating between the supporting unit (4) and the capping head (5) such as to keep the capping head (5) connected to the supporting unit (4), the process

comprising

a step of mounting the capping head (5) on the supporting unit (4) and/or a step of removing the capping head (5) from the supporting unit (4) and being **characterized in that** the step of mounting the capping head (5) comprises at least a step of moving the supporting unit (4) between the far position and the near position and/or the step of removing the capping head (5) comprises at least a step of moving the capping unit (3) between the far position and the near position.

2. The process according to claim 1, wherein the mounting step comprises a step of positioning the capping head (5) in the capping station (2) at least partly by using the feed means (7, 8, 9, 10, 11, 12, 17, 18, 200) and along the packaging path (P) and/or the removing step comprises a step of moving the capping head (5) away from the capping station (3), at least partly by using the feed means (7, 8, 9, 10, 11, 12, 17, 18, 200) and along the packaging path (P).
3. The process according to claim 1 or 2, wherein the removing step comprises a step of feeding, along the packaging path, a containing system (14) of the capping head (5), up to the capping unit (3) in the capping station (2);  
a step of releasing the capping head (5) in the containing system (14) in the capping station (2);  
a step of moving the containing system (14) with the capping head (5) away from the capping station (2) preferably along at least part of the packaging path (P).
4. The process according to any one of claims 1 to 3, wherein the mounting step comprises a step of feeding, along the packaging path (P) of the capping head (5) housed in a containing system (14), up to the capping unit (3) in the capping station (2);  
a step of engaging the capping head (5) to the supporting unit (4);  
a step of moving the containing system (14) when empty away from the capping station (2) preferably along at least part of the packaging path (P).
5. The process according to any one of claims 1 to 4, wherein the mounting step comprises a step of engaging the capping head (5) in the supporting unit (4) by means of a step of activating the releasable engaging system (6) in order to engage the supporting unit (4) of the capping head (5), comprising a step of relative movement of at least a first part (22, 35) of the releasable engaging system (6) and of at least a second part (23, 25, 36, 38) of the releasable engaging system (6).
6. The process according to any one of claims 1 to 5,

wherein the removing step comprises a step of disengaging the capping head (5) from the supporting unit (4) by means of a step of activating the releasable engaging system (6) comprising a step of relative movement of at least a first part (22, 35) of the releasable engaging system (6) and of at least a second part (23, 25, 36, 38) of the releasable engaging system (6).

7. The process according to claim 6, wherein the step of relative movement of at least a first part (22, 35) of the releasable engaging system (6) and of a second part (23, 25, 36, 38) of the releasable engaging system (6) in the disengaging step comprises a step of relative movement of a first part (33) of the supporting unit (4) and of a second part (34) of the supporting unit (4).
8. The process according to claim 7, wherein the relative movement step of at least a first part (22, 35) of the releasable engaging system (6) and of a second part (23, 25, 36, 38) of the releasable engaging system (6) in the disengaging step comprises a step of moving the first part (35) of the releasable engaging system (6) by means of a first part (33) of the supporting unit (4) and a step of moving the second part (38) of the releasable engaging system (6) by means of a second part (34) of the supporting unit (4).
9. The process according to any one of claims 1 to 8, wherein the removing step comprises  
a step of feeding, along the packaging path (P), a containing system (14) of the capping head (5) up to the capping unit (3) in the capping station (2);  
a step of disengaging the capping head (5) from the supporting unit (4) by means of a step of activating the releasable engaging system (6) comprising a step of interaction between the releasable engaging system (6) and the containing system (14).
10. The process according to claim 9, wherein the step of interaction between the releasable engaging system (6) and the containing system (14) occurs during the step of moving the capping unit (3) between the far position and the near position, an external collar (25) of the engaging system (6) being activated by an upper portion (20) of a supporting element (15b) of the capping head (5) forming part of the containing system (14).
11. The process according to any one of claims 1 to 10, wherein the removing step comprises a step of moving the capping head (5) away from the capping station (2) along an unloading path (P1) intersecting the packaging path (P).
12. A system for packaging a product (101) in a corresponding container (100), the system comprising

means (7, 8, 9, 10, 11, 12, 17, 18, 200) of feeding at least a container (100) for feeding the container (100) in an feed direction (V) along a packaging path (P); at least one capping station (2) arranged along the packaging path (P) and comprising  
 at least one capping unit (3) comprising a supporting unit (4), a capping head (5) and a releasable engaging system (6) for retaining the capping head (5) connected to the supporting unit (4), the capping unit (3) being movable relative to the feed means (7, 8, 9, 10, 11, 12, 17, 18, 200) between a far position and a near position of application of a cap (102) to the container (100), the system being **characterized in that** it comprises a containing system (14) for containing the capping head (5), shaped to house the capping head (5) and movable at least along part of the packaging path (P) by using the feed means (7, 8, 9, 10, 11, 12, 17, 18, 200).

13. The system according to claim 12, wherein the containing system (14) comprises a supporting element (15a, 15b) for the capping head (5) having a seat (16) for the capping head (5).
14. The system according to claim 13, wherein the feed means (7, 8, 9, 10, 11, 12, 17, 18, 200) comprise a conveyor (7) mobile along the packaging path (P) and the containing system (14) comprises at least a tray (200) fed by the conveyor (3) and having a second seat (18) for the supporting element (15a, 15b).
15. The system according to claim 13 or 14, wherein at least a first supporting element (15b) comprises means (20) for activating the releasable engaging system (6) at least such as to disengage the capping head (5) from the supporting unit (4), the activating means (20) being configured to interact with the releasable engaging system (6) upon a movement of the capping unit (3) between the far and near positions.
16. The system according to any one of claims 12 to 15, comprising collecting means (27, 28) of the containing system (14) and the capping head (5) from the packaging path.
17. The system according to claim 16, comprising a system (30, 31) for access to the packaging path (P), the collecting means (27, 28) being at least partly mobile through the access system (30, 31) between a first operating position far from the packaging path (P) and a second operating position near to the packaging path (P).

FIG. 1

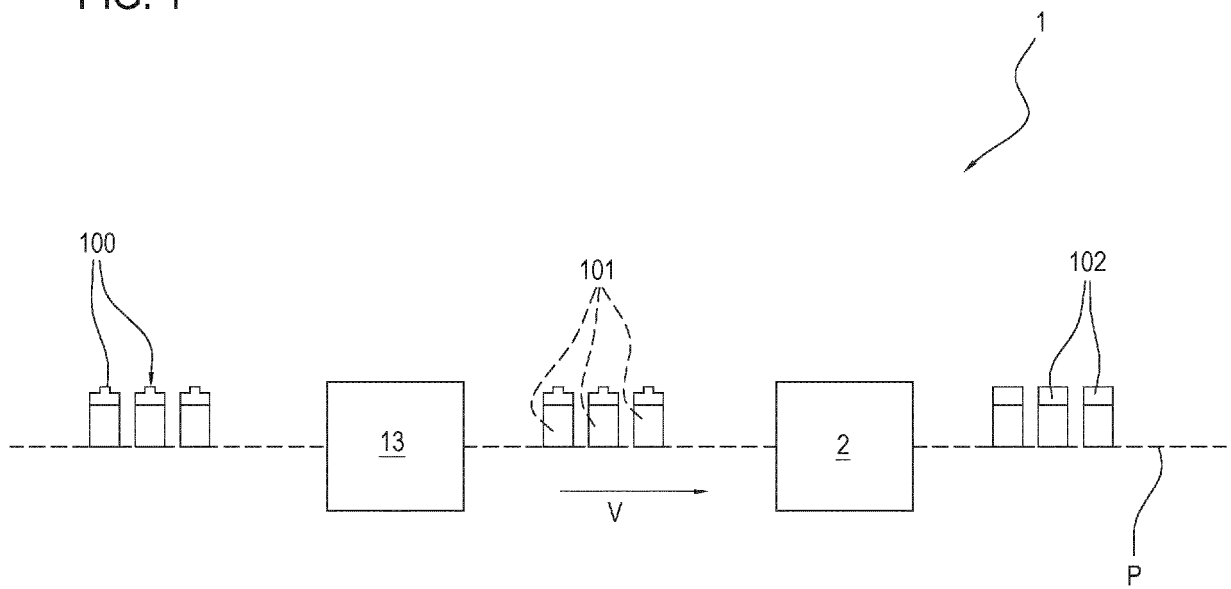


FIG. 2

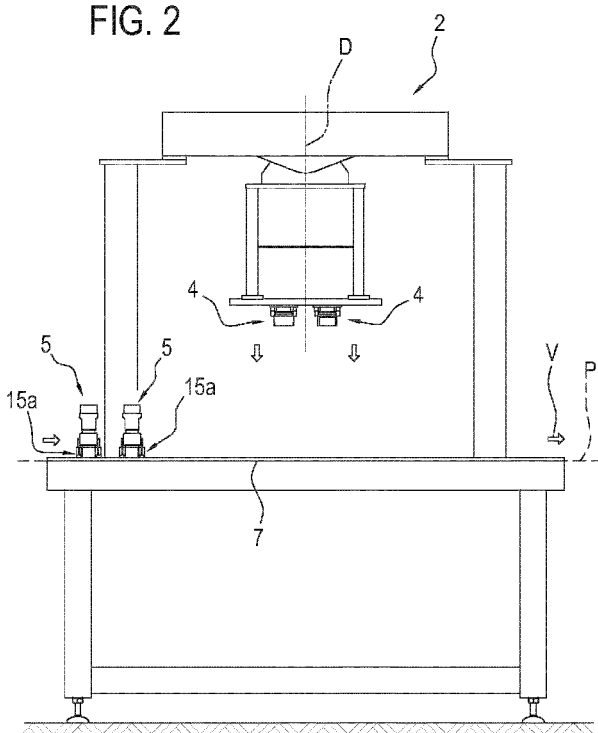
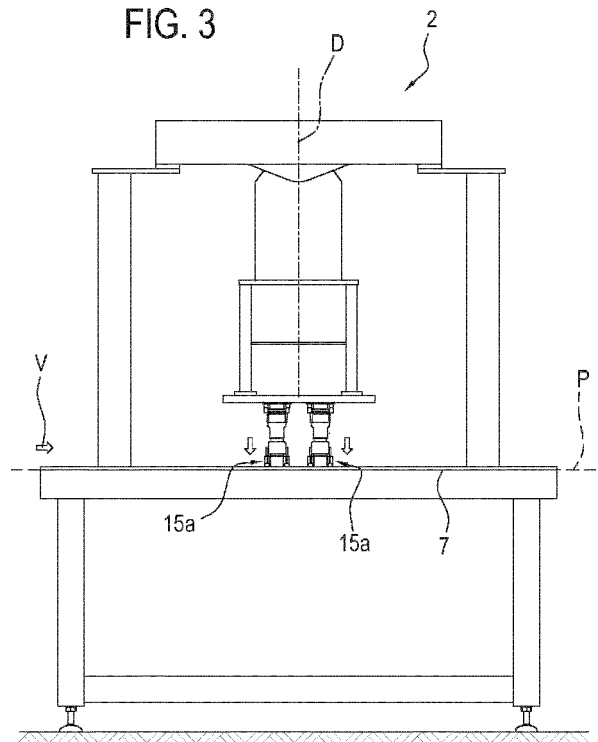


FIG. 3



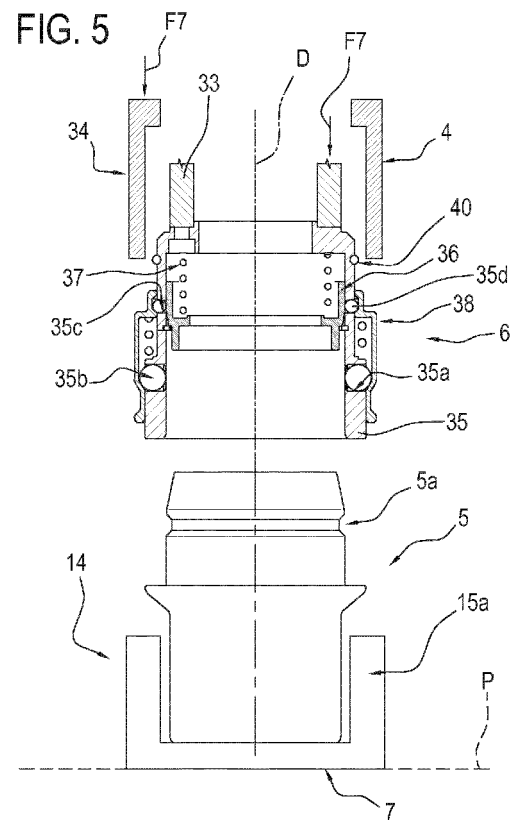
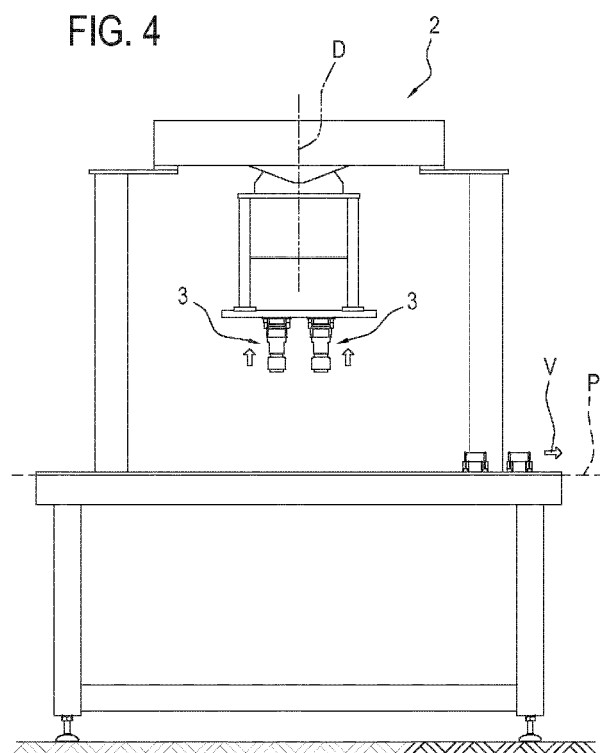


FIG. 6

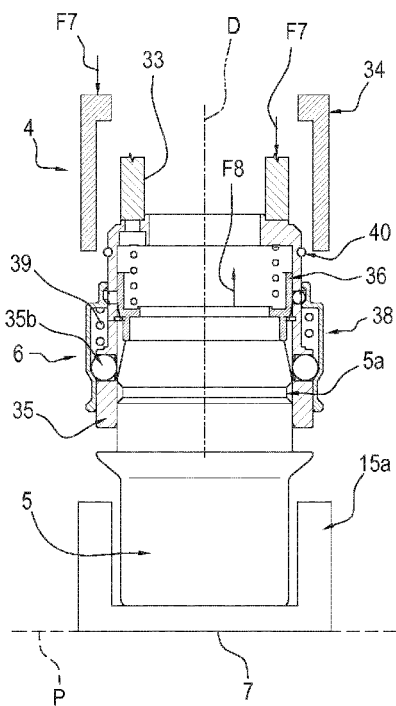


FIG. 7

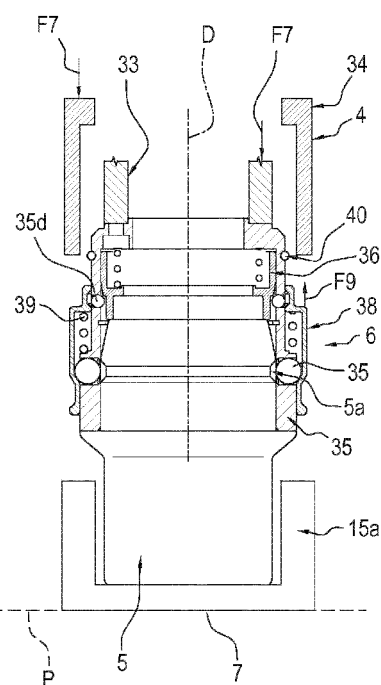
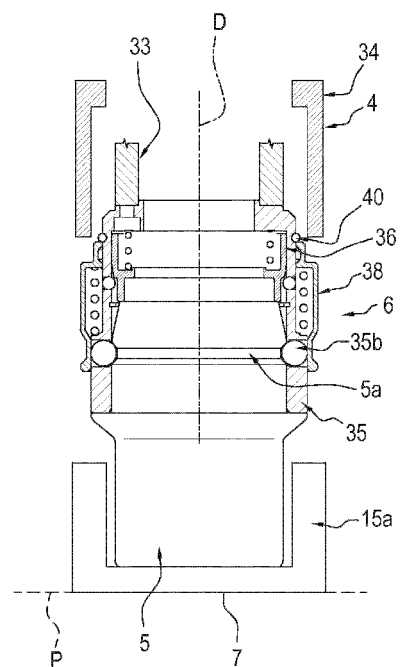


FIG. 8



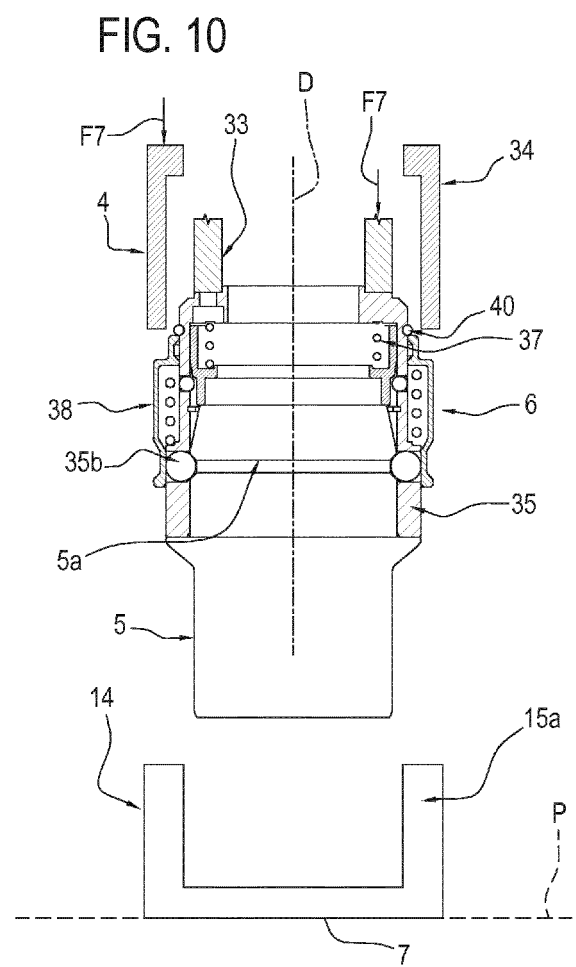
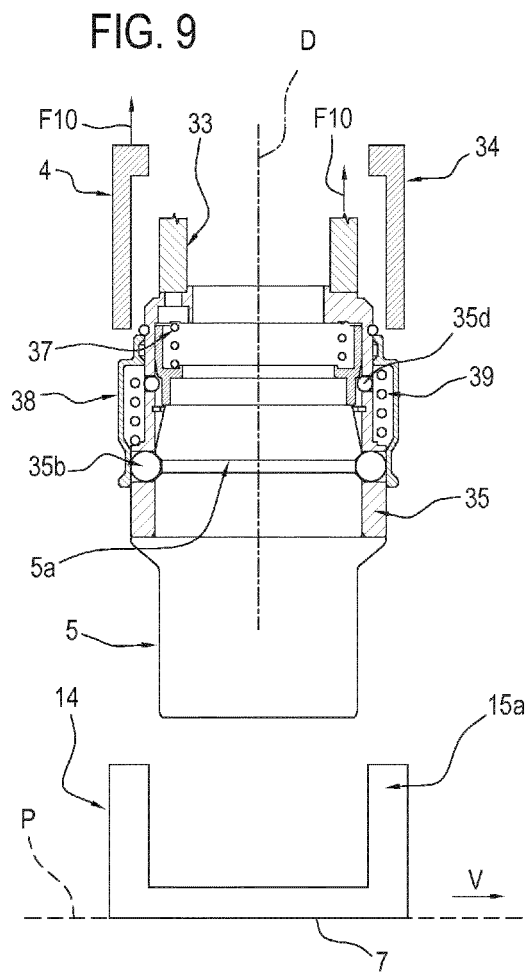


FIG. 11

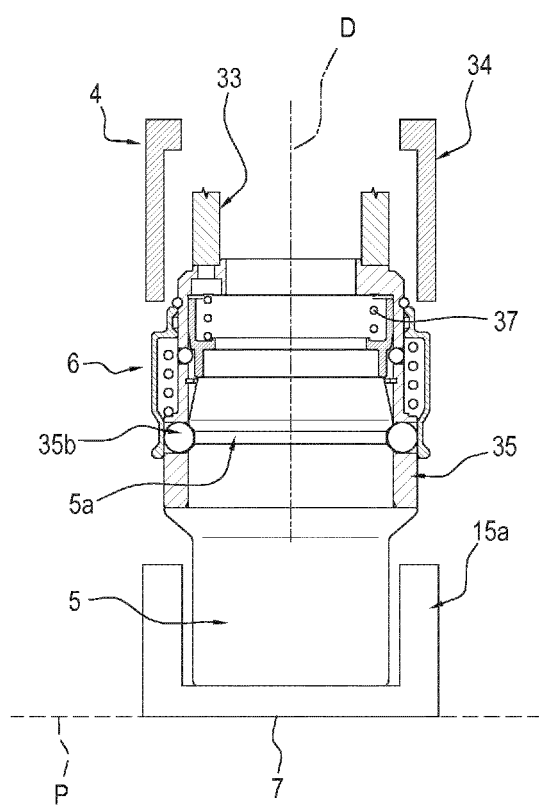


FIG. 12

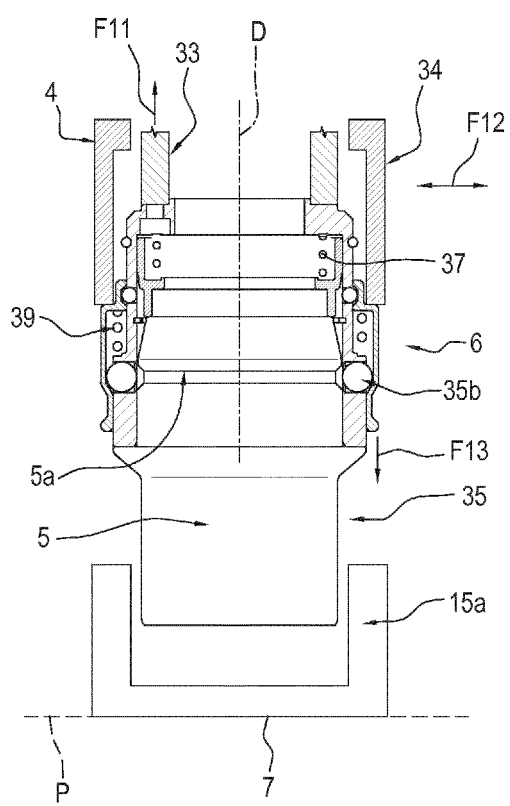


FIG. 13

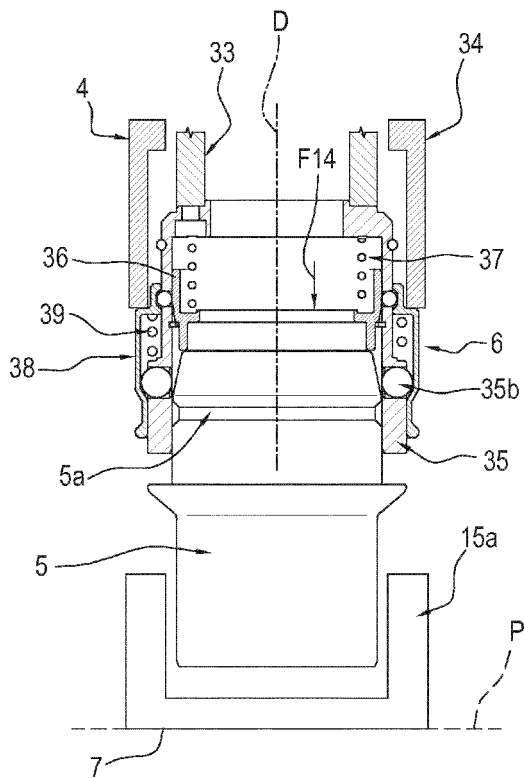


FIG. 14

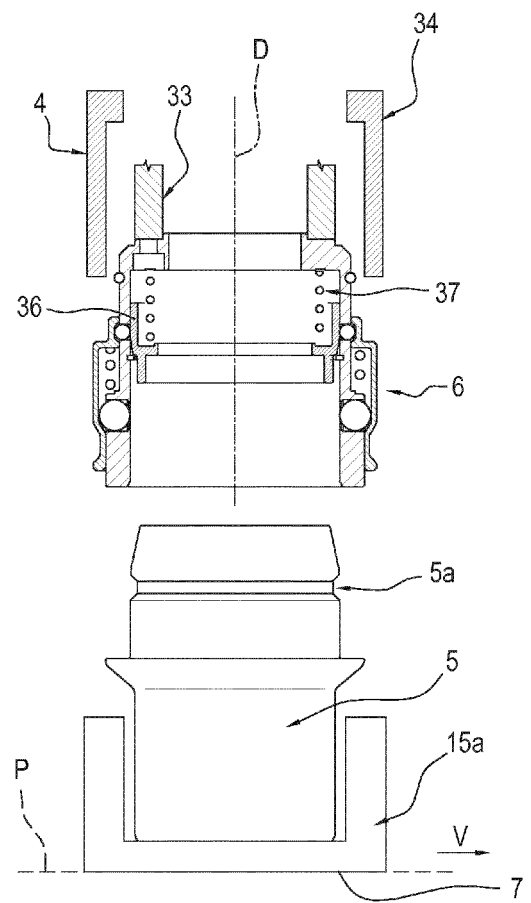


FIG. 14a

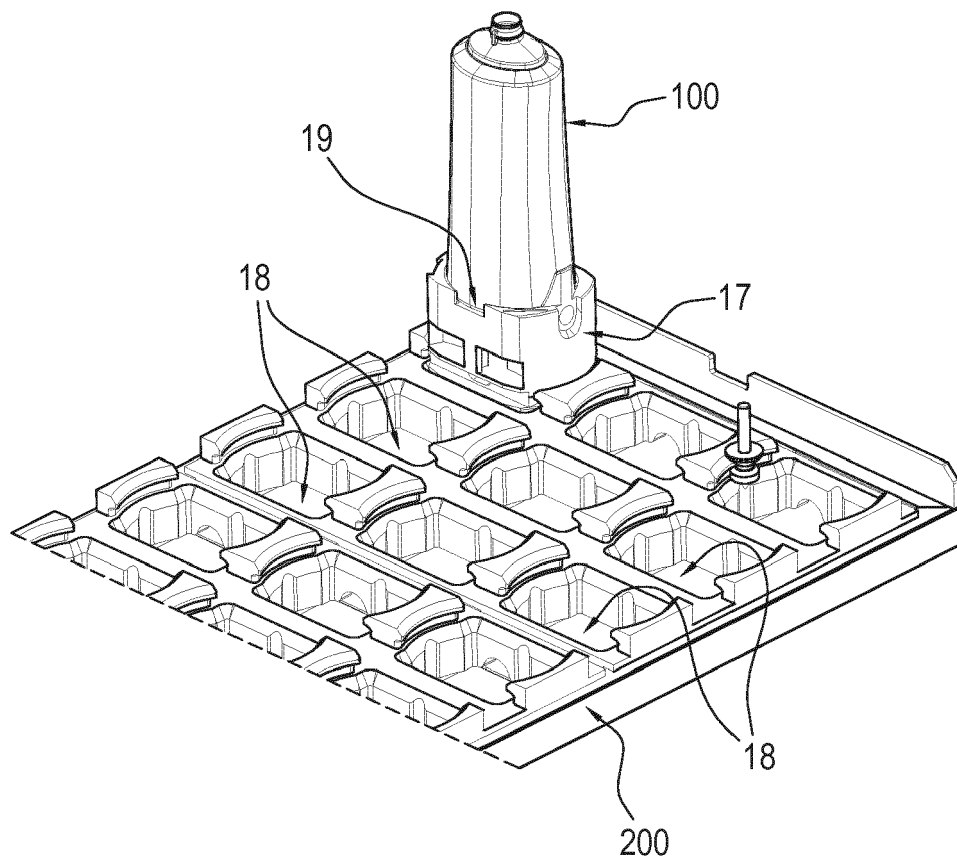


FIG. 15

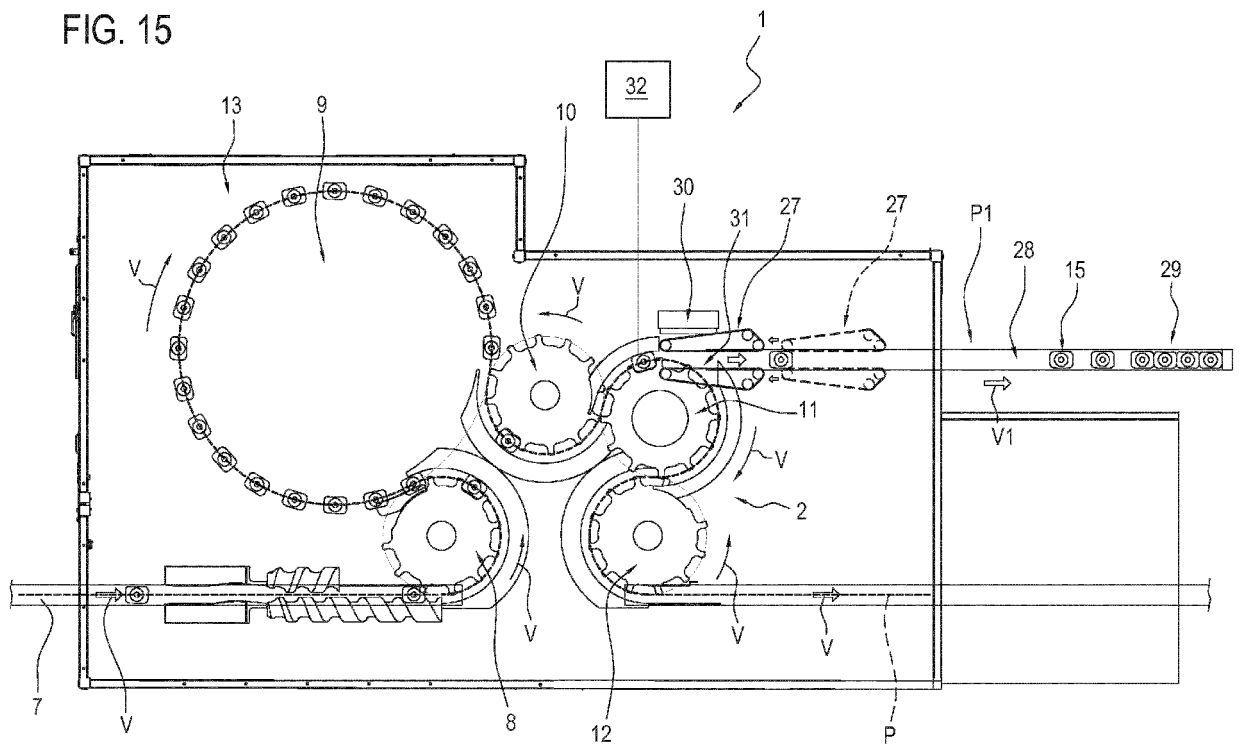


FIG. 16

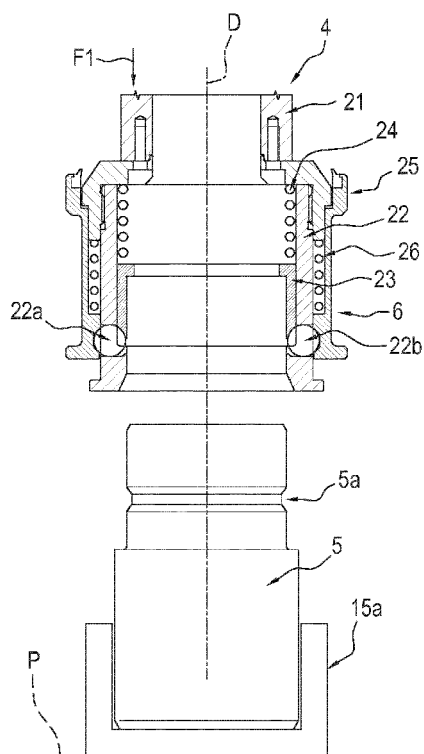


FIG. 17

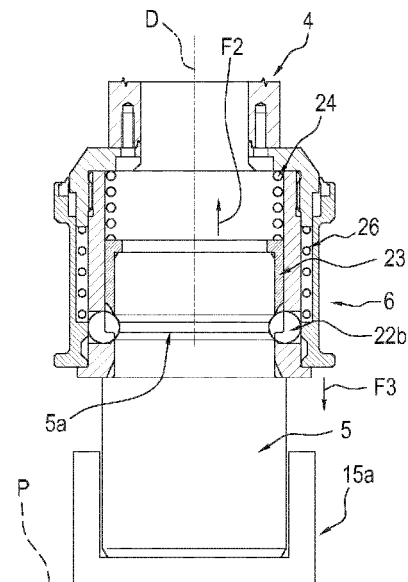
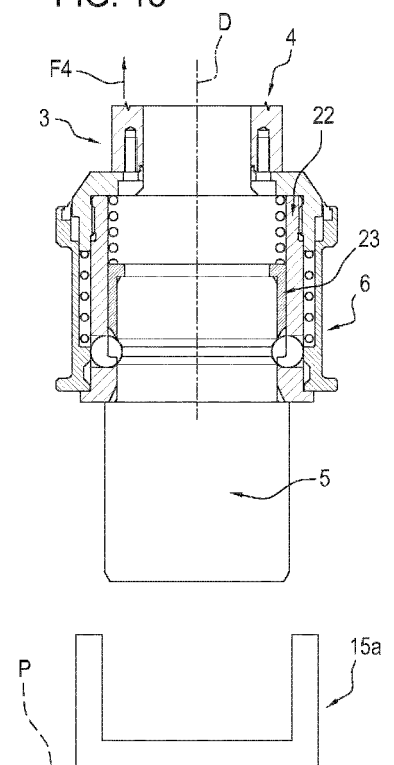
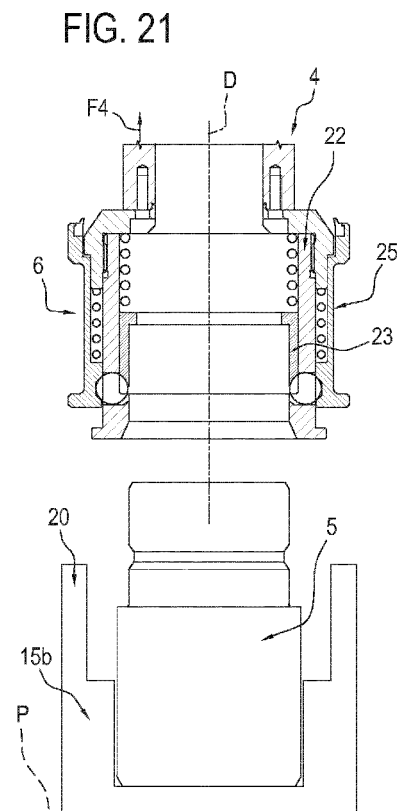
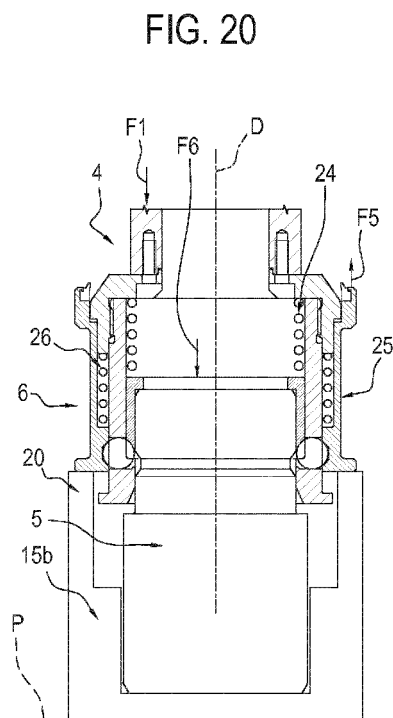
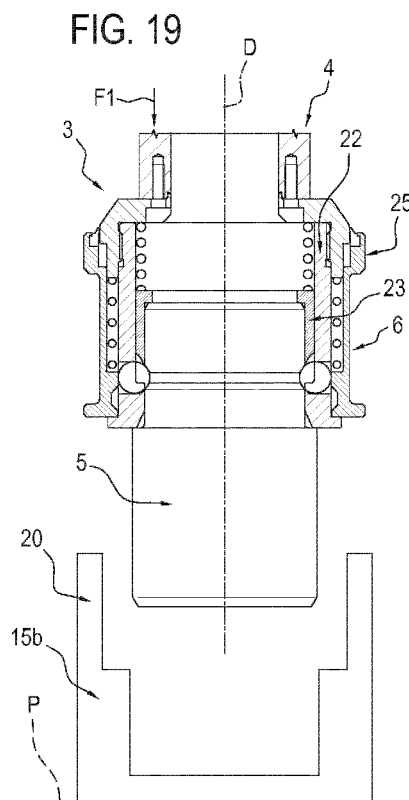


FIG. 18







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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                    |                                                                                                                                                                           |                                                                                                                                                                                                                                                                                       |                                                 |
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| The present search report has been drawn up for all claims                                                                                                                                                                                             |                                                                                                                                                                           |                                                                                                                                                                                                                                                                                       |                                                 |
| Place of search<br>The Hague                                                                                                                                                                                                                           |                                                                                                                                                                           | Date of completion of the search<br>12 April 2016                                                                                                                                                                                                                                     | Examiner<br>Pardo Torre, Ignacio                |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document |                                                                                                                                                                           | T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>.....<br>& : member of the same patent family, corresponding document |                                                 |



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|                                                                                                                                                                                                                                                        |                                                                                                                                          |                                                                                                                                                                                                                                                                                       |                                         |
| The present search report has been drawn up for all claims                                                                                                                                                                                             |                                                                                                                                          |                                                                                                                                                                                                                                                                                       |                                         |
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