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(71) Applicant: CAFFITALY SYSTEM S.P.A. [IT/IT]; Via
Panigali 38, I-40041 Gaggio Montano (Bologna) (IT).

(72) Inventor: CASIDDU, Franco; Caffitaly System S.p.A.,
Via Panigali 38, I-40041 Gaggio Montano (Bologna) (IT).

(74) Agent: PONCHIROLI, Simone; Ruffini Ponchiroli e As-
sociati S.r.l., Via Caprera 6, I-37126 Verona (IT).

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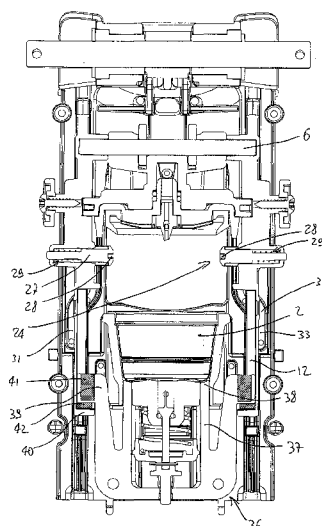


FIG. 15

(57) Abstract: A horizontal unit for making beverages using capsules (2) comprises a first part (4) and a second part (6), which are mobile between an operating position in which they form a chamber (8) for the capsule (2), and a capsule (2) insertion position in which they allow the capsule (2) to be positioned between them. The unit (1) also comprises ejection means (36) for ejecting the capsule (2) from the housing (5) when the first part (4) and the second part (6) are moved from the operating position to the insertion position, the ejection means being separate from the retaining means (24) and comprising at least one actuator element (40) fixed to the second part (6) and at least one pusher (37) slidably associated with the first part (4) and mobile between a first position in which it allows the insertion of a capsule (2) in the housing (5) and a second position in which it prevents the insertion of a capsule (2) in the housing (5). During the movement of the first part (4) and/or the second part (6) from the operating position to the insertion position the actuator element (40) moves the pusher (37) from the first position to the second position, whilst during the initial movement from the insertion position to the operating position the actuator element (40) moves the pusher (37) from the second position to the first position.

HORIZONTAL UNIT FOR MAKING BEVERAGES USING CAPSULES CONTAINING POWDERED FOOD SUBSTANCES

* * *

DESCRIPTION

5 This invention relates to a horizontal unit for making beverages using capsules containing powdered food substances.

In particular, the units with a horizontal axis for which this invention is preferably intended, are devices which use water to extract the powdered substance and which comprise a first part and a second part, at least one of
10 which is mobile relative to the other along a horizontal line, between an operating position in which the two parts are coupled and between them form an extraction chamber in which the capsule can be retained, and a capsule insertion position in which they are distanced and allow a capsule to be inserted in the unit. In fact, in the insertion position, the capsule can be
15 inserted using gravity from above until it reaches retaining means constituted of two converging lateral elements, which can then be spread apart during the unit closing step, to release the capsule in the housing.

Associated with the two mobile parts there are water injection means and beverage collection means operatively associated with the chamber for,
20 respectively, sending water into the capsule contained in the chamber and collecting a beverage coming out of the capsule (if necessary, piercing the lid and/or the bottom of the capsule).

Ejection means for ejecting the capsule are usually associated with the extraction chamber. Said ejection means expel the capsule when the unit is
25 opened after an extraction, and the first part and the second part move from the operating position to the insertion position.

According to a first embodiment currently used, the ejection means comprise an elastically operated pusher positioned at the extraction chamber. It is usually an annular portion operated by a helical spring which is compressed
30 by the capsule during unit closing, and which extends during unit opening.

In contrast, according to a second embodiment currently used, the ejection means are constituted of the retaining means which during the unit opening step hook onto the upper flange of the capsule to remove the capsule from the extraction chamber. Obviously, in order to make it possible for the
5 ejection means to hook onto the flange, part of the flange must project laterally relative to the first part.

However, these prior art technologies have several disadvantages.

The first embodiment of ejection means described above is unable to guarantee ejection under all conditions. Since the ejection thrust is
10 guaranteed only by the spring, ejection may not occur every time that the force applied by the spring is insufficient to move the capsule (for example, if the capsule is jammed in the chamber).

This disadvantage is only partly resolved by the second prior art embodiment. Although, in this case the force applied is a force generated
15 directly by the mechanical movement system of the first part and/or the second part, if the capsule is jammed and the flange is not rigid enough it is possible that the flange may bend without the capsule coming out of the chamber.

Consequently, in both cases there is a real risk that the operator opening the
20 unit will not realise that the previous capsule has not be ejected, and may therefore insert a new capsule which, during the subsequent closing of the unit would cause further jamming of unit operation.

In this context, the technical purpose which forms the basis of this invention is to provide a horizontal unit for making beverages using capsules
25 containing powdered food substances which overcomes the above-mentioned disadvantages.

In particular, the technical purpose of this invention is to provide a horizontal unit for making beverages using capsules containing powdered food substances which always guarantees ejection of the capsule from the
30 extraction chamber after unit opening.

The technical purpose specified and the aims indicated are substantially achieved by a horizontal unit for making beverages using capsules containing powdered food substances as described in the appended claims.

Further features and the advantages of this invention are more apparent in
5 the detailed description below, with reference to several preferred, non-limiting embodiments of a horizontal unit for making beverages using capsules containing powdered food substances, illustrated in the accompanying drawings, in which:

- Figure 1 is an axonometric view of a horizontal unit made in accordance
10 with this invention, in a closed configuration;
- Figure 2 is a section of the unit of Figure 1 in a vertical axial plane;
- Figure 3 shows the unit of Figure 2 in an open configuration with a capsule inserted before supplying;
- Figure 4 is a section of the unit of Figure 3 according to the line IV - IV of
15 Figure 9;
- Figure 5 shows the unit of Figure 3 in a subsequent intermediate configuration during closing;
- Figure 6 is a section of the unit of Figure 5 according to the line VI - VI of Figure 13;
- 20 - Figure 7 shows the unit of Figure 6 in a subsequent configuration towards the closed configuration;
- Figure 8 is a top view of a lower shell of the unit of Figure 1;
- Figure 9 is a section of the unit of Figure 3 in a horizontal axial plane;
- Figures 10 to 14 show various sequential steps of the passage of the unit
25 of Figure 9 from the open configuration to the closed configuration: in particular, Figures 12 and 13 correspond to the configurations respectively of Figures 6 and 7, whilst Figure 14 shows the unit in the closed configuration; and
- Figure 15 shows an intermediate configuration of the unit during the
30 passage from the closed configuration to the open configuration.

With reference to the accompanying drawings, the numeral 1 denotes in its entirety a horizontal unit for making beverages using capsules 2 containing powdered food substances according to this invention.

The horizontal unit 1 in general comprises a supporting structure 3. Mounted
5 on the structure are at least a first part 4 forming a housing 5 for receiving a capsule 2 containing a powdered food substance to be extracted, and a second part 6 mounted on the supporting structure 3 and shaped like an element for closing the housing 5. It should be noticed that in the preferred embodiment the housing 5 is sized in such a way that it can almost
10 completely receive the capsule 2. In fact, only a radial annular flange 7 of the capsule 2 remains outside the housing 5 (Figures 2 and 14).

At least one out of the first part 4 and the second part 6 is mobile relative to the other between an operating position (Figures 2 and 14) and an insertion position (Figures 3 and 9). In the operating position the two parts 4, 6 are
15 coupled and, at the housing 5, between them form an extraction chamber 8 in which the capsule 2 can be retained. In the position for insertion of the capsule 2, the two parts 4, 6 are distanced and allow the capsule 2 to be positioned between them. The two parts 4, 6 are mobile relative to one another substantially along an axial line parallel with a central axis of the
20 housing 5 which, in use, corresponds to a central axis of the capsule 2. Moreover, in use, the axial line is positioned substantially horizontally.

In the preferred embodiment illustrated in the accompanying drawings, in particular, the first part 4 is fixed relative to the supporting structure 3, whilst the second part 6 moves relative to the supporting structure 3 and relative to
25 the first part 4. In more detail, the supporting structure 3 comprises an upper shell 9 and a lower shell 10 which are coupled to one another and between them form a guide slit 11 parallel with the axial line, and to which the mobile second part 6 is slidably coupled (by elongate arms 12 parallel with the slit 11 and described in more detail below).

30 The unit 1 also comprises water injection means 13 and beverage collection

- means 14 operatively associated with the chamber 8 for, respectively, in use sending water into the capsule 2 contained in the chamber 8 and collecting a beverage coming out of the capsule 2. The water injection means 13 and the beverage collection means 14 are advantageously associated one set with
- 5 the first part 4 and the other set with the second part 6, and, depending on requirements, they may comprise piercing means 15 for the lid and/or perforating means 16 for the bottom of the capsule 2 (both in the embodiment illustrated). However, the particular structure of the perforating means 16 in the embodiment illustrated is described in more detail below.
- 10 In general, the unit 1 according to this invention comprises movement means 17 for reciprocal movement of the two parts 4, 6 mounted between the supporting structure 3 and at least the mobile part out of the first part 4 and the second part 6 (the second part 6 in the embodiment illustrated).
- Advantageously, the reciprocal movement means 17 comprise a movement
- 15 shaft 18 rotatably connected to the supporting structure 3, which is positioned perpendicularly to the axial line and which, in use, is positioned substantially horizontal, as well as a crank 19 comprising an inner end fitted on the shaft 18 and an outer end 20, and a connecting rod 21 comprising a rear end 22 rotatably connected to the outer end 20 of the crank and a front
- 20 end 23 rotatably connected to the mobile part out of the first part 4 and the second part 6 (therefore to the second part 6 in the embodiment illustrated). Depending on requirements, the movement means 17 may be manually operated (using a lever fixed to the movement shaft 18) or motor-driven (by a motor, also coupled to the movement shaft 18).
- 25 Since it is a horizontal unit 1, in the insertion position the first part 4 and the second part 6 are distanced along the axial line and the unit 1 comprises retaining means 24 for retaining a capsule 2 at a retaining zone which is interposed between the first part 4 and the second part 6 when said parts are in the insertion position. In fact, the capsule 2 can be inserted in the unit
- 30 1 from above, for example through an opening 25 made in the upper shell 9

(an opening 25 which can be selectively closed by a mobile panel 26 fixed to the mobile part, when the first part 4 and the second part 6 are in the operating position).

The retaining means 24 in general, and in the known way, are switchable
5 between a first configuration in which they can retain a capsule 2 (which can reach them thanks to the effect of gravity), and a second configuration in which they cannot retain a capsule 2.

Advantageously, the retaining means 24 comprise two opposite guide
10 elements 27, each forming a seat 28 facing towards the seat 28 of the other guide element 27, and designed to house a portion of the capsule 2. In the preferred embodiment each seat 28 is constituted of a channel extending mainly vertically, the lower part of it converging towards the other seat 28, and in which the radial annular flange 7 of the capsule 2 can be inserted (Figure 4).

15 In the preferred embodiment the guide elements 27 are mobile between the first configuration and the second configuration, and vice versa, by means of a movement respectively away from and towards one another (at least partly) in a divarication plane substantially orthogonal to the axial line (and therefore, in use, vertical).

20 In the second configuration, the guide elements 27 are also at least partly further apart than when they are in the first configuration.

Moreover, in the embodiment illustrated, the retaining means 24 move with the second part 6, for inserting the capsule 2 in the housing 5 and subsequently leaving it free before the first part 4 and the second part 6
25 reach the operating position. In fact, during the movement of the first part 4 and/or of the second part 6 from the insertion position to the operating position, the retaining means 24 advantageously remain in the first configuration at least until the capsule 2 is at least mainly inserted in the housing 5, after which they pass to the second configuration.

30 According to a preferred embodiment illustrated in the accompanying

drawings, each guide element 27 is slidably associated with the second part 6 along a divarication line which lies in the divarication plane and which, in use, is substantially horizontal, and the retaining means 24 also comprise first elastic means 29 mounted between each guide element 27 and the
5 second part 6 for pushing the guide element 27 towards the first configuration.

Furthermore, each guide element 27 comprises at least one follower foot 30 (advantageously two, one upper and one lower) slidably coupled to a sliding track 31 which is in turn fixed relative to the first part 4 (and which is
10 therefore stationary in the embodiment illustrated). The movement of the first part 4 and/or of the second part 6 between the operating position and the insertion position causes the relative sliding of the follower foot 30 and the sliding track 31. The sliding track 31 is also cam-shaped to cause the passage of the related guide element 27 from the first configuration to the
15 second configuration and vice versa respectively after the movement of the first part 4 and/or the second part 6 from the insertion position to the operating position and vice versa. As shown in Figure 8 (illustrating only the lower shell 10) each sliding track 31 advantageously comprises a distal stretch 32 (further from the first part 4) and a proximal stretch 33 (closer to
20 the first part 4) which extend parallel with the axial line and are connected by an angled stretch 34. The distal stretches 32 of each sliding track 31 are also closer to one another than the proximal stretches 33 are. Consequently, when the follower feet 30 are in the distal stretches 32 the guide elements 27 are in the first configuration, whilst when the follower feet 30 are in the
25 proximal stretches 33 the guide elements 27 are in the respective second configurations.

Moreover, advantageously, the sliding track 31 is substantially shaped to match the follower foot 30, so as to guide it in the best possible way. However, in the embodiment illustrated in which the first elastic means 29
30 push the guide elements 27 towards the first configuration (and therefore

towards the axial line), each sliding track 31 may advantageously comprise an enlargement 35 at its end located on the distal stretch 32 (where the follower foot 30 is positioned when the first part 4 and the second part 6 are in the insertion position). In fact, thanks to this measure, at the retaining
5 zone the two guide elements 27 can be manually spread apart to unload the capsule 2 from the unit 1 without having to close and re-open the unit 1 (it may be sufficient to press on the capsule 2 from above to spread apart the guide elements 27).

It should be noticed that what is described above relative to the retaining
10 means 24 and their movement by means of the sliding tracks 31 may also have applications independent of the other technical aspects described in this patent application. Therefore, it could form the subject matter of a specific divisional patent application relating only to those aspects.

According to this invention the horizontal unit 1 also comprises ejection
15 means 36 for ejecting the capsule 2 from the housing 5, which act when the first part 4 and the second part 6 move from the operating position to the insertion position, and which are separate from the retaining means 24.

According to the innovative aspect of this invention, the ejection means 36
comprise at least one pusher 37 slidably associated with the first part 4 and
20 equipped with a head 38 positioned at the chamber 8 and an actuator portion 39 positioned outside the chamber 8 (and advantageously outside the first part 4). The pusher 37 is mobile between a first position in which the head 38 allows the insertion of a capsule 2 in the housing 5 and a second position in which the head 38 prevents the insertion of a capsule 2 in the
25 housing 5. During the passage from the first position to the second position the head 38 in use causes the capsule 2 to be ejected from the housing 5, since when it is in the first position it occupies a space inside the housing 5 where the capsule 2 is located with the chamber 8 closed and advantageously keeps the centre of gravity of the capsule 2 outside the
30 housing 5.

The movement of the pusher 37 is guaranteed by at least one actuator element 40 which is fixed to the second part 6 and can be coupled to the actuator portion 39 at least during part of the movement of the first part 4 and/or the second part 6 from the operating position to the insertion position.

- 5 In fact, according to this invention, during the movement of the first part 4 and/or the second part 6 from the operating position to the insertion position, the actuator element 40 moves the pusher 37 from the first position to the second position to eject the capsule 2 contained in the chamber 8.

- 10 In the preferred embodiment, the movement of the first part 4 and/or the second part 6 from the operating position to the insertion position occurs along a trajectory comprising a first stretch extending from the operating position to a first intermediate position and along a second stretch extending from the intermediate position to the insertion position. During that movement the actuator element 40 in the first stretch is uncoupled from the
15 actuator portion 39 and moves relative to the actuator portion 39, in the intermediate position it couples to the actuator portion 39 of the pusher 37 positioned in the first position, and in the second stretch it moves the pusher 37 from the first position to the second position. Preferably, in the second stretch the actuator element 40 rests against the actuator portion 39 and
20 pushes it towards its second position.

- The movement of the first part 4 and/or the second part 6 from the insertion position to the operating position advantageously takes place along an opposite trajectory to the movement from the operating position to the insertion position, instead initially travelling along the second stretch and
25 then the first stretch. In the preferred embodiment, to facilitate insertion of the capsule 2 in the housing 5, during that movement the actuator element 40 in the second stretch is advantageously coupled to the actuator portion 39 and moves the pusher 37 from the second position to the first position, whilst in the subsequent first stretch it is uncoupled from the actuator portion
30 39 and moves relative to the actuator portion 39.

For that purpose, in the preferred embodiment the actuator element 40 and the actuator portion 39 comprise one a magnet 41 and the other a ferromagnetic element 42, which are positioned in such a way that the magnet 41 can retain the ferromagnetic element 42 when the actuator element 40 is in contact with the pusher 37. In this way, during the movement from the insertion position to the operating position along the second stretch, the actuator element 40 pulls the pusher 37 thanks to the magnetic attraction applied by the magnet 41 to the ferromagnetic element 42. In contrast, that pulling stops in the first stretch, since at the intermediate position the actuator portion 39 reaches its end of stroke and the subsequent movement relative to the actuator element 40 causes uncoupling of the magnet 41 from the ferromagnetic element 42 (Figure 10).

In the preferred embodiment, the second part 6 comprises at least one elongate arm 12 elongate along a line substantially parallel with the axial line, extending at least partly alongside the first part 4 and comprising a free end which can be coupled to the coupling portion and which constitutes the actuator element 40. In particular, the free end extends perpendicularly relative to the rest of the arm adjacent to it, and towards the central axis.

However, advantageously, the horizontal unit 1 comprises at least two actuator elements 40 fixed to the second part 6, which are positioned at two opposite sides of the second part 6, each couplable to a different part of the actuator portion 39. In the embodiment illustrated, in particular, the second part 6 comprises two elongate arms 12 elongate along the line substantially parallel with the axial line and extending at least partly at two opposite sides of the first part 4 at least when the first part 4 and the second part 6 are in the operating position (in the accompanying drawings they partly always are), and which each comprise a free end couplable to the coupling portion and which constitutes the respective actuator element 40. Moreover, in the case illustrated, the two arms are substantially specular and the guide elements 27 are slidably mounted along the divarication line, one on each

elongate arm 12.

In the preferred embodiment, the pusher 37 comprises at least two heads 38 which are positioned at the chamber 8 (advantageously in a position such that they act against the bottom of the capsule 2) and connected to the
5 actuator portion 39 which in turn extends mainly transversally to the central axis (in the horizontal plane). In fact, as can be seen in Figure 15, the actuator portion 39 extends in the horizontal plane in a C shape and with the ends of the C projecting outwards relative to the central axis and connectable to the actuator elements 40.

10 As can be seen in Figure 9, the second part 6 comprises a main body 43 which in the operating position closes the housing 5 and on which the injection means are at least partly mounted. The main body 43 is rotatably connected both to the front end 23 of the connecting rod 21 of the reciprocal movement means 17 and to the two elongate arms 12. The correct
15 orientation of the main body 43 relative to the line of movement is guaranteed by its additional connection to the mobile panel 26 which is in turn slidably guided on the upper shell.

Regarding the beverage collection means 14 and the perforating means 16 for perforating the bottom of the capsule 2 which are part of them, in general
20 they may have any shape and structure suited to the purpose. However, in the embodiment illustrated in the accompanying drawings, they have a structure which allows movement of the perforating means 16 relative to the capsule 2 and to the housing 5.

In particular, they comprise at least one perforating element 44 mobile
25 between an active position in which in use it can interfere with a capsule 2 inserted in the housing 5 to perforate it (Figure 5), and an inactive position in which it is retracted relative to the active position and in which, in use, it is distanced from the bottom of a capsule 2 inserted in the chamber 8 (Figure 2). Preferably, the perforating element 44 comprises at least one blade 45
30 extending in a plane parallel with the central axis and which is therefore able

to make a linear cut in the bottom of the capsule 2. Advantageously, the perforating element 44 is mobile parallel with the central axis.

Furthermore, the beverage collection means 14 comprise hooking means 46 operatively associated with the first part 4, which are switchable between a hooking configuration and an unhooking configuration. When they are in the hooking configuration, the hooking means 46 retain the perforating element 44 in the active position, whilst when they are in the unhooking configuration they allow movement of the perforating element 44 from the active position towards the inactive position.

As shown in Figures 3 and 9, when the first part 4 and the second part 6 are in the insertion position, the perforating means 16 are in the active position and the hooking means 46 are in the hooking configuration, whilst, as shown in Figures 2, 7 and 14, when the first part 4 and the second part 6 are in the operating position, the perforating means 16 are in the inactive position and the hooking means 46 are preferably in the unhooking configuration (although they could even be in the hooking configuration).

Second elastic means 47 operatively act on the perforating element 44 to push it towards the inactive position. The second elastic means 47 are advantageously constituted of a helical spring positioned between the first part 4 and a base portion 48 of the perforating element 44 which is outside the first part 4. The blade 45 is fixed to the base portion 48 and is inserted slidably and in a sealed fashion in a through hole which communicates with the drainage channel 49 for the beverage coming out of the capsule 2.

Advantageously, during the movement of the first part 4 and/or the second part 6 from the insertion position to the operating position, close to or at the operating position the second part 6 switches the hooking means 46 from the hooking configuration to the unhooking configuration, whilst, during the movement of the first part 4 and/or the second part 6 from the operating position to the insertion position, the second part 6 moves the perforating element 44 from the inactive position to the active position.

In the preferred embodiment, the hooking means 46 comprise at least one shaped body 50 which is elongate along a line transversal to the axial line and which comprises a central portion which in turn comprises at least one hooking tooth 51 and two ends 52. The hooking tooth 51 is couplable to the perforating element 44 positioned in the hooking configuration, for keeping it in that configuration (Figure 5). In contrast, the two ends 52 of the shaped body 50 are operatively connected to the second part 6. In particular, in the embodiment illustrated, the two ends 52 are slidably coupled to the second part 6 for sliding on it during the movement between the operating position and the insertion position (Figures 6 and 7). In particular, in the preferred embodiment, each end 52 of the shaped body 50 interacts with one of the elongate arms 12 of the second part 6, and it is the latter which move the shaped body 50 from the hooking position to the unhooking position.

In turn, the shaped body 50 is slidably associated with the first part 4 according to a sliding line substantially orthogonal both to the axial line and to the transversal line (advantageously it is, therefore, in use, a vertical line). The shaped body 50 can therefore be moved between a hooking position which corresponds to the hooking configuration of the hooking means 46 and an unhooking position which corresponds to the unhooking configuration of the hooking means 46.

In more detail, each end of the shaped body 50 is slidably associated with one of the elongate arms 12 (rests on it according to a resting line parallel with the sliding line), and the arms each comprise a resting face on which at least one raised zone 53 is made which rises according to a line parallel with the sliding line (in contrast, outside of the raised zone 53 the resting face has a uniform profile, in the same relative position, in every plane transversal to the axial line). The raised zones 53 in turn are all the same in terms of planes perpendicular to the axial line. In this way, as a whole the raised zones 53 are designed to cause the movement of the shaped body 50 from the hooking position to the unhooking position when they interact with the

ends 52 of the shaped body 50 (according to the methods indicated in more detail below).

Preferably, the shaped body 50 and/or the perforating element 44 comprise a shaped portion 54 substantially comprising a surface set at an angle to the line of movement of the perforating element 44 between the active position and the inactive position. During movement of the perforating element 44 from the inactive position to the active position, the perforating element 44 and the shaped body 50 interact at the shaped portion 54 to cause the passage of the shaped body 50 from the hooking position to the unhooking position.

Furthermore, the hooking means 46 comprise third elastic means 55 operatively acting on the shaped body 50 to push it towards the hooking position and to hold its ends 52 in contact with the elongate arms 12.

As is clearly shown in the accompanying drawings, in the preferred embodiment the hooking means 46 comprise two shaped bodies 50 mounted opposite one another along the sliding line and respectively close to and distanced from one another when they are both in the respective positions, respectively hooking and unhooking. The third elastic means 55 comprise two helical springs mounted between corresponding ends 52 of the shaped bodies 50 to pull them towards each other. Consequently, on one hand the shaped bodies 50 act one above and one below on the perforating element 44, and on the other hand their ends 52 are coupled one above and one below the respective elongate arm 12, which comprises two raised zones 53 which extend one downwards and one upwards (above, below, upwards and downwards are to be understood with reference to the position of the unit 1 in use).

Obviously, this invention also relates to a machine for making beverages by passing hot water through capsules 2 containing powdered food substances, which comprises a horizontal unit 1 of the type described above. Said machine may, in the known way, comprise means for feeding water to the

injection means, means for dispensing the beverage at the outfeed of the collection means, etc.

Operation of the unit 1 according to this invention derives from the description of the structure above.

- 5 When the first part 4 and the second part 6 are in the insertion position (Figures 3 and 9), the mobile panel 26 leaves free the opening 25 through the upper shell 9, and it is possible to insert a capsule 2 through it.

Thanks to gravity, the capsule 2 inserted in this way reaches the retaining means 24 which are positioned in the first configuration thanks to the
10 insertion of the follower feet 30 in the distal stretch 32 of the related sliding tracks 31 and the action of the first elastic means 29. The upper radial flange of the capsule 2 is inserted in the channels and the capsule 2 stops between the first part 4 and the second part 6 (Figure 4).

At that point the reciprocal movement means 17 are operated, moving the
15 first part 4 and the second part 6 into the operating position (Figures 2 and 14).

Thanks to the interaction of the magnets with the ferromagnetic elements (Figure 9), the movement of the first part 4 and/or of the second part 6 from the insertion position towards the operating position initially causes the
20 movement of the pusher 37 from the second position to the first position. However, when the intermediate position is reached, the actuator elements 40 are uncoupled from the actuator portion 39 which has reached the end of its stroke, and they continue their movement (Figures 10 and 11).

Moreover, during chamber 8 closing, the follower feet 30 slide along the
25 sliding tracks 31 until they reach the proximal stretches (Figure 12), therefore causing the guide elements 27 to move into the second configuration and the release of the capsule 2 in the housing 5.

Moreover, during unit 1 closing, the lid and/or the bottom of the capsule 2 may also be pierced (Figures 11 and 12). In particular, in the preferred
30 embodiment illustrated in the accompanying drawings, during capsule

insertion in the housing, the bottom of the capsule is pressed (by the retaining means and/or the second part) against the perforating element 44 which penetrates it and therefore creates the hole which allows the beverage to flow out. Once the bottom has been perforated, and just before reaching
5 the operating position, the ends 52 of the shaped body 50 are adjacent to the raised zones 53 of the arms (Figure 6). The subsequent relative movement between the second part 6 and the first part 4 lifts the ends 52 on the raised zones 53 (Figure 7) which therefore cause the shaped bodies 50 to be spread apart and in turn disengage from the perforating element 44
10 (Figure 13). The latter, at that point being free, is then pushed towards the inactive position by the second elastic means 47 (Figure 14), and disengages from the perforated bottom of the capsule 2 through which the beverage can then flow out.

Finally, when the capsule 2 substance extraction process has finished, the
15 reciprocal movement means 17 move the first part 4 and/or the second part 6 from the operating position to the insertion position. Consequently, the actuator elements 40 initially slide relative to the actuator portion 39, but in the intermediate position they engage with the actuator portion 39 (Figure 16) and from that moment onwards they push the pusher 37 from the first
20 position to the second position. The heads 38 of the pusher 37 therefore act on the bottom of the capsule 2, ejecting it from the housing 5.

This invention brings important advantages.

In fact, thanks to this invention it was possible to provide a horizontal unit for making beverages using capsules containing powdered food substances
25 which always guarantees ejection of the capsule from the extraction chamber after unit opening, since ejection is guaranteed by a mechanical pusher which is mechanically moved in such a way that it is synchronised with the openable part, either the first part or the second part. Consequently, if the capsule jams in the extraction chamber, the unit cannot be opened (at
30 least not fully) and the user can become aware of the problem and can

therefore take action.

Finally, it should be noticed that this invention is relatively easy to produce and that even the cost linked to implementing the invention is not very high.

The invention described above may be modified and adapted in several
5 ways without thereby departing from the scope of the inventive concept.

Moreover, all details of the invention may be substituted with other technically equivalent elements and the materials used, as well as the shapes and dimensions of the various components, may vary according to requirements.

10 **LEGEND**

- horizontal unit 1
- capsule 2
- supporting structure 3
- first part 4
- 15 housing 5
- second part 6
- annular flange 7
- extraction chamber 8
- upper shell 9
- 20 lower shell 10
- slit 11
- elongate arms 12
- water injection means 13
- beverage collection means 14
- 25 piercing means 15
- perforating means 16
- movement means 17
- movement shaft 18
- crank 19
- 30 outer end 20

- connecting rod 21
- rear end 22
- front end 23
- retaining means 24
- 5 opening 25
- panel 26
- guide elements 27
- seat 28
- first elastic means 29
- 10 follower foot 30
- sliding track 31
- distal stretch 32
- proximal stretch 33
- angled stretch 34
- 15 enlargement 35
- ejection means 36
- pusher 37
- head 38
- actuator portion 39
- 20 actuator element 40
- magnet 41
- ferromagnetic element 42
- main body 43
- perforating element 44
- 25 blade 45
- hooking means 46
- second elastic means 47
- base portion 48
- channel 49
- 30 shaped body 50

hooking tooth 51

end 52

raised zone 53

shaped portion 54

5 third elastic means 55

CLAIMS

1. A horizontal unit for making beverages using capsules (2) containing powdered food substances, comprising:
- a supporting structure (3);
 - 5 at least a first part (4) mounted on the supporting structure (3) and forming a housing (5) for receiving a capsule (2) containing a powdered food substance to be extracted;
 - a second part (6) mounted on the supporting structure (3) and shaped like an element for closing the housing (5),
 - 10 at least one out of the first part (4) and the second part (6) being mobile relative to the other between an operating position in which the two parts (4), (6) are coupled and, at the housing (5), between them form an extraction chamber (8) in which the capsule (2) can be retained, and a capsule (2) insertion position in which they are distanced and allow said capsule (2) to
 - 15 be positioned between them; the two parts (4), (6) being mobile relative to each other substantially along an axial line parallel with a central axis of said housing (5) and which in use is positioned substantially horizontally;
 - water injection means (13) and beverage collection means (14) operatively associated with the chamber (8) for, respectively, in use sending
 - 20 water into the capsule (2) contained in the chamber (8) and collecting a beverage coming out of the capsule (2);
 - movement means (17) for reciprocal movement of the two parts (4), (6) mounted between the supporting structure (3) and the mobile part out of the first part (4) and the second part (6);
 - 25 retaining means (24) for retaining a capsule (2) at a retaining zone interposed between the first part (4) and the second part (6) when the latter are positioned in the insertion position;
 - ejection means (36) for ejecting the capsule (2) from the housing (5) when the first part (4) and the second part (6) move from the operating
 - 30 position to the insertion position,

the ejection means (36) being separate from the retaining means (24) and comprising at least one pusher (37) slidably associated with the first part (4) and equipped with a head (38) positioned at the chamber (8) and an actuator portion (39) positioned outside the chamber (8), the pusher (37) being mobile between a first position in which the head (38) allows the insertion of a capsule (2) in the housing (5) and a second position in which the head (38) prevents the insertion of a capsule (2) in the housing (5); and at least one actuator element (40) fixed to the second part (6) and couplable to the actuator portion (39);

wherein:

during the movement of the first part (4) and/or the second part (6) from the operating position to the insertion position the actuator element (40) moves the pusher (37) from the first position to the second position to eject a capsule (2) contained in the chamber (8); the movement of the first part (4) and/or the second part (6) from the operating position to the insertion position takes place along a trajectory comprising a first stretch extending from the operating position to a first intermediate position and a second stretch extending from the intermediate position to the insertion position,

and during that movement the actuator element (40) in the first stretch is uncoupled from the actuator portion (39) and moves relative to the actuator portion (39), in the intermediate position it couples to the actuator portion (39) of the pusher (37) positioned in the first position, and in the second stretch it moves the pusher (37) from the first position to the second position; characterised in that the movement of the first part (4) and/or the second part (6) from the insertion position to the operating position takes place along an inverse trajectory compared with the movement from the operating position to the insertion position, and in that during the movement from the insertion position to the operating position the actuator element (40) in the second stretch is coupled to the actuator portion (39) and moves the pusher (37) from the second position to the first position, and in the subsequent first

stretch it is uncoupled from the actuator portion (39) and moves relative to the actuator portion (39).

2. The horizontal unit according to claim 1, characterised in that during the movement of the first part (4) and/or the second part (6) from the operating position to the insertion position in the second stretch the actuator element (40) pushes the actuator portion (39) towards the second position.

3. The horizontal unit according to claim 1, characterised in that the actuator element (40) and the actuator portion (39) comprise one a magnet (41) and the other a ferromagnetic element (42), and in that, during the movement from the insertion position to the operating position, along the second stretch the actuator element (40) pulls the pusher (37) thanks to the magnetic attraction applied by the magnet (41) to the ferromagnetic element (42).

4. The horizontal unit according to any one of the preceding claims, characterised in that the second part (6) comprises at least one elongate arm (12) elongate along a line substantially parallel with the axial line, extending alongside the first part (4) and comprising a free end which can be coupled to the coupling portion and which constitutes the actuator element (40).

5. The horizontal unit according to any one of the preceding claims, characterised in that the pusher (37) comprises at least two heads (38) positioned at the chamber (8) and connected to the actuator portion (39), in that the actuator portion (39) extends transversally to the central axis, in that it comprises at least two actuator elements (40) fixed to the second part (6) and positioned at two opposite sides of the second part (6), each couplable to a different part of the actuator portion (39).

6. The horizontal unit according to any one of the preceding claims, characterised in that the retaining means (24) are switchable between a first configuration in which they can retain a capsule (2) at them and a second configuration in which they cannot retain a capsule (2).

7. The horizontal unit according to claim 6, characterised in that the retaining means (24) comprise two opposite guide elements (27), each forming a seat (28) facing towards the seat (28) of the other guide element (27) and designed to house a portion of the capsule (2), the guide elements (27) being at least partly further apart in the second configuration than in the first configuration and being mobile between the first configuration and the second configuration and vice versa by means of a movement respectively away from and towards one another in a divarication plane substantially orthogonal to the axis line.
8. The horizontal unit according to claim 7, characterised in that each guide element (27) is slidably associated with the second part (6) along a divarication line, and in that the retaining means (24) comprise first elastic means (29) mounted between each guide element (27) and the second part (6) for pushing the guide element (27) towards the first configuration.
9. The horizontal unit according to claim 8, characterised in that each guide element (27) comprises at least one follower foot (30) slidably coupled to a sliding track (31) which is fixed relative to the first part (4), the movement of the first part (4) and/or of the second part (6) between the operating position and the insertion position causing the relative sliding of the follower foot (30) and the sliding track (31), the sliding track (31) being cam-shaped to cause the passage of the guide element (27) from the first configuration to the second configuration and vice versa respectively after the movement of the first part (4) and/or the second part (6) from the insertion position to the operating position and vice versa.
10. The horizontal unit according to claim 8 or 9, characterised in that the second part (6) comprises two elongate arms (12) elongate along a line substantially parallel with the axial line and extending at least partly at two opposite sides of the first part (4) at least when the first part (4) and the second part (6) are in the operating position, and in that the guide elements (27) are slidably mounted along the divarication line, one on each elongate

arm (12).

11. The horizontal unit according to any one of the preceding claims, characterised in that the first part (4) is fixed relative to the supporting structure (3), in that the second part (6) moves relative to the first part (4), in
5 that the retaining means (24) move with the second part (6), and in that during the movement of the first part (4) and/or of the second part (6) from the insertion position to the operating position, the retaining means (24) are initially in the first configuration and can retain a capsule (2) for its insertion in the housing (5), subsequently passing to the second configuration to leave
10 it free before the first part (4) and the second part (6) reach the operating position.

12. A machine for making beverages by passing hot water through capsules (2) containing powdered food substances, characterised in that it comprises a horizontal unit (1) according to any one of the preceding claims.

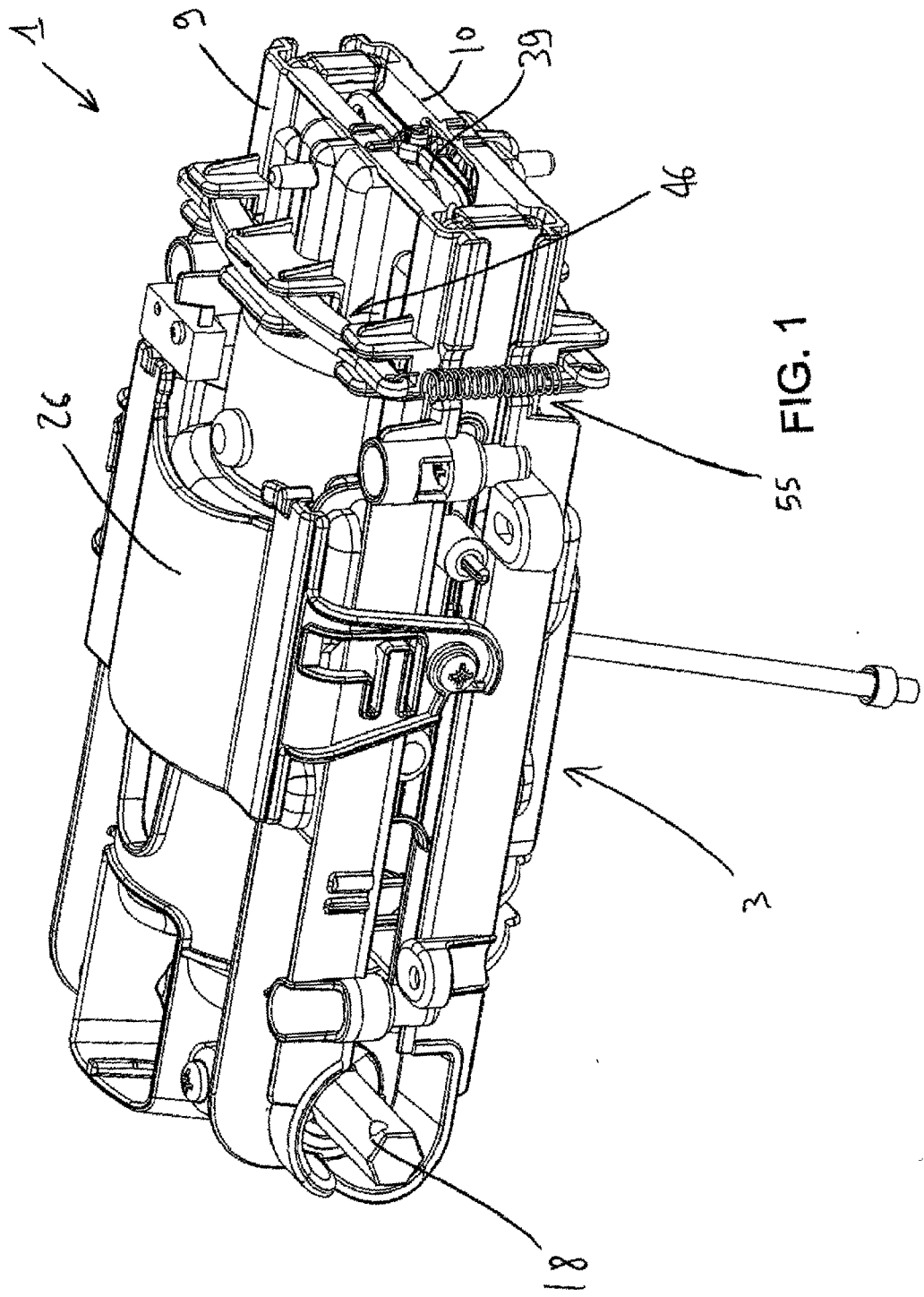
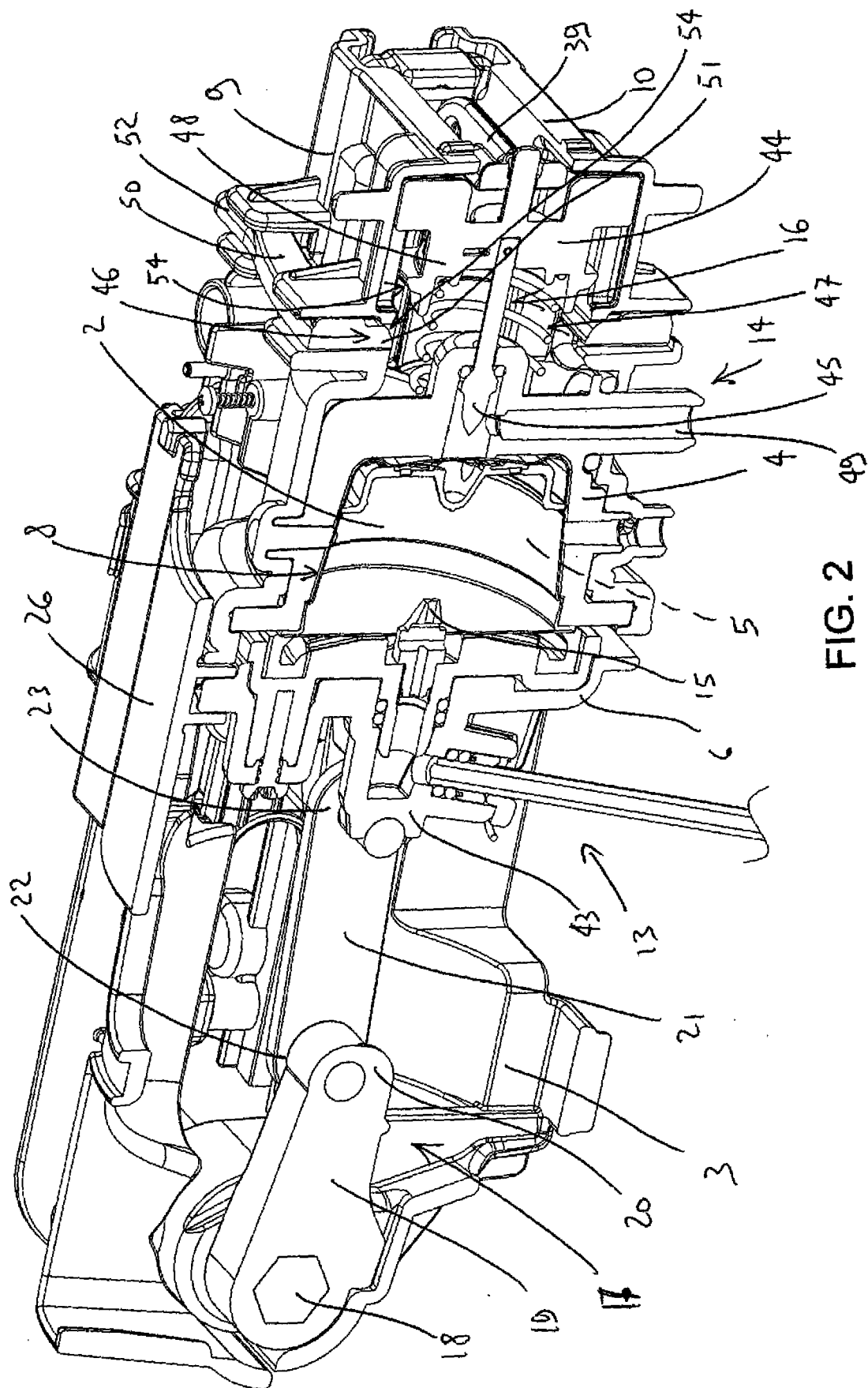


FIG. 1



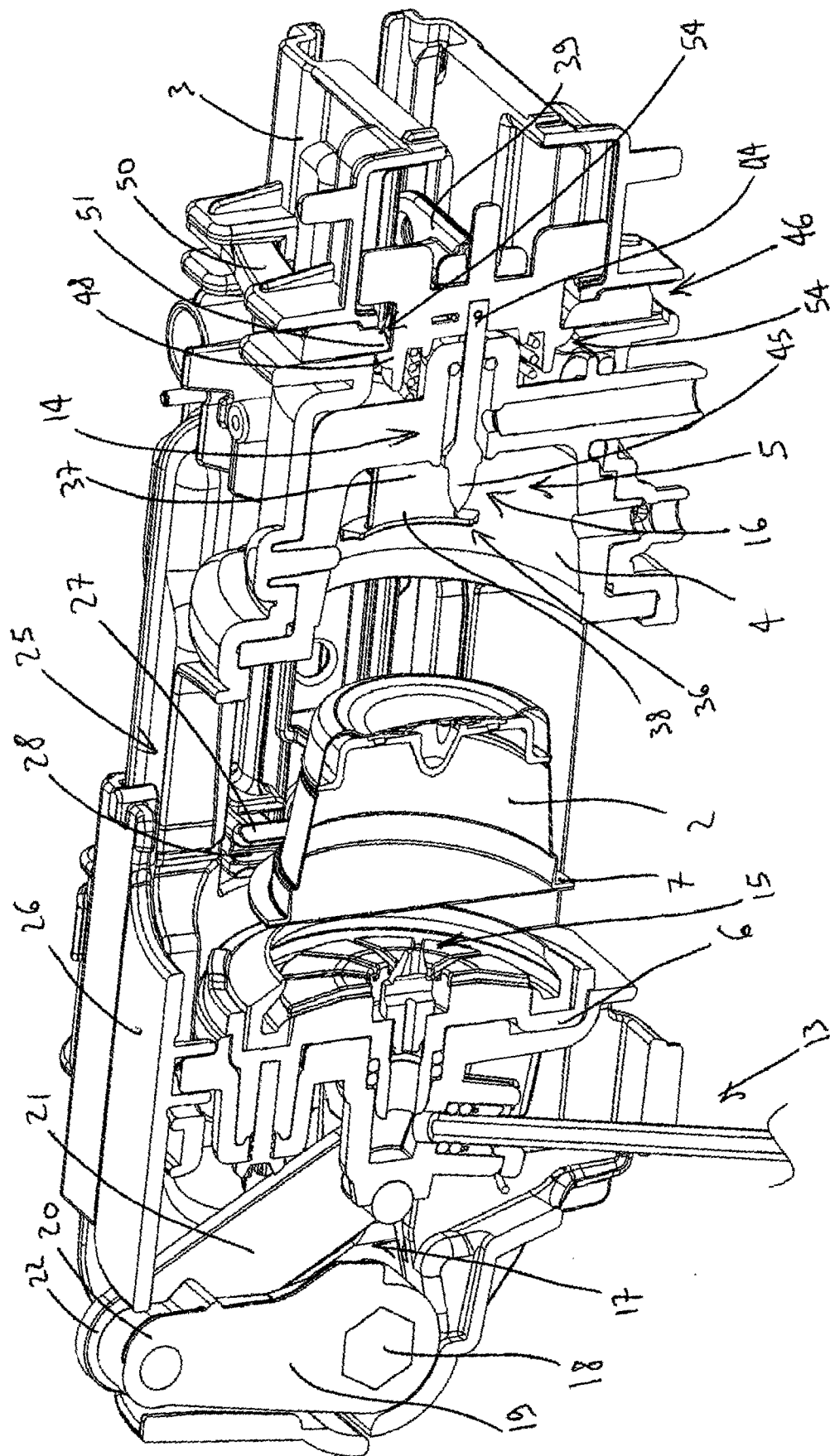


FIG. 3

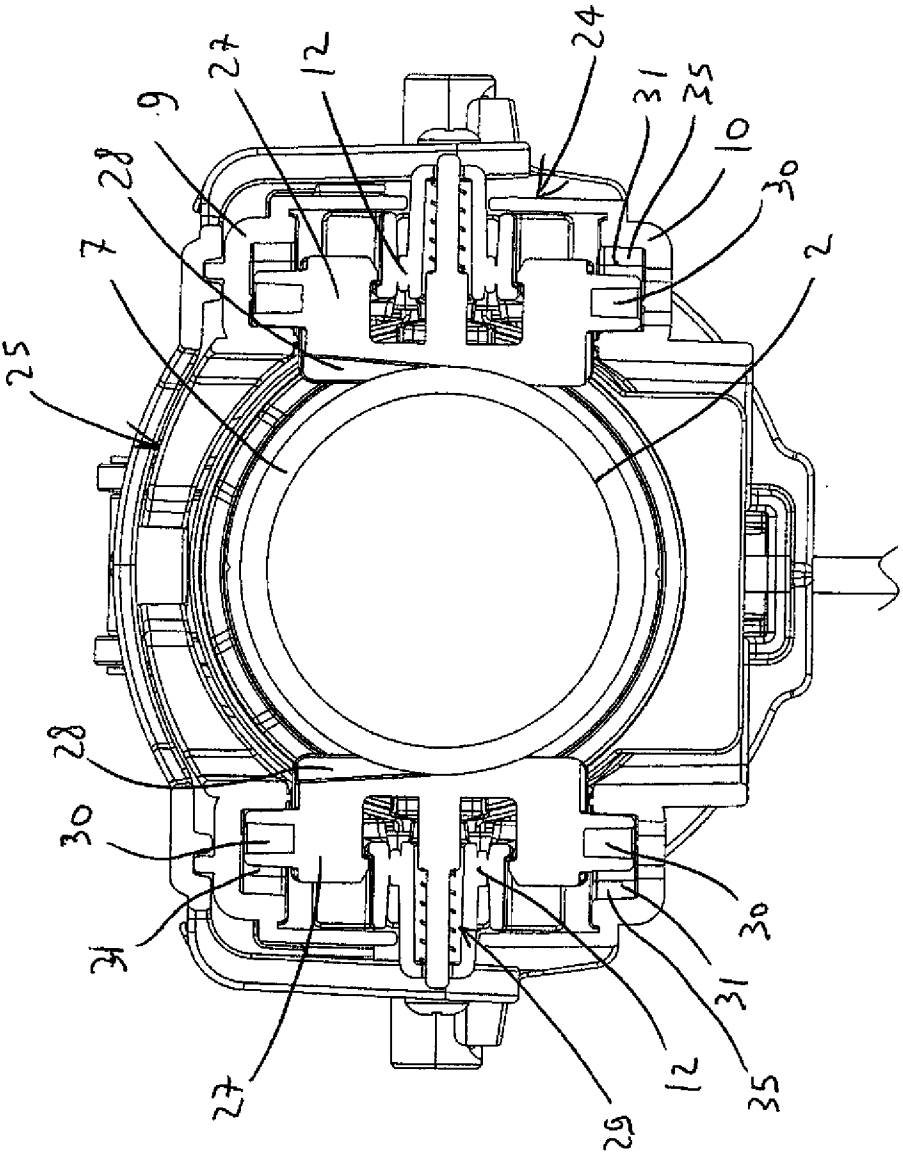


FIG. 4

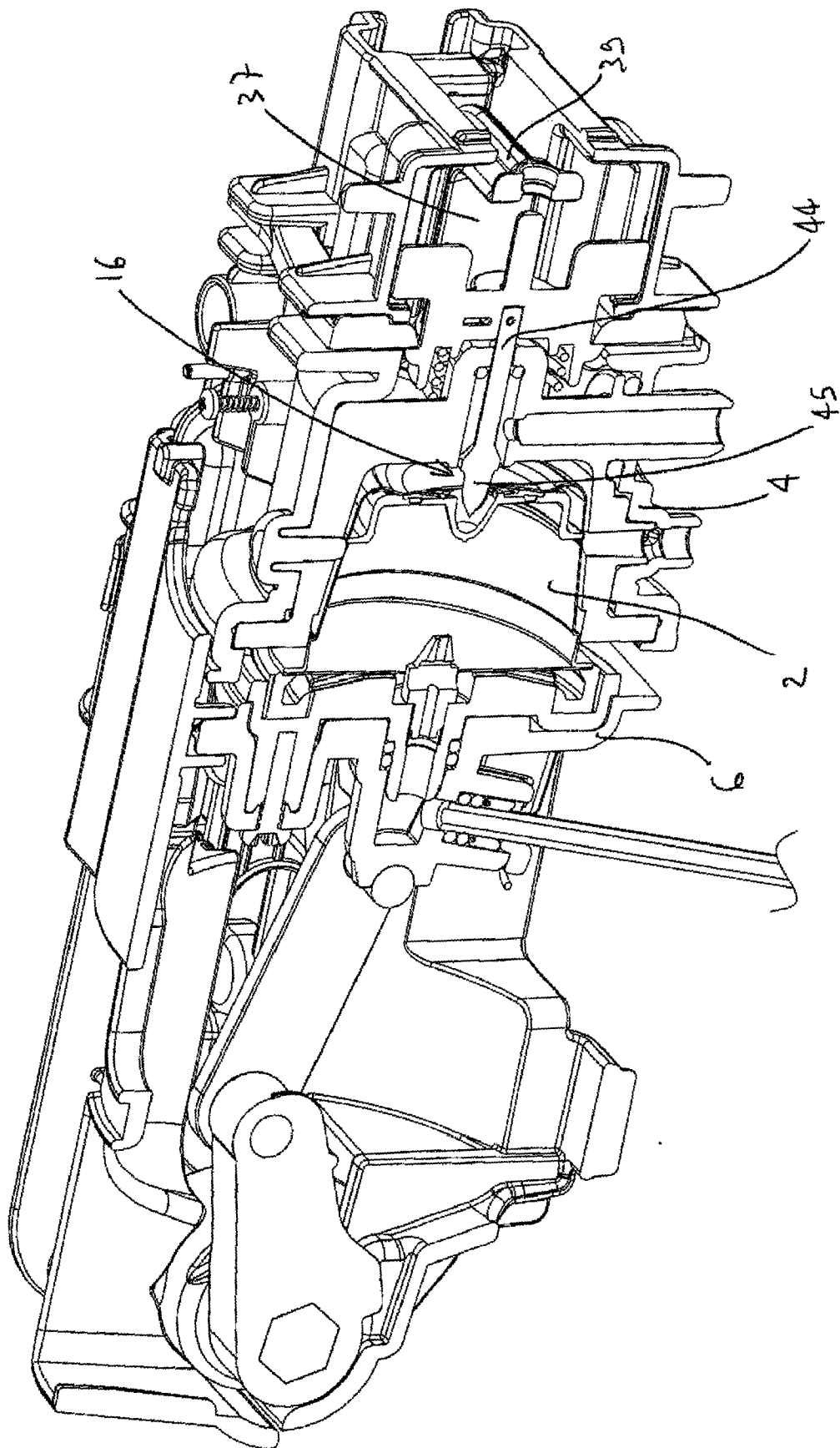
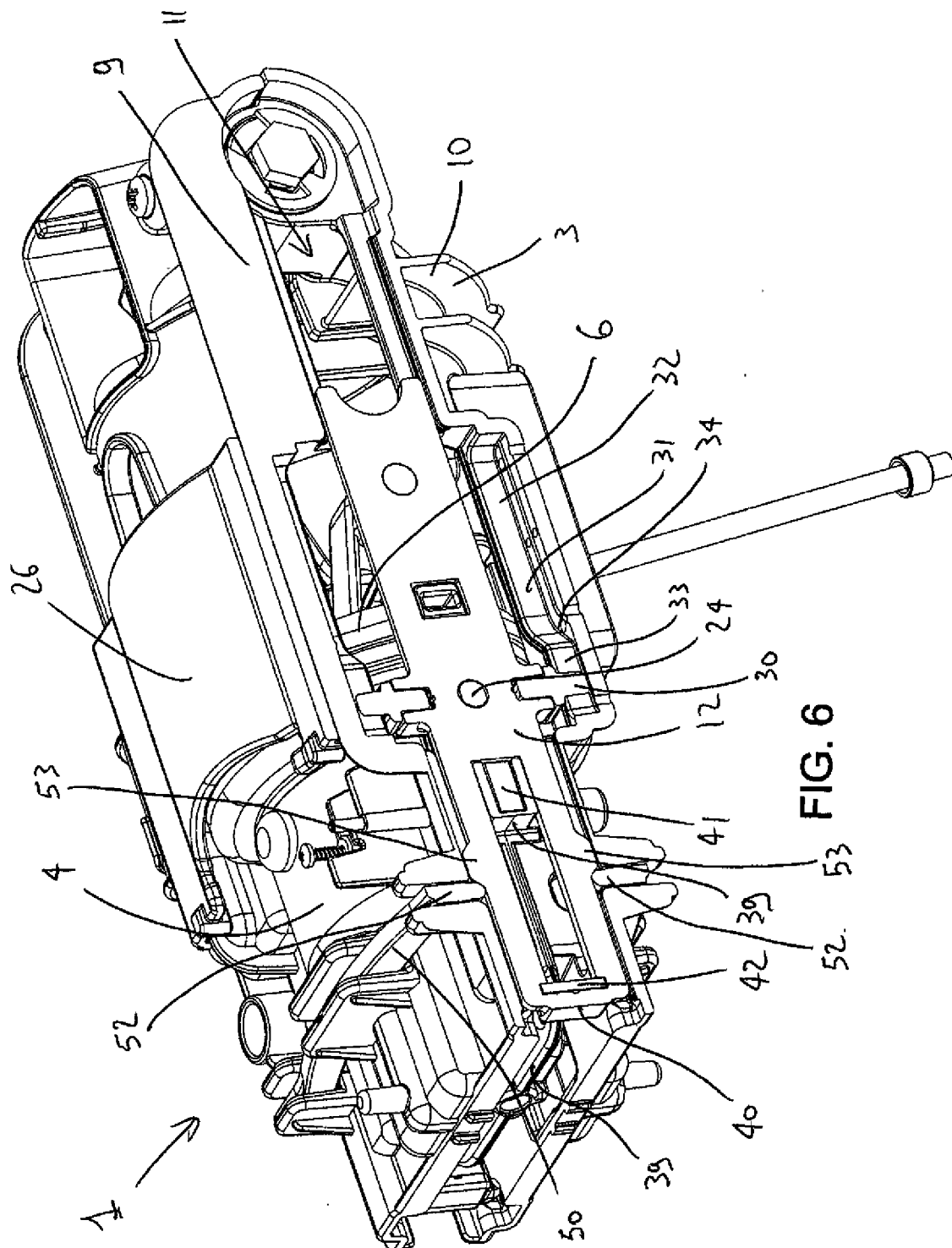
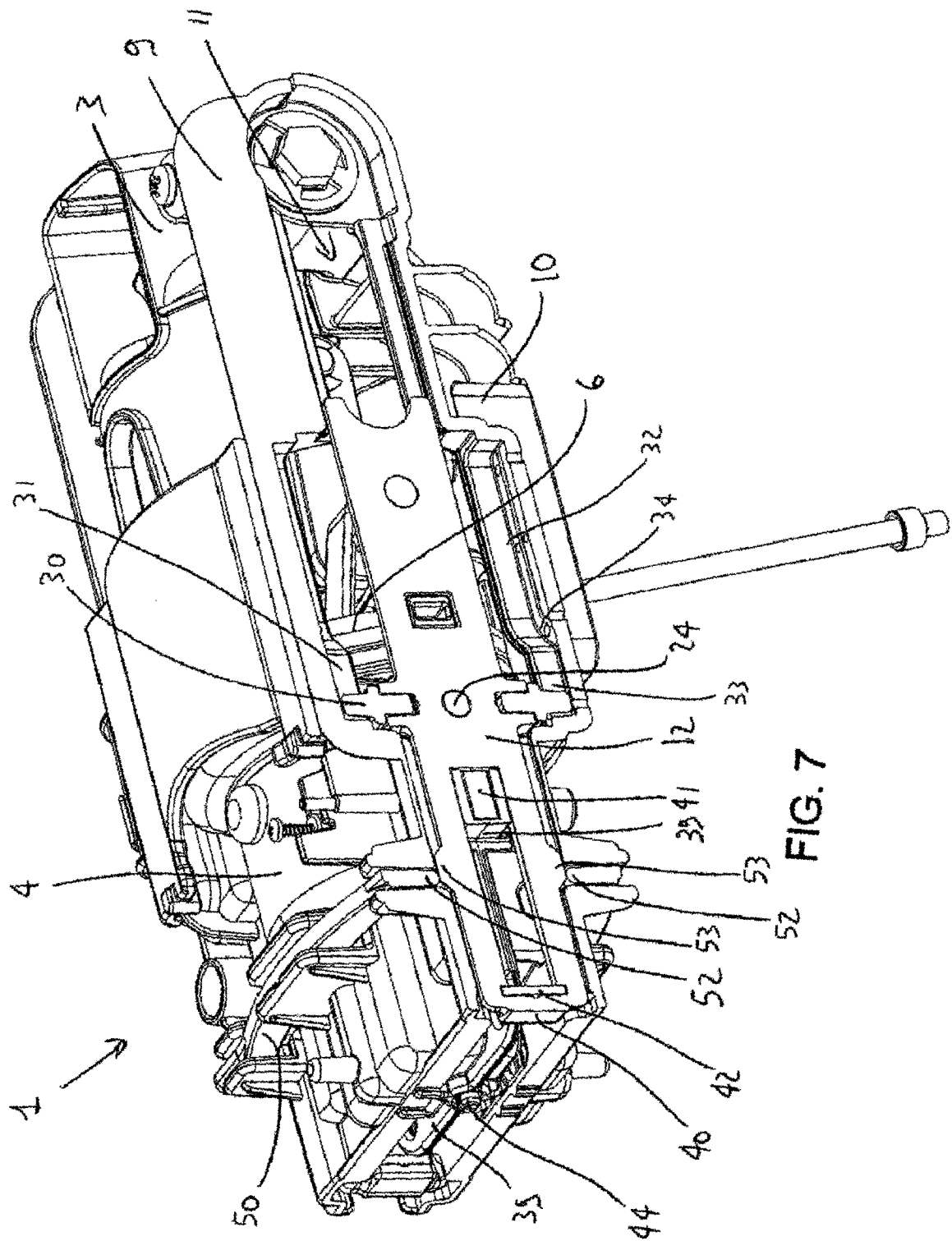


FIG. 5





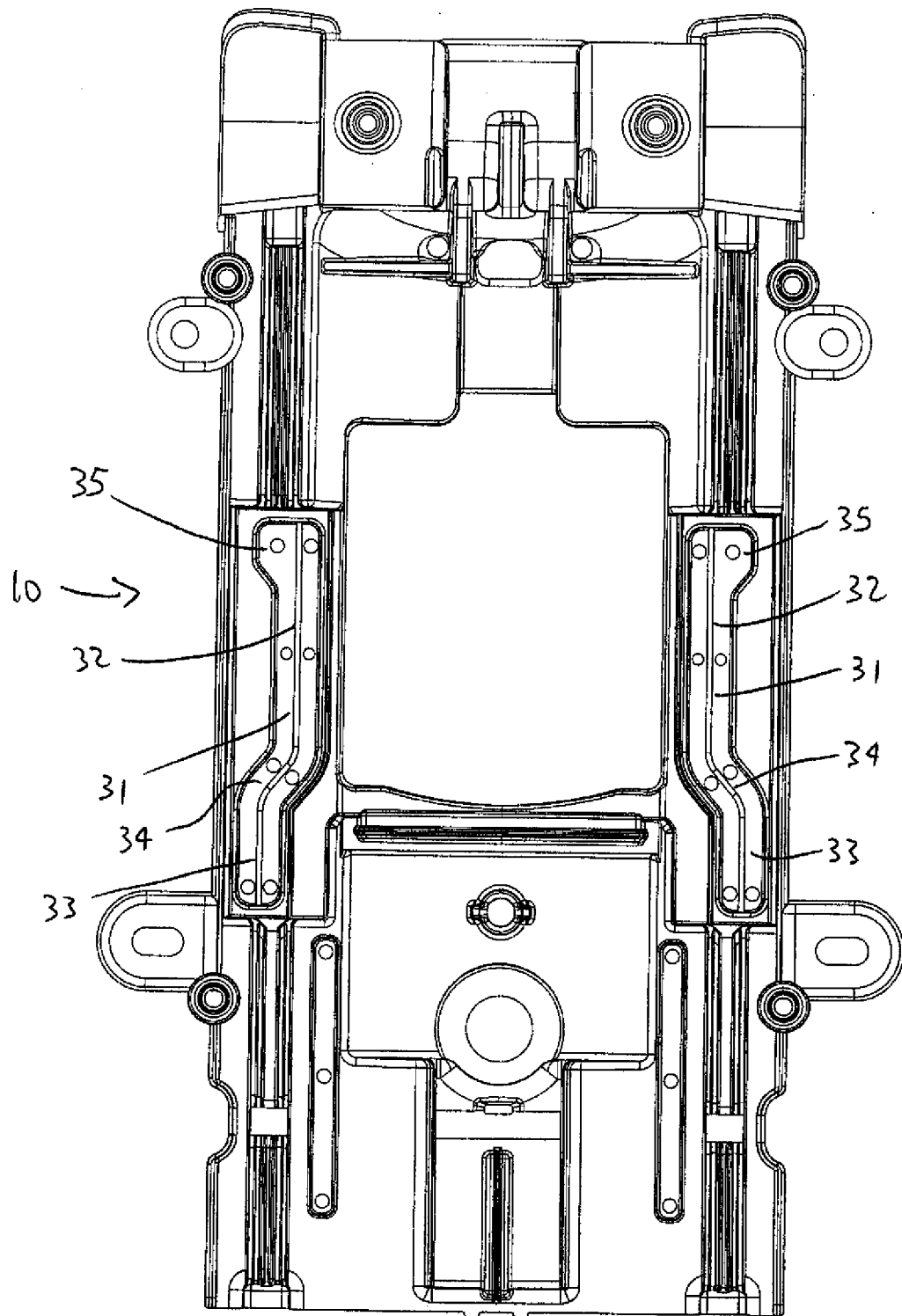


FIG. 8

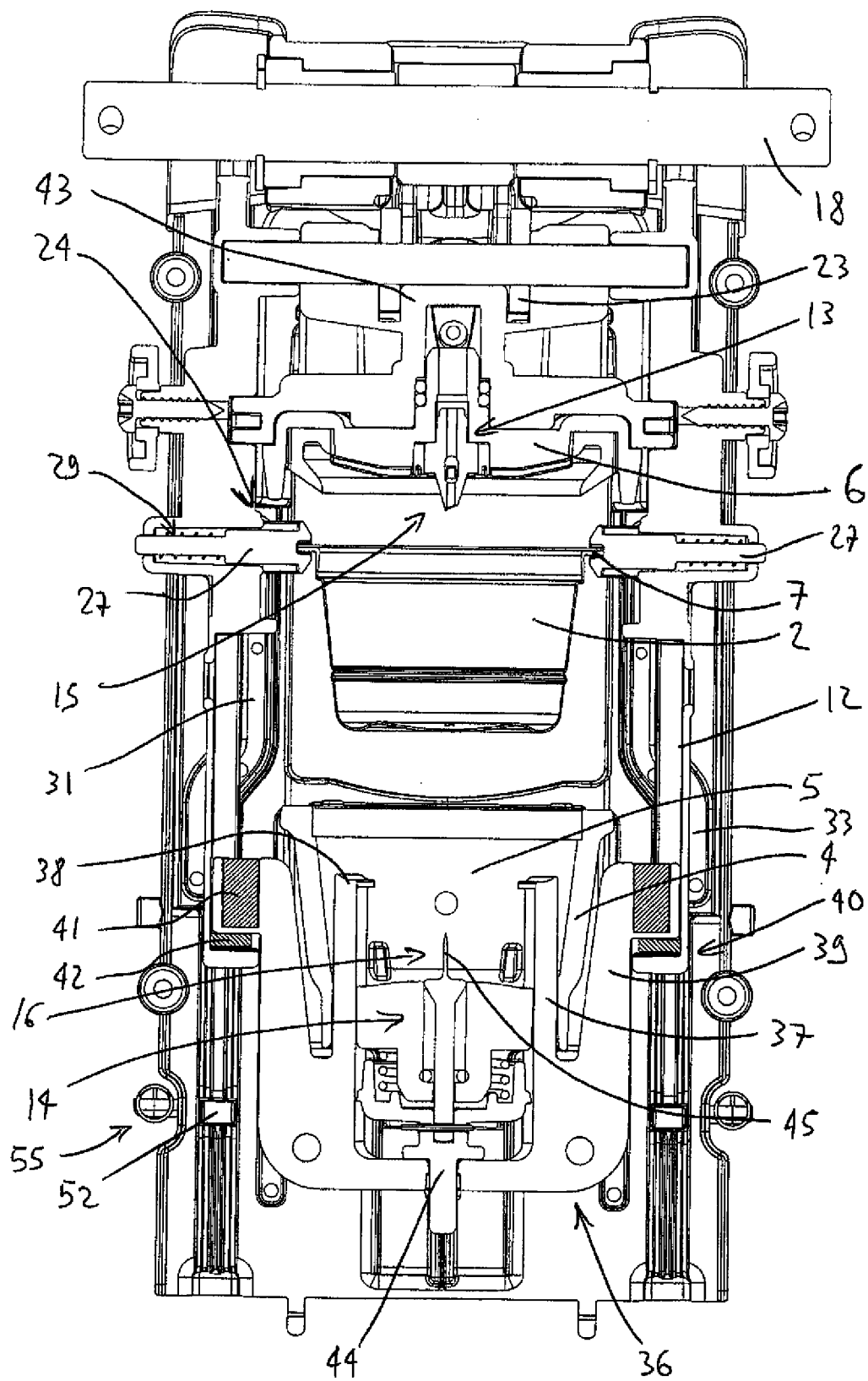


FIG. 9

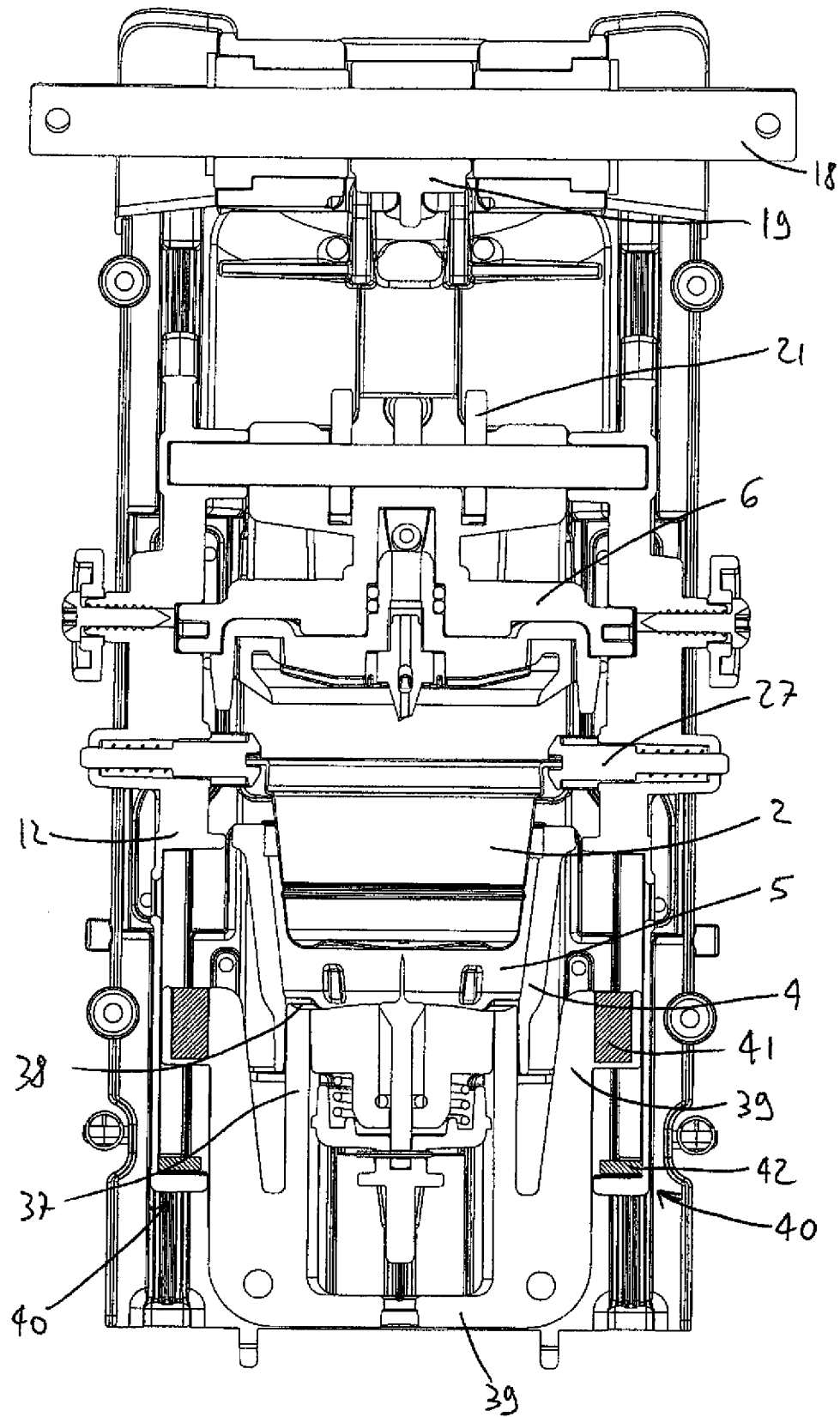


FIG. 10

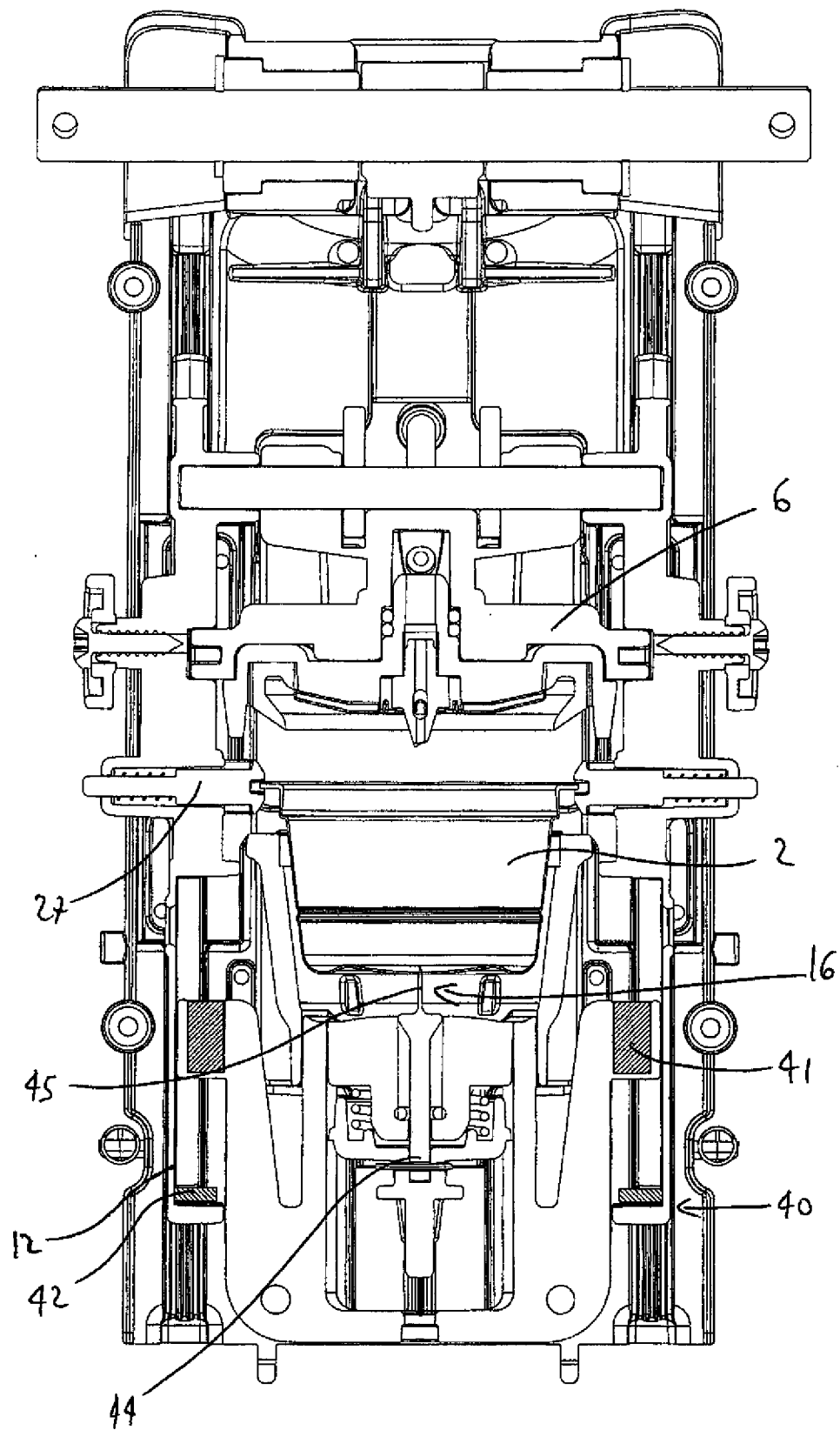


FIG. 11

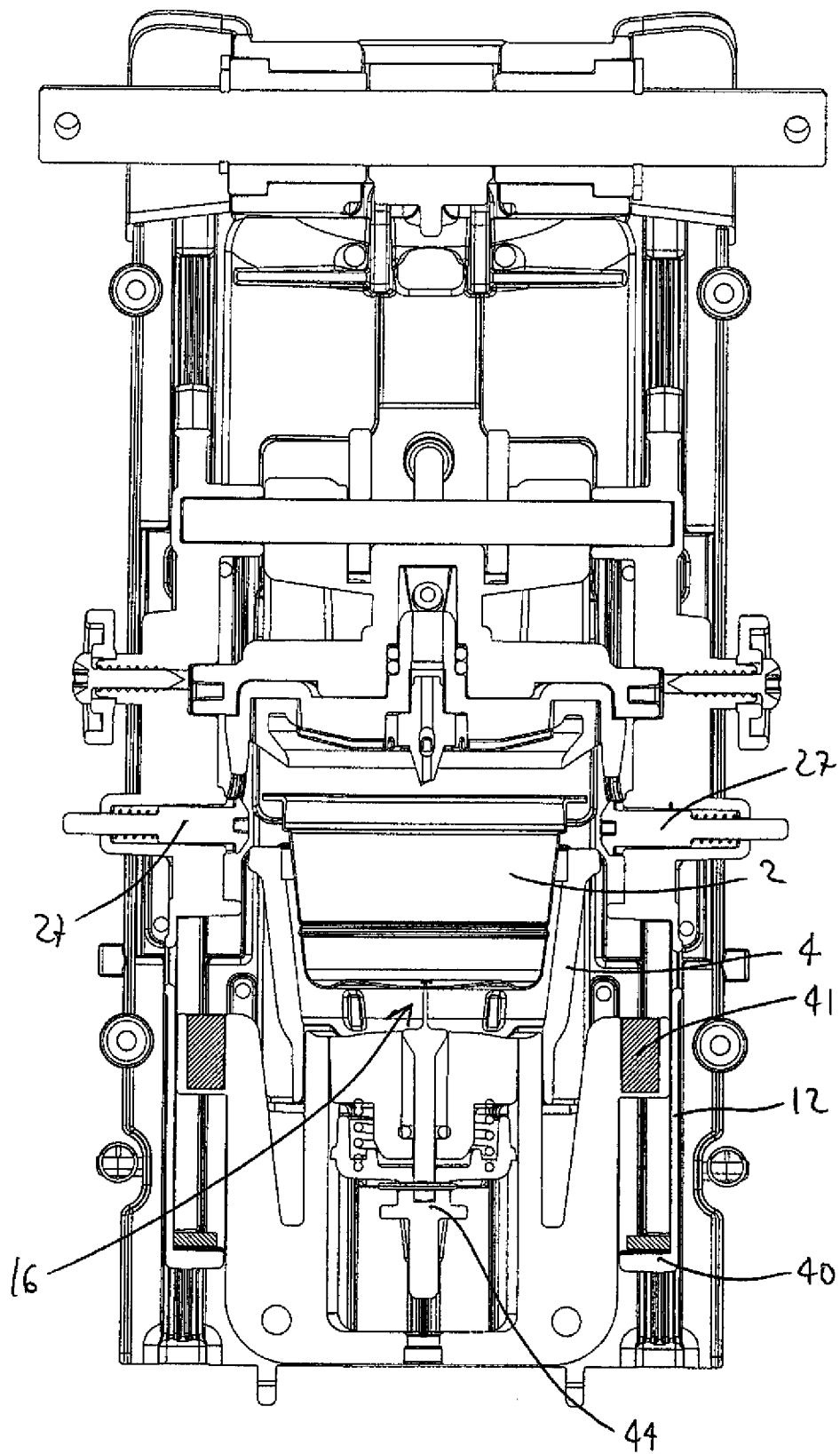


FIG. 12

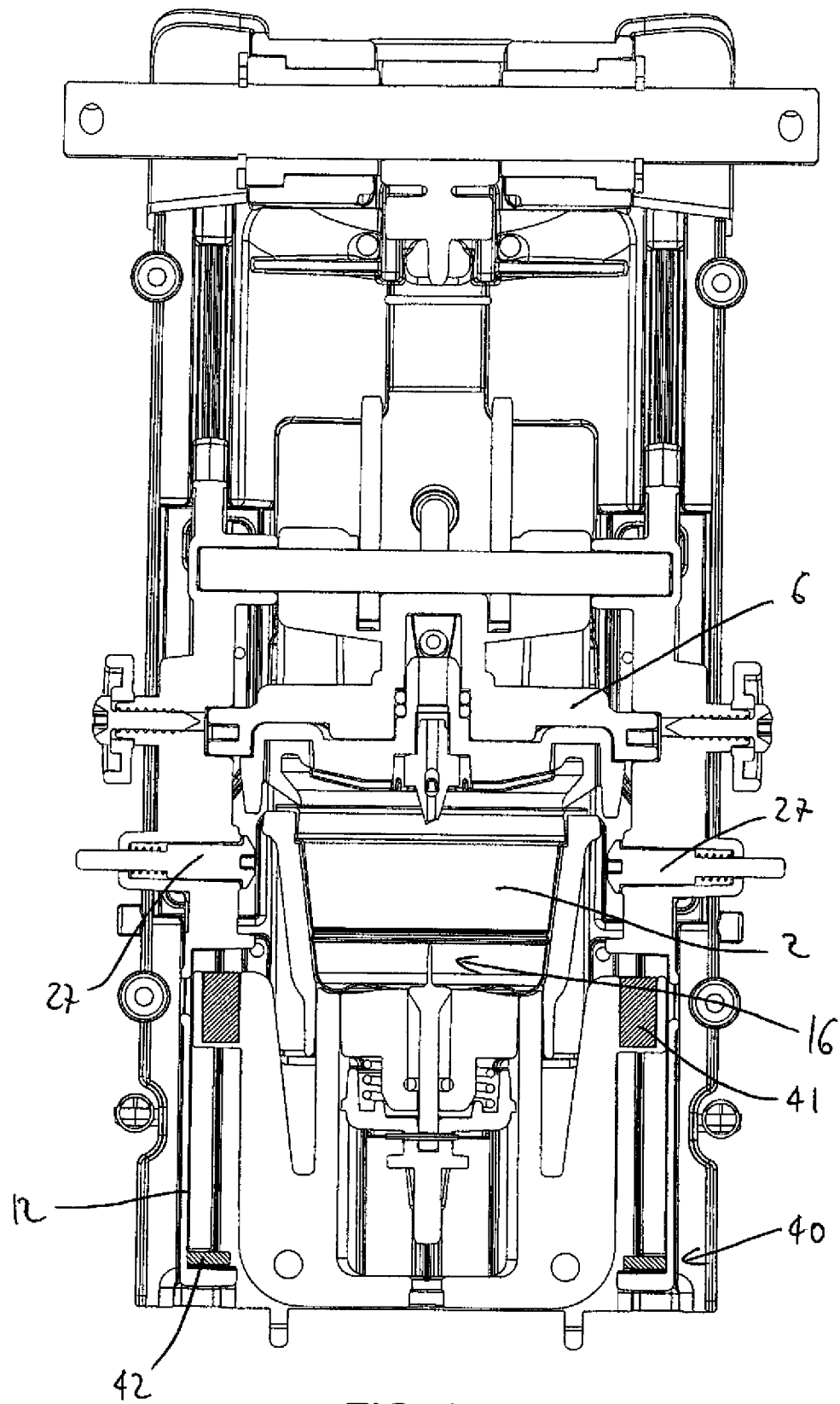


FIG. 13

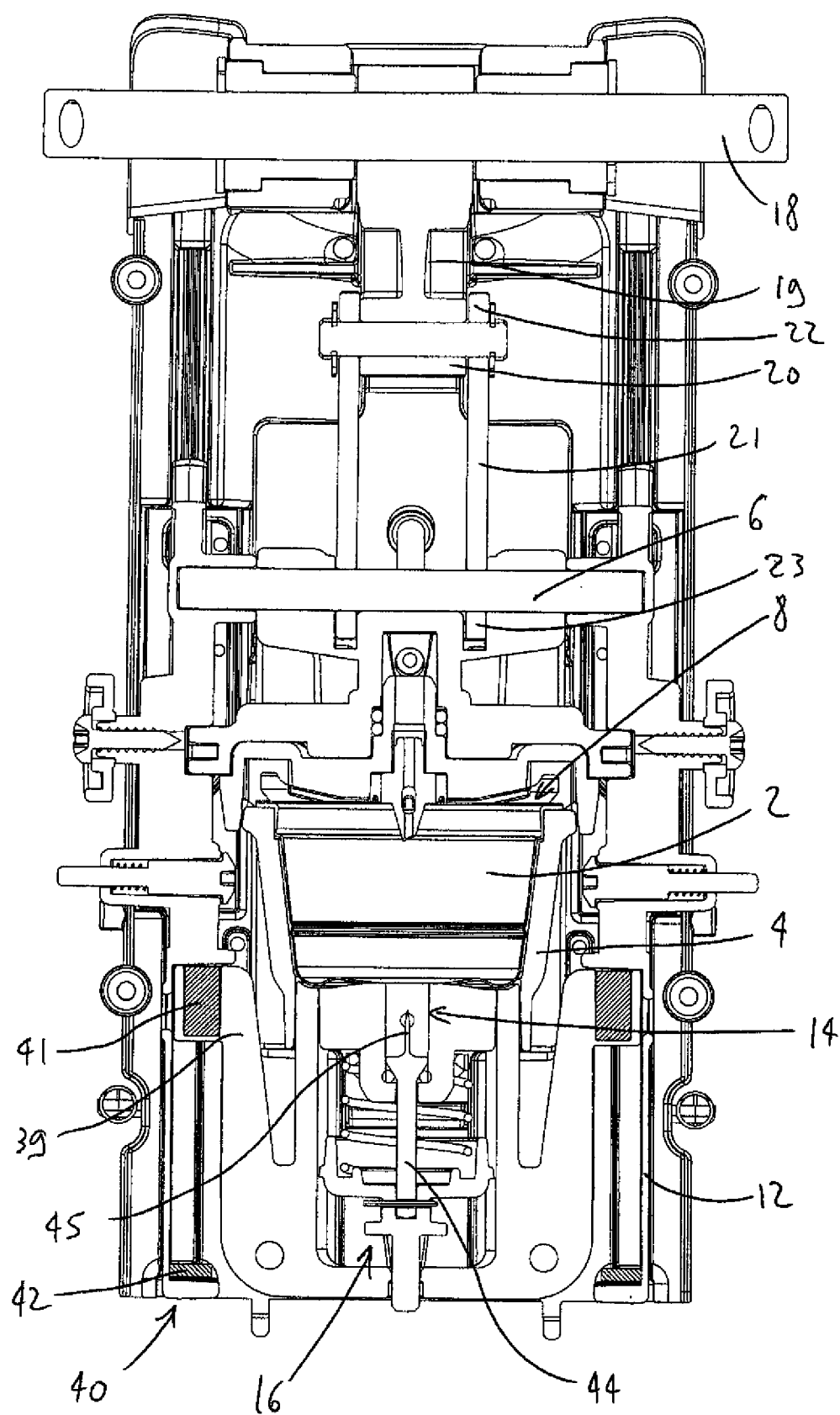


FIG. 14

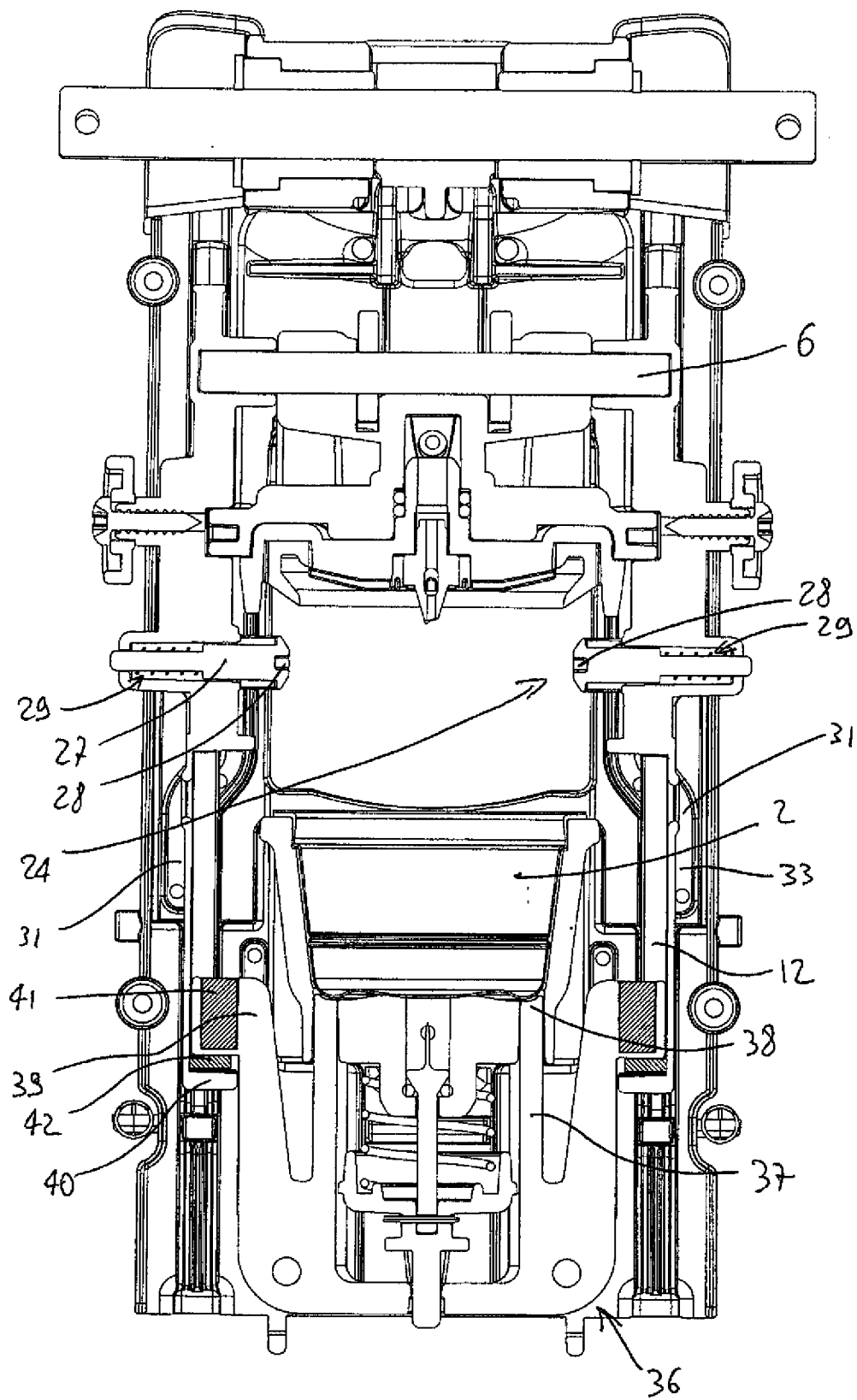


FIG. 15

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2014/063577

A. CLASSIFICATION OF SUBJECT MATTER
INV. A47J31/36
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A47J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EP0-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2012/158055 A1 (NOVADELTA COM E IND DE CAFES S A [PT]; NABEIRO RUI MIGUEL [PT]) 22 November 2012 (2012-11-22) page 8 - page 19 figures 1a, 1b, 3c, 3d, 4a-4f, 5a-5h -----	1,6,7, 11,12
A	US 2011/000377 A1 (FAVRE ERIC [CH]) 6 January 2011 (2011-01-06) paragraphs [0036] - [0041], [0043] - [0046] figures 2a-2f, 3 -----	1,12
A	US 2011/162530 A1 (CASTELLANI ANDREA [IT]) 7 July 2011 (2011-07-07) paragraphs [0058] - [0062], [0074], [0074] figures 4, 8, 14 ----- -/--	1,3,6-9, 11,12



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

6 October 2014

Date of mailing of the international search report

15/10/2014

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Novelli, Bruno

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2014/063577

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Information on patent family members

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