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(54) Rotary filler machine

(57) Rotary filler machine comprising a fixed support structure (9) whereto is pivotally engaged a structure (10) rotating according to a vertical axis of rotation. The rotating structure supports a first carrousel (11) peripherally bearing a plurality of plates (12) for housing a container to be filled, and a second carrousel (13) peripherally bearing a plurality of filling devices (14), each of which is positioned above one of said plates (12). Each filling device (14) has an internal conduit (15) having an end (16) for the entry of the product and an end (17) for the exit of the product, both able to be connected to means for feeding the product to allow a continuous circulation of the product inside the filling device (14), and a dispenser (18), connected in off-take fashion to the internal conduit (15) to tap liquid product from the conduit (15) and dispense it into the container.

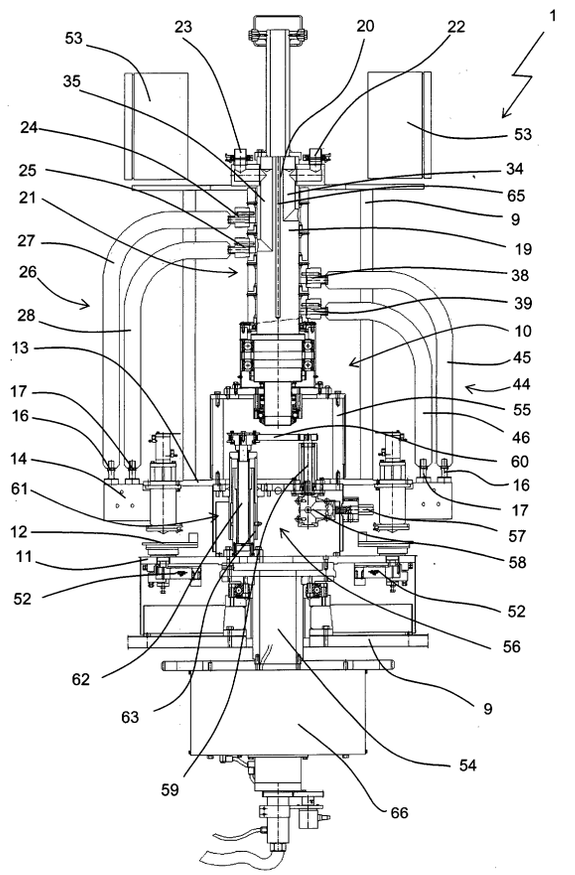

FIG. 2

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Description

[0001] The present invention relates to a rotary filler machine comprising the characteristics expressed in the preamble to claim 1.

[0002] The present invention is in particular destined to be employed in sectors in which the product to be inserted in the appropriate containers has such characteristics as to be subject to separation of the substances that compose it, with the heavier ones settling towards the bottom.

[0003] In particular, products of this kind are substantially all those products that are solid at ambient temperature, and that are packaged at higher than ambient temperature, such that they are in the liquid state.

[0004] Products of this kind are for instance stick deodorants, degreasing hand cleaner paste and stick glue.

[0005] Although hereafter explicit reference is mostly made to this type of product, the present invention can nonetheless be similarly applied also to fill containers with any other liquid product, whether or not it has the problem of the separation of the substances composing it (for instance, fruit juices).

[0006] The present invention is advantageously applicable in particular to weight-based rotary filler machines, i.e. machines in which the quantity of product inserted in each container is determined according to the weight of the product.

[0007] Today's technology provides for the use of rotary or linear filler machines.

[0008] Rotary machines are constituted by a fixed support structure whereon is pivotally engaged a rotary structure that supports a first carrousel and a second superposed carrousel.

[0009] The first carrousel peripherally bears a plurality of housing plates for the containers to be filled, whilst the second carrousels bears a plurality of filling devices, each of which is positioned above one of the plates to fill the related container.

[0010] The filling devices are fed from an upper tank integral with the rotating structure, which contains the product that may be kept in the liquid state by means of appropriate heating elements.

[0011] Rotary machines allow for the continuous filling of the containers, but they have the drawback that they are unable to keep the product always with a homogeneous composition, because the product itself tends to settle inside the tank, as well as in the conduits that join the tank to the filling devices.

[0012] Linear machines, on the other hand, have one or more filling devices positioned in correspondence with a work station identified along a rectilinear path of advance of the containers

[0013] Thanks to the static nature of the work station, the product is fed to the filling devices always correctly mixed, directly from the machines that prepared it.

[0014] This type of machines, however, also has a considerable drawback, since its productivity is very limited.

[0015] The filling operation cannot be conducted continuously, but requires three successive steps: a step of loading the containers underneath the filling devices, a step of filling the containers with the products, and a step of removing the full containers.

[0016] In this situation the technical task constituting the basis for the present invention is to provide a rotary filler machine that overcomes the aforementioned drawbacks.

[0017] In particular, a technical task of the present invention is to obtain a filler machine that allows to have a continuous filling of the containers.

[0018] Another technical task of the present invention is to provide a rotary filler machine that assures the ability of maintaining the product always with a homogeneous composition.

[0019] The specified technical task and the indicated aims are substantially achieved by a rotary filler machine, as described in the accompanying drawings.

[0020] Further features and advantages of the invention shall become more readily apparent from the detailed description of a preferred, but not exclusive, embodiment of a rotary filler machine, illustrated in the accompanying drawings, in which:

- Figure 1 shows a schematic top view of an apparatus for filling containers, comprising the filler machine of the present invention;
- Figure 2 shows a sectioned front elevation of a filler machine according to the present invention, with some parts removed the better to highlight others;
- Figure 3 shows the machine of Figure 2 in raised position;
- Figure 4 shows the detail of the manifold of the machine of Figure 3;
- Figure 5 shows the manifold of Figure 4 according to the trace V-V, with some parts removed the better to highlight others;
- Figure 6 shows the manifold of Figure 4 according to the trace VI-VI, with some parts removed and other added;
- Figure 7 shows the sectioned detail of the filling device of the machine of Figure 2; and
- Figure 8 shows a top view of the device of Figure 7 according to the trace VII-VII with some parts removed the better to highlight others.

[0021] With reference to the aforementioned figures, the reference number 1 globally indicates a rotary filler machine, according to the present invention in a complex embodiment thereof

[0022] Figure 1 shows a plan view of a complete apparatus 2 (known except for the filling machine 1 of the present invention), in which a linear feeding device 3 carries the containers to be filled to a first transfer star 4 that in turn feeds them to a filler machine 1 which fills them with the product.

[0023] A second transfer star 5 then draws them from the filler machine 1 and delivers them to a capper machine that closes them.

[0024] In known fashion, depending on whether the filling and the subsequent capping were completed correctly, a third transfer star 7 deposits the containers on an outlet device 8a or on a scrapping device 8b.

[0025] The rotary filler machine 1 is constituted by a fixed support structure 9 which can be associated to the base of the apparatus 2 described above, and hence fixed relative to the ground (Figure 2).

[0026] A rotary structure 10 is pivotally associated to the fixed structure 9 according to a vertical axis, and bears a first carrousel 11 peripherally provided with a plurality of housing plates 12 for a container to be filled, arranged along a circumference of lay centred on the same axis of rotation, and a second carrousel 13 peripherally provided with a plurality of filling devices 14, each positioned above one of the plates 12 to fill the container positioned on the plate 12 itself with a product in the liquid state.

[0027] In known ways, the machine is further provided with elements (such as pincers) for retaining the containers to be filled positioned on the plates 12 (not shown herein).

[0028] Each filling element 14 has an internal conduit 15 having an end 16 for the entrance of the product and an end 17 for the exit of the product (Figure 7). Both ends 16, 17 can be connected to means for feeding the product (not shown herein) to allow a continuous circulation of the product inside the filling device 14.

[0029] A dispenser 18 is then connected in off-take fashion to the internal conduit 15 to tap some liquid product from the conduit 15 and dispense it to the container.

[0030] Between the filling devices 14 and the feeding means, the filler machine 1 is further provided with at least a manifold 19 that has a junction portion 20 integral with the fixed structure 9, and a distribution portion 21 pivotally engaged to the junction portion 20 and integral with the rotating structure 10 (Figure 4).

[0031] In the junction portion 20 of the manifold 19 are obtained at least a first inlet conduit 22 and a first outlet conduit 23 able to be connected to the means for feeding a first product in the liquid state (Figure 5).

[0032] On the distribution portion 21 are instead mounted a plurality of first outlet mouths 24 and a plurality of first inlet mouths 25 (Figures 4 and 6).

[0033] The first outlet mouths 24 are in fluid communication with the first inlet conduit 22, whilst the first inlet mouths 25 are in fluid communication with the first outlet conduit 23.

[0034] Also provided are first pairs of hydraulic connections 26, each composed by a first delivery pipe 27 connected from one of the first outlet mouths 24 to the inlet end 16 of a filling device 14, and by a first return pipe 28 connected from the outlet end 17 of the same filling device 14 to one of the first inlet mouths 25.

[0035] Said hydraulic connections 26 allow the continuous flow of the first product between the feeding means and the filling device 14 through the manifold 19.

[0036] In the illustrated embodiment, the junction portion 20 of the manifold 19 comprises a widened upper head 29 in which are mounted the first conduits 22, 23, and a substantially cylindrical body 30 positioned under the upper head 29 with its axis coinciding with the axis of rotation of the rotating structure 10. The rotating portion is instead constituted by a tubular body 31 countershaped relative to the cylindrical body 30 and mounted in hydraulically sealed fashion externally thereto (Figure 4).

[0037] Between the cylindrical body 30 and the tubular body 31 are also obtained at least a first and a second annular chambers 32, 33, coaxial to the cylindrical body 30, and vertically distanced from each other. A first and a second channels 34, 35 respectively connect the first inlet conduit 22 to the first chamber 32 and the first outlet conduit 23 to the second chamber 33.

[0038] The first outlet mouths 24 are obtained radially in the tubular body 31 in correspondence with the first chamber 32, and, similarly, the first inlet mouths 25 are obtained radially in the tubular body 31 in correspondence with the second chamber 33.

[0039] Heretofore, a basic embodiment has been described in which the machine fills the containers with a single product.

[0040] In the case of a machine provided with sixteen plates 12 and with sixteen filling devices 14, as in the accompanying figures, therefore, sixteen first inlet mouths 25 and as many outlet mouths 24 would be present.

[0041] The accompanying figures instead show a more complete and versatile version of the filling machine 1 of the present invention.

[0042] In this version, the manifold 19 is substantially split in two, and further comprises at least a second inlet conduit 36 and a second outlet conduit 37 integral with the junction portion 20 (Figure 5), also able to be connected to the feeding means, and a plurality of second outlet mouths 38 and of second inlet mouths 39, similar to the first inlet mouths 25.

[0043] The second outlet mouths 38 are mounted on the rotating distribution portion 21 and are in fluid communication with the second inlet conduit 36, whilst the second inlet mouths 39 are mounted on the rotating portion 21 and are in fluid communication with the second outlet conduit 37.

[0044] In particular, in the illustrated embodiment, between the cylindrical body 30 and the tubular body 31 are further obtained at least a third and a fourth annular chambers 40, 41, coaxial to the cylindrical body 30 and vertically distanced from each other as well as from the first and the second chamber 32, 33.

[0045] The second outlet mouths 38 and the second inlet mouths 39 are obtained radially in the tubular body 31 respectively in correspondence with the third and with the fourth chamber 40, 41.

[0046] Additionally, a third and a fourth channel 42, 43 respectively connect the second inlet conduit 36 to the third chamber 40 and the second outlet conduit 37 to the fourth chamber 41.

[0047] In this case, too, second pairs of hydraulic connections 44 are provided, each composed by a second delivery tube 45 connected from one of the second outlet mouths 38 to the inlet end 16 of a filling device 14 and by a second return tube 46 connected from the outlet end 17 of the same filling device 14 to one of the second inlet mouths 39.

[0048] Said second connections 44 allow the continuous flow of a second product between the feeding means and the filling device 14 through the manifold 19, always keeping it separate from the first product.

[0049] In this case, part of the filling devices 14 is connected to the first mouths 24, 25 and part to the second mouths 38, 39.

[0050] In the preferred embodiment, the filling devices 14 are present in an even number and are uniformly distributed along their own circumference of lay. Advantageously, they are also connected alternatively to each plurality of inlet mouths 25, 39 and outlet mouths 24, 38. In this way, half of the filling devices 14 can dispense the first product and half the second product.

[0051] According to manners that are wholly similar to those described heretofore, filler machines with the capability of dispensing a plurality of different products can also be provided. In this cases the connector 19 will have, for each product, an additional pair of inlet and outlet conduits, as well as additional pluralities of inlet and outlet mouths connected from appropriate hydraulic connections to filling devices 14.

[0052] Advantageously, the number of plates 12 (and of filling devices 14) will be a whole multiple of the number of products to be dispensed, whilst the plates 12 relating to each product will be uniformly distributed along their circumference of lay, and mutually distanced by a number of plates 12 corresponding to the number of other products to be dispensed.

[0053] In regard to the structural conformation of the filling devices 14, each dispenser 18 comprises a nozzle 47, oriented towards the related plate 12, and a shutter 48, able to move between a first raised position (not shown herein) for opening the nozzle 47 and a second lowered position for closing the nozzle 47 (Figure 2). The operation of the shutter 48, which in the accompanying drawings is positioned inside the internal conduit 15, is assured by a pneumatic actuator 49 positioned externally to the conduit 15 and connected to the shutter 48 itself by means of a rigid connecting rod 50, provided with centring appendages 50a.

[0054] The area of entry of the rigid rod 50 into the conduit 15 is constructed with a flexible membrane 51 having its edge rigidly connected to a wall of the conduit and its central portion rigidly connected to the rod 50 to guarantee the hydraulic seal, preventing rubbing between the various parts.

[0055] In the illustrated embodiment, the filling machine 1 is of the weight-based type and it comprises a loading cell 52 associated to each plate 12 to measure the weight of the product poured into the container. The weight reading is then transmitted to a remote electronic control unit (not shown) operatively connected to the filling devices 14 (in particular to related actuators 48) and is used to control the dispensing of the product according to pre-set values.

[0056] The electronic control unit is also programmed to adapt the dispensing of the product by each filling device 14 according to the previous dispensing operation performed by the same dispensing device 14, in order to have an ideal filling, consistent over time, of individual containers.

[0057] The electronic control unit can also be set by the operators through appropriate control panels 53.

[0058] Advantageously, the individual plates 12 of the filler machine can easily be removed by unscrewing an appropriate screw (not shown herein).

[0059] It is therefore sufficient to provide the filler machine 1 with a series of interchangeable plates 12 of different sizes, to allow to adapt the machine to different formats of the containers to be filled, simply by replacing the plates 12.

[0060] In any case, in order to adapt in an even better manner the filler machine 1 to containers of different formats, the rotating structure 10 is subdivided into a lower part 54 bearing the first carrousel 11 and an upper part 55 bearing the second carrousel 13, which is connected in sliding fashion to the lower part 54 according to a vertical direction of sliding. Positioning means 56 allow to determine the position of the upper part 55 relative to the lower part 54.

[0061] In the illustrated embodiment, the positioning means 56 are constituted by a nut 57, able to be rotated by an operator by means of a wrench, which through an angular transmission 58 actuates a first threaded bar 59 connected by means of transmission belts 60 to three support element 61 constituted by threaded bars 62 screwed in cylinders 63 (the accompanying figures show only one).

[0062] The machine represented in the accompanying figures is then destined to be used with products that need to be maintained in the liquid state by means of continuous heating, and for this purpose it is provided with heating means 64 connected to the control unit.

[0063] In particular, both the filling devices 14 and the manifold 19 are provided with electrical resistors (not shown herein), whereof the housing seats 65 are shown, whilst the hydraulic connections 26 44 are constituted by commercial electrically heated pipes.

[0064] Additionally, probes (not shown herein) are provided, also housed in some of the housing seats 65 and connected to the control unit.

[0065] A resistor and a probe can also be inserted in the shutter 48.

[0066] All electrical and electronic connections be-

tween the fixed structure 9 and the rotating structure 10 are obtained by means of known rotating connections inside a fixed connection box 16 positioned under the rotating structure 10.

[0067] In regard to the operating modes of the subject machine, they can be adapted according to the user's needs.

[0068] In particular, the machine can be used, for instance, to fill alternatively at successive times containers with different products, or to fill simultaneously containers with different products, or to fill containers with a single product adapting productivity as required.

[0069] In the simplest operating mode, the machine operates exploiting only half the plates 12 and the filling devices 14 to fill containers with a first product.

[0070] Once this production run is complete, the machine can immediately be converted to fill products with a second product with no need to empty it and clean it.

[0071] It is sufficient, in fact, to exploit the second half of the plates 12 and of the filling devices 14.

[0072] At the user's discretion, the two products (or more than two in the case of more complex machine) can also be dispensed simultaneously filling half of the containers with one and half with the other. This in particular can be found useful in the case of identical containers that can be filled with products having, for instance, different colours.

[0073] In any case, the filling devices 14 can also be used to fill simultaneously containers with the same product in order to increase the production of the machine.

[0074] In all cases of operation, the product is fed to the inlet conduit, always correctly mixed, directly by the apparatuses that prepared.

[0075] Through the first outlet mouths 24, it reaches the filling devices 14, where a part thereof is tapped when necessary, to return to the outlet mouths, and thence to the outlet conduit and then to the supply means.

[0076] With reference to Figure 1, the dispensing of the product into the individual containers takes place along the path travelled by the containers from the point of their drawing from the first transfer star to the point in which they are released to the second transfer star. Once the containers are loaded on the first carrousel 11, the shutter 48 is opened and the product, which circulates under pressure, egresses. Thanks to the shaping of the outlet nozzle 47, product splashes due to excessively fast egresses, are prevented.

[0077] When, through the loading cell 52, the control unit sees that the proper quantity of product has been poured into a container, it activates the pneumatic actuator 49 to close the shutter 48.

[0078] Due to the delay of the closure relative to the time when the loading cell 52 measures a determined weight, the command to close the shutter 48 is given when the weight reached is close, but lower than, to the required one, so that the product dispensed during the delay interval correctly completes the filling operation.

[0079] Since the quantity of product dispensed during the delay interval can vary over time, for instance because of slight differences in the composition of the product or temperature variations, at each filling the control unit checks the product actually dispensed at the end and, if necessary, changes the closure time for the subsequent cycles.

[0080] The present invention achieves important advantages.

[0081] In the first place, the filler machine of the present invention allows continuously to fill the containers.

[0082] In the second place, said machine assures the capability of maintaining the product always with a homogeneous composition, thanks to the continuous circulation thereof in the conduits, without any stagnation areas. Additionally, this also holds true in the case of product that need to be continuously heated to remain liquid.

[0083] Moreover, the machine of the present invention can be used to dispense any number of products, simultaneously or in succession.

[0084] When the machine is used for a single product, the arrangement with two or more separate hydraulic systems allows to keep the manifold diameter, and consequently the related moment of inertia, to a limited size.

[0085] It should be noted that the present invention is relatively easy to construct and that the cost connected with its embodiment is not very high.

[0086] The invention thus conceived can be subject to numerous modifications and variations, without thereby departing from the scope of the inventive concept that characterises it.

[0087] All components can be replaced by other technically equivalent elements and in practice all materials used, as well as the shapes and dimensions of the various components, can be any depending on requirements.

Claims

1. Rotary filler machine comprising:

- a fixed support structure (9);
- a rotating structure (10) pivotally associated to said fixed structure (9) according to a vertical axis of rotation;
- a first carrousel (11) mounted on said rotating structure (10) and peripherally bearing a plurality of plates (12) for housing a container to be filled, positioned along a circumference of lay centred on said axis of rotation;
- a second carrousel (13) associated to said rotating structure (10) and peripherally bearing a plurality of filling devices (14), each positioned above one of said plates (12) to fill a container

positioned on the plate (12) itself with a product in the liquid state;

characterised in that each of said filling devices (14) has an internal conduit (15) having an end (16) for the entry of the product and an end (17) for the exit of the product, both able to be connected to means for feeding the product to allow a continuous circulation of the product inside the filling device (14), and a dispenser (18) connected in off-take fashion to said internal conduit (15) to tap liquid product from said conduit and dispense it into said container.

2. Filler machine as claimed in claim 1, **characterised in that** it further comprises at least a manifold (19) having:

- a junction portion (20) that is integral with said fixed structure (9), and a distribution portion (21) pivotally engaged to said junction portion and integral with said rotating structure (10);
- at least a first inlet conduit (22) and a first outlet conduit (23) integral with said junction portion (20), and able to be connected to said means for feeding a first product in the liquid state;
- a plurality of first outlet mouths (245) mounted on said rotating portion and in fluid communication with said first inlet conduit (22); and
- a plurality of first inlet mouths (25) mounted on said rotating portion and in fluid communication with said first outlet conduit (23);

and a plurality of first hydraulic connections (26) connected from one of said first outlet mouths (24) and from one of said first inlet mouths (25) respectively to the inlet end (16) and to the outlet end (17) of a filling device (14), to allow the continuous flow of the first product between the feeding means and the filling device (14) through said manifold (19).

3. Filling machine as claimed in claim 2, **characterised in that**:

- said junction portion (20) comprises a substantially cylindrical body positioned with the axis coinciding with said axis of rotation,
- said rotating portion comprising a tubular body (31) counter-shaped relative to said cylindrical body (30) and mounted externally thereto;
- between said cylindrical body (30) and said tubular body (31) are obtained at least a first and a second annular chambers (32), (33), coaxial to the cylindrical body (30), and vertically distanced from each other;
- a first and a second channel (34), (35), respectively connecting said first inlet conduit (22) to said first chamber (32) and said first outlet conduit (23) to said second chamber (33);
- said first outlet mouths (24) being obtained radially in said tubular body (31) in correspondence with said first chamber (32), and
- said first inlet mouths (25) being obtained radially in said tubular body (31) in correspondence with said second chamber (33).

4. Filler machine as claimed in any of the previous claims, **characterised in that** said manifold (19) further comprises:

- at least a second inlet conduit (36) and a second outlet conduit (37) integral with said junction portion (20), and able to be connected to said feeding means to feed a second product in the liquid state;
- a plurality of second outlet mouths (38) mounted on said rotating portion and in fluid communication with said second inlet conduit (36); and
- a plurality of second inlet mouths (39) mounted on said rotating portion and in fluid communication with said second outlet conduit (37);

and a plurality of second pairs of hydraulic connections (44) connected from one of said second outlet mouths (38) and from one of said second inlet mouths (39) respectively to the inlet end (16) and to the outlet end (17) of a filling device (14), to allow the continuous flow of the second product between the feeding means and the filling device, through said manifold (19), part of said filling devices (14) being connected to said first mouths and part being connected to said second mouths.

5. Filler machine as claimed in claim 3 and 4 **characterised in that**:

- between said cylindrical body (30) and said tubular body (31) are further obtained at least a third and a fourth annular chambers (40), (41) coaxial to the cylindrical body (30) and vertically distanced relative to one another and relative to the first and to the second chamber (33);
- a third and a fourth channel (42), (43) respectively connecting said second inlet conduit (36) to said third chamber (40) and said second outlet conduit (37) to said fourth chamber (41);
- said second outlet mouths (38) being obtained radially in said tubular body (31) in correspondence with said third chamber (40); and
- said second inlet mouths (39) being obtained radially in said tubular body (31) in correspondence with said fourth chamber (41).

6. Filler machine as claimed in claim 4 o 5 **characterised in that** said manifold (19) comprises a series of said pairs of inlet and outlet conduits, and a re-

lated series of said plurality of inlet and outlet mouths, each pair of inlet and of outlet conduits being operatively connected to the feeding means, to a plurality of inlet and outlet mouths, and to a part of the filling devices (14) to feed them with a respective liquid product.

7. Filler machine as claimed in any of the claims from 4 to 6, **characterised in that** the filling devices (14) are uniformly distributed along their circumference of lay, and **in that** the filling devices (14) connected to each plurality of inlet and of outlet mouths, are in turn uniformly distributed along the circumference of lay.

8. Filler machine as claimed in any of the previous claims, **characterised in that** each dispenser (18) comprises a nozzle (47) oriented towards the related plate (12), and a shutter (48) able to move between a first raised position for opening said nozzle (47) and a second lowered position for shutting said nozzle (47).

9. Filler machine as claimed in claim 8 **characterised in that** each dispenser (18) further comprises a pneumatic actuator (49) connected to said shutter (48) to determine its position.

10. Filler machine as claimed in claim 9 **characterised in that** said shutter (48) is positioned internally to said conduit and **in that** each dispenser (18) further comprises a rigid connecting rod (50) mounted between the actuator and the shutter (48), and a flexible membrane (51) having its edge rigidly connected to a wall of said conduit and its own central portion rigidly connected to said rod (50).

11. Filler machines as claimed in any of the previous claims, **characterised in that** it further comprises a loading cell (52) associated to each plate (12) to measure the weight of the product poured into the container, and an electronic control unit operatively connected to said loading cell (52) and to the filling device (14) positioned above the related plate (12) to control the dispensing of the product according to the weight measured by the loading cell (52).

12. Filler machine as claimed in claim 11 **characterised in that** said electronic unit is programmed to adapt the dispensing of the product by each filling device (14) according to the previous dispensing operation performed by the same dispensing device (14).

13. Filler machine as claimed in any of the previous claims, **characterised in that** it comprises a series of pluralities of interchangeable plates (12) of different dimensions, and **in that** said plates (12) are connected in removable fashion to the first carrousel (11) to allow to change the format of the containers to be filled by replacing the plates (12).

14. Filler machine as claimed in any of the previous claims, **characterised in that** said rotating structure (10) has a lower part (54) bearing the first carrousel (11) and an upper part (55) bearing the second carrousel (13) and connected in sliding fashion to the lower part (54) according to a vertical direction of sliding, and **in that** it further comprises positioning means (56) to determine the position of the upper part (55) relative to the lower part (54).

15. Filler machine as claimed in any of the previous claims, **characterised in that** each filling device (14) is provided with heating means (64) to keep the product heated.

16. Filler machine as claimed in claim 2 and in any of the other claims, **characterised in that** said manifold (19) and said hydraulic connections are provided with heating means (64) to keep the product heated along its entire path inside the machine.

17. Filler machine as claimed in claim 15 or 16 **characterised in that** said heating means (64) are constituted by electrical resistors.

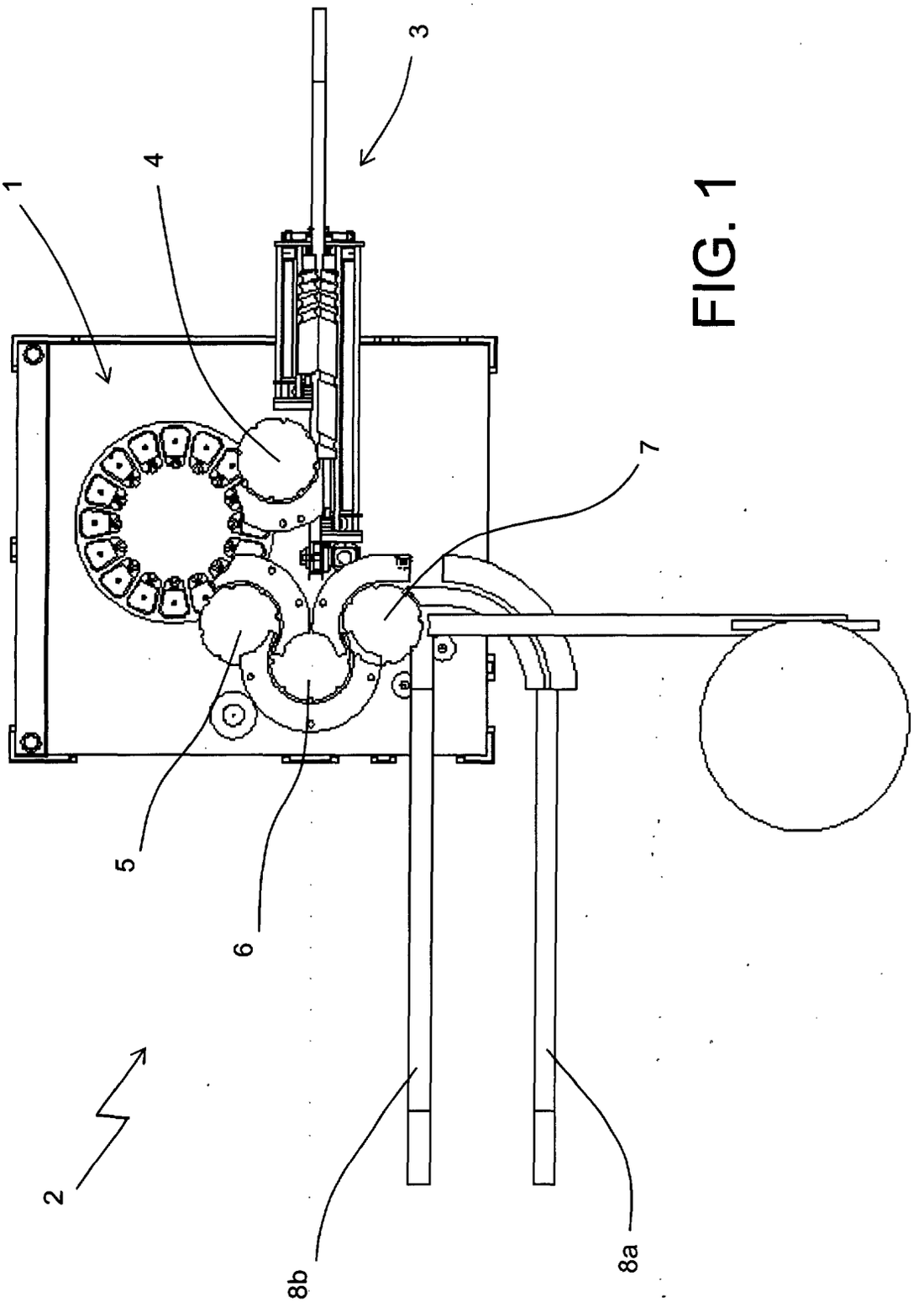

FIG. 1

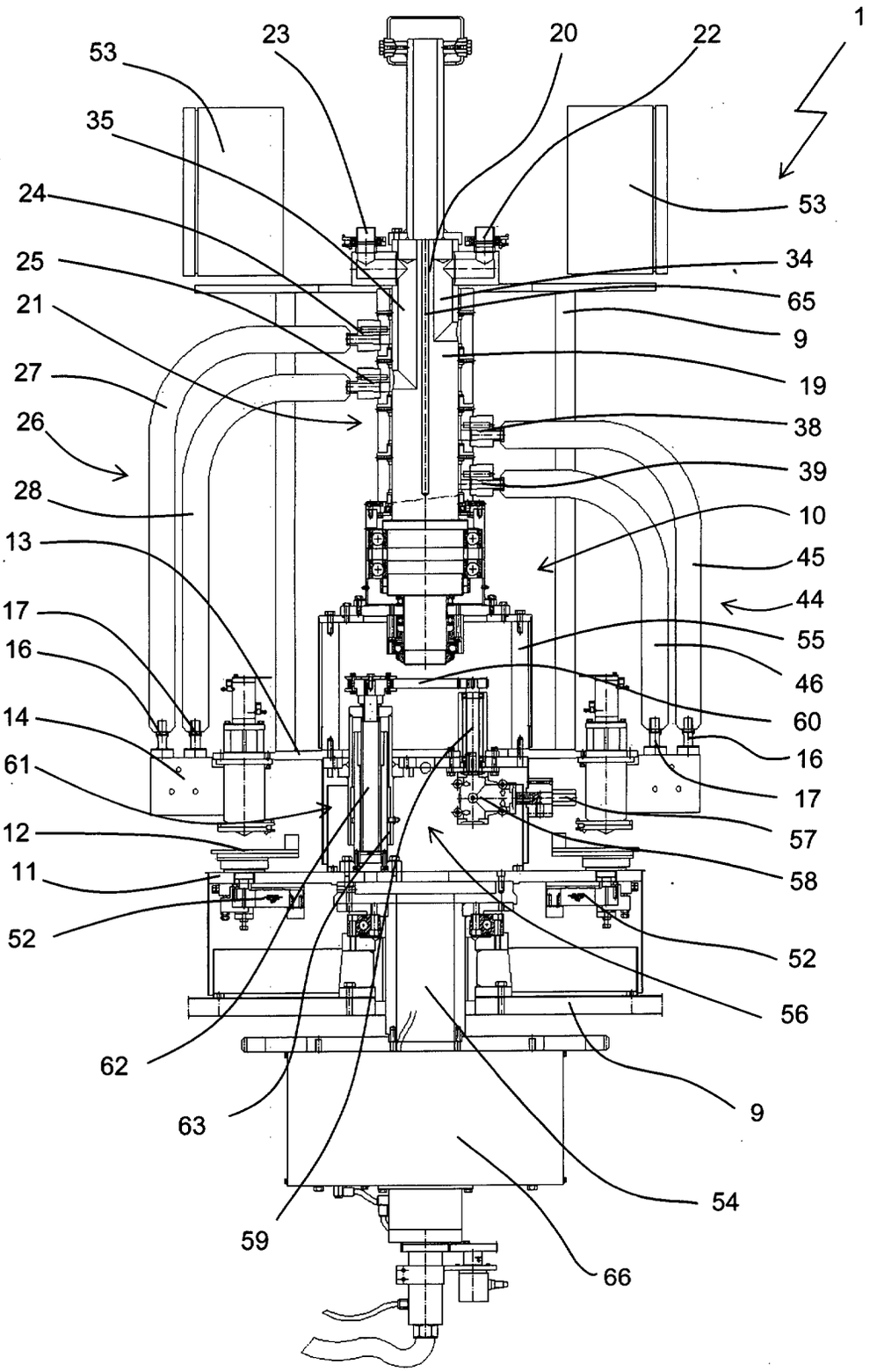
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FIG. 2

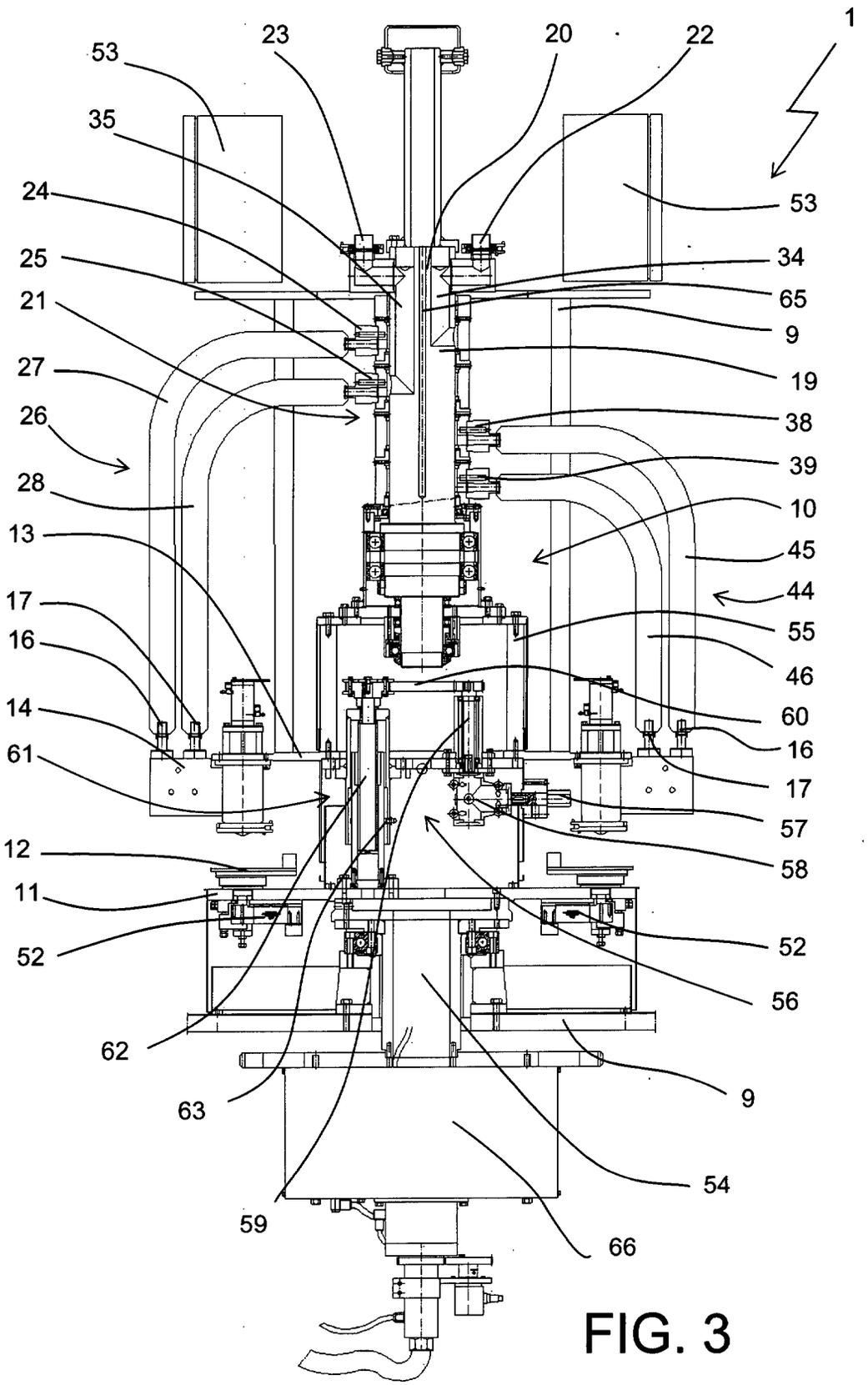
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FIG. 3

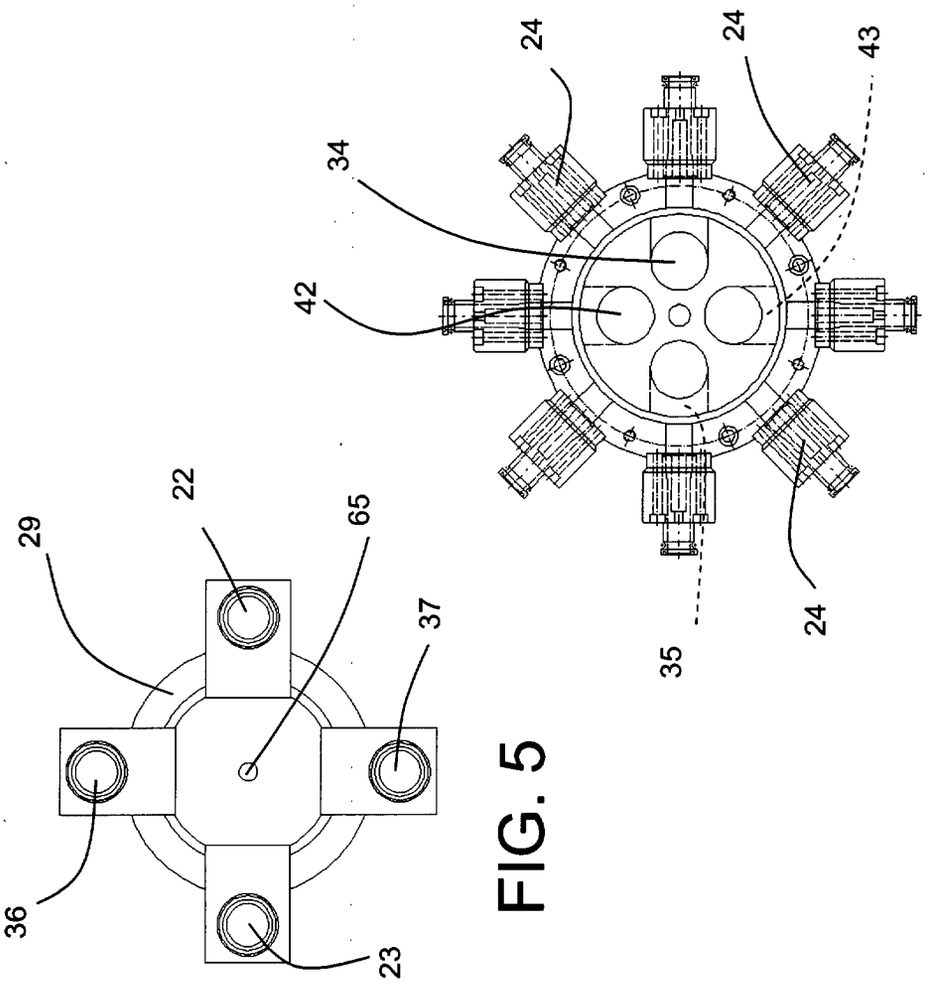

FIG. 6

FIG. 5

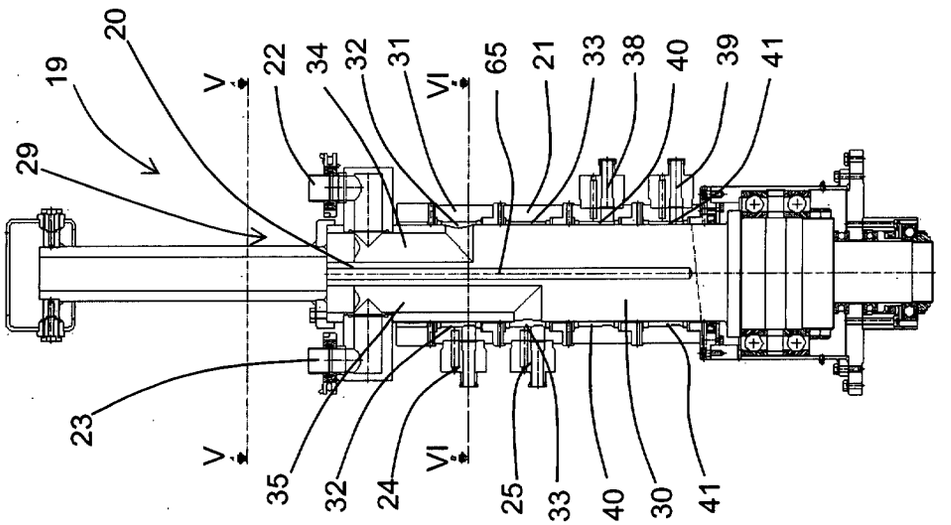

FIG. 4

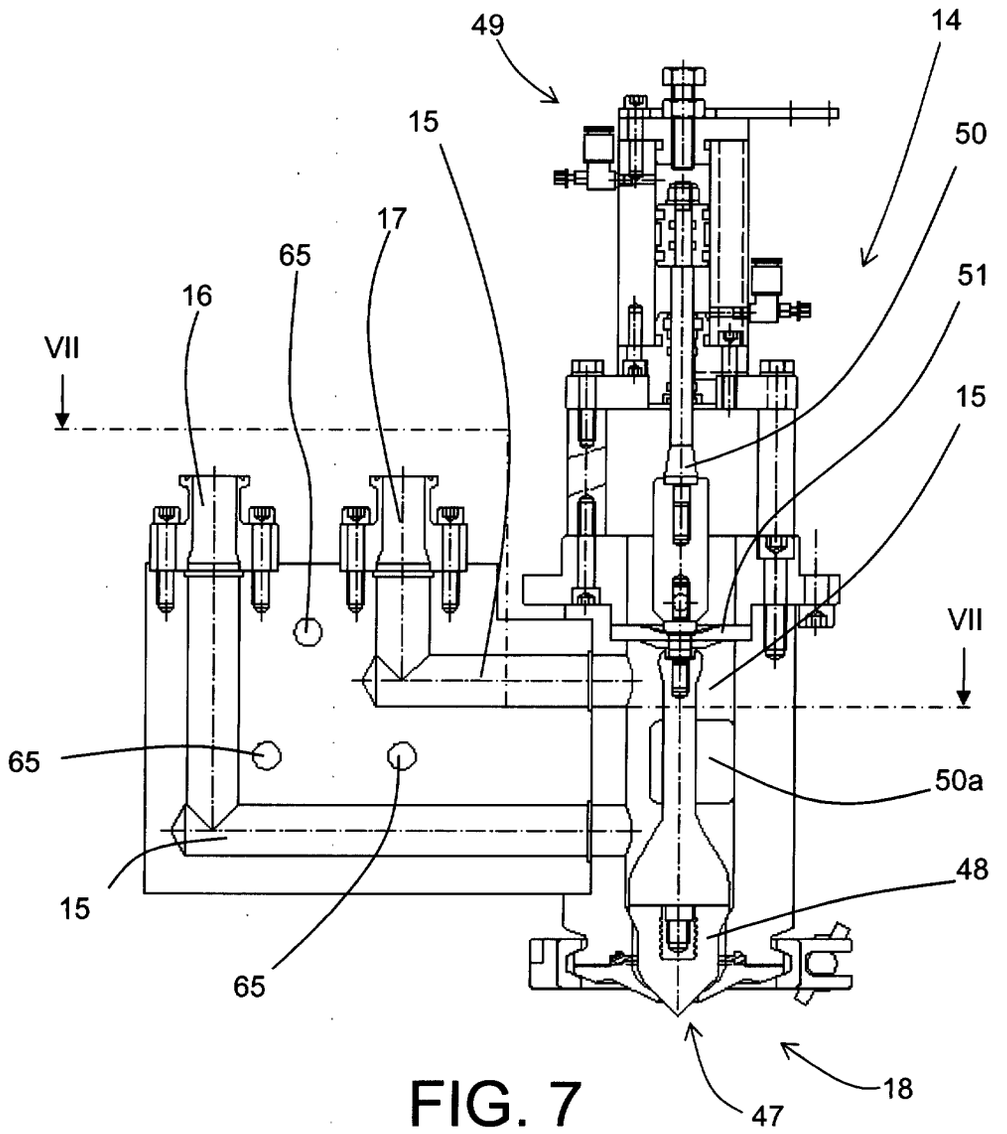
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FIG. 7

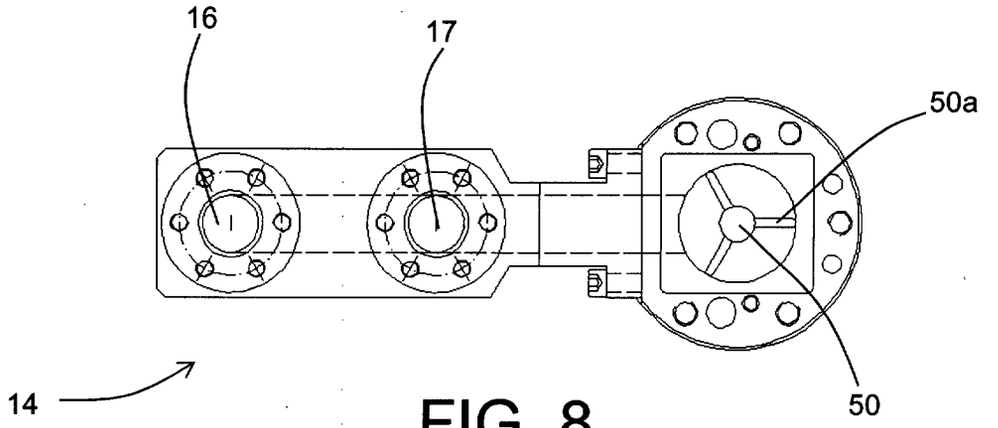
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FIG. 8

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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	20 February 2003	Berrington, N

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