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(72) Inventors:  
 • **GERMINIASI, Roberto**  
**43126 Parma (IT)**  
 • **MILAZZO, Daniel**  
**43126 Parma (IT)**

(74) Representative: **Sidel Group**  
**c/o Sidel Participations**  
**Avenue de la Patrouille de France**  
**76930 Octeville-sur-mer (FR)**

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(71) Applicant: **Sidel Participations**  
**76930 Octeville-sur-Mer (FR)**

(54) **MANIFOLD ASSEMBLY FOR A FILLING MACHINE AND METHOD FOR FILLING A RECEPTACLE WITH A POURABLE PRODUCT**

(57) The invention refers to a manifold assembly (6; 106) for a filling machine (1) adapted to fill a plurality of receptacles (2) with a pourable product; the assembly (6; 106) comprises a manifold (7) provided with a stator (8) defining a first channel (9) which can be fed with the pourable product and a rotor (10) rotatable, in respect to the stator (8), about a given axis (A) and defining a second channel (11) fluidically connected to the first channel (9); the rotor (10) comprises at least an opening (14) fluidically connected to the second channel (11) and fluidically connectable, in use, to at least a respective filling device (5); the manifold (7) also comprises at least an interface element (17, 18, 20, 21, 23, 24; 111, 117) interposed between the stator (8) and the rotor (10) and subject, in use, to overheating; the assembly (6; 106) further comprises feeding means (50, 150) configured to feed a coolant fluid to at least a heat exchange area (51) between the interface element (17, 18, 20, 21, 23, 24; 111, 117) and the coolant fluid.

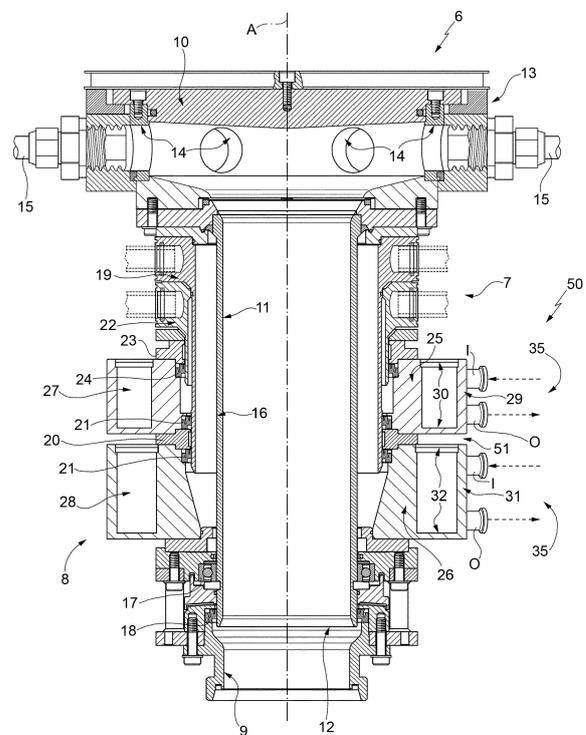


FIG. 2

## Description

**[0001]** The present invention relates to a manifold assembly for a filling machine apt to fill a plurality of receptacles, in particular containers such as bottles or the like, with a pourable product, preferably of the food type.

**[0002]** The present invention further relates to a method for filling a receptacle, in particular a container such as a bottle or the like, with a pourable product, preferably of the food type.

**[0003]** Rotary filling machines are known, which substantially comprise a carousel, rotatable about a vertical axis, a tank containing the pourable product and a plurality of valve filling devices peripherally carried by the carousel in respective radially outer positions relatively to the aforementioned axis. More specifically, the filling devices are advanced along a circular transfer path defined by the carousel.

**[0004]** In detail, each filling device is configured to feed a pre-set amount of pourable product to a respective receptacle, while the latter advances below the relative filling device along the aforementioned transfer path.

**[0005]** Typically, the known filling machines further comprise a manifold assembly configured to fluidically connect the filling devices to the tank.

**[0006]** In detail, the manifold assembly is provided with a manifold, generally arranged concentrically to the axis of the carousel and comprising:

- a stator having substantially cylindrical configuration and defining a first channel for the pourable product fluidically connected to the tank by means of a duct; and
- a rotor also having a substantially cylindrical configuration, which defines a second channel fluidically connected to the first channel, is rotatable, relatively to the stator, about the axis of the carousel, and comprises a plurality of openings, each fluidically connected to the second channel and to a respective filling device.

**[0007]** In detail, the first channel receives the pourable product from the tank through the duct; the second channel receives, in use, the pourable product from the first channel and is configured to distribute it to the filling devices through the respective openings and through respective pipes.

**[0008]** In particular, each pipe is rotatable about the axis of the carousel integrally with the respective filling device and is configured to fluidically connect the second channel to a single respective filling device.

**[0009]** In this way, the pourable product can be conveyed from the tank, which is fixed, to the filling devices, which are mobile, and, from the latter to respective receptacles to be filled.

**[0010]** Therefore, the manifold enables a fluidic connection to be achieved between fixed components and rotating components.

**[0011]** The manifolds of the known type further comprise one or more sealing elements, operating in a dynamic manner, configured to enable a fluid-tight coupling between the stator and the rotor.

5 **[0012]** Generally, said manifolds are further provided with one or more mechanical members configured to allow the rotation of the rotor relatively to the stator, for example, bearings, bushings or the like.

**[0013]** In particular the sealing elements, bearings and bushings mentioned above operate at high speeds and, consequently, are subject to overheating which can cause a significant wear and a reduction of their lifespan.

10 **[0014]** It is therefore an object of the present invention to provide a manifold assembly for a filling machine, which allows to overcome the above-mentioned drawback in a straightforward and low-cost manner.

**[0015]** According to the invention, this object is achieved by a manifold assembly for a filling machine as claimed in claim 1.

20 **[0016]** The present invention further relates to a filling method as claimed in claim 12.

**[0017]** For a better understanding of the present invention, two preferred non-limiting embodiments will be described in the following, purely by way of example and with the aid of the attached figures, wherein:

- Figure 1 is a schematic side view, partially sectioned and with parts removed for clarity, of a filling machine comprising a manifold assembly implemented according to a first preferred embodiment of the present invention;
- Figure 2 is a larger-scale section view with parts removed for clarity of part of the manifold assembly of figure 1;
- 35 - Figure 3 schematically illustrates some of the components of the manifold assembly of figure 2;
- Figure 4 is a section view, with parts removed for clarity, of a manifold assembly implemented according to a second preferred embodiment of the present invention; and
- 40 - Figure 5 schematically illustrates some of the components of the manifold assembly of figure 4.

**[0018]** With reference to the attached figures, number 1 indicates as a whole a filling machine adapted to fill a plurality of receptacles 2 (only one schematically illustrated in figure 1), in particular containers such as bottles or the like, with a pourable product, preferably a pourable food product.

50 **[0019]** The filling machine 1 substantially comprises a carousel 3, rotatable about a vertical axis A, a fixed tank 4 (only schematically shown in figure 1) containing the pourable product, and a plurality of filling devices 5, preferably valve filling devices 5.

55 **[0020]** In particular, each filling device 5 is peripherally carried by the carousel 3 in a respective radially outer position relatively to the axis A.

**[0021]** Each filling device 5 is configured to feed a pre-

set amount of pourable product to a respective receptacle 2, while the latter advances below the relative filling device 5 along a circular transfer path defined by the carousel 3.

**[0022]** Preferably, each filling device 5 is designed to be selectively moved, according to a known manner and not described in detail, between a closed position, in which it prevents the pourable product from flowing within the respective receptacle 2 and, an open position, in which it allows the outflow of the pourable product within the respective receptacle 2.

**[0023]** The filling machine 1 further comprises a manifold assembly 6 including, in turn, a manifold 7, the latter having a substantially cylindrical configuration, being arranged concentric to the axis A and being configured to fluidically connect the tank 4 to the filling devices 5.

**[0024]** As can be seen in figure 2, the manifold 7 comprises:

- a hollow stator 8, substantially cylindrical and internally defining a channel 9 coaxial to the axis A and fluidically connected to the tank 4 by means of a duct 4a (illustrated in figure 1); and
- a rotor 10, also being hollow, substantially cylindrical and coaxial to the stator 8, defining a channel 11 coaxial to the channel 9 and fluidically connected thereto by means of an axial opening 12, and rotatable about the axis A relatively to the stator 8.

**[0025]** Preferably, the rotor 10 comprises, at one upper end portion 13 thereof, a plurality of radial openings 14, in particular having a circular shape.

**[0026]** In detail, each opening 14 is fluidically connected to the channel 11 on one side and, on the opposite side, it is connected to a respective filling device 5 through a relative pipe 15 extending from the manifold 7 in a substantially radial manner towards the outside relatively to the axis A. In particular, each pipe 15 is rotatable about the axis A in an integral manner to the respective filling device 5 and to the rotor 10, whereas the duct 4a is fixed and integral to the stator 8.

**[0027]** In light of what has been described above, the manifold 7 enables a fluidic connection to be achieved between fixed components, namely the tank 4 and the duct 4a, and rotating components, namely the filling devices 5 and the relative pipes 15.

**[0028]** According to the preferred and non-limiting embodiment illustrated in figure 2, the rotor 10 comprises:

- a first rotor element 16 arranged, at least partly, within the stator 8 and externally cooperating with the latter by means of first interface elements, in particular a bearing 17 and a sealing element 18;
- a second rotor element 19 surrounding at least part of the rotor element 16 arranged, at least partly, within the stator 8 and cooperating externally with the latter by means of second interface elements, in particular a radial bearing 20 and two sealing elements

21, arranged on axially opposite sides of the bearing 20;

- a third rotor element 22 surrounding at least part of the rotor elements 16 and 19 arranged, at least partly, inside the stator 8 and cooperating externally with the latter by means of third interface elements, in particular a radial bearing 23 and a sealing element 24.

**[0029]** Preferably, the rotor elements 16, 19 and 22 are coaxial to the axis A and have respective cylindrical flanged shapes.

**[0030]** In detail, each rotor element 16, 19 and 22 comprises a hollow cylindrical portion and a flange also being hollow and axially extending from the cylindrical portion. In greater detail, the upper flange of the cylindrical element 16 defines the upper portion 13 of the rotor.

**[0031]** As can be seen in figure 2, the interface elements are radially interposed between the stator 8 and the rotor 10.

**[0032]** In particular, the bearings 17, 20 and 23 are configured to allow the rotation of the rotor elements 16, 19 and 22 respectively, with respect to the relative portions of the stator 8 with which they cooperate.

**[0033]** Preferably, the sealing elements 18, 21 and 24 are carried by the stator 8 and comprise at least an operating portion configured to cooperate in contact, in a dynamic manner, with the rotor 10.

**[0034]** In the specific case described herein, the sealing elements 18, 21 and 24 are housed in respective dedicated radial grooves obtained in the stator 8 and are configured to cooperate in contact, in a dynamic manner, with the rotor elements 16, 19 and 22, respectively.

**[0035]** According to a known manner not described in detail, the sealing element 18 is configured to prevent the leaking of the pourable product when the product flows from the channel 9 of the stator 8 to the channel 11 of the rotor 10.

**[0036]** In addition, the sealing elements 21 and 24 are configured to prevent the leaking of gas (for example, carbon dioxide or air) from fluidic connection portions, between the stator 8 and the rotor 10, of the pressurisation/discharge and decompression ducts (partially illustrated in figures 1 and 2 and known per se and not described in detail). In particular, said connection portions are defined, respectively, by the rotor elements 19 and 22.

**[0037]** According to a possible alternative not illustrated herein, the sealing elements 18, 21 and 24 could be carried by the rotor 10, in respective dedicated radial grooves made in respective rotor elements 16, 19 and 22 and, could comprise at least an operating portion configured to cooperate in contact, and in a dynamic manner, with the stator 8.

**[0038]** In use the interface elements, namely the bearings 17, 20 and 23 and, the sealing elements 18, 21 and 24 are subjected to overheating, due to the friction to which they are subjected to during their sliding onto the

rotor 10 and due to the high operating speeds.

**[0039]** Advantageously, the manifold assembly 6 further comprises feeding means 50 configured to feed a coolant fluid to at least a heat exchange area 51 between at least one of the aforementioned interface elements, namely the bearings 17, 20 and 23 and the sealing elements 18, 21 and 24 and the coolant fluid.

**[0040]** Preferably the coolant fluid is water.

**[0041]** In particular, the heat exchange area 51 is arranged in a radially outer position relatively to the channel 9 and to the channel 11, with respect to the axis A.

**[0042]** In detail, the manifold 7 comprises at least a wall 25 carried by the stator 8 and defining the heat exchange area 51.

**[0043]** In greater detail, the coolant fluid is configured to lap, preferably externally, the wall 25 in order to remove an amount of heat that the wall 25 absorbs, in use, from the interface element and therefore to cool the latter.

**[0044]** According to the preferred yet non-limiting embodiment described and illustrated herein, the manifold 7 comprises two walls 25 and 26 of the type described above, carried by the stator 8.

**[0045]** In particular the wall 25 defines the heat exchange area between the coolant fluid and: the bearings 20 and 23; one of the sealing elements 21 (the one axially interposed between the bearings 20 and 23); the sealing element 24. Therefore, the wall 25 absorbs the amount of accumulated heat, due to the friction, from said interface elements.

**[0046]** The wall 26 defines the heat exchange area 51 between the coolant fluid and: the bearing 20; the other sealing element 21. Therefore, the wall 26 absorbs the amount of accumulated heat, due to friction, from these interface elements.

**[0047]** In particular, the wall 25 is arranged in contact with the bearings 20 and 23 and with the sealing elements 21 and 24, in order to absorb the amount of accumulated heat from said interface elements by heat conduction.

**[0048]** In the same manner, the wall 26 is arranged in contact with the bearing 20 and with the sealing element 21, in order to absorb the amount of accumulated heat from these latter interface elements by heat conduction.

**[0049]** Preferably, the aforementioned feeding means 50 comprise two chambers 27, 28 delimited, respectively, and at least partly, by the walls 25, 26.

**[0050]** In detail, the chamber 27 is delimited by a further radially outermost wall 29 parallel and facing the wall 25, and by another two walls 30 facing one another and orthogonal to the walls 25 and 29. The chamber 27 has, therefore, a rectangular cross-section and annularly develops about the axis A.

**[0051]** In the same manner, the chamber 28 is delimited by a further radially outermost wall 31 parallel and facing the wall 26, and by another two walls 32 facing one another and orthogonal to the walls 26 and 31. The chamber 28 has, therefore, rectangular cross-section and annularly develops about the axis A.

**[0052]** In particular, the chamber 27 is arranged above

the chamber 28 in respect to the axis A.

**[0053]** In detail, the chambers 27 and 28 are configured to be supplied in a continuous manner with a coolant fluid, through respective inlet openings I, and to be emptied (from the coolant fluid) through respective outlet openings O.

**[0054]** For this purpose, the feeding means 50 further comprise a circuit 33 (figure 3) configured to supply the coolant fluid in a continuous manner within the chambers 27 and 28 through the respective inlet openings I, and configured to extract the coolant fluid in a continuous manner from the same chambers 27 and 28, through the respective outlet openings O.

**[0055]** As can be seen in figure 3, the circuit 33 comprises:

- a source, preferably a tank 34, containing the coolant fluid;
- ducts 35, configured to convey the coolant fluid from the tank 34 inside the respective chambers 27 and 28; and
- a cooler 36 configured to lower the temperature of the coolant fluid, in respect to a given network temperature, before the latter laps the walls 25 and 26.

**[0056]** In detail, the cooler 36 ensures an optimal adjustment of the coolant fluid temperature, in order to obtain an effective heat exchange, in particular a cooling, between the interface elements and the coolant fluid itself.

**[0057]** The operation of the manifold assembly 6 according to the present invention will be described in the following, with reference to a regime operating condition wherein the pourable products flows from the channel 9 of the stator 8 towards the channel 11 of the rotor 10 and from the latter towards each filling device 5 through the relative opening 14 and the corresponding pipe 15.

**[0058]** In this condition, the rotor 10 rotates about the axis A at a given speed and the interface elements are, therefore, subjected to an overheating caused by friction, due to the sliding of the same onto the respective outer surfaces of the rotor elements 16, 19 and 22.

**[0059]** With the aim of removing the accumulated heat from the interface elements, the coolant fluid is conveyed, by means of the circuit 33, to the inside of the cooler 36 and, subsequently to the inside of the chambers 27 and 28, so as to lap the walls 25 and 26, respectively.

**[0060]** Therefore, the coolant fluid removes the heat absorbed by the walls 25 and 26.

**[0061]** Subsequently, the heated coolant fluid exits the chambers 27 and 28 through the respective outlet openings O and is recirculated inside the cooler 36, in order to lower the temperature.

**[0062]** Therefore, the cooled coolant fluid is again, re-directed towards the chambers 27 and 28 and the cooling process is repeated.

**[0063]** In order to tackle the possible loss of coolant fluid, a new amount of coolant fluid, drawn from the tank

34, is periodically added. Therefore, the circuit 33 is a closed circuit.

**[0064]** In figure 4, number 106 indicates as a whole, a second preferred embodiment of the manifold assembly according to the present invention.

**[0065]** Since the manifold assembly 106 is similar, in terms of its operation, to the manifold assembly 6, the description that follows will be limited to the structural differences between the two manifold assemblies 6, 106; the parts of the manifold assembly 106 that are the same or correspond to parts already described, in relation to the manifold assembly 6, will be indicated by using, whenever possible, the same references.

**[0066]** In particular, the manifold 7 of the manifold assembly 106 comprises a thrust bearing plate 117 that operates in the same manner as the bearing 17 of the manifold 7 of the manifold assembly 6.

**[0067]** Furthermore, according to this second preferred embodiment of the present invention, the manifold assembly 106 comprises feeding means 150 including, in turn, three spraying members, preferably three nozzles 108 configured to spray the coolant fluid directly on radially outer surfaces 25a and 26a of the walls 25 and 26, respectively, defining the heat exchange area 51.

**[0068]** As illustrated in figure 5, the feeding means 150 further comprise, a circuit 133 configured to supply the coolant fluid in a continuous manner to the spraying members 108.

**[0069]** In particular, the circuit 133 of the manifold assembly 106 is similar to the circuit 33 of the manifold assembly 6. Even more in particular, the circuit 133 differs from the circuit 33 due to the fact that it is an open circuit.

**[0070]** Furthermore, as can be seen in figure 4, the manifold assembly 106 is different from the manifold assembly 6 due to the fact that the stator 8 of the manifold 7 of the manifold assembly 106 comprises a hollow cylindrical stator element 110, radially interposed between the rotor element 16 and the rotor element 19 and coaxial to the axis A.

**[0071]** In particular, the stator element 110 externally cooperates with the rotor element 19 by means of a further sealing element 111, carried by the stator element 110 itself in a dedicated radial groove.

**[0072]** Only the differences between the operation of the manifold assembly 6 and the operation of the manifold assembly 106 are illustrated hereinafter.

**[0073]** In detail, the coolant fluid sprayed by the nozzles 108 laps the surfaces 25a and 26a, removing the heat accumulated by the interface elements and absorbed by the walls 25 and 26 and, therefore, cools said interface elements.

**[0074]** Furthermore, the coolant fluid runs axially, due to gravity, firstly along the surface 25a and then along the surface 26a, until lapping the area of the manifold 7 of the manifold assembly 106 at which the sealing element 18 and the thrust bearing plate 117 are axially arranged.

**[0075]** In this manner, also the latter interface elements

are cooled.

**[0076]** In light of what has been described above, the coolant fluid, after having been sprayed by the nozzles 108, is not reintroduced in the circuit 133. Therefore, a new amount of coolant fluid is added in a continuous manner within the circuit 133, drawn from the relative tank 34.

**[0077]** From an examination of the characteristics of the manifold 6, 106 according to the present invention, the advantages that it allows to obtain are obvious.

**[0078]** In particular, the presence of feeding means 50, 150 for the coolant fluid according to the present invention allows an efficient cooling of the interface elements 17, 18, 20, 21, 23, 24, 111, 117 interposed between the stator 8 and the rotor 10, limiting in this manner, the wear and increasing their lifespan.

**[0079]** It is clear that modifications and variations can be made to the manifold assembly 6, 106 described and illustrated herein, without departing from the scope of protection defined by the claims.

**[0080]** In particular, the feeding means 50, 150 could comprise, simultaneously, both the chambers 27 and 28, as well as the nozzles 108, or any one of their combinations, for example, a single chamber 27, 28 and two nozzles 108, or two chambers 27, 28 and one nozzle 108 apt to spray coolant fluid in the area of the sealing element 18 and of the bearing 17/thrust bearing plate 117.

## 30 Claims

1. A manifold assembly (6; 106) for a filling machine (1) apt to fill a plurality of receptacles (2) with a pourable product; said assembly (6; 106) comprising a manifold (7) provided with:

- a stator (8) defining a first channel (9) configured to be fed with said pourable product; and
- a rotor (10) rotatable in respect to said stator (8) about an axis (A) and defining a second channel (11) fluidically connected to said first channel (9);

said rotor (10) comprising at least one opening (14) fluidically connected to said second channel (11) and fluidically connectable, in use, to at least one respective filling device (5) of said filling machine (1);

said manifold (7) further comprising at least one interface element (17, 18, 20, 21, 23, 24; 111, 117) interposed between said stator (8) and said rotor (10) and subject, in use, to overheating;

**characterized in that** it further comprises feeding means (50, 150) configured to feed a coolant fluid to at least a heat exchange area (51) between said interface element (17, 18, 20, 21, 23, 24; 111, 117) and said coolant fluid.

2. The manifold assembly according to claim 1, wherein

- said heat exchange area (51) is arranged in a position radially external to said first channel (9) and said second channel (11).
3. The manifold assembly according to claim 1 or 2, wherein said manifold (7) comprises at least a wall (25, 26) defining said heat exchange area (51); said coolant fluid lapping, in use, said wall (25, 26) in order to remove an amount of heat absorbed by said wall (25, 26) and, therefore, to cool said interface element (17, 18, 20, 21, 23, 24; 111, 117).
  4. The manifold assembly according to claim 3, wherein said wall (25, 26) is arranged in contact with said interface element (17, 18, 20, 21, 23, 24; 111, 117), so that said wall (25, 26) absorbs said amount of heat from said interface element (17, 18, 20, 21, 23, 24; 111, 117) through conduction; and/or wherein said wall (25, 26) is carried by said stator (8).
  5. The manifold assembly according to any one of the claims 2 to 4, wherein said feeding means (50) comprise at least a chamber (27, 28) delimited, at least partly, by said wall (25, 26) and configured to be fed in a continuous manner with said coolant fluid through an inlet opening (I), and to be emptied via an outlet opening (O).
  6. The manifold assembly according to claim 5, wherein said feeding means (50) further comprise a circuit (33) configured to feed, in a continuous manner, said coolant fluid to said chamber (27, 28), through said inlet opening (I), and to extract, in a continuous manner, said coolant fluid from said chamber (27, 28), via said outlet opening (O).
  7. The manifold assembly according to any one of the claims 2 to 4, wherein said feeding means (150) comprise at least one spraying member (108) configured to spray said coolant fluid directly on a radially outer surface (25a, 26a) of said wall (25, 26).
  8. The manifold assembly according to claim 7, wherein said feeding means (150) further comprise a circuit (133) configured to feed, in a continuous manner, said coolant fluid to said spraying member (108).
  9. The manifold assembly according to any one of the preceding claims, wherein said interface element (17, 18, 20, 21, 23, 24; 111, 117) defines at least a sealing element (18, 21, 24; 111) comprising at least an operating portion configured to cooperate in contact with one of said rotor (10) and said stator (8).
  10. A filling machine (1) adapted to fill a plurality of receptacles (2) with a pourable product; said filling machine (1) comprising:
    - at least a filling device (5) configured to feed said pourable product to a respective receptacle (2);
    - a fixed tank (4) containing said pourable product and fluidically connectable to said at least one filling device (5); and
    - a manifold assembly (6; 106) according to any one of the preceding claims.
  11. The filling machine according to claim 10, when depending from claim 6 or 8, wherein said circuit (33; 133) further comprises a cooler (36) configured to lower the temperature of said coolant fluid, in respect to a given network temperature, before the latter laps said wall (25, 26).
  12. A method for filling a receptacle (2) with a pourable product, by means of a filling device (5), comprising the steps of:
    - i) feeding said pourable product to a manifold assembly (6; 106) comprising a manifold (7) comprising, in turn:
      - a stator (8), defining a first channel (9) which can be fed with said pourable product; and
      - a rotor (10) rotatable, in respect to said stator (8), about a given axis (A) and defining a second channel (11) fluidically connected to said first channel (9);
      - at least an interface element (17, 18, 20, 21, 23, 24; 111, 117) interposed between said stator (8) and said rotor (10) and subject to heating;
    - ii) feeding said pourable product to said filling device (5) by means of an opening (14) of said rotor (10) fluidically connected to said second channel (11) and fluidically connectable to said filling device (5); and
    - iii) feeding said pourable product to said receptacle (2) by means of said filling machine (5);

**characterized in that** it also comprises the step of:

    - iv) adducing a coolant fluid to a heat exchange area (51) between said interface element (17, 18, 20, 21, 23, 24; 111, 117) and said coolant fluid.
  13. The method according to claim 12, wherein said heat exchange area (51) is radially external to said first channel (9) and said second channel (11).
  14. The method according to claim 12 or 13, further comprising the steps of:
    - v) adducing said coolant fluid to a wall (25, 26) defining said heat exchange area (51); said coolant fluid lapping, in use, said wall (25, 26) so as to remove

an amount of heat absorbed by said wall (25, 26)  
and, therefore, to cool said interface element (17,  
18, 20, 21, 23, 24; 111, 117).

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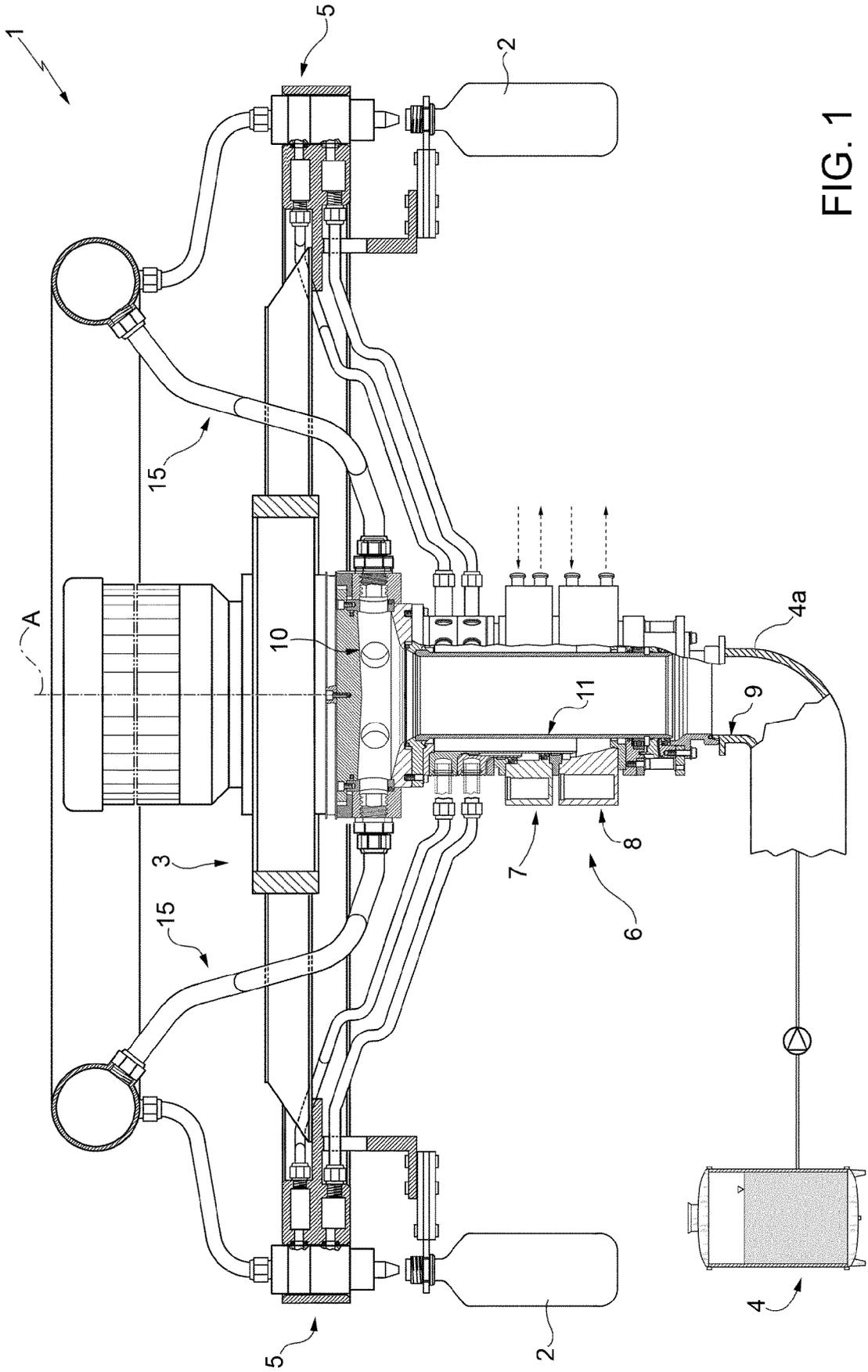


FIG. 1

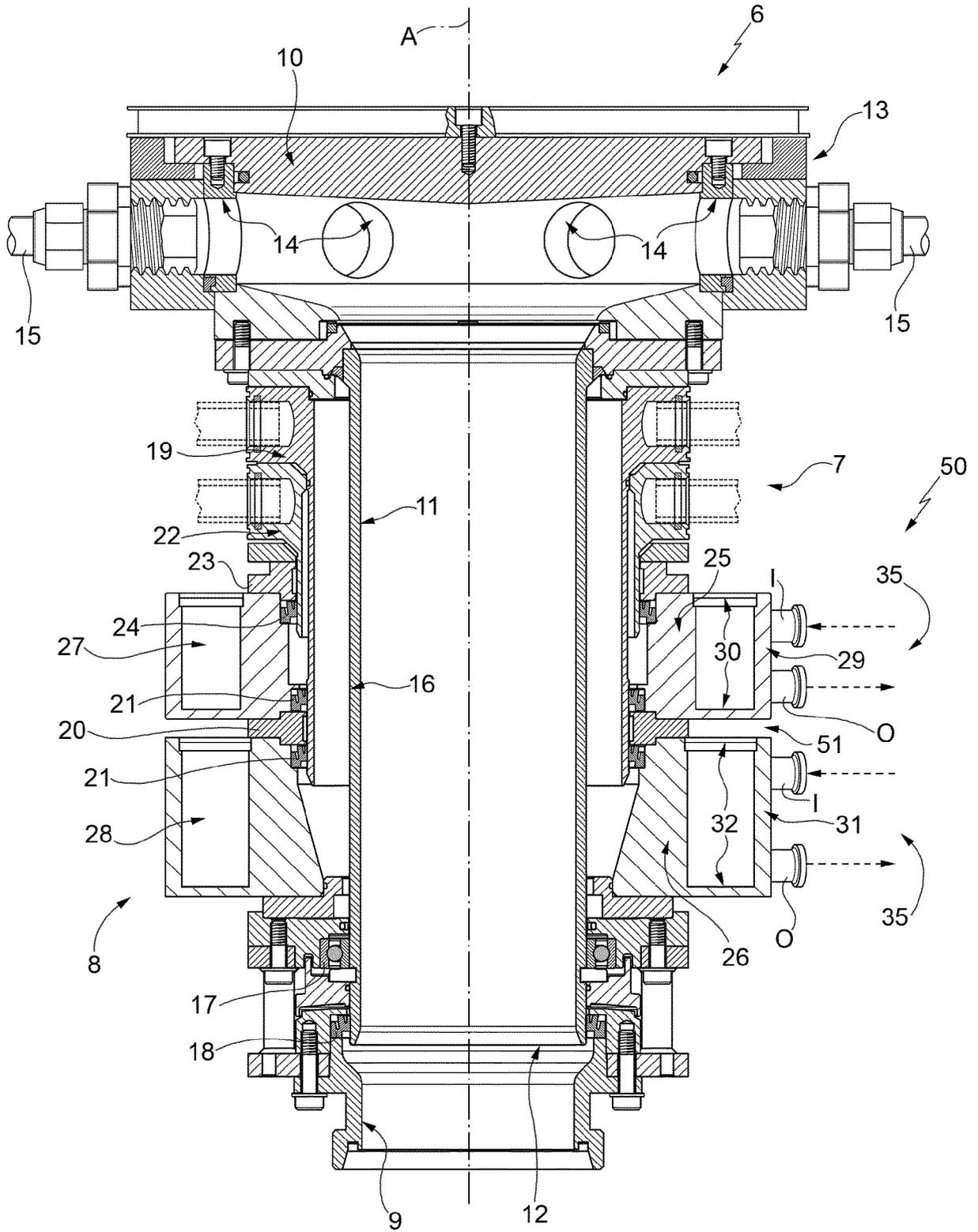


FIG. 2

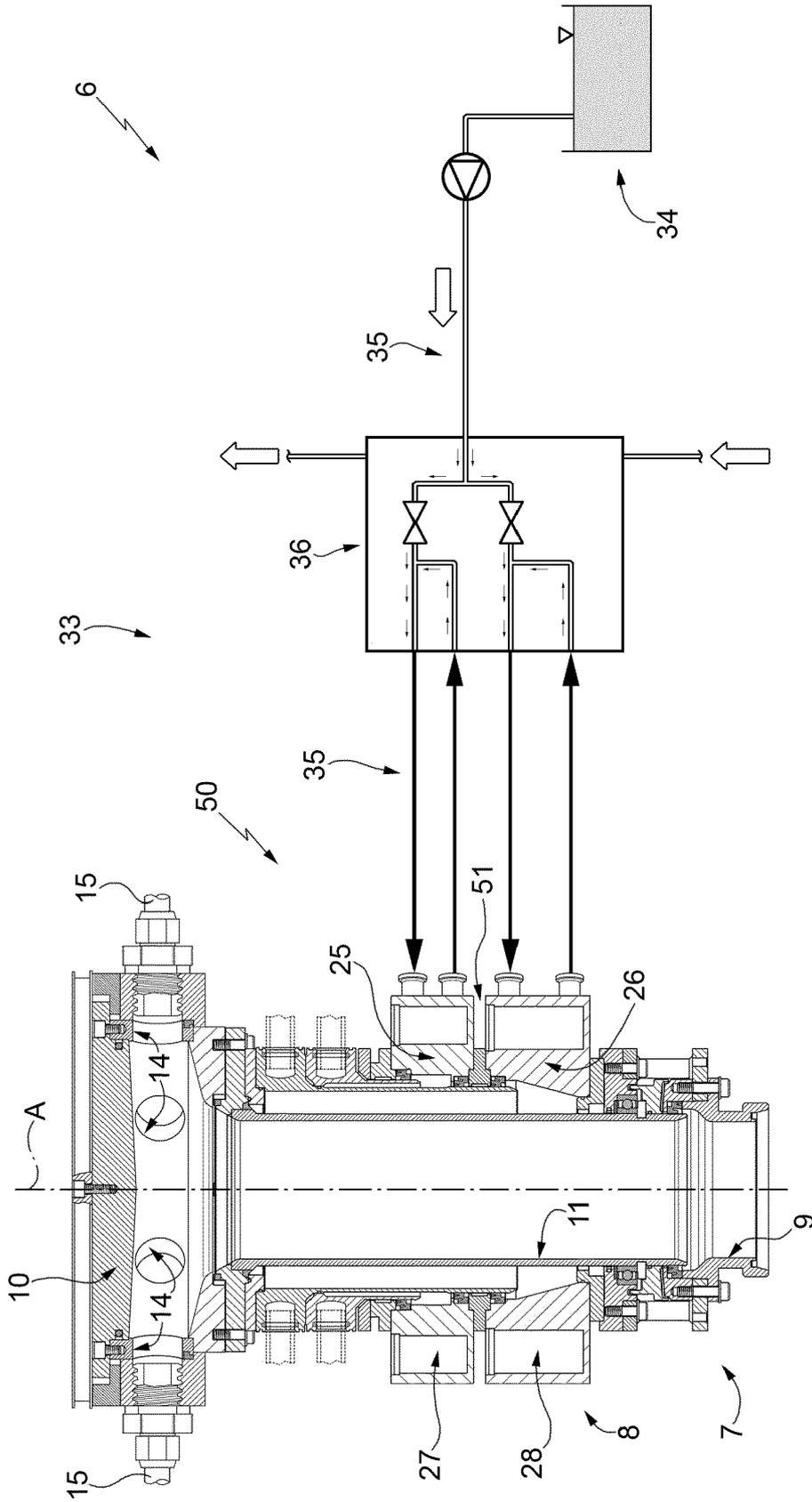


FIG. 3

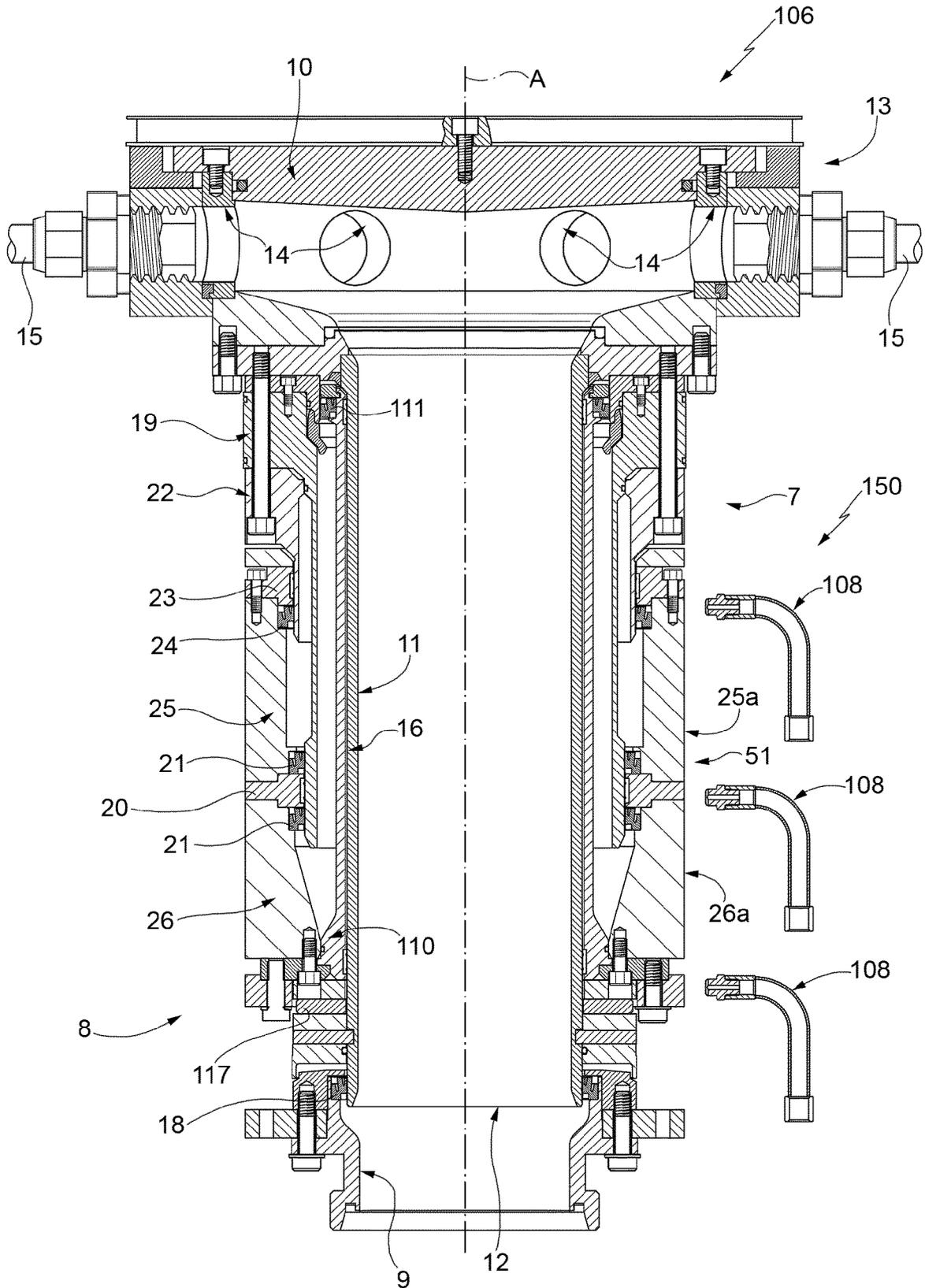


FIG. 4

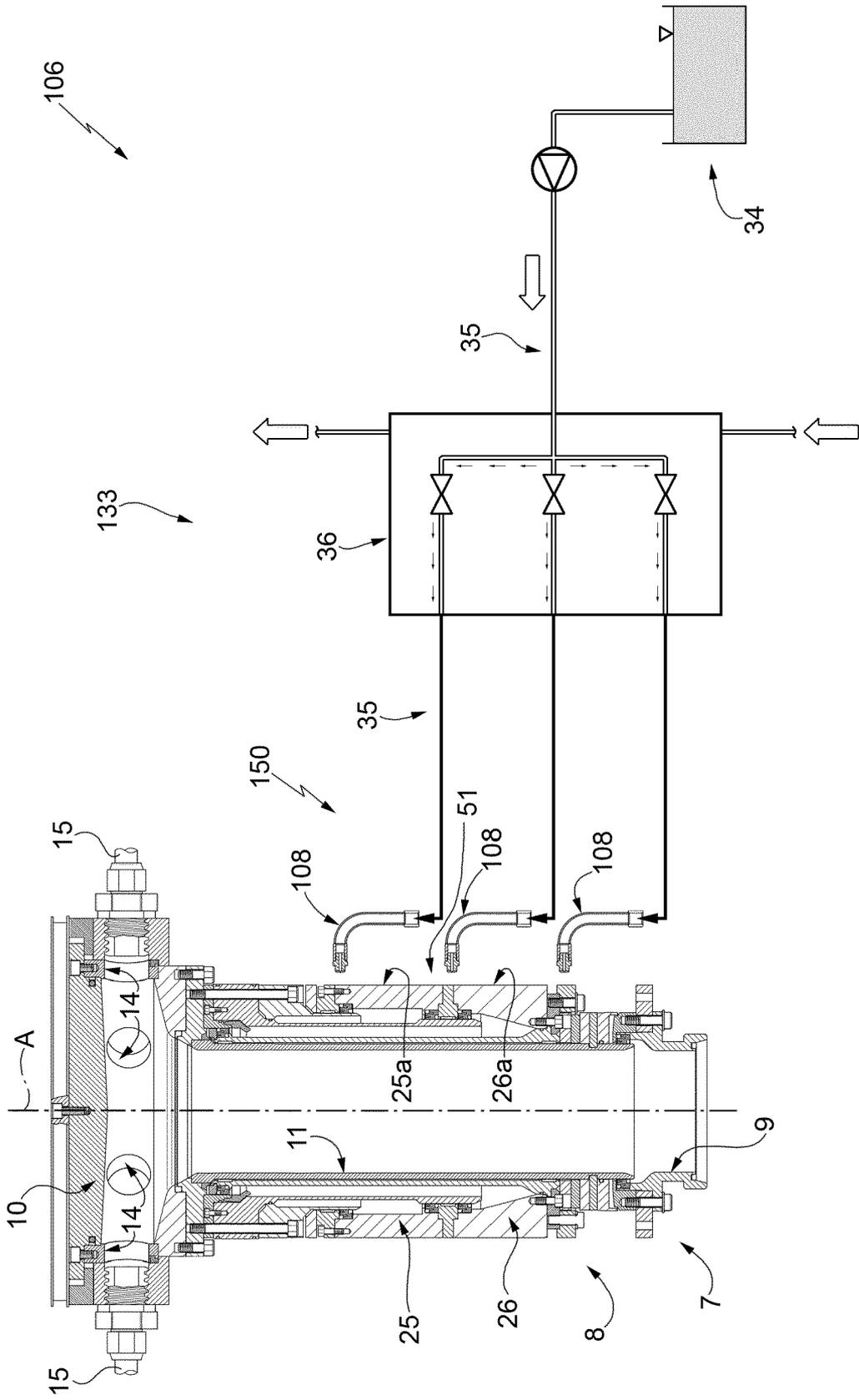


FIG. 5



EUROPEAN SEARCH REPORT

Application Number  
EP 19 18 3758

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	EP 2 070 865 A1 (KRONES AG [DE]) 17 June 2009 (2009-06-17) * paragraphs [0021], [0027] - [0029]; claim 4; figures 3,5 *	1-6,9, 10,12-14 7,8,11	INV. B67C3/22
X,P	WO 2019/048615 A1 (KRONES AG [DE]) 14 March 2019 (2019-03-14) * page 16, lines 1-7 * * page 17, line 20 - line 32; figures 4-13 *	1-6,9, 10,12-14	
			TECHNICAL FIELDS SEARCHED (IPC)
			B67C
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 29 November 2019	Examiner Wartenhorst, Frank
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	

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EPO FORM 1503 03 82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 19 18 3758

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
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29-11-2019

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2070865 A1	17-06-2009	DE 102007060392 A1 EP 2070865 A1	18-06-2009 17-06-2009
-----	-----	-----	-----
WO 2019048615 A1	14-03-2019	DE 102017120657 A1 WO 2019048615 A1	21-03-2019 14-03-2019
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82