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(54) Title: MACHINE FOR PRODUCING LIQUID OR SEMILIQUID FOOD PRODUCTS

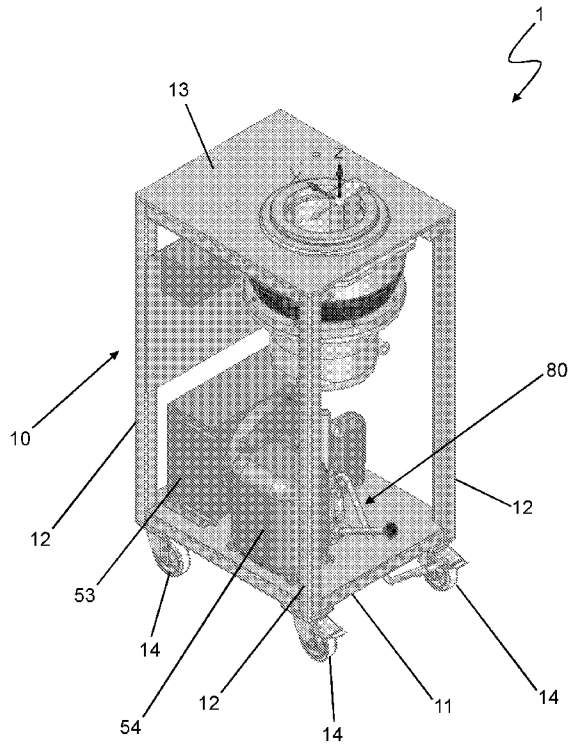

FIG. 1

(57) Abstract: Machine for producing liquid or semiliquid food products, comprising: a) a frame (10); b) a container (20) associated with said frame (10) and adapted to contain a liquid or semiliquid food product, and/or a basic mixture and/or a semifinished product for producing said food product, said container having a substantially vertical extension and a top opening (21); c) an actuator (30) associated with said container (20) and adapted to drive tools for the production of said food product; d) at least one tool (40) mounted on said actuator (30) and extending inside said container (20) to work said food product and/or said basic mixture and/or said semifinished product, e) a thermal exchange system (50) comprising at least one cooling sleeve (51) associated with said container (20) for absorbing heat from the latter.

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MACHINE FOR PRODUCING LIQUID OR SEMILIQUID FOOD PRODUCTS

DESCRIPTION

[TECHNICAL FIELD]

The present invention relates to a machine for producing liquid or semiliquid food products.

By way of example, the machine according to the invention can be used for producing artisan ice cream.

[PRIOR ART]

As is known, the production of artisan ice cream includes a step of pasteurizing the mixture in use, wherein the latter is brought to a temperature in the range of, for example, 65°C to 85°C, for the purpose of eliminating any heat-sensitive pathogenic organisms.

The mixture is then quickly brought to a considerably lower temperature, around 4°C.

The pasteurized mixture is then left to settle for a preset time, at a substantially constant temperature around 4°C (maturing).

The last substantial production step is the so-called batch freezing, wherein the mixture is mixed and kept at a temperature of approx. 4°C - 5°C, so that the product will acquire its typical softness and creaminess.

Machines are currently available which can carry out one or more of the above-mentioned steps.

Such machines, however, are characterized by a complex and costly mechanical structure.

Furthermore, the machines known in the art require complex and time-consuming interventions for the execution of the various steps in succession.

In addition to the above, the machines known in the art do not allow checking the product being worked in real time in a simple and immediate manner, and typically do not allow adding further ingredients in progress, e.g. during the batch freezing step.

In particular, it must be highlighted that the machines according to the state of the art require, at the end of the production of the artisan ice cream, the execution of the following steps:

- the product is removed from the container in which it has been prepared;
- the product is laid into a “free” container, i.e. a container which has not been mounted on the machine or which does not belong to the latter;
- this second container is placed in a controlled environment at very low temperatures, around -40°, for a predefined time.

This last step is necessary because, during the removal step, the ice cream is moved from an environment kept at about -10°C to the outside environment, which may have a temperature around 20°C, and will essentially stay there until the end of the removal step. This implies an undesired rise in the temperature of the product, which, before being sold/consumed, will then have to undergo the additional thermal treatment at -40°C.

The present invention aims at providing a machine for producing liquid or semiliquid food products, which can overcome the above-mentioned drawbacks.

In particular, it is one object of the present invention to provide a machine having a simple mechanical structure.

It is another object of the present invention to provide a machine that can be easily adapted for the execution of all the required production steps.

It is a further object of the present invention to provide a machine that allows adding supplementary ingredients into the basic mixture without difficulty while production is in progress.

These and other objects are substantially achieved through a machine for producing liquid or semiliquid food products as set out in the appended claims.

Machines for producing/processing liquid or semiliquid food products are described in the following documents:

US 2011/283897 A1; EP 0352917 A1; US 6,332,333 B1; EP 2402690 A2; NL 7613458 A; EP 0240085 A1; GB 2193111 A; WO 96/11583 A1; WO 2009/029233 A1; US 2011/228632 A1; WO 2015/008071 A1; WO 2013/030033 A2; DE 20 2012 104659 U1; US 5,150,967 A; US 2003/197080 A1.

None of these documents, however, shows a machine equipped with a thermal exchange system that comprises at least one cooling sleeve associated with said container for absorbing heat from the latter.

[BRIEF DESCRIPTION OF THE DRAWINGS]

Further features and advantages will become more apparent from the following detailed description of some preferred but non-limiting embodiments of the invention.

This description will refer to the annexed drawings, which are also provided merely as explanatory and non-limiting examples, wherein:

- Figure 1 is a schematic perspective view of a machine in accordance with the present invention;

- Figure 2 is a partial sectional view of the machine of Figure 1;
- Figure 3 is a simplified block diagram of a part of the machine of Figure 1;
- Figure 4 schematically shows some elements of the machine of Figure 1;
- Figures 5-7 show a first embodiment of a detail of the machine of Figure 1;
- Figures 8-10 show a second embodiment of the detail shown in Figures 5-7;
- Figures 11-13 show a third embodiment of the detail shown in Figures 5-7;
- Figure 14 shows the machine of Figure 1 with some parts removed in order to highlight other parts;
- Figure 15 is a sectional side view of the machine of Figure 1;
- Figure 16 shows an enlargement of a first part of Figure 15;
- Figure 17 shows an enlargement of a second part of Figure 15;
- Figure 18 shows an enlargement of a third part of Figure 15;
- Figure 19 shows a detail of the machine of Fig. 1.

The drawings show different aspects and embodiments of the present invention and, where appropriate, similar structures, components, materials and/or elements are designated in the various drawings by the same reference numerals.

[DETAILED DESCRIPTION OF THE INVENTION]

With reference to the annexed drawings, reference numeral 1 designates as a whole a machine for producing liquid or semiliquid food products in accordance with the present invention.

The machine 1 (Figure 1) comprises a frame 10, on which the various components making up the machine 1 are mounted.

The frame 10 (Figures 1, 14) may comprise a base 11, one or more support elements 12 (e.g. in the form of columns or uprights), and a top wall 13 having a top surface 13a that can be used as a worktop.

Preferably, the frame 10 can be associated with one or more motion elements 14, such as swivelling castors, as schematically shown in Figure 1.

The machine 1 also comprises a container 20 associated with said frame 10. The container 20, also known as "*carapina*", is suitable for containing a liquid or semiliquid food product and/or a basic mixture and/or a semifinished product for the production of said food product.

By way of example, ingredients for making ice cream, whipped cream, egg cream, fruit sausage, meringues, infusions, oven dough, or for processing (tempering) chocolate, etc. can be inserted into the container 20.

The container 20 (Figures 2, 15, 17) has a substantially vertical extension and a top opening 21. The top opening 21 has multiple functions: allowing ingredient insertion, allowing finished product removal, and allowing tools, such as, for example, a mixer, a batch freezer, a cream whisk, etc. to act upon the substances in the container 20.

Preferably, the container 20 has a substantially cylindrical shape with a substantially vertical axis of extension.

More in detail, the container 20 may be slightly tapered along its whole vertical extension, and may show a more accentuated tapering in its lower portion 22, which is axially opposite to said top opening 21. This shape of the container 20 allows it to be constrained to the frame 10 in a sufficiently stable manner, while also being easy enough to remove.

The container 20 is, in fact, removably associated with the frame 10.

This drastically simplifies the operations that need to be carried out after the product has been prepared: at the end of the production cycle, the container 20 can be removed from the frame 10 and directly moved into the sale environment, the temperature of which is appropriately controlled by means of a thermostat, without requiring any additional treatment.

In other words, the product is not removed from the container 20, like commonly required by prior-art machines, since it is the very container 20 that is extracted from the machine 1. Thanks to the possibility of removing the container 20, the ice cream can be quickly moved from the machine 1 to the area where it will be kept and sold, typically for takeaway. In this manner, in addition to significantly shorter processing times and higher intrinsic quality of the product (since it is not subject to any thermal shocks between production and sale to the consumer), a significant simplification of the production structure is also obtained because a machine for treating the product at -40°C is no longer necessary.

Preferably, the container 20 is positioned in a housing Y defined by the cooling sleeve 51 of the thermal treatment system 50, which will be described below.

Preferably, the housing Y is substantially cylindrical.

The inner walls of the housing Y are shaped in such a way as to substantially match the outer surface of the container 20.

Due to the non-perfect cylindrical shape of the container 20, the outer surface of the container 20 remains very close to, though not in contact with (e.g. max. distance of 0.5 mm), the surface of the housing Y over the whole extension of the container 20, except for the above-mentioned lower portion 22. The latter, which may be, for example, approx. 25-35mm high,

rests in a slightly forced manner on the base of the housing Y, so that a force greater than the weight of the container 20 (and of any content thereof) will need to be exerted in order to remove the container 20 from the housing Y.

In order to facilitate the removal of the container 20, a mechanism 80 (Figures 1, 19), preferably a pneumatic one, is provided: an actuator 81, preferably a pneumatic one, is configured to exert, when operated, a vertical force onto the base (lower portion 22) of the container 20 (arrow F), so as to "release" the latter and make it easily graspable and removable by an operator.

The ejection mechanism 80 may be operated either by hand or by means of a pedal.

By way of example, Figure 19 shows a pedal-type drive mechanism.

When the container 20 needs to be repositioned into the housing Y, the operator will have to operate the knob 82 in order to open the valve associated with the pneumatic actuator 81 and allow the container 20 to be positioned at a level corresponding to the lower end-of-stroke position of the actuator itself.

When the container 20 needs to be removed, instead, the operator will have the press the pedal 83 in order to operate the actuator and push the container 20 upwards, so that it can be comfortably grasped and removed.

Advantageously, the stroke of the pneumatic actuator is longer than the height of the lower portion 22 of the container 20; by way of example, the stroke of the pneumatic actuator may be approx. 45-55 mm.

The pneumatic actuator can thus bring the container 20 to a height where there will no longer be any friction between the outer surface of the container 20 itself and the inner surface of the housing Y, thereby facilitating the extraction of the container by the operator.

The container 20 may be made, for example, of stainless steel.

The machine 1 further comprises an actuator 30 associated with the container 20 for driving tools for the production of the food product.

In accordance with the invention, the actuator 30 comprises a torque motor 31 (Figures 2, 4, 15, 16).

The Applicant wishes to remind that a torque motor is a particular type of brushless motor, which can output a high torque even at slow speeds, in a substantially continuous manner. Therefore, it allows applying the desired torque in a way not strictly related to the revolution speed. A torque motor is typically characterized by a large number of poles: while traditional

brushless motors typically have 2-10 poles, a torque motor may have, for example, 24-56 poles. It is an electronically switched synchronous motor, with the phases offset by 120 electric degrees.

The torque motor 31 comprises:

i. a rotor structure 32 having a substantially annular or cylindrical shape and a substantially vertical axis of rotation X;

ii. a stator 34 mounted on the frame 10 and defining a substantially circular housing 35, in which the rotor structure 32 is rotatably accommodated.

Preferably, the rotor structure 32 comprises an active portion 36 having a substantially annular or toroidal shape, which is formed by a plurality of permanent magnets appropriately oriented and arranged in a *per se* known manner.

The permanent magnets are distributed in accordance with said annular or toroidal shape.

In one embodiment, the permanent magnets are arranged along the whole circumferential extension of the active portion 36. As an alternative, the magnets may be arranged along just an arc of the same.

The stator 34 comprises a plurality of windings, which, in a plan view, are circumferentially arranged in such a way as to delimit the above-mentioned circular housing 35.

Note that the windings may be distributed over the entire circumference of the stator 34 or over just an arc of the same.

It is however envisaged that, for the motor 31 to operate appropriately, the permanent magnets of the active portion 36 are distributed along the entire circumferential extension thereof and/or the windings of the stator 34 are distributed over the entire circumference thereof.

The windings of the stator 34 are suitably powered and controlled to generate a magnetic field that, by interacting with the permanent magnets belonging to the rotor structure 32, will cause the latter to rotate about its own axis of rotation X.

Figure 4 schematically shows the permanent magnets "NS"/"SN" that make up the active portion 36 and the stator 34 (the windings of the latter are not shown for the sake of simplicity).

It is advantageously envisaged that a detection element (e.g. a Hall sensor) is associated with the rotor structure 32 in order to detect the position of the latter and allow the stator windings to be driven correctly. In this manner, the revolution speed of the rotor structure 32 can be

adjusted appropriately.

More in detail, the detection element is located in a suitable seat in the stator body. By reading the magnetic flux of the active portion 36 of the rotor structure 32, it is possible to determine the angular position and the speed of the rotor structure 32 itself.

One can thus avoid using encoders/resolvers or other similar detection devices; it is however envisaged that the same may be employed wherever appropriate or necessary.

In one embodiment, a so-called "sensorless" technique is used for controlling the actuator 30, i.e. a control technique that requires no transducer and provides a reference representative of the mutual position and/or speed of the rotor 32 and stator 34: this control is based on the electromotive force of the motor 31 itself.

Preferably, the machine 1 is equipped with a bearing structure 61 associated with the rotor structure 32 to allow the latter to rotate relative to the other parts of the machine 1, particularly to the stator 34.

In particular, the bearing structure 61 can be mounted higher than the stator 34 in a radially external position relative to the rotor structure 32.

In accordance with the invention, the rotor structure 32 has a radially internal zone 33 (Figures 2, 4) that, in a plan view, is at least partially superimposed on the top opening 21.

In particular, the rotor structure 32 is arranged in a radially external position relative to the container 20, so that, in a plan view, the top opening 21 is wholly contained in the radially internal zone 33 of the rotor 32.

Preferably, the rotor structure 32 and the stator 34 define a substantially cylindrical structure which is substantially coaxial to the container 20.

Advantageously, through the radially internal zone 33 of the rotor structure 32 it is possible to gain access, via the top opening 21, to the inside of the container 20.

Among other advantages, this implies that some ingredients can be very easily introduced into the mixture while the latter is being processed (e.g. pieces of fruit, candied fruit, etc.).

Advantageously, the machine further comprises a thermal treatment system 50 (Figures 1, 3, 17) for heating and/or cooling the container 20 and the content thereof.

Said thermal treatment system 50 comprises, in a *per se* known manner, a compressor 54, an exchanger 53, one or more thermal expansion elements 52, and at least one cooling sleeve 51, within which a thermal fluid circulates which can change its own physical conditions to allow the thermal treatment system 50 to absorb heat from the container 20.

The sleeve 51 is advantageously made as a substantially cylindrical interspace arranged in a radially external position relative to the container 20, so as to heat/cool the latter and the content thereof by conduction and irradiation.

Advantageously, the thermal fluid of the thermal treatment system 50 is distributed throughout the whole sleeve 51, i.e. throughout the whole aforesaid interspace.

Preferably, the sleeve 51 is substantially coaxial to the container 20, the stator 34 and the rotor structure 32. In particular, the sleeve 51 is mounted on the frame 10 lower than the actuator 30.

Preferably, the sleeve 51 has a plurality of inlets, e.g. three inlets 51.1, 51.2, 51.3, equally spaced angularly from one another; through said inlets, the fluid that must act upon (e.g. cool) the container 20 and the content thereof is fed.

Preferably, the inlets are located in the lower part of the sleeve 51.

The sleeve 51 also has at least one outlet 51.4, preferably located in the upper part of the sleeve itself, to allow the fluid to be recirculated in the thermal treatment system.

The sleeve 51 also has an auxiliary inlet 51.5 for hot fluid exiting the compressor or the exchanger, for dissolving any condensate that may form between the container 20 and the housing Y. Said condensate might in fact freeze and hinder/prevent the extraction of the container 20; therefore it should be removed.

In addition or as an alternative to the thermal treatment system 50, the operator may manually supply liquid nitrogen.

Advantageously, in order to work the food product and/or the basic mixture and/or a semifinished product, the machine 1 comprises at least one tool 40.

The tool 40 is mounted on the rotor structure 32 and extends inside the container 20.

Preferably, the tool 40 comprises:

a) an engaging portion 41 for mounting it on the rotor structure 32;

b) an operating portion 42, associated with the engaging portion 41, for working the food product and/or the basic mixture and/or the semifinished product.

Preferably, the operating portion 42 has a substantially vertical extension and, when in use, it extends in the container 20 at a distance from the inner surface of the latter which is shorter than the radius of the container 20. In other words, when the tool 40 is mounted on the rotor structure 32 and is turned by the latter, there will still be a substantially cylindrical radially internal zone of the container 20 that will not be reached by the tool 40.

Conveniently, the tool 40 is removably mounted on the rotor structure 32.

In this manner, different tools may be used depending on the operation that needs to be carried out.

For example, the tool may be a mixer, a batch freezer, a cream whisk, etc.

Advantageously, for the execution of the pasteurization step, wherein the mixture must be heated in a controlled manner, it is envisaged to employ a heating element 90.

Preferably, the heating element 90 is positioned at a lower level than the container 20, in particular underneath it, in proximity to the lower portion of the container 20.

In one embodiment, the heating element 90 may be an electric resistor, appropriately powered to provide the required heat whenever necessary.

In a different embodiment, the heating element 90 may be an induction plate.

Advantageously, the heating element 90 may have a substantially plate-like conformation, e.g. with a substantially circular profile.

In a preferred embodiment, the heating element 90 may act as a terminal element of the ejection mechanism 80 (Figure 19): the pneumatic actuator of the ejection mechanism 80 will directly act upon the heating element 90, and this, as it comes in contact with the container 20, will exert on the latter the necessary upward force to release it from the sleeve 51 and make it easily removable by the operator.

The rotor structure 32 preferably comprises an annular connection element 70 integral with the above-mentioned active portion 36.

The annular connection element 70 is used for connecting to and supporting the tool 40.

More in detail, a top surface 71 of the element 70 may have a profiled seat 72 (Figures 5-13) in which the connection portion 41 of the tool 40 is positioned.

In one embodiment (Figures 5-7), within the seat 72 there may be one or more holes 72a, into which respective substantially vertical pins 41a of the connection portion 41 are inserted.

It is also envisaged that the connection element 70 has a groove 73, at least in the radial region of the seat 72; into said groove 72, a respective horizontal expansion 41b of the connection portion 40 is inserted. Note that the groove 73 may also be substantially continuous along the circumference, as schematically shown in Figure 6.

In a different embodiment (Figures 8-10), an engaging block 74 extends vertically from the seat 72, in which block a cavity 75 is formed, the cross-section of which has a U-shaped profile having an inclination comprised, for example, between 40° and 50° relative to the

horizontal plane.

In this case, the engaging portion 41 is provided with a substantially cylindrical element 41c, the cross-section of which has substantially the same curvature as the cavity 75.

Once inserted into the cavity 75, the substantially cylindrical element 41c can be fixed by means of a pair of pins 76 inserted into respective through holes 77 of the engaging block 74.

In a further embodiment (Figures 11-13), the engaging block 74 has a pair of substantially cylindrical cavities 78 extending horizontally, into which a pair of pins 41d are inserted, which extend horizontally from the engaging portion 41 of the tool 40.

The machine 1 preferably comprises a covering element 100 (Figure 1), such as, for example, a cover associated with the top wall 13 of the frame 10.

The covering element 100 may be simply laid on the top wall 13 or may be hinged thereto.

The function of the covering element 100 is to keep the container 20 and the content thereof isolated from the outside, for both hygienic and thermal reasons.

When the tool 40 needs to be replaced, or when the container 20 needs to be removed, it will suffice to remove/open the covering element 100 and then carry out the desired operation.

Preferably, the machine 1 further comprises a protection ring 110 (Figures 15, 18) integrally mounted on the rotor structure 32, in particular on top of the annular connection element 70.

Preferably, the protection ring 110 is made of thermoplastic polyurethane (trade name: Sintek H-TPU), generally also known as “food grade rubber”.

The task of the protection ring 110 is to avoid that any food residues or parts might fall into the interspace between the rotor structure 32 and the rest of the machine 1, thus jeopardizing the proper operation of the machine 1.

As schematically shown in Figure 18, the protection ring 110 has a first portion 111a adhering to the annular element 70 and an inclined second portion 111b.

The slope points from the top of the annular connection element 70, which is at a relatively higher level, towards the top wall or worktop 13, which is at a relatively lower level.

The protection ring 110 also has an engaging expansion 112 to be fixed to a respective groove 113 formed on the radially external surface of the annular connection element 70.

The invention offers significant advantages.

First and foremost, due to the use of a torque motor it considerably reduces the number of moving mechanical parts, since there is no motion reduction/transmission between the motor and the tool. The latter is, in fact, mounted directly on and integrally with the rotor structure.

As a result, the reliability, service life and structural simplicity of the machine are significantly improved.

In addition, because of the possibility of removing the container from the frame, the product can be removed from the machine and brought to the point of sale/consumption without requiring the use of other containers, thus providing considerable advantages in terms of consumption, possible bacterial contamination and transfer speed.

Moreover, the structure of the machine allows further ingredients to be quickly, easily and uninterruptedly added to the mixture when the latter has already been at least partially processed.

A further advantage relates to the fact that the structure of the cooling sleeve belonging to the thermal treatment system allows the mixture being processed to be cooled in a uniform and efficient manner.

Another advantage is that the machine of the invention can be assembled easily, even by non-skilled personnel: in particular, the rotor structure simply needs to be laid onto the support wall, and the tool simply needs be hooked to the annular connection element of the rotor structure.

CLAIMS

1. Machine for producing liquid or semiliquid food products, comprising:

a) a frame (10);

b) a container (20) associated with said frame (10) and adapted to contain a liquid or semiliquid food product, and/or a basic mixture and/or a semifinished product for producing said food product, said container having a substantially vertical extension and a top opening (21);

c) an actuator (30) associated with said container (20) and adapted to drive tools for the production of said food product;

d) at least one tool (40) mounted on said actuator (30) and extending inside said container (20) to work said food product and/or said basic mixture and/or said semifinished product,

e) a thermal exchange system (50) comprising at least one cooling sleeve (51) associated with said container (20) for absorbing heat from the latter.

2. Machine according to claim 1, wherein said sleeve (51) has a substantially cylindrical shape and is radially external to said container (20).

3. Machine according to claim 1 or 2, wherein said sleeve (51) defines a housing (Y) for said container (20).

4. Machine according to any one of the preceding claims, wherein said thermal treatment system (50) further comprises:

a) a compressor (54);

b) an exchanger (53);

c) one or more thermal expansion elements (52);

wherein a thermal fluid circulates in said thermal treatment system (50), which can modify its own physical conditions so as to allow said system (50), in particular said sleeve (51), to absorb heat from said container (20).

5. Machine according to any one of the preceding claims, wherein said sleeve (51) has a plurality of inlets (51.1, 51.2, 51.3), through which the thermal fluid is supplied to said sleeve (51) from said thermal expansion element (52), said sleeve (51) having also an outlet (51.4) that allows said thermal fluid to circulate again in said system (50) after a thermal exchange has occurred with said container (20).

6. Machine according to claim 5, wherein said inlets (51.1, 51.2, 51.3) are located at the

base of said sleeve (51), said outlet (51.4) being located at the top of said sleeve (51).

7. Machine according to any one of claims 4 to 6, wherein said sleeve (51) further comprises an auxiliary inlet (51.5) for supplying thermal fluid to said sleeve (51) from said compressor (54) or from said exchanger (53).

8. Machine according to any one of the preceding claims, wherein said actuator (30) comprises a torque motor (31), the latter being equipped with:

a) a rotor structure (32) having a substantially annular shape and including a radially internal zone (33) that, in a plan view, is at least partially superimposed on said top opening (21), said rotor structure (32) having a substantially vertical axis of rotation (X);

b) a stator (34) mounted on said frame (10) and defining a substantially circular housing (35), in which said rotor structure (32) is rotatably accommodated.

9. Machine according to claim 8, wherein said rotor structure (32) and said stator (34) are substantially coaxial to said sleeve (51).

10. Machine according to claim 9, wherein said container (20) can be vertically extracted from said housing (Y) through the radially internal zone (33) of said rotor structure (34).

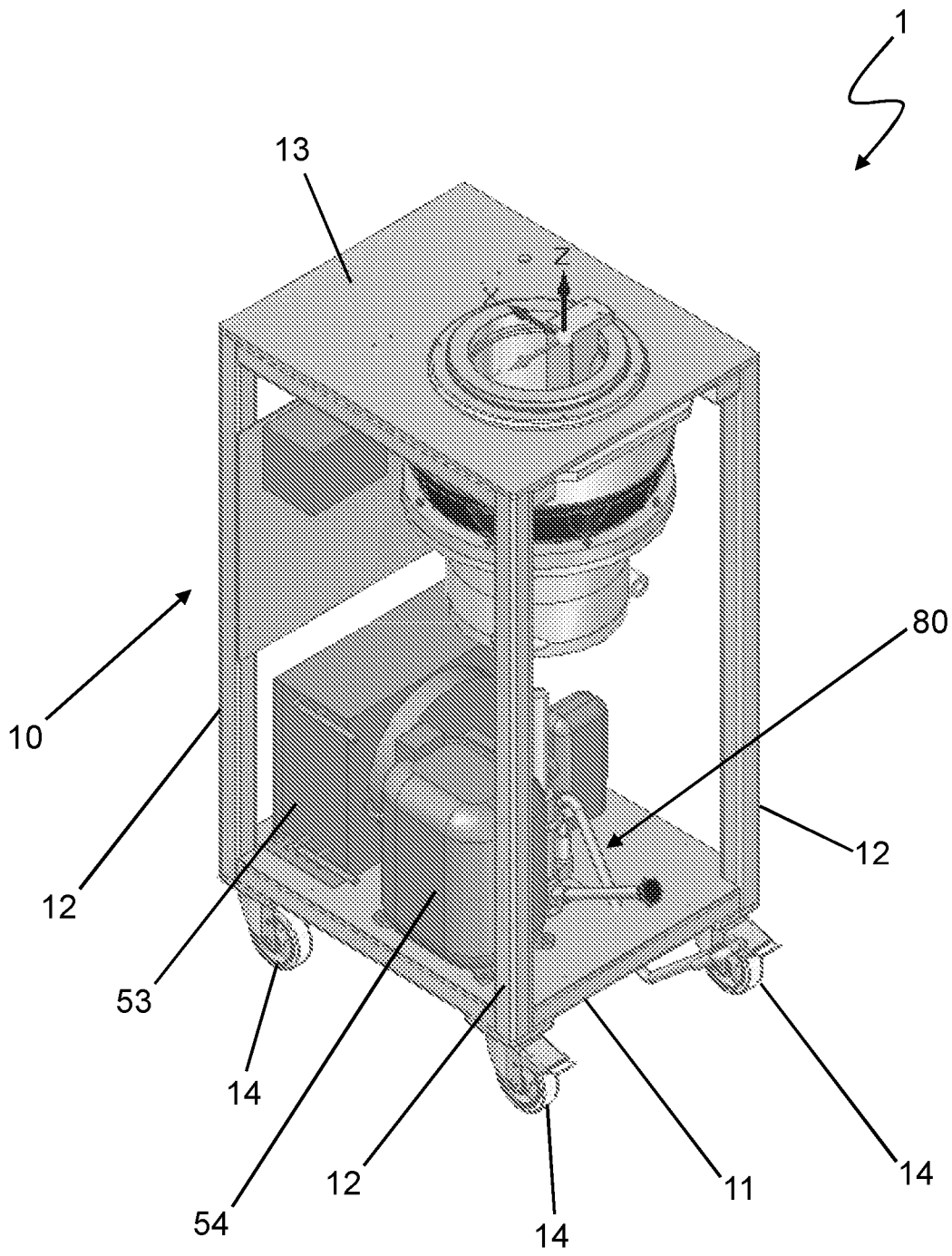

FIG. 1

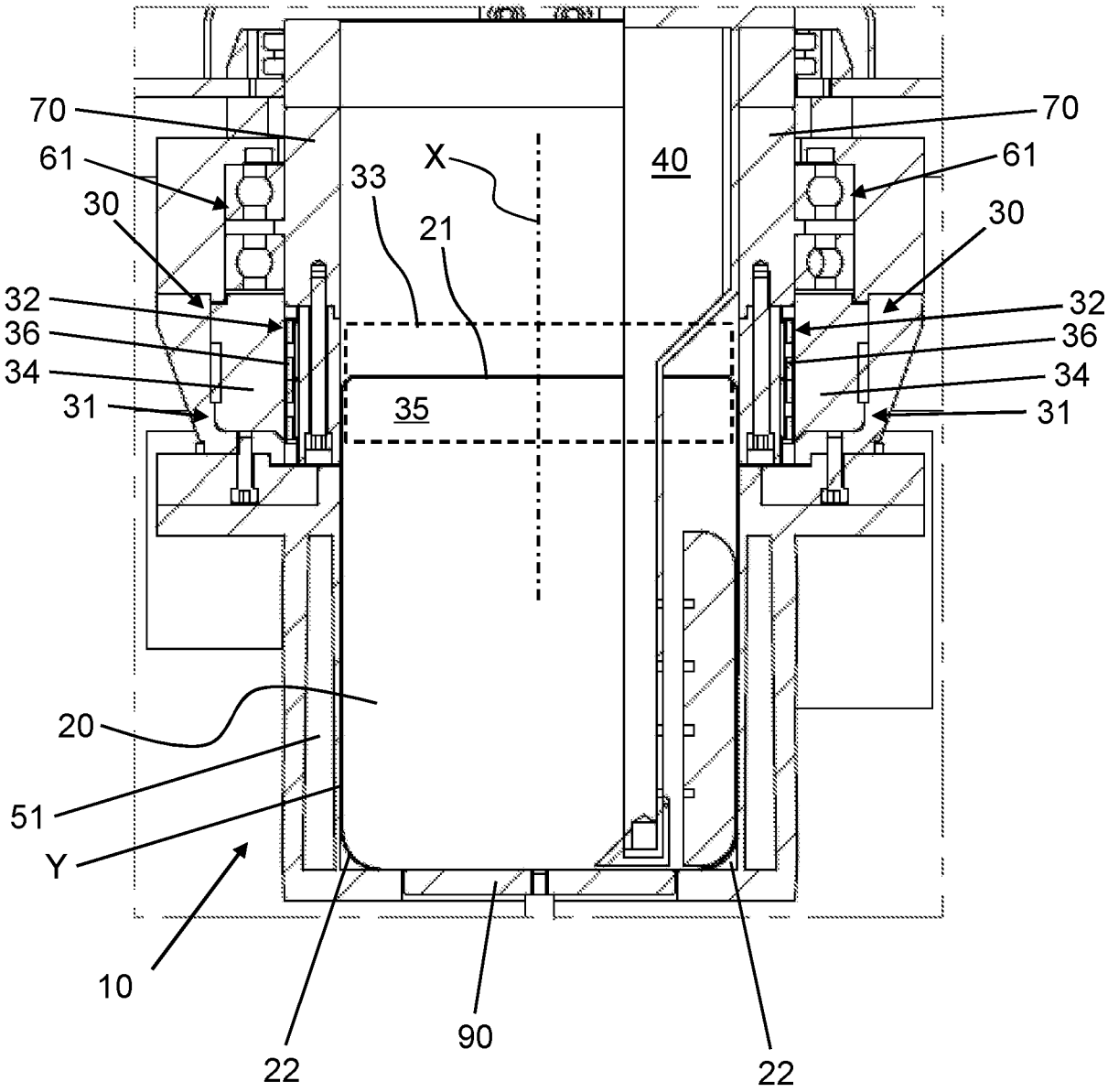
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FIG. 2

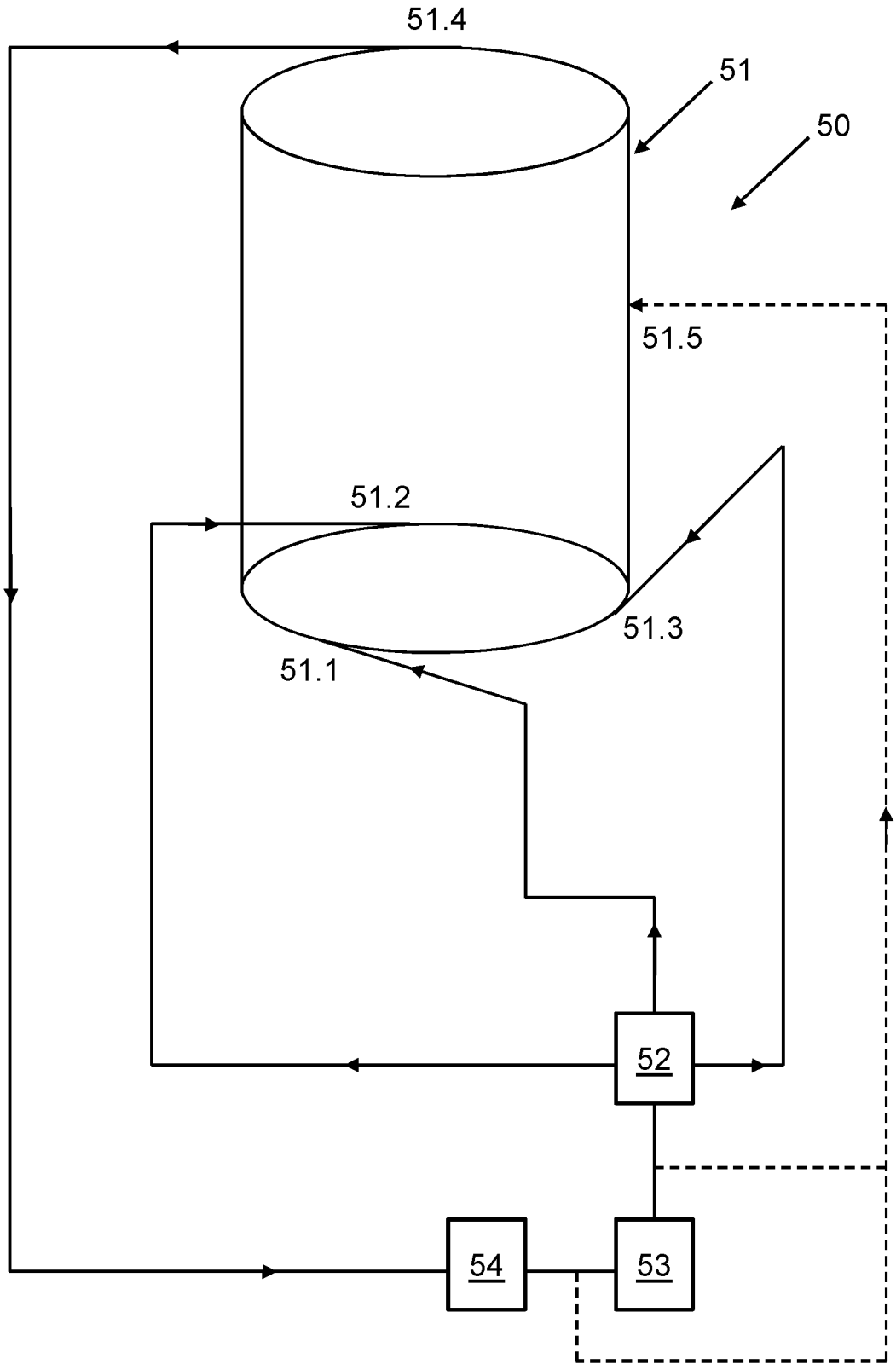

FIG. 3

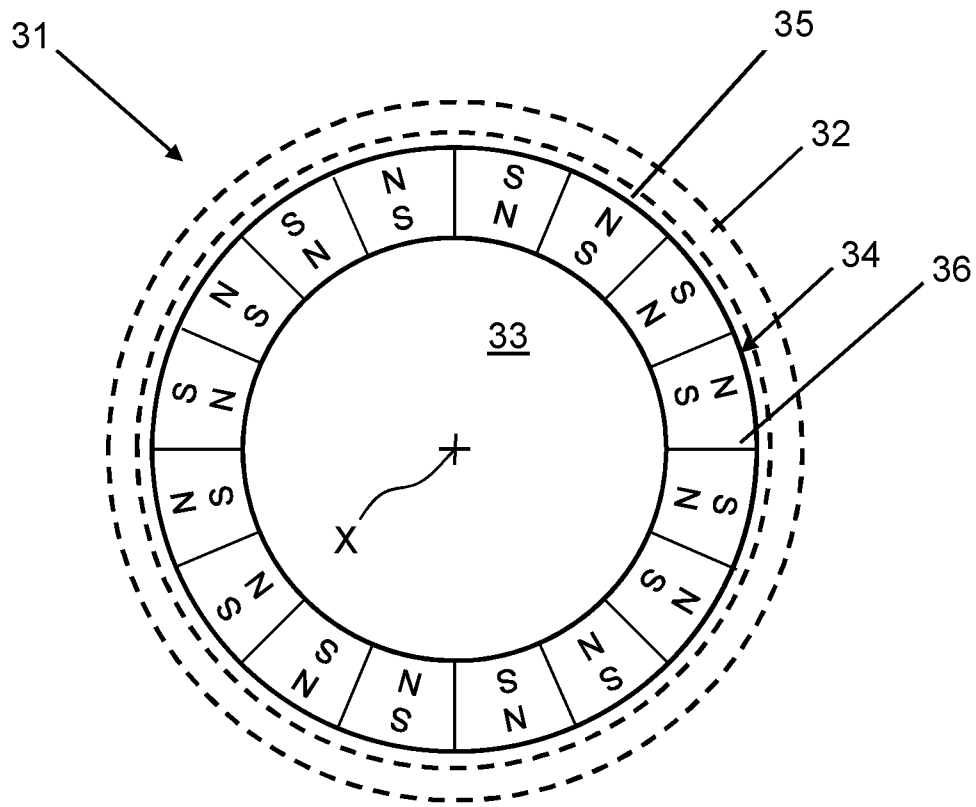

FIG. 4

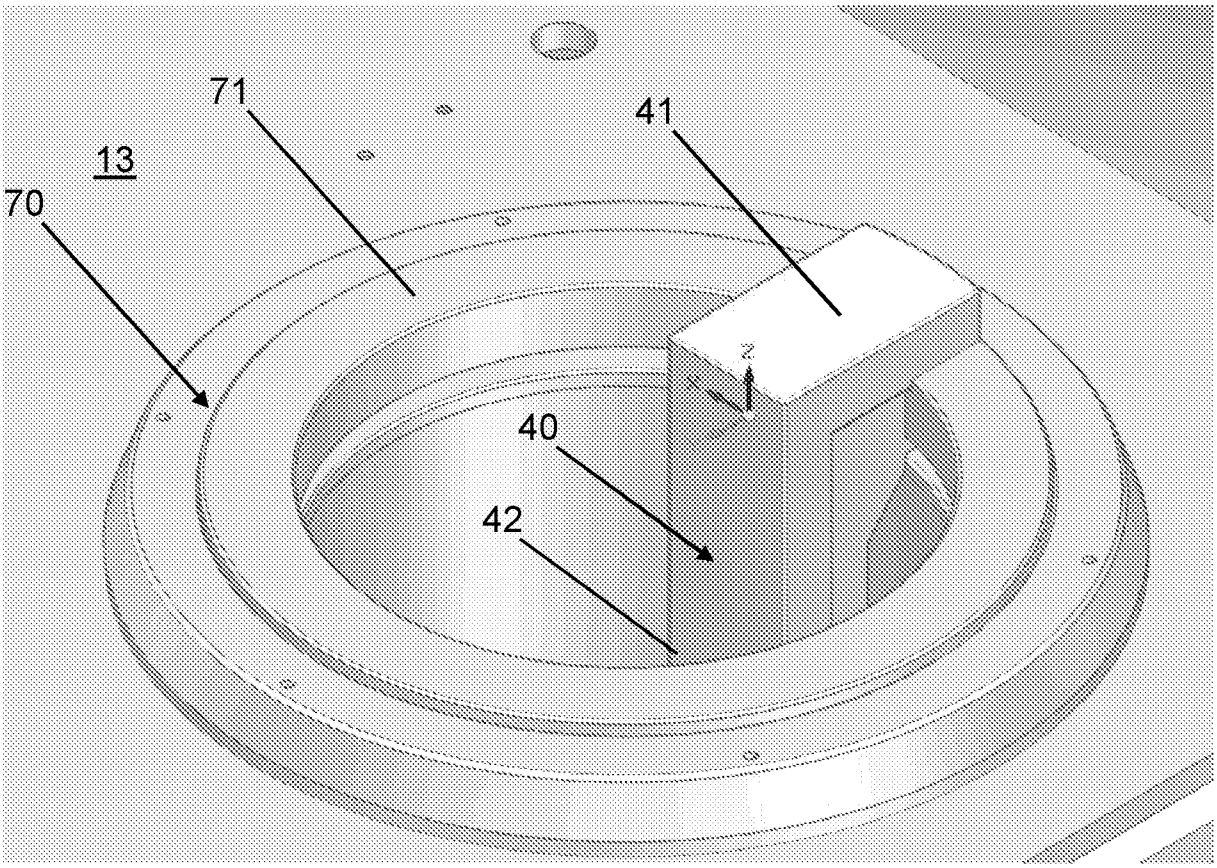

FIG. 5

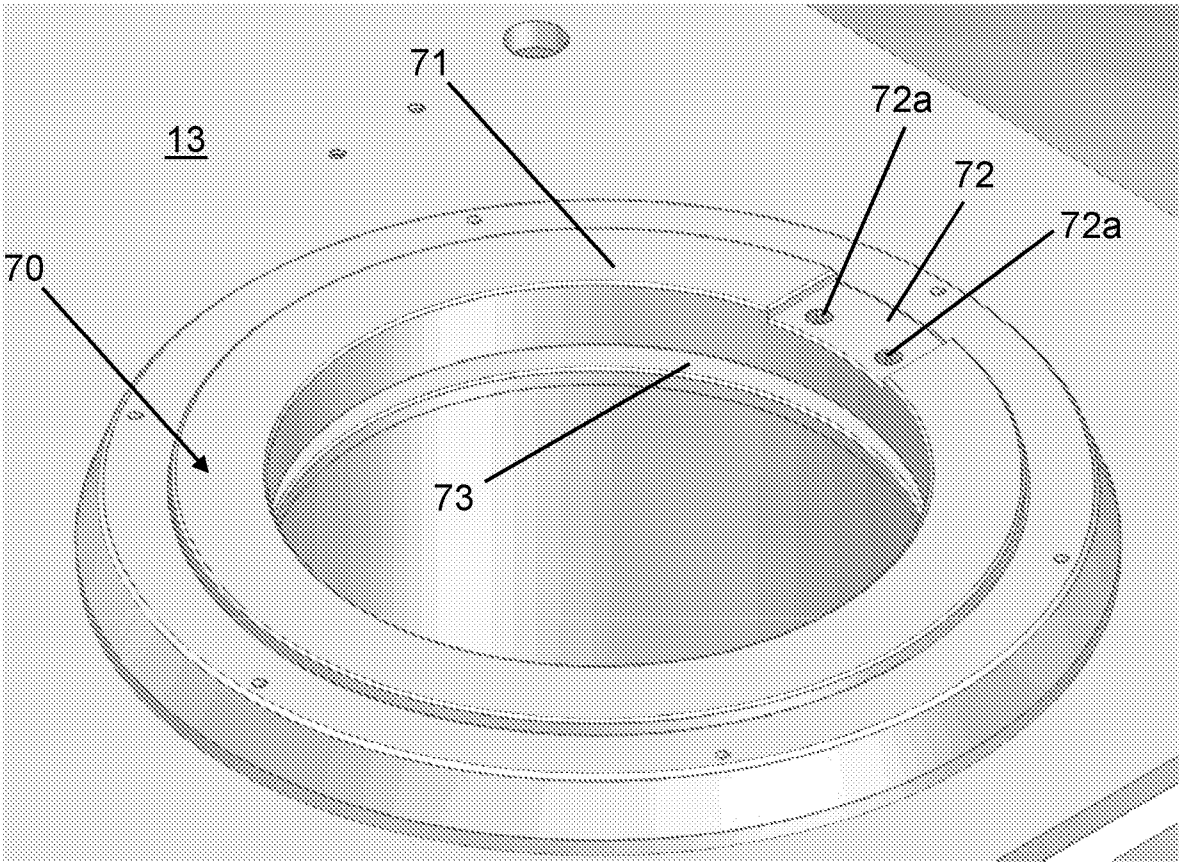

FIG. 6

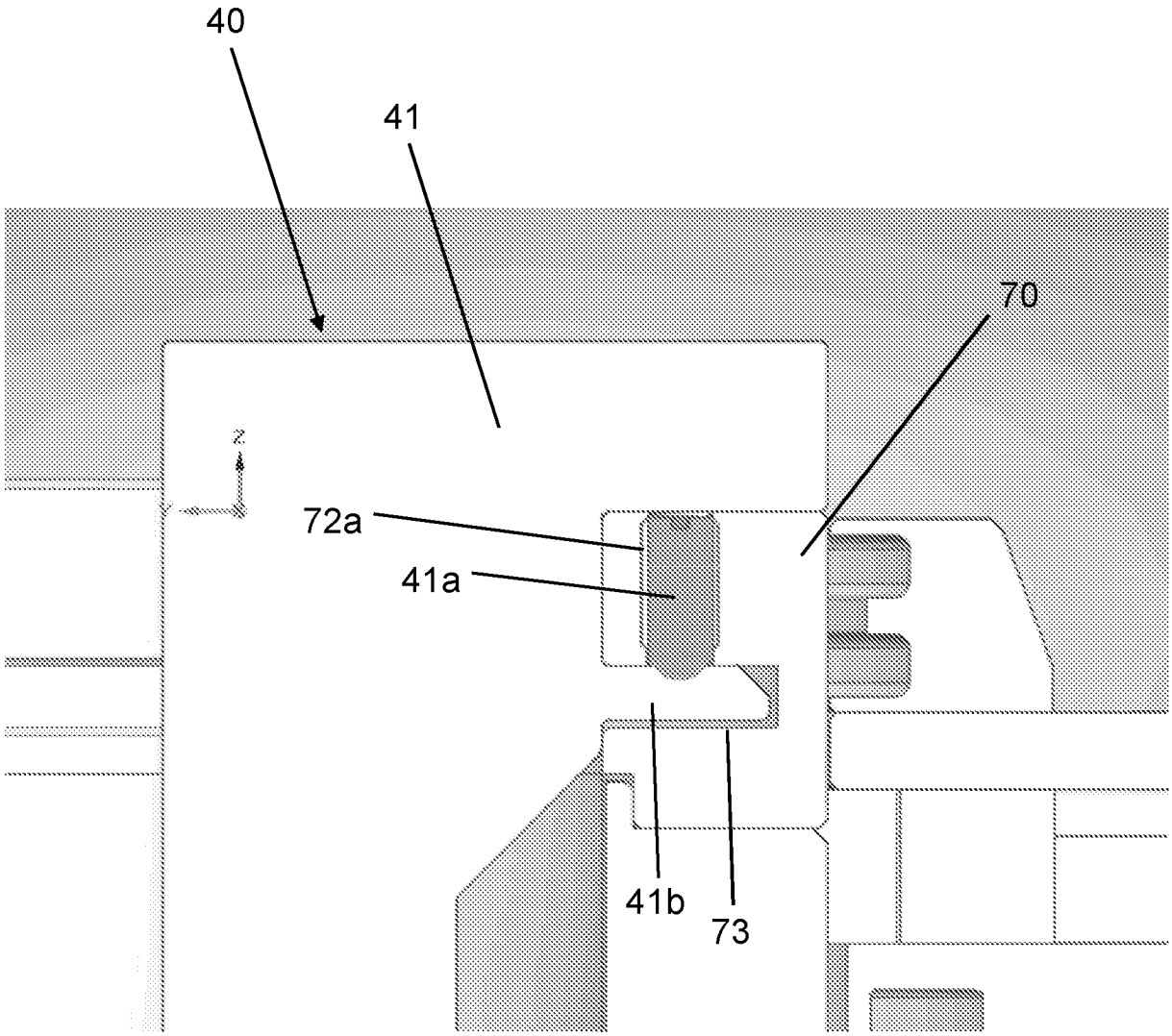

FIG. 7

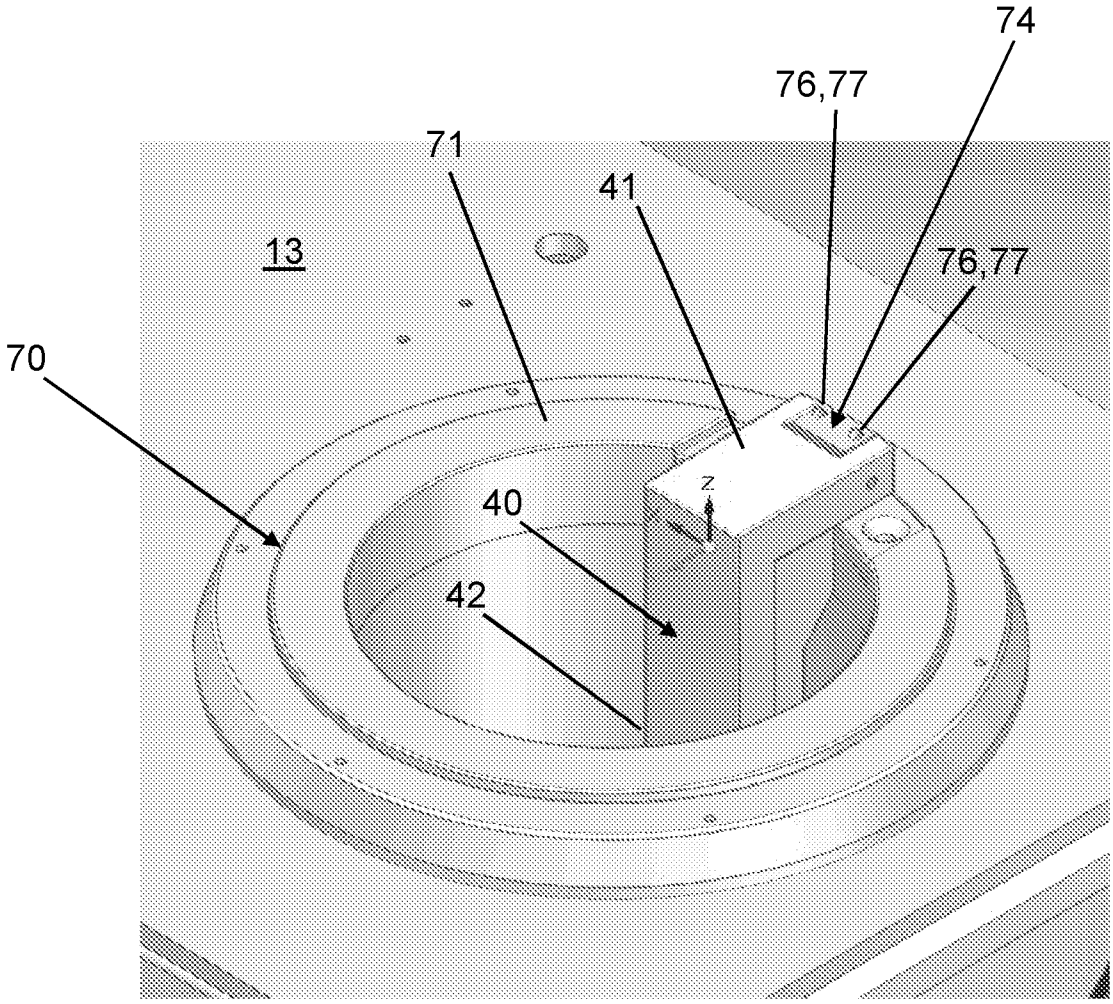

FIG. 8

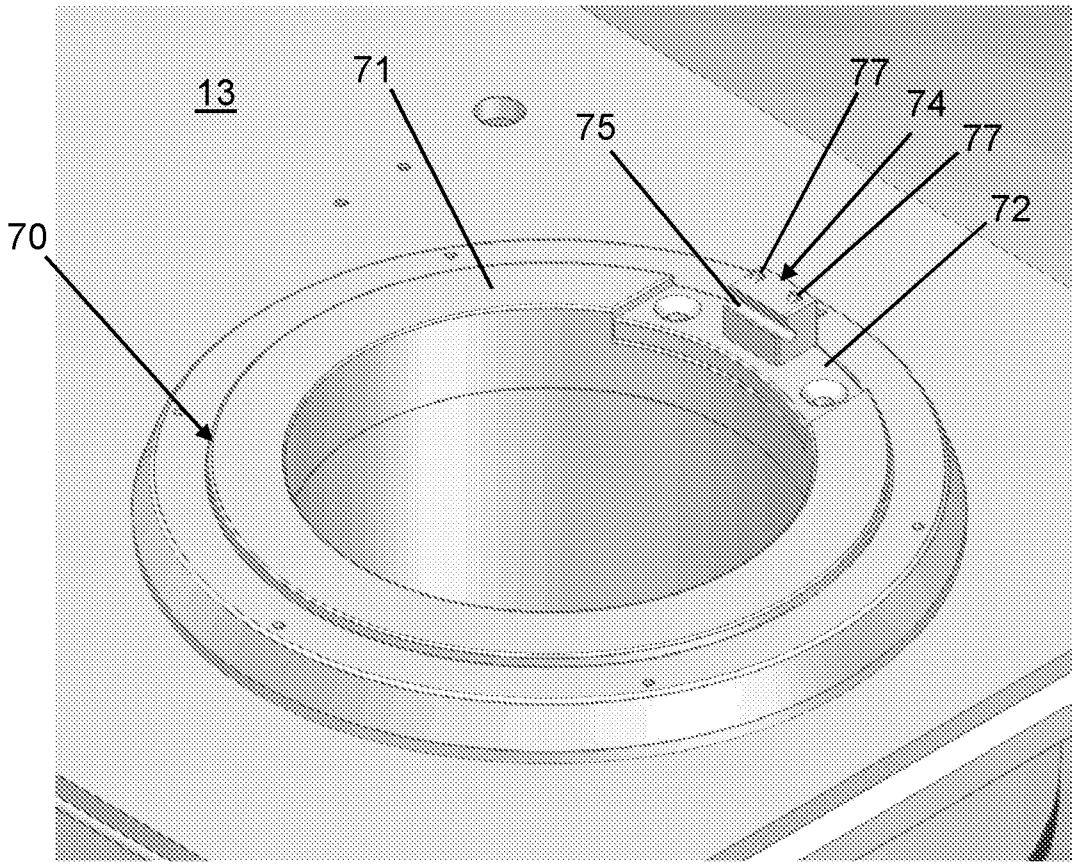

FIG. 9

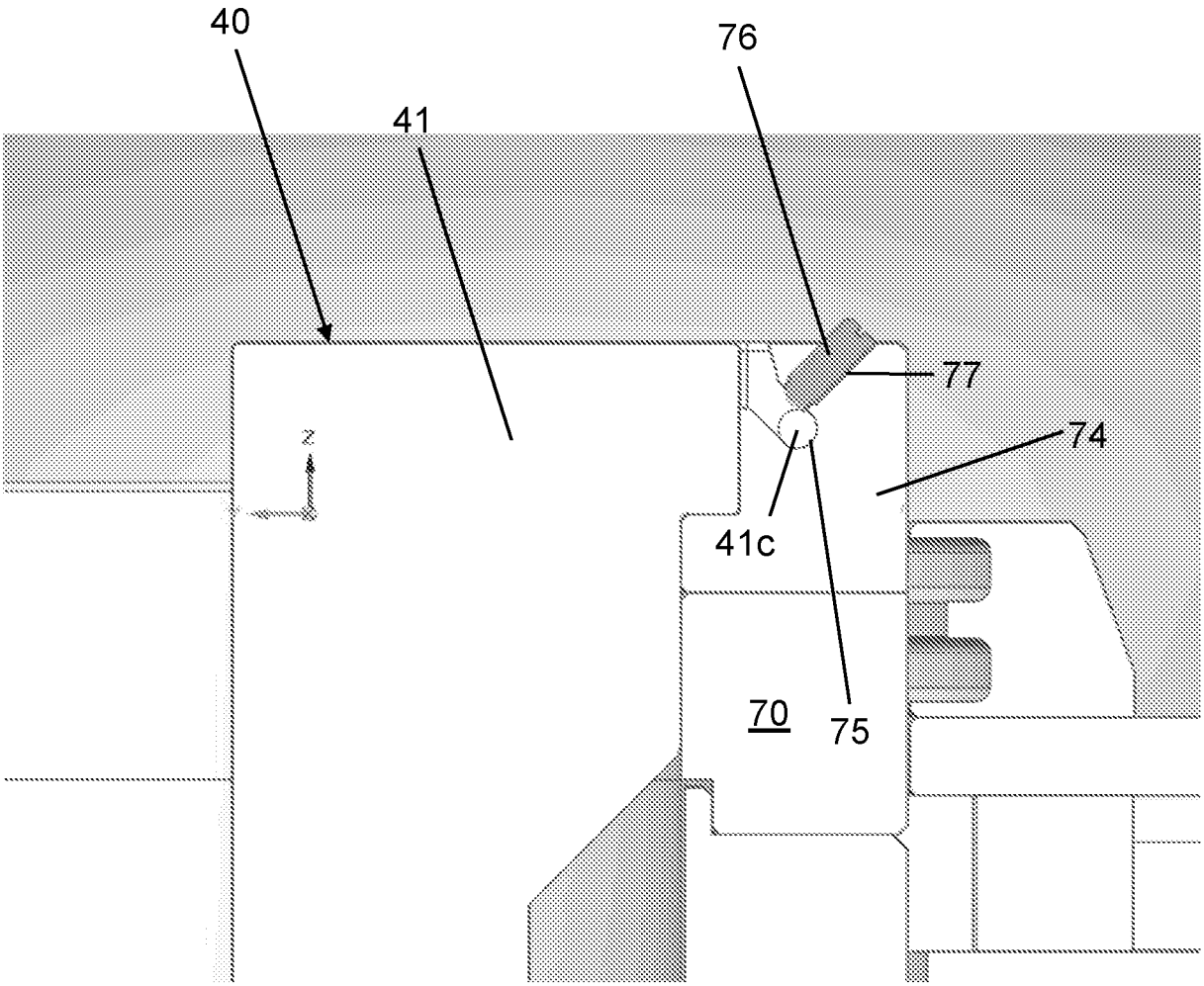

FIG. 10

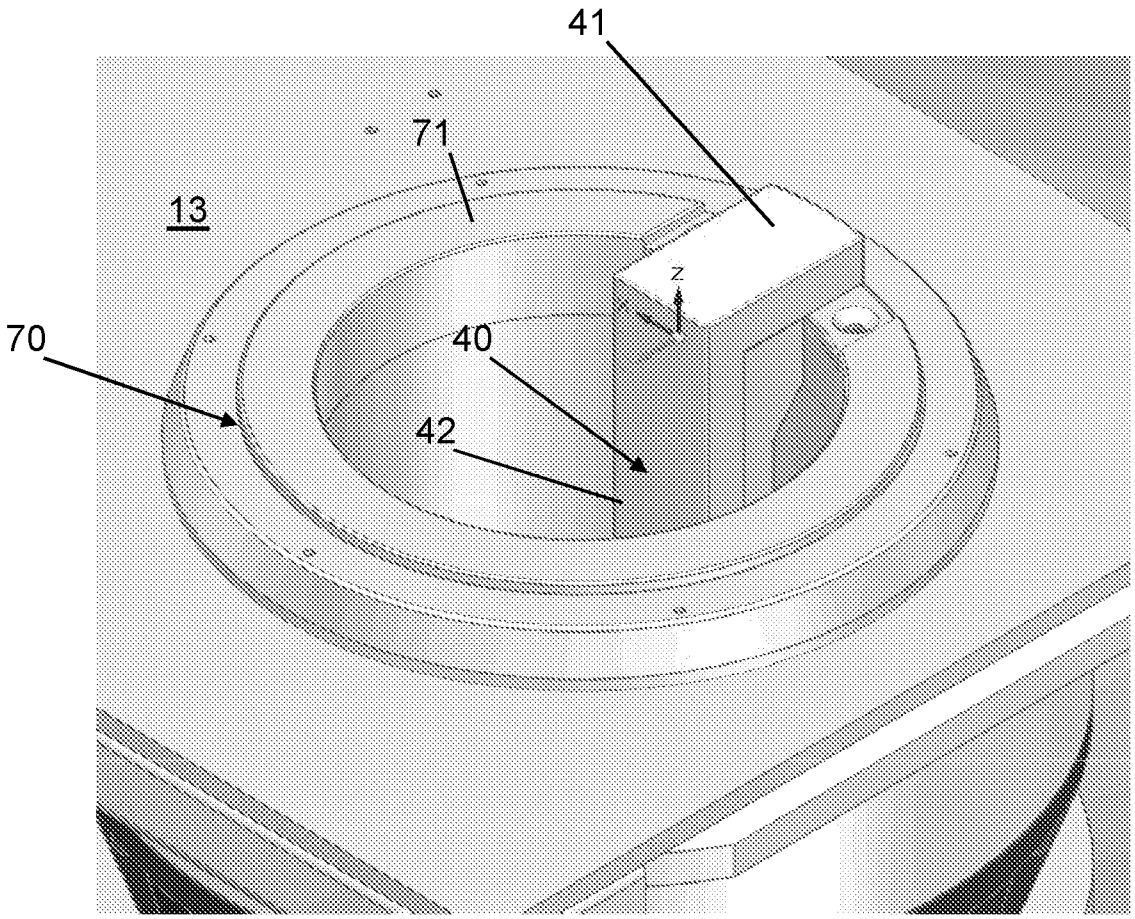

FIG. 11

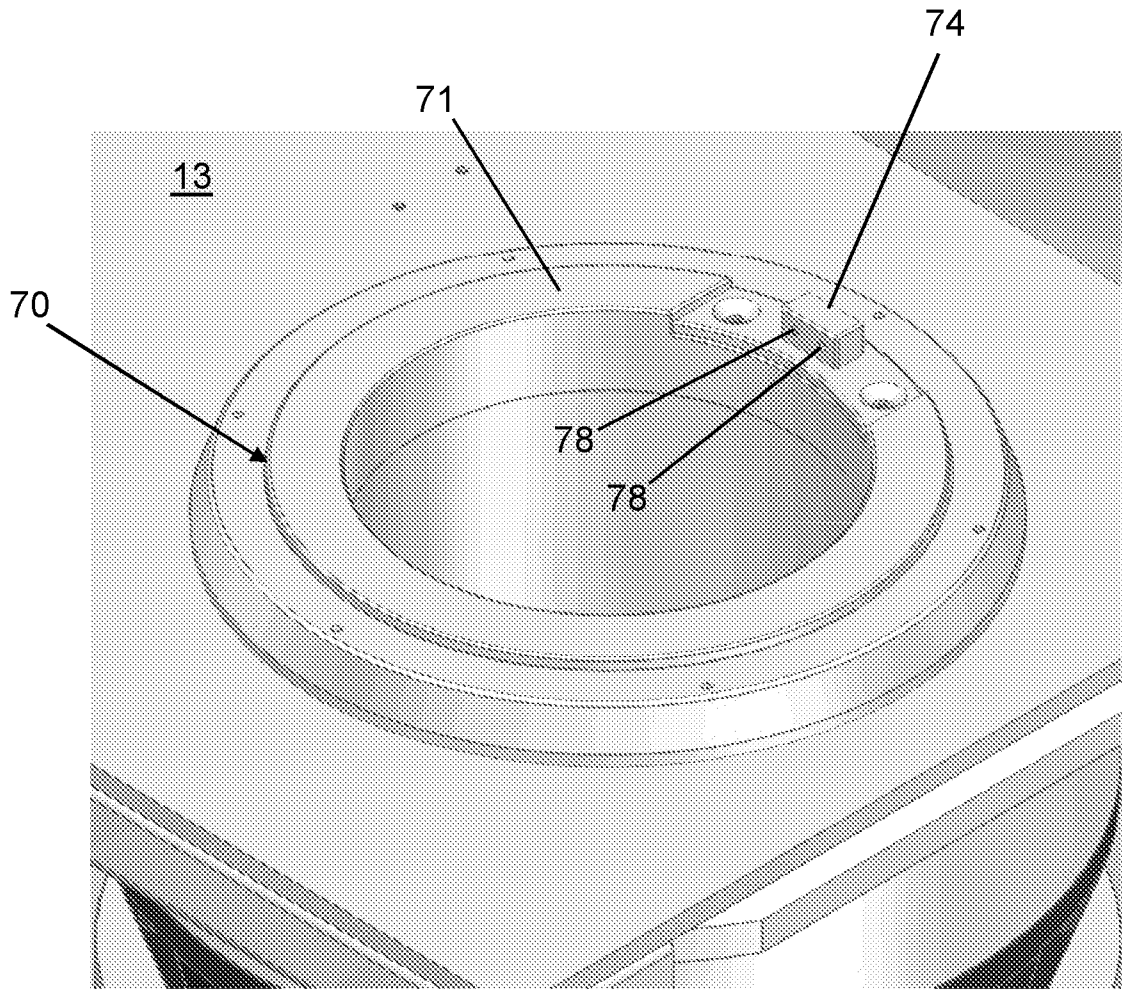

FIG. 12

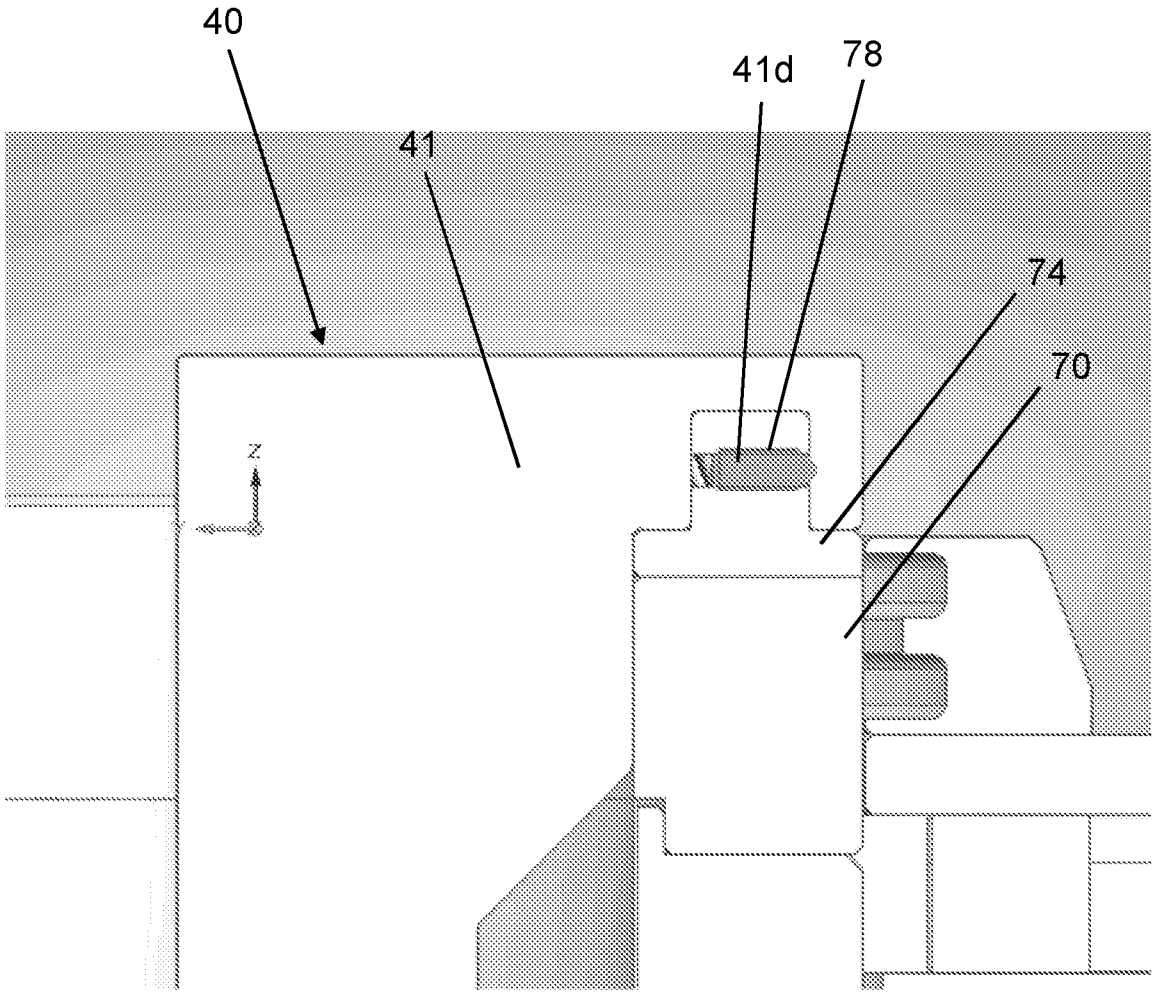

FIG. 13

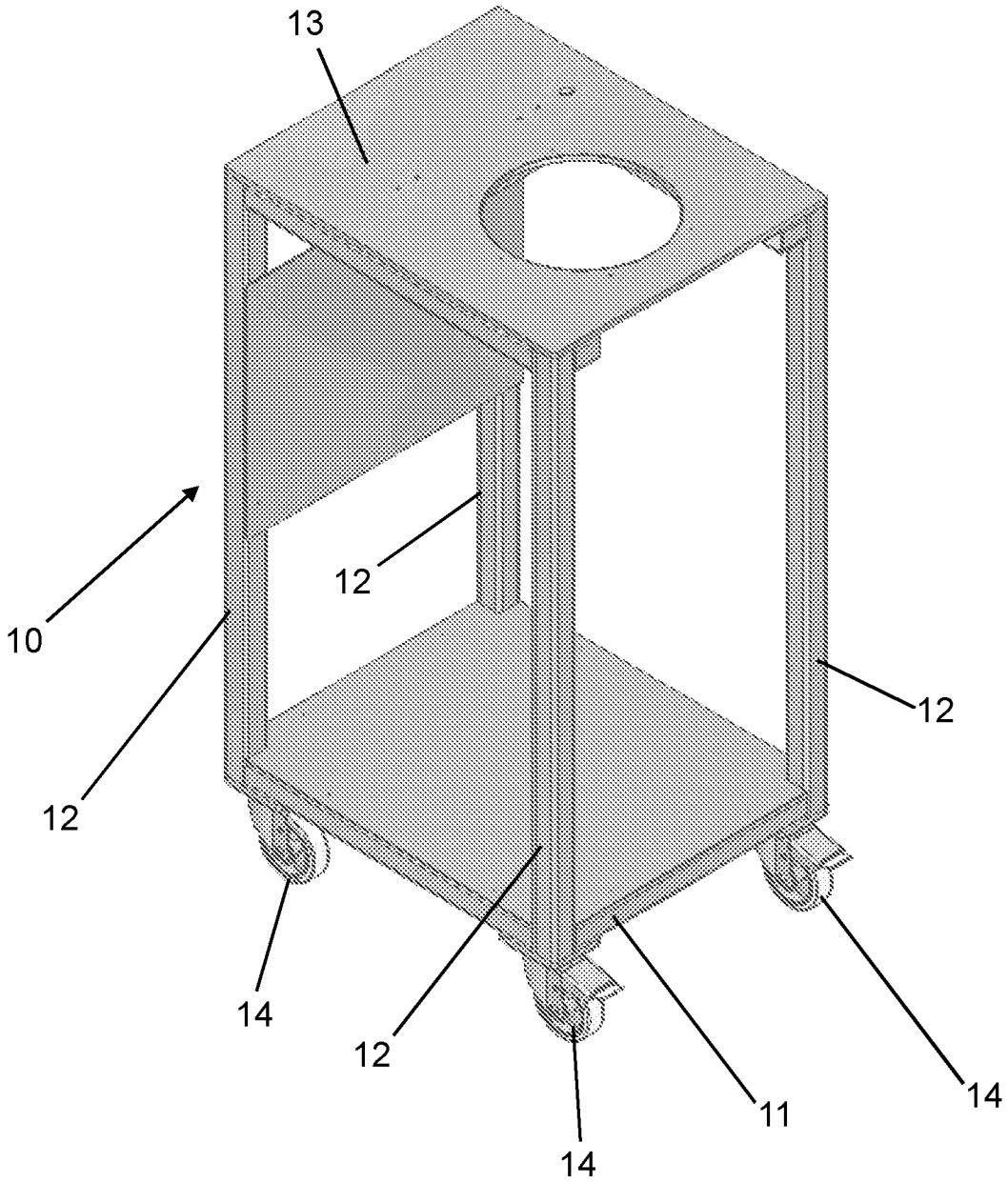

FIG. 14

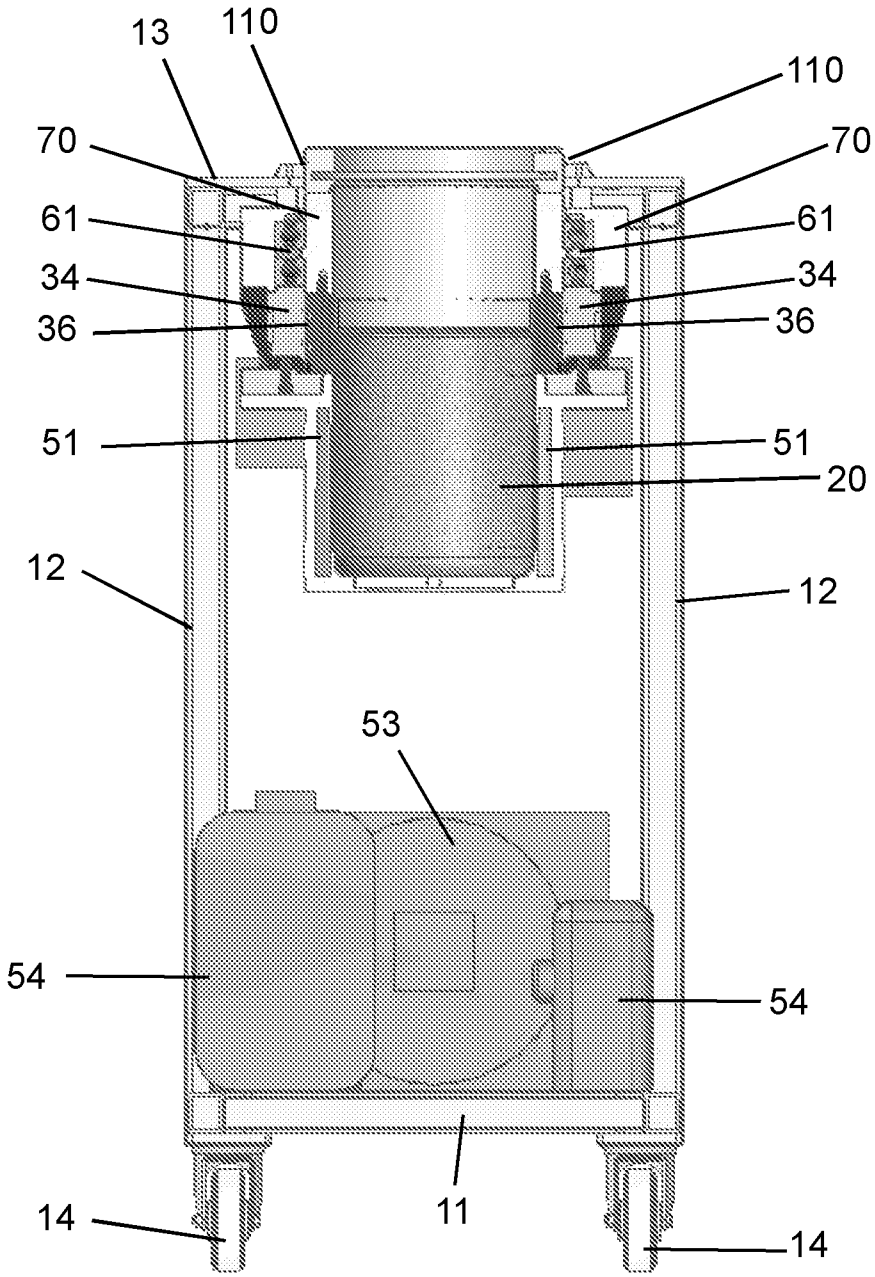

FIG. 15

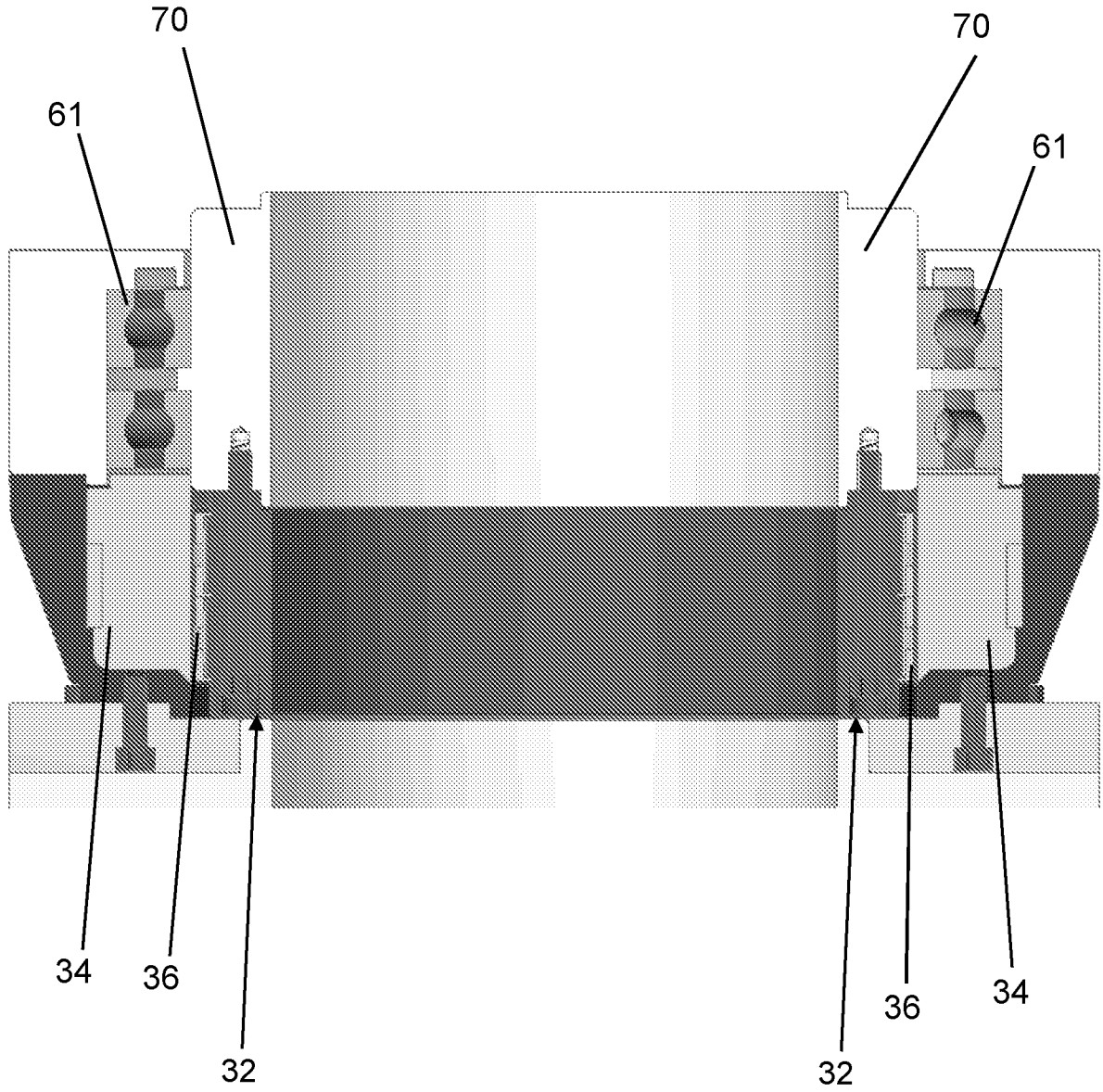

FIG. 16

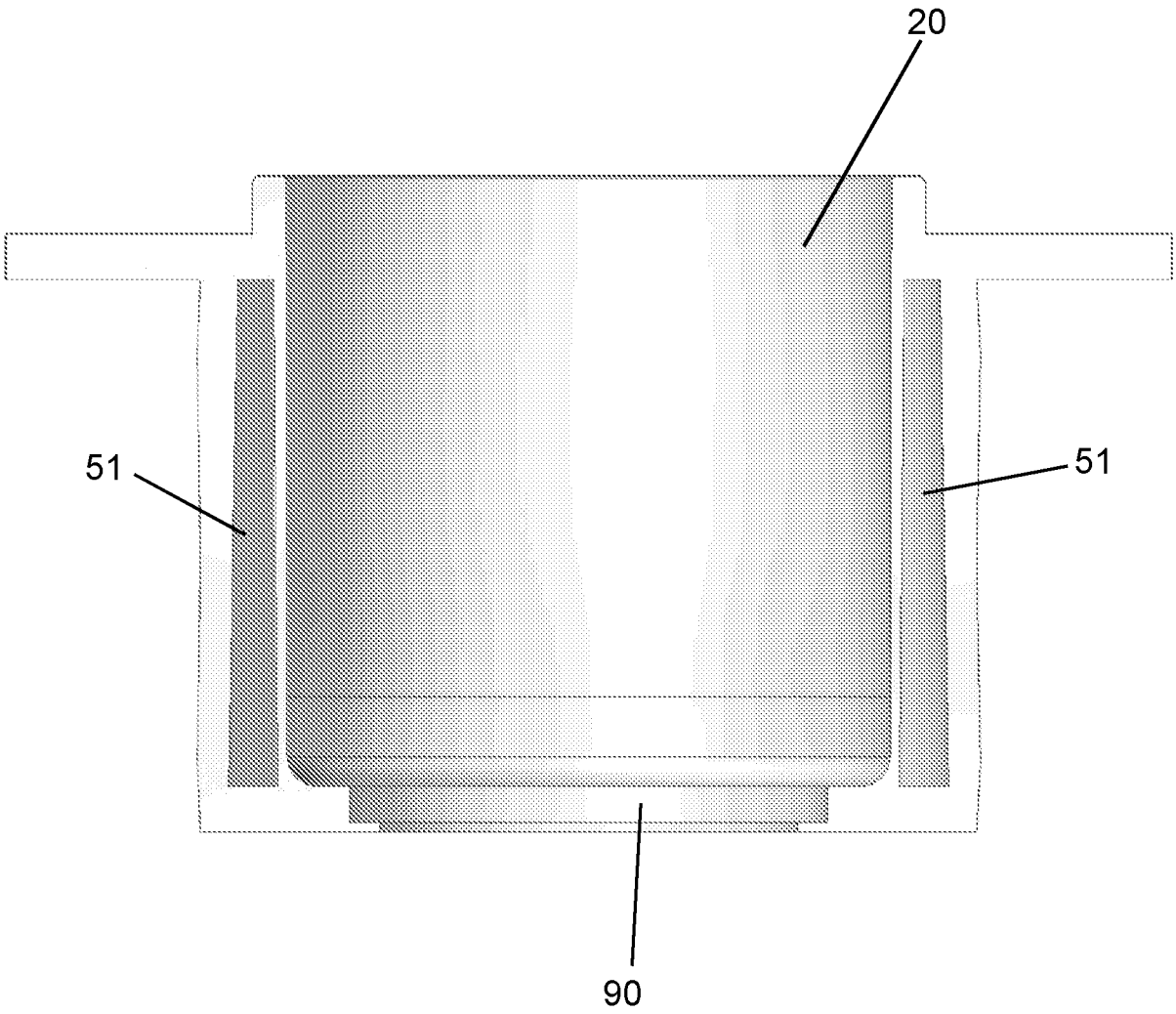

FIG. 17

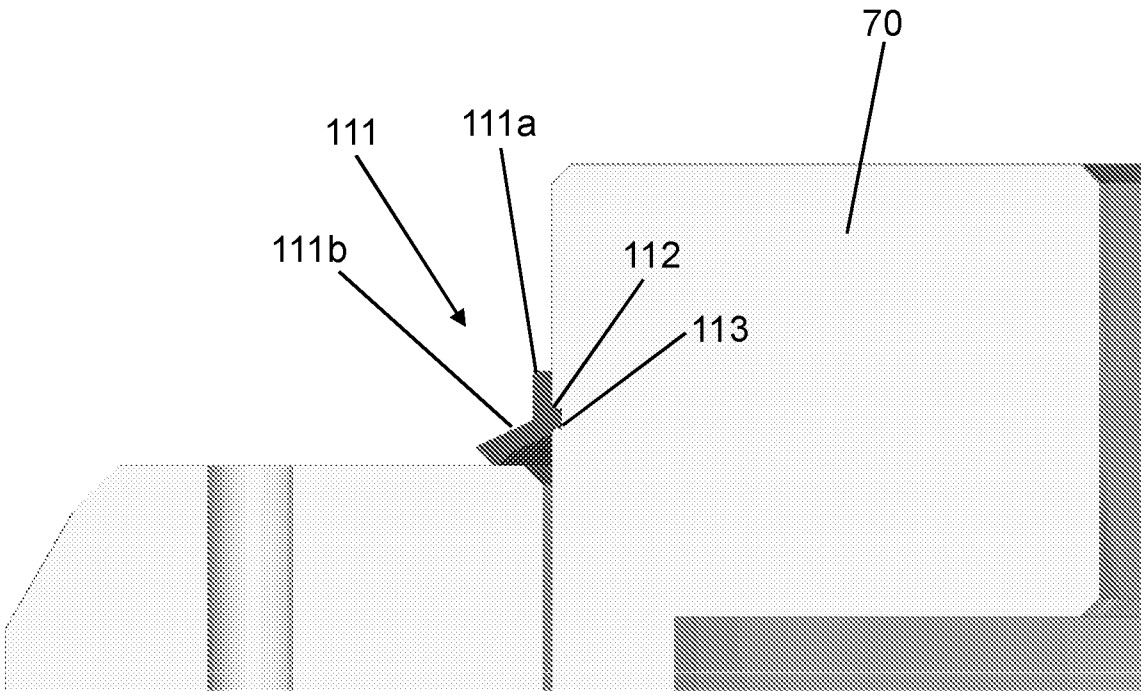

FIG. 18

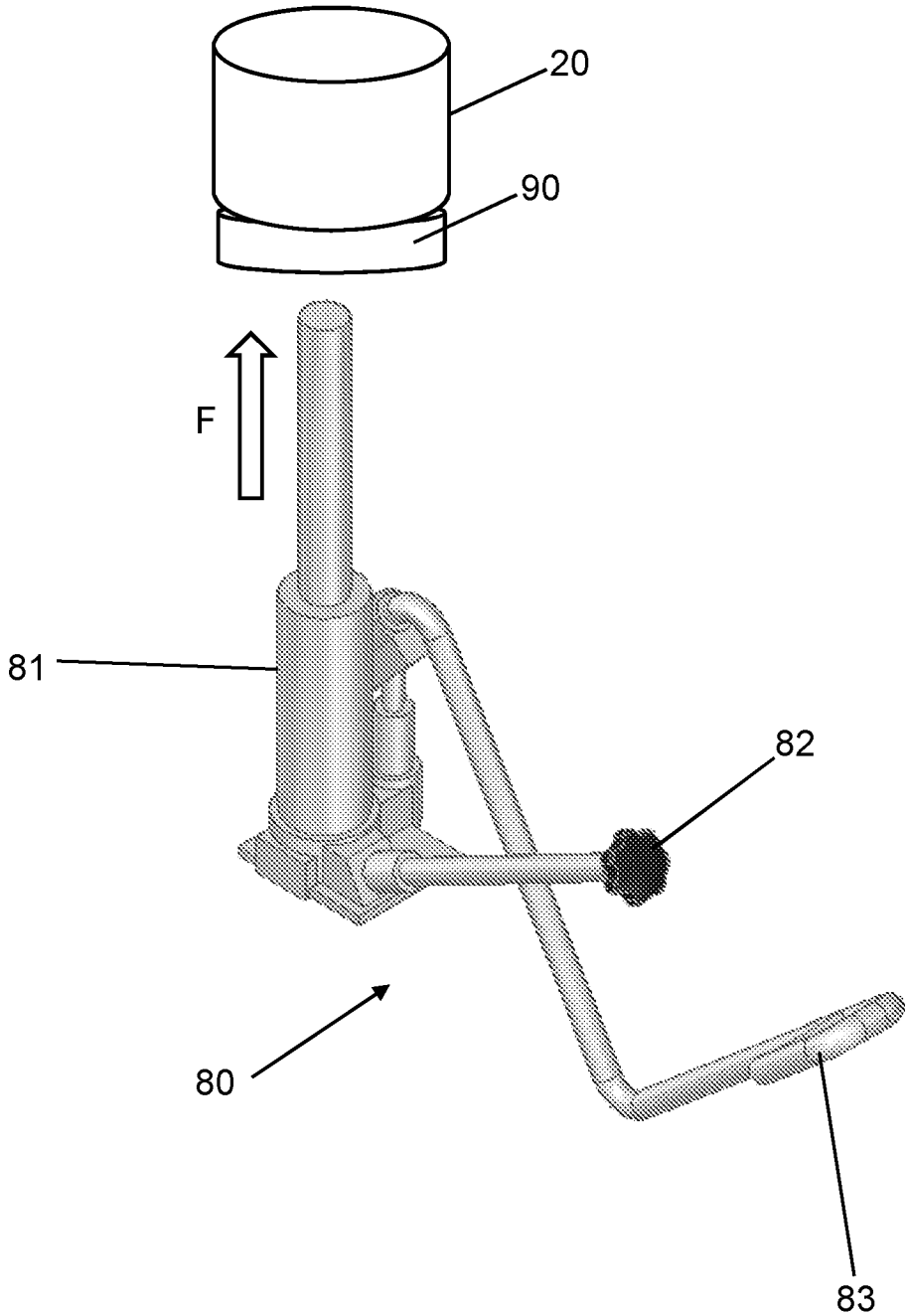

FIG. 19

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2015/059886

A. CLASSIFICATION OF SUBJECT MATTER
INV. A23G9/12
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)
A23G 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)
EPO-Internal, WPI Data, FSTA

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X	US 2011/283897 A1 (FANG CHUAN HUI [CN] ET AL) 24 November 2011 (2011-11-24) pages 1,2; claims; figures	1-10
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X	US 6 332 333 B1 (LEE MING-TSUNG [TW]) 25 December 2001 (2001-12-25) claims; figures	1-10
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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
18 March 2016	31/03/2016

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Boddaert, Peter

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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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