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- (73) Patenthaver: **CUP&CINO Kaffeesystem-Vertrieb GmbH & Co. KG, Paderborner Strasse 33, 33161 Hövelhof,
Tyskland**
- (72) Opfinder: **Epping, Frank Josef Paul, Paderborner Strasse 33, 33161 Hövelhof, Tyskland**
- (74) Fuldmægtig i Danmark: **Plougmann Vingtoft A/S, Strandvejen 70, 2900 Hellerup, Danmark**
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ESPRESSO AND COFFEE MACHINETechnical field of the invention

5 The present invention relates to an espresso and coffee machine and to a method for operating an espresso and coffee machine of this kind.

Prior art

10 In the field of espresso and coffee machines there are various different systems, which are basically divided into groups known as “semi-automatic machines”, also referred to as “portafilter machines”, and “fully automatic machines”.

 In the “semi-automatic machines” having a removable portafilter, coffee beans are ground in a grinder, which is spatially separated from the actual coffee machine, to make
15 ground coffee. If the desired amount of ground coffee is filled into a portafilter or a filter insert, the ground coffee is pressed down by hand in order to produce a coffee puck that is of a uniform height and uniformly compressed. The force to be exerted for the tamping, for example by a barista, differs depending on a number of factors including the type of coffee, the grinding fineness and the type of brewing filter used, and is a significant factor
20 in the quality of the coffee.

 Once a quantity of ground coffee has been filled into the portafilter and manually compressed, the portafilter received in a portafilter holder is manually clamped into the coffee machine and the actual brewing process follows. In this case, the coffee machine meters hot water under pressure into the portafilter via a distributor element rigidly
25 installed in the machine, and the brewed coffee is delivered directly from the portafilter into a provided cup. Under optimal conditions, the brewing result is of excellent quality in terms of aroma and crema, but it is particularly subject to variations in quality.

 In the second large group of espresso and coffee machines, i.e. the fully automatic machines, the processes of grinding, metering and tamping, as well as the actual brewing
30 process, take place automatically. In general, coffee machines of this kind are equipped with a built-in grinder, which measures a defined amount of coffee into a piston-cylinder arrangement depending on the selected programme. The piston-cylinder arrangement may be formed from a cylinder and an upper and a lower piston, each having filters, which

also act as brewing or distributor filters. The cylinder closed by the piston is supplied with hot water, which flows through the compressed ground coffee and is conducted into a provided cup as espresso or coffee.

5 With fully automated machines, a stable quality can be achieved through the selection of the correct settings, but this does not provide a special experience for the user. Furthermore, the quality produced is impaired, for example, by the fact that the temperature cannot be kept constantly high, since brewing modules made of metal and plastics extract different amounts of energy from the brewing water depending on the prevailing temperature. In particular, after a relatively long period of disuse and/or in the
10 case of small brewing quantities, the first cup is critical, i.e. the coffee is often too cold, not sufficiently extracted or lacks good crema. Portafilters are generally solid and made of metal and are flange-mounted directly on a boiler to keep the temperature as constant as possible. If they are decoupled from the brewing module by a barista, they will be warmed up by the brewing water therein when they are replaced; this energy is then not
15 available for heating the brewed coffee, such that the first espresso does not have a sufficient temperature and is too cold.

Generally, it is recommended to store coffee beans or ground coffee outside the espresso and coffee machine since they are very sensitive to temperature.

A problem with semi-automatic machines also proves to be that the metering of a
20 quantity of ground coffee from an external coffee grinder is subject to fluctuations. For instance, the hygroscopic property of ground coffee can lead to a loss of quality, the quality also being dependent on the metering and thus on the operator.

Another problem is the correct metering quantity of ground coffee with which a portafilter is filled. Commercially available portafilters have diameters in the range of
25 approximately 55 mm to 58 mm, which is suitable for receiving ground product that is sufficient for a double serving of espresso. However, if only a single portion is to be made, the filter must be greatly narrowed in order to achieve a sufficient height for the compacted ground coffee. In that case, the extraction of the filled ground coffee is often not homogeneous enough and can lead to water passing through the coffee cake (known
30 as channelling), such that the espresso is of poorer quality.

Espresso and coffee machines which fall as it were between the “semi-automatic machines” and the “fully automatic machines” are also known. The term “hybrid systems” is used for espresso and coffee machines which combine different elements or techniques

of the aforementioned groups. Espresso and coffee machines of this kind may comprise, for example, a grinding mechanism integrated into the machine and a portafilter which can be received in a holder. The portafilter is automatically filled with a portion of ground coffee at a grinder outlet and moved into a brewing position; the filled ground coffee can also be tamped automatically.

For example, GB 2 488 327 A discloses a brewing device for coffee production, in which a brewing piston is received in a brewing cylinder and can be moved by means of an actuating lever. A lid is formed on the brewing piston such that in its open position a defined amount of brewing water is introduced into a brewing chamber to produce coffee.

KR 2010/0010456 U discloses a manual espresso machine in which hot brewing water is introduced into the housing of the espresso machine laterally, the hot brewing water being distributed, by means of an annular channel formed in the housing, to the ground coffee filled in a brewing chamber.

Summary of the invention

The object of the present invention is therefore to provide an espresso and coffee machine which minimises the heat losses from the brewing water before the actual brewing process in a simple manner. In particular, the espresso and coffee machine should enable a high, consistent quality of the espresso or coffee to be dispensed, i.e. should in particular prevent losses of quality caused by fluctuations in the temperature of the brewing water for the actual brewing process, with simple control and as few components as possible being required in the process. Furthermore, the object of the present invention is to specify a method for operating an espresso and coffee machine. Particularly advantageous embodiments are mentioned in the dependent claims and in the description.

The espresso and coffee machine according to the present invention comprises a brewing chamber, means for generating and delivering hot water under pressure into the brewing chamber, and a brewing piston for repeatedly closing and opening the brewing chamber. The brewing chamber, the means and the brewing piston can be considered to be a brewing unit or the brewing module. The brewing water is introduced into the

brewing unit after being heated to a preset temperature. The brewing unit comprises a filter insert for receiving the extracted product, i.e. the ground coffee.

According to the present invention, the brewing water is to be introduced into the brewing unit laterally. As a result of the short flow path for the brewing water up to its
5 distribution over the ground coffee that can be achieved as a result of said lateral introduction, the temperature loss of the brewing water is minimised. In addition, the mass that has to be heated to a higher temperature in order to achieve a stable temperature level of the brewing water along its flow path is advantageously reduced.

In the espresso and coffee machine according to the present invention, the brewing
10 unit is configured such that the brewing piston is displaceably received in the brewing chamber by means of a radially acting seal. In the process, in one embodiment of the invention the brewing piston is configured as a double piston having an upper piston and a lower piston, i.e. the brewing piston, which are connected by means of a piston rod. Accordingly, the brewing piston is arranged in a cylinder-piston arrangement that, for
15 example, is in operative connection to adjusting means of the espresso and coffee machine according to the present invention and can be moved into a pressing and/or brewing position by means of said adjusting means. Hereinafter, the cylinder-piston arrangement in which the brewing piston is arranged is referred to as the second cylinder-piston arrangement. The upper piston can be displaceably received in a fluid chamber by
20 means of a radially acting seal, the fluid chamber being able to be associated with the fluid system of the espresso and coffee machine and being in operative connection to adjusting means for actuating the brewing piston. On the arrangement thus formed as a double piston, a spring element, configured to reset the double piston counter to a hydraulic pressure force acting on the upper piston, can be arranged.

25 The brewing piston can penetrate the preferably cylindrical brewing chamber in a freely displaceable manner and can compress, i.e. tamp, ground coffee located on a filter insert (the outlet filter) arranged in said chamber in a defined manner.

According to the present invention, a brewing water inlet opens at the brewing piston and is in fluid communication with the brewing chamber. The brewing piston is
30 configured such that a connection for the brewing water is provided as close as possible to a lower end of the brewing piston through which the introduced brewing water is uniformly distributed over the ground coffee, for example through an inlet filter. The fluid communication between the connection for the brewing water and the distribution is

marked by a short flow path. In addition, the release of energy from the brewing water to components arranged along the flow path is reduced. In addition, the supply line for the brewing water extends inside a portion of the brewing piston, which can be configured as a hollow body. In one embodiment, the espresso and coffee machine according to the present invention comprises an actuating lever which is movable at least partly by hand, the brewing piston in the brewing chamber being moved into a pressing position and/or a brewing position upon movement of the actuating lever in one direction.

A control unit can be provided to control operations during the espresso or coffee production. Furthermore, the espresso and coffee machine may comprise a grinding mechanism for producing ground coffee, and a metering and conveying apparatus for introducing ground coffee into a portafilter inserted in a holder of the brewing chamber. Individual components, in particular a store of coffee beans, the grinding mechanism and the metering and conveying apparatus may be integrated in a housing of the machine. In this case, "integrated" does not mean that all components are arranged inside the housing. Thus, e.g. the container, associated with the grinding mechanism, for storing coffee beans can be positioned at least partly outside the housing. If the brewing module is located outside a housing of the espresso and coffee machine, heating up of the stored coffee beans can be substantially eliminated.

The espresso and coffee machine is characterised in that adjusting means having a fluid system are provided, comprising at least one first cylinder-piston arrangement, the actuating lever being in operative connection to a piston of the first cylinder-piston arrangement and to adjusting means, such that upon movement of the actuating lever in one direction pressure builds up in the fluid system, in which case the brewing piston, arranged in the second cylinder-piston arrangement, in the brewing chamber is moved into the pressing position and/or into the brewing position.

By coupling the movement of the actuating lever to the adjusting means, according to the present invention both tamping and a brewing process can be activated. The actuating lever according to the present invention gives the impression of direct involvement in the coffee production process, which is perceived as being advantageous in semi-automatic machines.

The adjusting means comprise at least one first cylinder-piston arrangement. In one embodiment, the first cylinder-piston arrangement is directly coupled to the actuating lever.

The fluid system may comprise a compensating reservoir and a pressure sensor, which are configured to detect the pressure in the fluid system and adjust it to a defined value. In the process, an existing control unit can control corresponding processes, as will be explained below.

5 Preferably, the fluid system is a hydraulic system containing a hydraulic fluid. The fluid is preferably hydraulic oil that is suitable for use with foodstuffs. It is also conceivable that instead of a hydraulic system, a pneumatic system is used to set in motion the operations, coupled to a movement of the actuating lever, for espresso and/or coffee production. The fluid system or preferably the hydraulic system may also comprise a
10 restrictor in addition to the compensating reservoir, and at least one first valve and means for filling the fluid system with fluid, preferably with hydraulic fluid. By means of a line system, the compensating reservoir is in fluid communication with the first cylinder-piston arrangement and with the arrangement comprising the brewing piston (the second cylinder-piston arrangement).

15 It is also conceivable that the brewing piston, which is associated with the second cylinder-piston arrangement, is moved by a drive unit, e.g. a stepper motor, during coffee production, the movement of the brewing piston being able to be at least indirectly coupled to a movement of the actuating lever and controlled by the control unit.

 The brewing piston is arranged in the second cylinder-piston arrangement, the
20 brewing piston being displaceably received in the brewing chamber by means of a radially acting seal and being connected to a piston rod having an upper piston by means of a radially acting seal, said upper piston being displaceably received in a fluid chamber. A spring element is arranged on the arrangement thus formed as a double piston, and is configured to reset the double piston counter to a hydraulic pressure force acting on the
25 upper piston.

 The brewing piston can penetrate the preferably cylindrical brewing chamber in a freely displaceable manner and compress, i.e. tamp, the ground coffee located on a filter insert arranged in said chamber to form a coffee cake.

 The pressing force to be applied by the brewing piston to compress the filled ground
30 coffee is preferably adjustable, the transmission ratios of the piston arrangement being selectable accordingly. The fluid system is configured to adjust the tamping force, that is the pressing force. Thus, once the tamping force or the defined pressing force determined by the pressure sensor and displayed by the control unit is reached, corresponding means

are activated, such that the pressure in the fluid system is not further increased and the brewing piston is precisely positioned in a defined position.

The position of the brewing piston should be varied, inter alia, if a swelling of the ground coffee must be taken into account, which occurs depending on the product in a process known as pre-brewing. In some forms of preparation, a possible repeated pressing is also provided in order to achieve improved quality.

According to the present invention, for the production of certain coffee specialties, after the process of pressing, i.e. tamping, the brewing piston is easily moved back from the surface of the coffee cake. This can be accomplished by incorporating apparatuses in the fluid system which cause a reduction in the pressure acting on the brewing piston. For this purpose, a valve is provided in a line of the fluid system and reduces, when in the open position, the pressure acting on the brewing piston in the fluid system. When the valve is open at least briefly, fluid flows from the fluid chamber back into the fluid system, in particular into the compensating reservoir, such that the brewing piston rises up from the surface of the coffee cake, due to the spring force of the spring element.

The fluid system according to the present invention makes it possible to position the brewing piston in a defined manner. Accordingly, on the one hand the pressing force can be limited, and on the other hand the position of the brewing piston can be determined freely during a brewing process. This expands the variety of coffee specialties which can be produced using the espresso and coffee machine according to the present invention.

According to the present invention, in an example of manual movement of the actuating lever from a start position, e.g. an upper position, towards an end position, e.g. a lower position, fluid is conveyed into the fluid chamber of the second cylinder-piston arrangement by the operative connection to adjusting means. In an opposite movement of the actuating lever, which preferably takes place automatically when the force on the actuating lever is released, i.e. starting from the end position, the fluid is forced out of the fluid chamber by resetting the double piston of the second cylinder-piston arrangement.

The actuating lever can be in operative connection to the actuating means via a lever and spring system, this system comprising a pivot bearing, about which the actuating lever is pivotable, and a hinge connection, which is mechanically coupled to at least one of the adjusting means, in particular to the piston of the first cylinder-piston arrangement. If the actuating lever is moved by an operator from the start position towards the end

position, espresso or coffee production processes are set in motion by the associated operative connections.

5 In one embodiment, at least some successive espresso and coffee production operations are coupled to the movement of the actuating lever by the lever and spring system and/or the adjusting means. Optionally, one of the operations may include that a defined amount of freshly ground coffee is metered or conveyed, by means of a metering and conveying apparatus, into a provided filter insert of a portafilter. In this case, a mechanism may be provided which can be brought into operative connection to a metering and conveying apparatus, such that the metering and conveying apparatus can
10 accordingly be moved into and/or removed from a filling position.

In a preferred embodiment, at least some of the activated operations run decoupled from the force acting on the actuating lever. This guarantees a consistent quality of the coffee product. In this case, the movement of the actuating lever, which is also referred to below as a toggle lever, triggers a sequence of processes, at least some
15 of which take place automatically. In this embodiment, the movement of the toggle lever in one direction is coupled to the first cylinder-piston arrangement such that fluid of the fluid system is moved into the compensating reservoir. In addition, a circuit is activated by actuating the toggle lever, said circuit automatically actuating adjusting means independently of the first cylinder-piston arrangement, such that the espresso or coffee
20 production operations are set in motion.

It is envisaged that upon the movement of the actuating lever from the start position, a pump is connected, which is arranged in the fluid system and configured to convey fluid under pressure from the compensating reservoir into the second cylinder-piston arrangement. A non-return valve and the pressure sensor may be arranged
25 downstream of the pump; a flow sensor may be arranged upstream thereof. By means of the applied pressure in the fluid system, the brewing piston of the second cylinder-piston arrangement is moved to a position in which the ground coffee filled onto the filter insert is compressed with a pressing force. To limit the pressing force, the pressure sensor is configured to cause an interruption to the delivery of the fluid when a defined pressing force or a certain pressure has been reached in the fluid system. For example, the pump
30 can be turned off for this purpose.

In a preferred embodiment, the brewing piston can be positioned in any position along its travel path. This is achieved, for example, by means of the flow measuring apparatus arranged in the fluid system and the associated control unit.

Once the ground coffee has been pressed into a largely homogeneous coffee cake,
5 the actual brewing process takes place in the brewing chamber closed by means of the brewing piston. A hot water heater, which is hydraulically connected to the brewing chamber, supplies the brewing chamber with heated water, possibly at a defined pressure of preferably 1 to 9 bar. The brewing water is preferably introduced laterally into the brewing unit. Due to the short flow path of the water that can be achieved as a result, the
10 temperature loss of the water between the boiler or water heater and the brewing chamber is minimised. The mass that has to be heated to a higher temperature in order to achieve a stable temperature level is thus advantageously reduced. The water is distributed as evenly as possible over the surface of the compressed ground coffee located in the portafilter; it then flows through the coffee cake and the filter insert and
15 exits downwards, for example via an outlet opening, into a provided cup.

The actual brewing process can be designed to be variable, the position of the brewing piston as a closing member of the brewing chamber being adapted for various coffee preparation methods. In particular, it can be provided that the brewing chamber is easily opened after a first brewing process, in particular when no crema is necessarily
20 required. Subsequently it is closed again, with the spent coffee grounds being re-pressed. A dry coffee cake is thus produced, which is easier to dispose of from the filter insert, and the portafilter is thus made less dirty. This avoids any complicated cleaning. It is envisaged that the entire brewing process takes place largely automatically and under constant conditions.

25 In one embodiment, the espresso and coffee machine according to the present invention comprises a bypass system, which is configured to divide the hot, pressurised water into an extraction stream and a bypass stream. This system is used to produce a larger quantity of coffee, for example referred to as an Americano or long black. The extraction stream is distributed into the brewing chamber or over the ground coffee
30 introduced into the portafilter in such a way that coffee is extracted from the ground coffee. The bypass stream is not distributed over the ground coffee but rather is directed past it, and only at a suitable downstream point is it then combined with the coffee stream originating from the brewing chamber and supplied to the outlet opening. For this

purpose, a fluid-conducting connection can be provided on a wall of the portafilter, into which connection a portion of the brewing water (the bypass stream) is introduced and directed past the portafilter and into a discharge region for the coffee exiting the portafilter. Advantageously, it may be possible to choose a different temperature for this
5 since the above-described preparation differs from that for espresso production. The bypass system accordingly increases the variety of the product range producible using the espresso and coffee machine according to the present invention.

Furthermore, the espresso and coffee machine according to the present invention may comprise a container for storing coffee beans, said container having a fan. The fan
10 ensures ventilation of the stored coffee beans, in the process of which they are also cooled. Ventilation and cooling promote the quality assurance of the temperature-sensitive coffee beans.

A grinding mechanism or a grinder and the brewing chamber are arranged separately from one another in the espresso and coffee machine according to the present
15 invention, such that a suitable temperature prevails in each region. In particular, the brewing chamber is arranged outside the housing delimiting the espresso and coffee machine, on a front side thereof. The grinding mechanism or grinder is arranged in the interior of the housing and spatially separated from the brewing chamber by both the front side of the housing and the metering apparatus.

Furthermore, an air supply apparatus is provided, such that warm air from the
20 interior of the espresso and coffee machine is guided to the outside, which also contributes to the temperature reduction in the interior. The outflowing air can spread the aroma of coffee into the surroundings.

It can be provided that air is suctioned in from the surroundings and guided through
25 an air gap in a double-walled bean container and to the adjoining grinding mechanism, such that heating of the coffee beans in the bean container and in the grinding mechanism, as well as heating of the actual grinding mechanism itself, is avoided.

The portafilter received in a holder of the brewing chamber preferably has a diameter in the range of 35 to 50 mm. The diameter differs from that of the prior art,
30 which is used to produce a sufficiently high and homogeneous coffee puck when filled with approximately 6 to 9 g of ground coffee for a single cup. The amount of ground coffee added to the portafilter may vary depending on whether only one portion of

approximately 6 to 9 g of ground coffee is to be produced or a double portion of approximately 13 to 20 g.

5 The openings or holes of a filter insert which can be received in the portafilter must be dimensioned such that coffee water can still flow out of the openings or holes, but the individual grains of ground coffee are retained. The openings or holes can be produced by means of an etching process, the distribution, shape and number thereof being able to be varied almost arbitrarily. The open filter surface of the filter insert can thus be increased, and the extraction of the coffee thus significantly improved.

10 The method according to the present invention for producing espresso and/or coffee using the espresso and coffee machine, which comprises a brewing chamber, means for generating and delivering hot water under pressure into the brewing chamber, and a brewing piston for repeatedly closing and opening the brewing chamber, and an actuating lever and adjusting means having a fluid system, comprising at least one first cylinder-piston arrangement, the actuating lever being movable at least partly by hand
15 and is operatively connected to actuating means such that, upon movement of the actuating lever in one direction, pressure builds up in the fluid system, the brewing piston, arranged in a second cylinder-piston arrangement, in the brewing chamber being moved into a pressing position and/or a brewing position, comprises inserting a portafilter into a holder provided therefor on the brewing chamber, into which portafilter ground coffee
20 produced by a grinding mechanism can be filled. Manual movement of the actuating lever from a start position to an end position and generation of pressure in the fluid system through an operative connection of the actuating lever to the adjusting means. The brewing chamber is closed by the brewing piston, which is acted upon by the pressure generated by the adjusting means. This is followed by the ground coffee being
25 compressed in the portafilter into a coffee cake by the pressurised brewing piston at a defined pressing force. Subsequently, heated water is distributed on the compressed ground coffee. When the brewing process has ended, for example when a defined amount of coffee has been dispensed, the brewing piston automatically returns to the start position. Subsequently, the spent coffee grounds remaining in the portafilter can be
30 removed. This can be done by being knocked out by hand.

In a preferred embodiment, the spent coffee grounds are removed automatically. Where the spent coffee grounds are removed semi-automatically, it is not necessary for the portafilter to be removed from the holder. By means of a handgrip arranged on the

portafilter, the portafilter is rotated in the holder so far that an apparatus coupled to the movement pushes the spent coffee grounds into a provided container. The resetting of the portafilter causes a resetting of the coupled apparatus.

5 Brief description of the drawings

In the following, the invention will be explained in more detail with reference to the embodiments illustrated in the drawings, in which:

10 Fig. 1 is a schematic view of an espresso and coffee machine according to a first embodiment of the invention; Fig. 2 is a schematic view of an espresso and coffee machine according to the present invention according to a second embodiment of the invention; and

15 Fig. 3a to 3c are views of a detail of a portafilter of the espresso and coffee machine according to the present invention illustrating the automatic removal of the spent coffee grounds.

Detailed description of the embodiments of the invention

20 In Fig. 1, an espresso and coffee machine according to the present invention (referred to as machine 10 for short) is shown schematically. The purely schematically illustrated machine 10 comprises a holder into which a portafilter 12 can be inserted. The inserted portafilter 12 is open at the top towards a brewing chamber 16 and at the bottom adjoins an outlet having a discharge opening (not shown). A filter insert 14 can be received in the portafilter 12. The portafilter 12 is designed such that it can be inserted in the holder and sealed, for example by a bayonet closure. As is known, the portafilter 12 may be provided with a lateral handgrip. The brewing chamber 16 is supplied with hot pressurised water (indicated by arrow 20). In the brewing chamber 16, a brewing piston 18 associated with a second cylinder-piston arrangement 22 is displaceably mounted.

30 A second cylinder-piston arrangement 22 comprises a double piston 24, the lower piston of which is designed as a brewing piston 18 and is displaceably received in the brewing chamber 16, and an upper piston 26, which is displaceably received in a fluid chamber or a hydraulic chamber 30. The lower and upper pistons 18, 26 are interconnected by a rigid piston rod. The upper piston 26 is pressed upwards by a spring

element 32. On the upper piston 26 and the lower piston or the brewing piston 18, radially acting seals are provided in each case. The hydraulic chamber 30 is connected to a fluid system or hydraulic system (generally designated as 34). In the hydraulic system 34, a hydraulic fluid flows in a line system 36. The hydraulic system 34 comprises means 38 for filling the hydraulic system 34, as well as a compensating reservoir 40. Furthermore, in the line system 36, a restrictor 42, a valve 44 and a pressure sensor 46 are arranged. The line system 36 connects the second cylinder-piston arrangement 22 to a first cylinder-piston arrangement 48 such that the hydraulic fluid can flow between the two cylinder-piston arrangements 22, 48.

An actuating lever 50 is connected to the first cylinder-piston arrangement 48. If the actuating lever 50 is moved from a start position to an end position (indicated by arrow 64), the movement is transmitted to a hydraulic piston 52 of the first cylinder-piston arrangement 48 such that hydraulic fluid is pushed from the cylinder-piston arrangement 48 into the line system 36 of the hydraulic system 34 as pressure builds up. The valve 44 is open. As a result, the pressure on the upper piston 26 of the second cylinder-piston arrangement 22 is increased such that the double piston 24 is displaced downwards counter to the spring force of the spring element 32. The brewing piston 18 moves into the brewing chamber 16 and compresses, for example, the ground coffee filled on the filter insert 14 into a coffee cake or seals the brewing chamber 16 for the brewing process. The pressure sensor 46 detects the prevailing pressure in the hydraulic system 34 and may transmit a signal to a control unit (not shown), which closes the valve 44 when a predetermined pressure is reached.

When the brewing process is completed, the valve 44 is opened and the hydraulic fluid flows in the reverse direction back into the first cylinder-piston arrangement 48, the actuating lever 50 moving back to the start position, supported by a spring element (not shown). Any air introduced into the hydraulic system 34, e.g. as a result of faulty handling, accumulates in the compensating reservoir 40.

A second embodiment of an espresso and coffee machine is shown in Fig. 2. Like elements are denoted by the same reference numerals. Coupled to the movement of the actuating lever 50, the hydraulic piston 52 moves the first cylinder-piston arrangement 48, with hydraulic fluid being conveyed via the restrictor 42 into the compensating reservoir 40. The line system 36 adjoins the compensating reservoir 40 and brings the compensating reservoir 40 into fluid communication with the second cylinder-piston

arrangement 22. The design of the second cylinder-piston arrangement 22 corresponds to the embodiment shown in Fig. 1. The fluid-conducting connection of the compensating cylinder 40 to the hydraulic chamber 30 of the second cylinder-piston arrangement 22 comprises two flow paths. A first flow path 54 runs via the valve 44. A second flow path 56 runs from the compensating reservoir 40 via a flow measuring apparatus 58, a pump 60, a non-return valve 62 and the pressure sensor 46. If the actuating lever 50 is moved from a start position to an end position (indicated by arrow 64), the hydraulic piston 52 presses the hydraulic fluid into the compensating reservoir 40. At the same time, a signal is transmitted to the pump 60 by a control unit 100, such that it switches on and conveys hydraulic fluid from the compensating reservoir 40 into the hydraulic chamber 30. The ensuing pressure in the hydraulic system 34 is detected by the pressure sensor 46. When a predetermined pressure is reached, the control unit switches off the pump 60. The predetermined pressure may correspond to the pressing force required for compressing the ground coffee filled in the filter insert 14 and exerted by means of the operation of the brewing piston 18. At the end of the brewing process, the valve 44 can be opened by means of the control unit, the pressure in the hydraulic chamber 30 is reduced, the double piston 24 moves upwards due to the spring element 32, and the hydraulic fluid passes via the compensating reservoir 40 into the first cylinder-piston arrangement 48 and effects a movement of the actuating lever 50 back to the start position, the movement also being supported by a spring element (not shown).

Fig. 3a to 3c shows individual steps, which show an at least partly automatic removal of the spent coffee grounds from the portafilter 12 after the brewing process. Inside the portafilter 12, a slider 70 is received so as to be rotatable about a rotation axis 72 at one end. A second end 74 is received in a receptacle 76. If the portafilter 12 is now moved into a different position in the holder, i.e. if it is displaced in the holder in the circumferential direction of the portafilter 12, the end 74 is released from the receptacle 76. The rotational movement of the slider 70 about the rotation axis 72 is coupled, for example by means of a spring element 78, to the movement of the portafilter 12 in the holder such that the slider 70 rotates about the rotation axis 72 and thereby pushes the spent coffee grounds towards an opening 80 from which the spent coffee grounds are removed from the portafilter 12.

Patentkrav

- 1.** Espresso- og kaffemaskine (10) med en bryggeenhed, omfattende et bryggekammer (16),
organ til at generere og levere varmt bryggevand under tryk til bryggekammeret
5 (16),
et bryggestempel (18) til gentagne gange at lukke og åbne bryggekammeret (16),
og til at bevæge bryggestemplet (18) i bryggekammeret (16) til en presseposition
og/eller en bryggeposition, hvor bryggeenheden er udformet på en sådan, at
bryggevandet kan indføres lateralt i bryggeenheden,
- 10 **kendetegnet ved,**
at bryggevandet kan indføres ved hjælp af et bryggevandsindløb tilvejebragt på
en nedre ende af bryggestemplet (18).
- 2.** Espresso- og kaffemaskine (10) ifølge krav 1, **kendetegnet ved,**
15 **at** bryggestemplet (18) er udformet som en hul cylinder, hvorved indløbet af
bryggevandet er tilvejebragt i det indre af den hule cylinder på et nedre område.
- 3.** Espresso- og kaffemaskine (10) ifølge krav 1 eller 2, yderligere omfattende en
betjeningsarm (50), som mindst delvist er bevægelig med hånden, hvormed med
20 bevægelse af betjeningsarmen (50) i en retning presses bryggestemplet (18) i
bryggekammeret (16) ind i en presseposition og/eller en bryggeposition, og
omfatter justeringsorgan med et fluidsistem (34), som omfatter mindst en første
cylinder-/stempelindretning (48), hvorved betjeningsarmen (50) er operativt
forbundet med et stempel (52) i den første cylinder-/stempelindretning (48) og
25 med justeringsorgan på en sådan måde, at med bevægelse af betjeningsarmen
(50) i en retning opbygges der tryk i fluidsystemet (34), hvorved bryggestemplet
(18) anbragt i en anden cylinder-/stempelindretning (22) i bryggekammeret (16)
presses ind i pressepositionen og/eller bryggepositionen.
- 30 **4.** Espresso- og kaffemaskine (10) ifølge krav 3, **kendetegnet ved,**
at fluidsystemet (34) omfatter en udligningsbeholder (40) og en tryksensor (46).
- 5.** Espresso- og kaffemaskine (10) ifølge krav 4, **kendetegnet ved,**
at justeringsorganet yderligere omfatter en pumpe (60), hvilken i operativ

forbindelse med betjeningsarmen (50) og på en omstillelig og fluidledende måde er forbundet med udligningsbeholderen (40), hvorved pumpen (60) er indrettet til at opbygge tryk i fluidsyste­met (34).

5 **6.** Espresso- og kaffemaskine (10) ifølge et af kravene 3 til 5, **kendetegnet ved, at** bryggestemplet (18) indrettet i den anden cylinder-/stempelindretning (22), med en radial virkende tætning, er forskydeligt modtaget i brygge­kammeret (16), og med en stempelstang er forbundet med et øvre stempel (26) med en radial virkende tætning, hvilket øvre stempel er forskydeligt modtaget i et fluidkammer
10 (30).

7. Espresso- og kaffemaskine (10) ifølge et af kravene 3 til 6, **kendetegnet ved, at** i fluidsyste­met (34) er der indrettet en tryksensor (46) til at registrere trykket i fluidsyste­met (34), hvilket er justerbart til en foruddefineret værdi.
15

8. Espresso- og kaffemaskine (10) ifølge krav 7, **kendetegnet ved, at** trykket er justerbart til den foruddefinerede værdi ved hjælp af en omstillelig ventil (44), hvilken er indrettet i fluidsyste­met (34).

20 **9.** Espresso- og kaffemaskine (10) ifølge krav 8, **kendetegnet ved, at** med åbnet ventil (44) transporteres fluid fra den anden cylinder-/stempelindretning (22) til udligningsbeholderen (40), hvorved det øvre stempel (26) presses opad ved hjælp af en fjederkraft fra et indrettet fjederelement (32).

25 **10.** Espresso- og kaffemaskine (10) ifølge et af kravene 3 til 9, **kendetegnet ved, at** fluidet er en hydraulikolie godkendt til fødevarer.

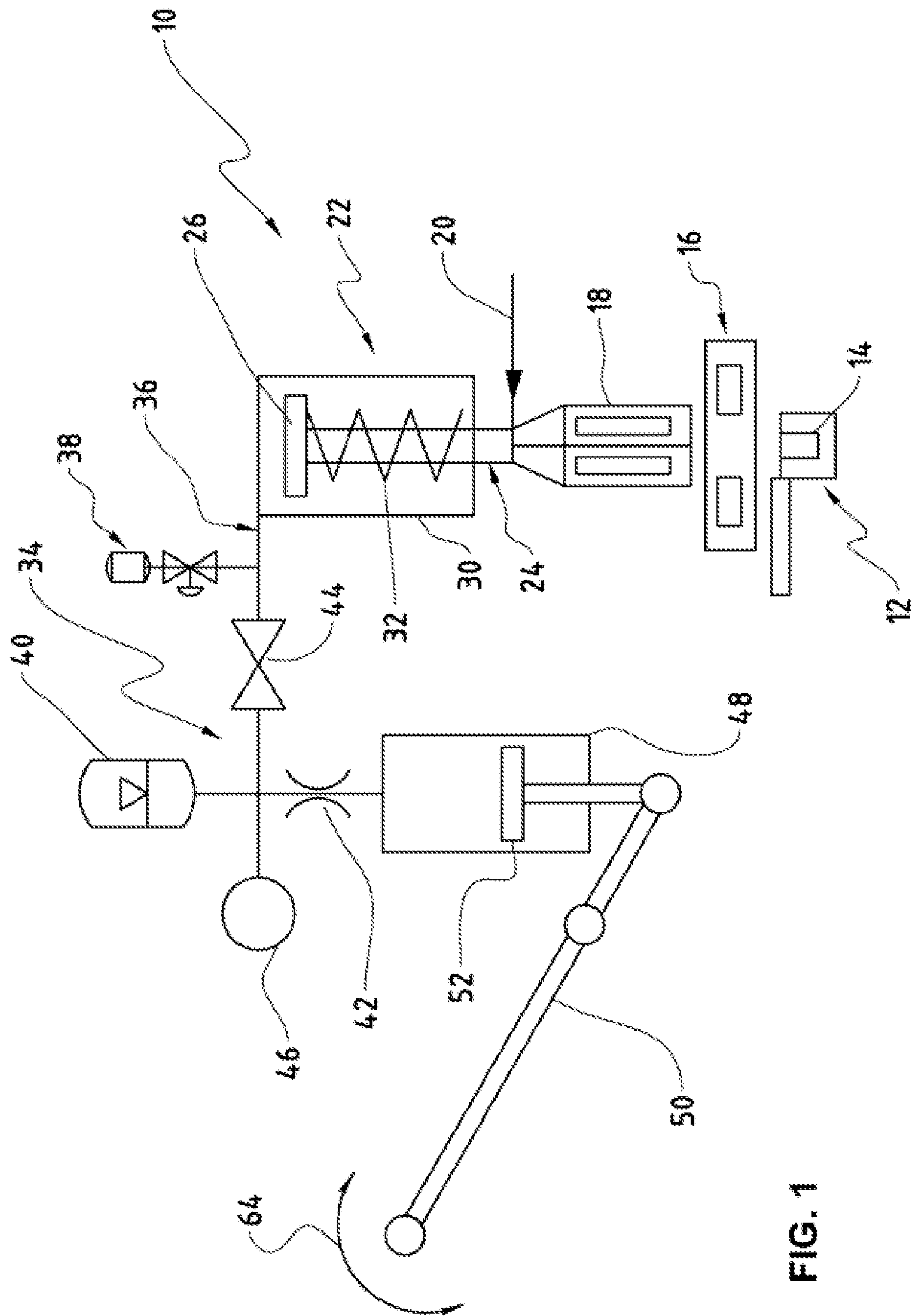
11. Espresso- og kaffemaskine (10) ifølge et af kravene 1 til 10, **kendetegnet ved, at** et bypass-bryggesystem er indrettet til at opdele det varme vand ledt ind
30 i bryggestemplet i en ekstraktionstrøm og en bypass-strøm, hvilken ledes forbi den malede kaffe placeret i brygge­kammeret (16), og hvorved begge strømme føres sammen nedstrøms.

12. Fremgangsmåde til betjening af espresso- og kaffemaskinen (10) ifølge et af
35 kravene 3 til 11 omfattende følgende trin:

- at anbringe en filterholder (12) i en dertil tilvejebragt holder i et bryggekommer (16), i hvilket malet kaffe fremstillet med en kværn kan påfyldes;
- manuelt at bevæge en betjeningsarm (50) indrettet på espresso- og kaffemaskinen, fra en startposition til en slutposition;
- at generere tryk i et fluidsistem (34) gennem en operativ forbindelse af betjeningsarmen (50) og espresso- og kaffemaskinens (10) justeringsorgan, mindst omfattende en første cylinder-/stempelindretning;
- at lukke bryggekommeret (16) med bryggestemplet (18) indrettet i en anden cylinder-/stempelindretning, hvilket sættes under tryk med trykket genereret af justeringsorganet;
- at presse den malede kaffe i filterholderen (12) til en kaffekage gennem det tryksatte bryggestempel (18) med et defineret kontaktryk;
- at fordele varmt vand på den pressede malede kaffe i filterholderen (12);
- uafhængigt at bevæge betjeningsarmen (50) tilbage til startpositionen;
- og
- at fjerne kafferester fra filterholderen (12).

13. Fremgangsmåde ifølge krav 12, **kendetegnet ved, at** efter sammenpresning af den malede kaffe bevæges bryggestemplet (18) til en position med afstand til kaffekagen.

14. Fremgangsmåde ifølge krav 12 eller 13, **kendetegnet ved, at** et kontaktryk anvendt til sammenpresning er justerbart.



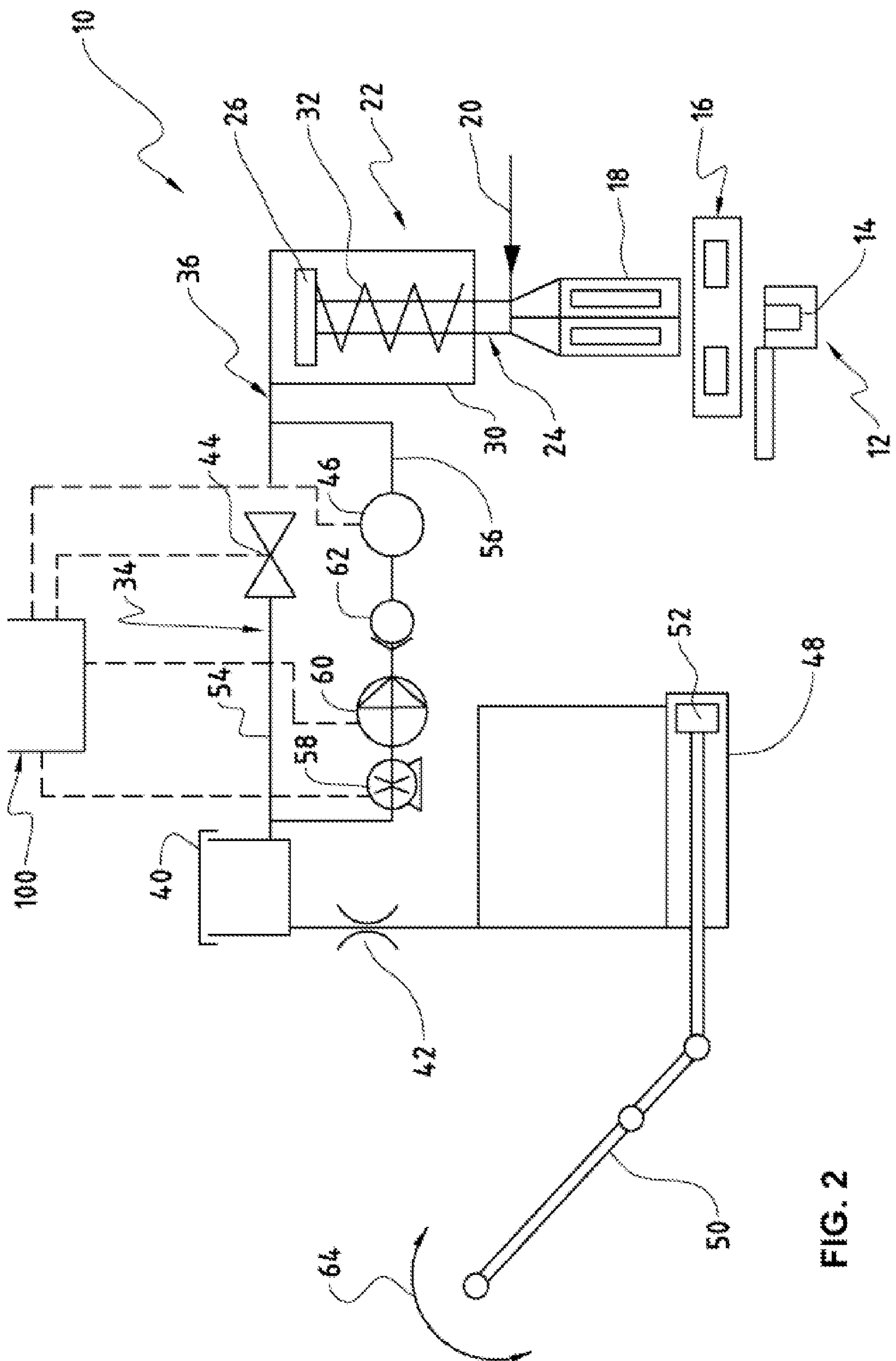


FIG. 2

FIG. 3a

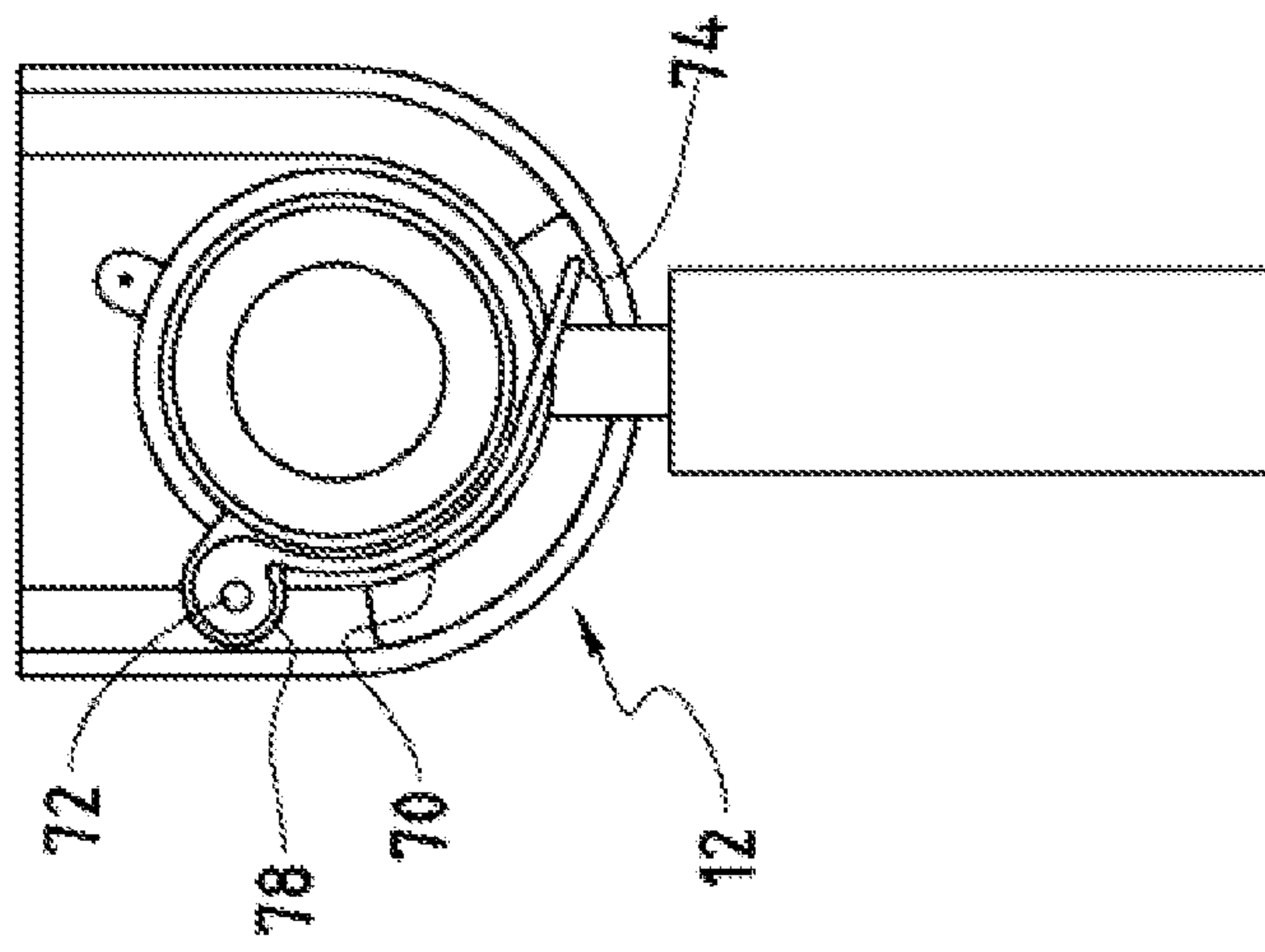


FIG. 3b

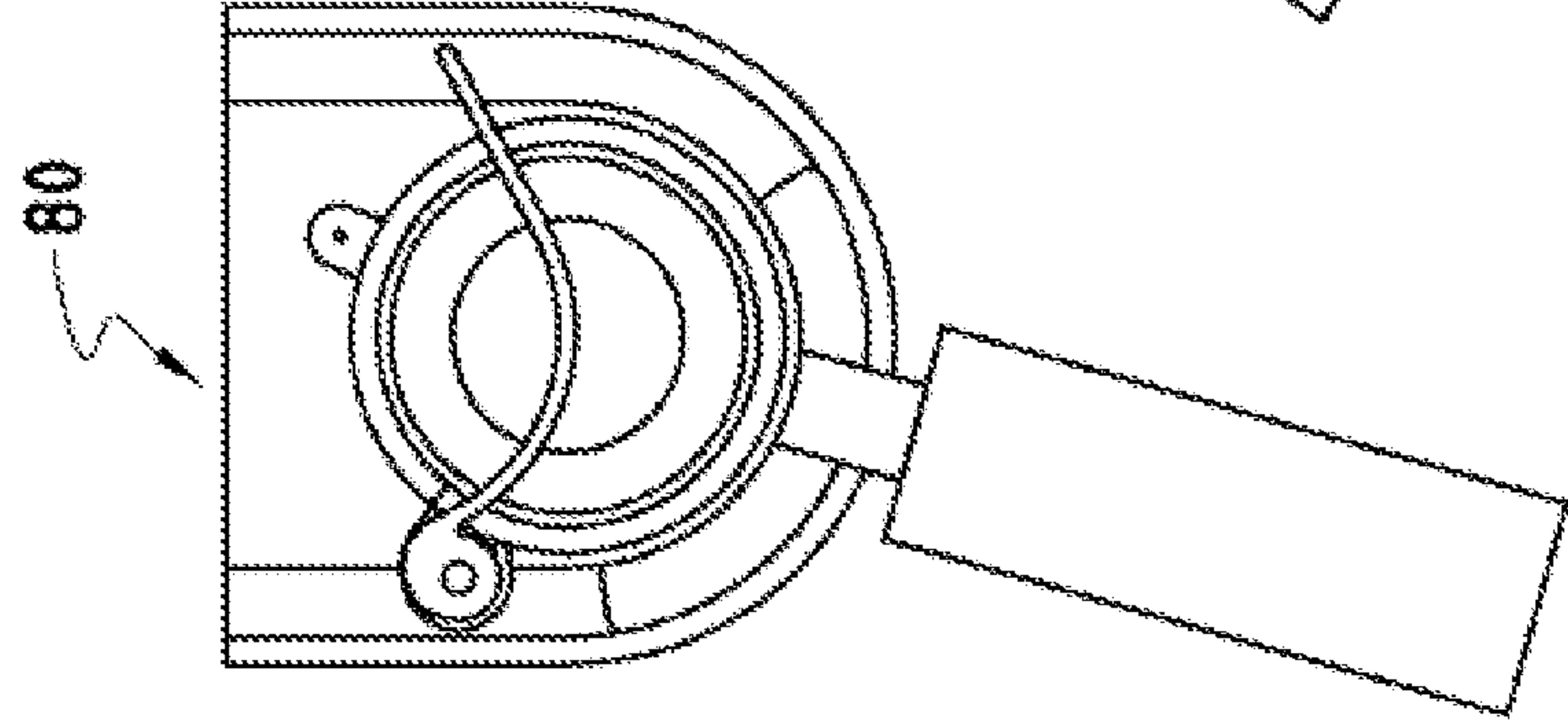


FIG. 3c

