(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 576 958 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
16.09.1998 Bulletin 1998/38

(51) Int Cl.[6]: **F17C 5/00**

(21) Application number: **93109900.6**

(22) Date of filing: **22.06.1993**

(54) LP gas filling equipment

Flüssiggasfüllanlage

Installation de remplissage pour GPL

(84) Designated Contracting States:
FR GB IT

(30) Priority: **29.06.1992 JP 170580/92**

(43) Date of publication of application:
05.01.1994 Bulletin 1994/01

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- **PATENT ABSTRACTS OF JAPAN vol. 10, no. 044 (M-455)21 February 1986 & JP-A-60 196 497 (MEIKOU SANGYO K.K.) 4 October 1985**
- **PETROLE INFORMATIONS - GPL ACTUALITE no. 22, February 1992, PARIS, FR pages 52 - 54 , XP249911 'PAM: UN NOUVEAU CONCEPT DE CENTRES EMPLISSEURS AUTOMATISES'**

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Description

BACKGROUND OF THE INVENTION

The present invention relates to an LP gas filling equipment and more particularly to an LP gas filling equipment for filling a predetermined amount of LP gas into a gas container on the basis of a metered value obtained by an electrobalance.

Heretofore, various apparatus have been developed for performing the LP gas filling work. In all of such conventional apparatus, however, docking of a gas filling nozzle to a gas filling port of a gas container had to be conducted manually by a worker. For example, a prior application (see Japanese Patent Laid-Open No. 93598/1984) filed by the applicant in the present case relates to an LP gas filling equipment capable of introducing and discharging gas containers to and from a place where the containers are to be filled with the gas, in order to attain the concentration and rationalization of the gas filling work. In the equipment of the said prior application, inlet and outlet for gas containers are provided in certain positions on a turntable; inlet and outlet passages for the conveyance of gas containers are connected to the gas container inlet and outlet; gas containers are conveyed automatically through the inlet passage onto container rest portions formed at regular intervals on the same circumference of the upper surface of the turntable; then, a worker manually connects a gas filling nozzle of a gas filling machine disposed for each container rest portion to a gas filling port of the gas container on each container rest portion; a predetermined amount of LP gas based on a metered value obtained by an electrobalance is filled into the gas container while the container is transferred from the inlet to the outlet by the rotation of the turntable; and the worker is required to remove the gas filling nozzle manually from the gas filling port of the gas container which has arrived at the outlet. In the conventional equipment, moreover, at the time of connecting the gas filling nozzle to the gas filling port of the container, the worker is required to rotate the container to effect a directional positioning of the container gas filling port relative to the gas filling nozzle. This is a heavy labor. Further, after the connection of the gas filling nozzle and at the time of removing the same nozzle, it has been necessary to open and close a rotary valve of the container by a manual operation. In the conventional equipment, therefore, it is impossible to expect automation for the concentration and rationalization of the gas filling work.

German document No. DE-A-3739950 discloses an apparatus for the filling of gas cylinders, but the apparatus is of the type for filling of a single cylinder placed in the filling position, by means of an automatic positioning robot. That robot, in advance of the filling, accurately orientates the cylinder so that it will be at the correct attitude for filling when the cylinder is placed in the filling position in the apparatus. The cylinder when filled is removed by the robot. The apparatus is a single cylinder filling machine.

In Belgian Patent No. 687964 a gas filling machine is disclosed wherein a filling port direction modifying mechanism is displaced from the filling position.

SUMMARY OF THE INVENTION

The present invention has been accomplished in view of such conventional circumstances and it is the object of the invention to make complete automation of the gas filling work possible by providing an LP gas filling equipment wherein, merely by putting on a container rest portion a gas container which has been weighed by an electrobalance, it is made possible to effect a directional positioning of a gas filling port relative to a gas filling nozzle as well as the connection and removal of the nozzle.

According to the present invention there is provided LP gas filling apparatus comprising a machine frame which is disposed sideways of a container rest portion which is for putting a gas container thereon so as to permit filling of the container with a predetermined amount of gas on the basis of a measured value obtained using an electrobalance;

a lift member which is moved vertically according to the height of the container by means of a lift device unit, and disposed in the machine frame;

a horizontal movable gas filling nozzle to be advanced and docked with the gas filling port of the gas container by means of an advance/retreat drive unit which is attached to the lift member;

and a valve opening/closing mechanism also mounted to the lift member for opening and closing the rotary valve projecting from the upper end of the gas filling port of the container, said valve opening/closing mechanism having a valve opening/closing head positioned on an axis which perpendicularly intersects an extension of the axis of the gas filling nozzle, said valve opening/closing head being moved vertically and rotated in forward and reverse directions by means of both a lift drive unit disposed in the lift member and a rotation drive unit supported by the lift drive unit, to thereby open or close the rotary valve of the container;

characterised by a filling port direction modifying mechanism for performing a directional positioning of the gas filling port of the gas container on the container rest portion with respect to the gas filling nozzle which is mounted to the lift member; and characterised in that said filling port direction modifying mechanism comprises a clamp unit at a position of the lift member below the gas filling nozzle, said clamp unit having a rotating means adapted to be opened and closed by an opening/closing

unit according to the thickness of the container to clamp and to rotate the container, the filling port direction modifying mechanism also having a direction detecting unit in a position above the gas filling nozzle, said direction detecting unit being mounted to be rotated between an advanced position above the gas filling port of the container and a stand-by position retreated from the advanced position, by means of a rotation drive unit, and being moved vertically according to the height of the gas filling port by means of a lift drive unit to detect the direction of the gas filling port.

According to a further technical feature of the present invention there is provided an inlet and an outlet for gas containers which are formed at predetermined positions on a turntable;

The inlet and outlet passages each being provided with an electrobalance; container rest portions each for putting a gas container thereon so as to permit filling the container with a predetermined amount of gas on the basis of a measured value obtained using the electrobalance on the inlet passage and which are arranged at regular intervals on the same circumference on the upper surface of the turntable.

The above mechanisms are operated in predetermined sequence and timings by the respective drive units which start operation under a pre-programmed computer control.

According to the above first technical means for the LP gas filling equipment of the present invention, when a gas container which has been weighted by the electrobalance is put on a container rest portion, the lift drive unit starts operation in accordance with information, or required data, of the container such as height and thickness (outside diameter) and brings down the lift member which stands by in its upper limit position, according to the height of the container, then when the descending motion of the lift member stops, the opening/closing drive unit of the filling port direction modifying mechanism starts operation and causes the clamp unit to operate in the closing direction according to the thickness of the container and clamp the container. When the container is clamped, the rotation drive unit of the modifying mechanism starts operation and causes the direction detecting unit which stands by in its retreated stand-by position, to rotate and advance to a position above the gas filling port. At the same time, the lift drive unit starts operation and causes the direction detecting unit to move down according to the height of the gas filling port, and the container is rotated by the rotating means of the clamp unit to effect a directional positioning of the gas filling port relative to the gas filling nozzle.

When the gas filling port is aligned with the gas filling nozzle in an opposed relation thereto, the opening/closing drive unit operates again and causes the clamp unit to operate in its opening direction to release the clamp for the container, and the lift drive unit also operates. Then, at a later timing, the rotation drive unit operates and causes the direction detecting unit to move back from the position above the gas filling port to its stand-by position.

Subsequently, the lift drive unit of the valve opening/closing mechanism starts operation and causes the valve opening/closing head to descend toward the opening/closing valve until head comes into engagement with the valve. Thereafter, the advance/retreat drive unit which supports the gas filling nozzle starts operation and causes the nozzle to advance toward the gas filling port until the nozzle is docked with the filling port. At the same time the rotation drive unit of the valve opening/closing mechanism starts operation and causes the valve opening/closing head to rotate in the opening direction of the opening/closing valve, namely, leftwards, to open the valve, thereby allowing the gas filling operation for the container to be started.

When a predetermined amount of gas has been filled into the container to complete the filling operation, the rotation drive unit of the valve opening/closing mechanism operates to rotate the valve opening/closing head rightwards, thereby closing the opening/closing valve. At the same time, the lift drive unit of the valve opening/closing mechanism operates to raise the valve opening/closing head away from the valve opening/closing valve. At the same time, the advance/retreat drive unit which supports the gas filling nozzle starts operation and causes the gas filling nozzle to retreat away from the gas filling port to complete the filling operation. When the gas filling operation is completed by a series of these operations, the lift drive unit operates to raise the lift member back to its upper limit position.

According to the foregoing second technical means adopted in the present invention, the weight of each gas container is measured by the electrobalance in a predetermined position on the inlet passage while the container is conveyed toward the turntable, then the container passes through the inlet on the turntable and is put on a container rest portion, then while the container is conveyed from the inlet to the outlet by the rotation of the turntable, a predetermined amount of gas is filled into the container in the foregoing operation sequence and timings of the constituent mechanisms as in the first technical means described above, and the container which has reached the outlet is carried out to the outlet passage.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a plan view showing an outline of an LP gas filling equipment according to the present invention;

Fig. 2 is an enlarged side view taken along line II-II in Fig. 1;

Fig. 3 is a side view showing a principal portion (a gas filling machine) on a larger scale;

Fig. 4 is a front view thereof;

Fig. 5 is a plan view thereof in transverse section;

Fig. 6 is a partially sectional view taken along line

VI-VI in Fig. 5;

Fig. 7 is an enlarged plan view showing a clamp unit in a filling port direction modifying mechanism;

Fig. 8 is an enlarged side view showing the operation of a direction detecting unit in the filling port direction modifying mechanism;

Fig. 9 is a side view similar to Fig. 8, showing state after directional positioning of a gas filling port of a gas container;

Fig. 10 is an enlarged plan view in transverse section taken along line X-X in Fig. 9;

Fig. 11 is a partially cut-away side view showing a valve opening/ closing mechanism portion;

Fig. 12 is a side view similar to Fig. 11, showing a connected state of a gas filling nozzle to the gas filling port of the container;

Fig. 13 is a perspective view showing a scanner; and

Fig. 14 is a plan view showing a container rest portion on a larger scale.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

An embodiment of the present invention will be described in detail hereinunder with reference to the drawings. Fig. 1 is a plan view schematically showing an LP gas filling equipment embodying the invention and Fig. 2 is an enlarged side view thereof. In the drawings, the reference mark A denotes a turntable installed on a floor surface in a horizontally rotatable manner; numerals 1 and 2 denote an inlet passage and an outlet passage, respectively, which are each constituted by, for example, a chain conveyor or a roller conveyer installed in an appropriate length and which are connected to an inlet 1a and an outlet 2a, respectively, formed in predetermined positions on the turntable A; numerals 3 and 4 respectively denote an electrobalance mounted on the inlet passage 1 to measure the weight of a container 5 which is conveyed on the inlet passage 1 toward the inlet and an electrobalance mounted on the outlet passage 2 to measure the weight of a gas-filled container 5' which is discharged from the outlet and conveyed on the outlet passage 2. Numerals 6, 6, ... denote container rest portions arranged at regular intervals on the same circumference on the upper surface of the turntable A, including the positions of the inlet 1a and outlet 2a; the mark B denotes a gas filling machine mounted sideways of each container rest portion 6; numeral 7 denotes an air rotary joint disposed centrally of the upper surface of the turntable A; numeral 8 denotes a gas distributor mounted bridgewise above the air rotary joint 7 for distributing gas to each gas filling machine B; and the mark C denotes a central processing unit (CPU). While each gas container 5 is conveyed along the inlet passage 1 toward the turntable A, its weight is measured by the electrobalance 3 on the inlet passage, then the containers 5 are put one by one onto the container rest portions 6, 6, on the turntable A through the inlet 1a and conveyed from the inlet to the outlet 2a by the rotation of the turntable. During this movement, the gas containers are each filled with a predetermined amount of gas automatically by the gas filling machines B, B, ... disposed in association with the container rest portions 6, 6, ... which amount is calculated by the central processing unit on the basis of a metered value for each container 5 fed from the electrobalance 3, then the gas-filled container 5' which has arrived at the outlet 2a is discharged to the outlet passage 2.

The container rest portions 6, 6, ... are each of a size having a rest area based on the thickness (outside diameter) of a container with an internal volume corresponding to a maximum gas storage, e.g. 50 kg, and each comprise rollers 9 separated right and left toward the inlet and outlet passages 1, 2 so that the introduction from the inlet passage 1, discharge to the outlet passage 2 and the rotation of the gas filling machines B, B, ... in the axial direction of the container 5 by a filling port direction modifying mechanism which will be described later, can be done smoothly (see Fig. 14).

The gas filling machines B, B, ... each comprise a machine frame disposed sideways of the container rest portions 6, 6, ..., a lift member 12 supported by the machine frame 10 vertically movably through a lift drive unit 11, a gas filling nozzle 14 supported by the lift member 12 horizontally movably through an advance/retreat drive unit 13 so as to advance into docking with a gas filling port 5a of the gas container 5, a filling port direction modifying mechanism 15 for performing a directional positioning of the gas filling port 5a of the container on the container rest portion 6, and a valve opening/closing mechanism 16 for opening and closing a rotary valve 5b projecting from the upper end of the gas filling port 5a of the container.

The machine frame 10 is constituted in the following manner. A frame generally ⊐-shaped in side view and having an appropriate height is formed using an L- or ⊐-shaped angle member, and two guide rods 17 are fixedly erected at appropriate intervals between the front edge of an upper wall 10a and that of a lower wall 10b. Then, a lift member 12 is supported in a vertically passing-through state by both guide rods 17 and thus the lift member 12 is disposed vertically movably in the machine frame 10. Further, a wire 19 is passed onto pulleys 18 mounted on the upper and lower walls 10a, 10b and end portions thereof are connected to the upper and lower ends of the lift member 12, while an intermediate part of the wire is connected to a lift drive unit 11, e.g. rodless air cylinder, of the machine frame 10, causing the lift member 12 to be moved up or down by the cylinder 11. To the upper end of the lift member 12 is connected one end of a wire 21 to which is to be attached a weight 20 for pulling the lift member upward, then the wire 21 is passed onto a pulley 22 mounted on the upper wall 10a of the machine frame 10, and the weight 20 is attached to the other end of the wire.

The gas filling nozzle 14 is provided with a solenoid valve and starts and stops the gas filling operation in accordance with opening and closing motions of the solenoid valve. The nozzle 14 is attached to an advance/retreat unit 13, e.g. air cylinder, mounted horizontally and centrally on the lower side of the lift member 12 and is advanced by the drive unit 13 into docking with the gas filling port 5a of the container 5 positioned opposedly on the same axis. After completion of the gas filling operation, the nozzle 14 is moved back to its stand-by position. Further, a fill hose 24 extending from a fill valve 23 in each distribution pipe of the distributor is connected to the nozzle 14.

The filling port direction modifying mechanism 15 is constituted as follows. A clamp unit 27 having a rotating means 26 which is moved in opening and closing directions by an opening/closing drive unit 25, e.g. air cylinder, in accordance with the thickness (outside diameter) of the container 5 to clamp and rotate the container, is mounted to the lift member 12 in a position below the gas filling nozzle 14. There is also provided a direction detecting unit 30 in a position above the gas filling nozzle 14, the direction detecting unit 30 being moved forward and backward by a rotation drive unit 28, e.g. air motor, between an advanced position above the gas filling port 5a of the container 5 and a stand-by position retreated from the advanced position and moved vertically by a lift drive unit 29, e.g. air cylinder, according to the height of the gas filling port 5a, to detect a direction of the port 5a.

The clamp unit 27 includes clamp members 27a mounted slidably on right and left rails 31 which are disposed on both aides of the lower end face of the lift member 12. The opening/closing drive unit 25 is mounted between the rear ends of the right and left clamp members 27a, and a rack 32 projecting in an appropriate length from each of both clamp members 27a is engaged with a pinion 33 to permit opening and closing motions of both clamp members 27 in synchronism with each other. To the inner surface of each clamp member 27a are mounted two rollers in front and rear positions, the rollers 26a constituting the rotating means 26. An air motor 26b with brake is disposed on the rear end portion of one clamp member 27a, and a connecting member 26c, e.g. belt, is stretched from the air motor 26b and passed onto the front and rear rollers 26a. Both rollers 26a are rotated in the same direction by the motor 26b to rotate the container 5 in a clamped state by the right and left clamp members 27a (see Figs. 5 to 6).

The direction detecting unit 30 is constituted as follows. A horizontal arm 35, which is generally L-shaped in plan, is supported through a shaft by a rotation drive unit 34 mounted to the lift member 12, and a lift drive unit 36 and two support rods 37 are erected on the front end portion of the horizontal arm 35. Further, a connecting cylinder 38 is slidably fitted on each support rod 37, then the connecting cylinder 38 and the drive unit 36 are interconnected through a generally L-shaped connecting frame 39, and a plate 40 is mounted to the connecting cylinder 38 forwardly and horizontally and an air cylinder 41 having rods 41a in both directions is mounted on the plate 40. A detector 42 extending vertically upward at an appropriate height and then bent horizontally toward the upper ends of both support rods 37 is mounted to the front edge of the plate 40, and by linkage thereof to leak sensors 43 provided on the upper ends of the supports rods 37 it is detected that the gas filling port 5a of the container 5 has been aligned with the gas filling nozzle 14. Further, a pair of right and left detection members 46 are fixedly suspended from the front ends of both-side rods 41a of the air cylinder 41, the detection members 46 having concaves 45a in lower horizontal portions 46a thereof which, upon abutment of opposed edges thereof, define a detection hole 45 conforming to an external shape of a valve body 44 of the gas filling port 5a.

In the direction detecting unit 30, the horizontal arm 35 is moved rotatively toward a position above the gas filling port 5a of the container 5 on the container rest portion 6 by means of the rotation drive unit 34, and by an interlocked operation of the lift drive unit 36 provided on the front end portion of the horizontal arm 35 and the air cylinder 41, the lower horizontal portions 46a of the paired right and left detection members 46 mounted to the air cylinder 41 are brought into abutment onto the valve body 44 in a formed state of the detection hole 45 conforming to the external shape of the valve body. In this state, the container 5 is rotated by the clamp unit 27 and the direction of the gas filling port 5a is thereby modified toward the gas filling nozzle 14, whereby the detection hole 45 is brought into conformity with the valve body 44 and brought down and fitted thereon. In this way the detector 42 is connected with the leak sensors 43 provided on the upper ends of the support rods 37 to detect that the gas filling port 5a of the container 5 has become aligned with the gas filling nozzle 14 (see Figs. 9 and 10).

In the valve opening/closing mechanism 16, a lift drive unit 47, e.g. air cylinder, is attached to the front face of the upper portion of the lift member 12, and right and left guide rods 48 are mounted on both sides of the lift drive unit. A head case 50 which holds a valve opening/closing head 49 is slidably fitted on the right and left guide rods 48 and is connected to the lift drive unit 47. The valve opening/closing head 49 is fixedly inserted rotatably in a central part of the head case 50 which central part is located on an axis perpendicularly intersecting an extension of the axis of the gas filling nozzle 14. Further, a rotation drive unit 51, e.g. air motor, is mounted on the front end side where the valve opening/closing head 49 is mounted, and gears 52 and 53 meshing with the rotation drive unit 51 and the valve opening/closing head 49, respectively, are mounted so that the head 49 is rotated in the forward and reverse directions by the rotation drive unit 51. A through hole 54 is formed along the axis of the valve opening/closing head 49, and a de-

tector 55 for detecting the height of the container 5 is provided vertically slidably within the through hole 54. A spring member 58 for urging the detector 55 downward is disposed between a detection plate 56 attached to the lower end of the detector 55 and a recess 57 formed in the underside of a head portion 49a, and a leak sensor 59 for detecting a height of the container 5 by contact with the detector 55 is disposed on the top of the head case 50 in a position located on an extension of the axis of the detector 55.

Thus, the valve opening/closing mechanism 16 is moved vertically and rotated forward and reverse by both the lift drive unit 47 disposed in the lift member 12 and the rotation drive unit 51 supported by the lift drive unit 47 through the head case 50, to open and close the rotary valve 5b of the container 5. When the detection plate 56 attached to the lower end of the detector 55 disposed through the axis of the valve opening/closing head 59 comes into abutment with the upper surface of the opening/closing valve 5b of the container 5, the detector 55 comes into contact with the leak sensor 59 in this state to thereby detect a height of the container 5, that is, the lift drive unit 11 of the lift member 12 is stopped operation to control the vertical movement of the lift member, particularly the downward movement thereof according to the height of the container 5 (see Figs. 11 and 12).

The numeral 60 denotes an advance/retreat drive unit, e.g. air cylinder, which causes an abutment plate 61 thereof to come into abutment with the outer peripheral surface of the container 5 in accordance with the thickness (outside diameter) of the container disposed on the lower wall 10b of the machine frame 10 to effect centering of the container to the center of the container rest portion 6 and which, after completion of the gas filling operation, pushes the gas-filled container 5 to the outlet passage from the container rest portion 6. The abutment plate 61 is curved for conformity with the external shape of the container 5. Numeral 62 denotes a scanner for reading a bar code stuck on the container 5 and outputting such data as container symbol, container number, type, weight and manufacturing date of the container, fill deadline, user and company number to the central processing unit C for example. As shown in Fig. 13, the scanner 62 is mounted in several positions on a ring member 65 which is suspended from a lift wire 64 so that the bar code 63 can surely be read no matter in which position on the container the bar code may be stuck (the hatched portion in the figure).

The following description is now provided about the gas filling operation performed by the LP gas filling equipment of the present invention. Reference will first be made to an example of a single use of the gas filling machine B. When the container 5 which has been weighed by the electrobalance is put on the container rest portion 6, the lift drive unit 11 first starts operation in accordance with the required data which have been inputted to the central processing unit C, and causes the lift member 12 to move down. At the same time, the detection plate 56 attached to the lower end of the detector 55 in the valve opening/closing mechanism 16 comes into abutment onto the opening/closing valve 5b of the container 5, and by the continuous descent of the lift member 12, the detector 55 is brought into contact with the leak sensor 59, whereupon a signal is provided from the sensor 59 to stop the operation of the lift drive unit 11. Subsequently, the opening/closing drive unit 25 in the filling port direction modifying mechanism 15 starts operation, causing the right and left clamp members 27a of the clamp unit 27 to operate in the closing direction in synchronism with each other to clamp the container 5. Upon clamp of the container 5, the lift drive unit 47 in the valve opening/closing mechanism 47 starts operation, raises the head case 50 and causes the detection plate 56 and the valve opening/closing head 49 to be retracted to the upper limit position from above the opening/closing valve 5b. At this time, the detector 55 is brought down away from the leak sensor 59 by means of the spring member 58. Following this movement, the rotation drive unit 34 which supports the direction detecting unit 30 starts operation, and direction detecting unit 30 which has been retracted to its standby position (see Fig. 5) is advanced rotatively to a position above the valve body 44 in the gas filling port 5a of the container 5 by virtue of rotation (left-hand rotation) of the horizontal arm 35 (see Fig. 7). Upon arrival of the direction detecting unit 30 at the position above the valve body 49a, the lift drive unit 36 starts operation and causes the paired right and left detection members 46a to move down toward the valve body 44. At a later timing the opening/closing drive unit 41 starts operation to close the detection members 46, and in this state the lower horizontal portions 46a of the detection members 46 are brought into abutment onto the valve body 44 (the state shown in Fig. 8). At this time, the lift drive unit 36 has a driving force (pressure) for pushing the paired right and left detection members 46, and in this state the rotation drive unit 26b of the valve direction modifying mechanism 15 operates and imparts a rotating power to the rollers 26a to rotate the container 5. When the container 5 has been rotated up to a state in which the detection hole 45 defined by both detection members 46 can conform to the outside diameter of the valve body 44, both detection members 46 move downward and the detector 42 comes into contact with the leak sensor 43, so that the motor 26b in the clamp unit 27 stops to discontinue the rotation of the container 5, whereby there is effected a directional positioning of the gas filling port 5a with respect to the gas filling nozzle 14 (see Fig. 10).

When the gas filling port 5a has been positioned face to face with the gas filling nozzle 14, the opening/closing drive unit 25 operates again to move the clamp members 27a in the opening direction and thereby release the clamped state of the container 5. At the same time, the lift drive unit 36 operates and then at a predetermined timing the rotation drive unit 28 operates, caus-

ing the direction detecting unit 30 to move back to its stand-by position from above the gas filling port 5a of the container 5. Subsequently, the lift drive unit 47 in the valve opening/closing mechanism 16 starts operating and causes the head case 50 to move down until the valve opening/closing head 49 is fitted on the opening/closing valve 5b. Thereafter, the advance/retreat drive unit 13 which supports the gas filling nozzle 14 starts operation and causes the nozzle 14 to advance toward the gas filling port 5a, allowing both to come into docking with each other. At the same time, the rotation drive unit 51 in the valve opening/closing mechanism 16 starts operation and causes the valve opening/closing head 49 to turn in the opening direction of the valve 5b, namely in the leftward direction, to open the valve, thereby starting the gas filling operation for the container 5 (see Fig. 12). The gas filling operation is started by opening of the solenoid valve in the gas filling nozzle 14.

When the container 5 has been filled with a predetermined amount of gas and the gas filling operation is over, a filling end signal is issued from the central processing unit C, whereupon the solenoid valve is closed and the rotation drive unit 51 in the valve opening/closing mechanism 16 operates and causes the valve opening/closing head 49 to turn rightwards to close the opening/closing valve 5b. At the same time, the lift drive unit 47 in the opening/closing mechanism 16 operates and raises the head case 50 to disengage the head 49 from the valve 5b. The advance/retreat drive unit 13 starts operating and causes the gas filling nozzle to move back away from the gas filling port 5a. The gas filling work is now over. Thereafter, the lift drive unit operates to raise the lift member 12 back to its upper-limit position.

Next, reference will be made to a rotary filling system in which gas filling machines B are arranged on the turntable A in a number corresponding to the number of the container rest portions 6, 6, ... While the gas containers 5 are conveyed toward the turntable A along the inlet passage 1, they are weighed by the electrobalance 3 on the same passage. Thereafter, the containers 5 pass through the inlet 1a of the turntable A and are put one by one on the container rest portions 6, 6, ... formed on the turntable. Then, the gas filling machines B arranged respectively for the container rest portions 6, 6, ... perform a directional positioning of the gas filling port 5a with respect to the gas filling nozzle 14 in the foregoing operation sequence and operation timing. While the containers 5 are conveyed from the inlet 1a to the outlet 2a by the rotation of the turntable A, each container 5 is filled with a predetermined amount of gas, and the container 5' which has arrived at the outlet 2a is pushed by the abutment plate under the operation of the advance/retreat drive unit 60 and is thereby discharged to the outlet passage 2 from the outlet 2a. The gas-filled container 5' being conveyed on the outlet passage 2 is weighed by the electrobalance on the same passage to check if it has been filled with the predetermined amount of gas.

As to the transfer form of the container 5 to the container rest portion 6, a linear transfer path contiguous to the container rest portion may be formed so that the container is filled with gas by the gas filling machine B under such linear transfer form.

Since the LP gas filling equipment of the present invention is constructed as above, there can be obtained the following functions and effects.

According to the first technical means adopted by the invention, once each gas container which has been weighed by the electrobalance is put on a container rest portion, there are automatically performed directional positioning of the gas filling port of the gas container relative to the gas filling nozzle, connection and disconnection of the gas filling nozzle with respect to the gas filling port, and opening and closing of the container opening/closing valve. Thus, all that is required for the worker is merely putting the weighed container onto the container rest portion. Consequently, the filling work efficiency is greatly improved and not only speed-up of the filling work can be attained but also the worker's labor (fatigue) can be diminished.

According to the second technical means adopted by the invention, directional positioning of the gas filling port of the gas container which has been conveyed along the inlet passage and put on a container rest portion on the turntable, with respect to the gas filling nozzle, connection and disconnection of the gas filling nozzle with respect to the gas filling port, and opening and closing of the container opening/closing valve, are performed automatically while the container is conveyed from the inlet to the outlet of the turntable. Therefore, it is possible to attain the concentration and rationalization of gas filling operations in the rotary filling system, and further possible to attain a complete automation of a series of operations from the introduction of gas containers up to the discharge thereof.

Claims

1. LP gas filling apparatus comprising a machine frame (10) which is disposed sideways of a container rest portion (6) which is for putting a gas container (5) thereon so as to permit filling of the container with a predetermined amount of gas on the basis of a measured value obtained using an electrobalance (3);

   a lift member (12) which is moved vertically according to the height of the container by means of a lift drive unit (11), and disposed in the machine frame;

   a horizontally movable gas filling nozzle (14) to be advanced and docked with the gas filling port (5a) of the gas container by means of an

advance/retreat drive unit (13) which is attached to the lift member;

and a valve opening/closing mechanism (16) also mounted to the lift member for opening and closing the rotary valve (5b) projecting from the upper end of the gas filling port of the container, said valve opening/closing mechanism having a valve opening/closing head (49) positioned on an axis which perpendicularly intersects an extension of the axis of the gas filling nozzle, said valve opening/closng head being moved vertically and rotated in forward and reverse directions by means of both a lift drive unit (47) disposed in the lift member and a rotation drive unit (51) supported by the lift drive unit, to thereby open or close the rotary valve of the container;

characterised by a filling port direction modifying mechanism (15) for performing a directional positioning of the gas filling port of the gas container on the container rest portion with respect to the gas filling nozzle which is mounted to the lift member; and characterised in that said filling port direction modifying mechanism comprises a clamp unit (27) at a position of the lift member below the gas filling nozzle, said clamp unit having a rotating means (26) adapted to be opened and closed by an opening/closing unit (25) according to the thickness of the container to clamp and rotate the container, the filling port direction modifying mechanism also having a direction detecting unit (30) in a position above the gas filling nozzle, said direction detecting unit (30) being mounted to be rotated between an advanced position above the gas filling port of the container and a stand-by position retreated from the advanced position, by means of a rotation drive unit (34), and being moved vertically according to the height of the gas filling port by means of a lift drive unit (36) to detect the direction of the gas filling port.

2. LP gas filling apparatus according to claim 1, characterised by an inlet (1a) and an outlet (2a) for gas containers which are formed at predetermined positions on a turntable (A);
the inlet and outlet passages each being provided with an electrobalance (3.4); container rest portions (6) each for putting a gas container (5) thereon so as to permit filling the gas container with a predetermined amount of gas on the basis of a measured value obtained using the electrobalance on the inlet passage and which are arranged at regular intervals on the same circumference on the upper surface of the turntable.

Patentansprüche

1. Flüssiggasfüllvorrichtung, umfassend ein Maschinengestell (10), das seitwärts von einem Behälterauflageteil (6) angeordnet ist, auf den ein Gasbehälter (5) gestellt wird, so daß der Behälter mit einer vorgegebenen Menge Gas aufgrund eines Meßwertes gefüllt werden kann, der mit einer Elektrowaage (3) erhalten wird;

ein Hubelement (12), das gemäß der Höhe des Behälters vertikal über eine Hubantriebseinheit (11) bewegt wird und in dem Maschinengestell angeordnet ist;
eine horizontal bewegbare Gasfülldüse (14), die vorgeschoben und an die Gasfüllöffnung (5a) des Gasbehälters über eine Vorschub-/Rückzug-Antriebseinheit (13) gekoppelt wird, die an dem Hubelement angeschlossen ist;
und einen Ventilöffnungs-/-schließmechanismus (16), der ebenfalls an dem Hubelement montiert ist, um den vom oberen Ende der Gasfüllöffnung des Behälters vorstehenden Drehschieber (5b) zu öffnen und zu schließen, wobei der genannte Ventilöffnungs-/-schließmechanismus einen Ventilöffnungs-/-schließkopf (49) aufweist, der auf einer Achse positioniert ist, die eine Erweiterung der Achse der Gasfülldüse senkrecht schneidet, wobei der genannte Ventilöffnungs-/-schließkopf über eine in dem Hubelement angeordnete Hubantriebseinheit (47) und eine von der Hubantriebseinheit getragene Rotationsantriebseinheit (51) vertikal bewegt und in Vorwärts- und Rückwärtsrichtung gedreht wird, um so den Drehschieber des Behälters zu öffnen oder zu schließen;

gekennzeichnet durch einen Füllöffnungsrichtungs-Änderungsmechanismus (15), der eine Richtungseinstellung der Gasfüllöffnung des Gasbehälters auf dem Behälterträgerteil mit Bezug auf die Gasfülldüse durchführt und an dem Hubelement montiert ist; und dadurch gekennzeichnet, daß der genannte Füllöffnungsrichtungs-Änderungsmechanismus eine Klemmeinheit (27) in einer Position des Hubelementes unterhalb der Gasfülldüse umfaßt, wobei die genannte Klemmeinheit ein Drehmittel (26) aufweist, das so ausgestaltet ist, daß es über eine Öffnungs-/-Schließeinheit (25) gemäß der Dicke des Behälters geöffnet und geschlossen werden kann, um den Behälter einzuklemmen und zu drehen, wobei der Füllöffnungsrichtungs-Änderungsmechanismus auch eine Richtungsbestimmungseinheit (30) in einer Position oberhalb der Gasfülldüse aufweist, wobei die genannte Richtungsbestimmungseinheit (30) so angebracht ist, daß sie mittels einer Rotationsantriebseinheit (34) zwischen einer vorgeschobenen Position oberhalb

der Gasfüllöffnung des Behälters und einer von der vorgeschobenen Position zurückgezogenen Bereitschaftsposition gedreht werden kann, und gemäß der Höhe der Gasfüllöffnung mit einer Hubantriebseinheit (36) vertikal bewegt wird, um die Richtung der Gasfüllöffnung zu bestimmen.

2. Flüssiggasfüllvorrichtung nach Anspruch 1, gekennzeichnet durch einen Einlaß (1a) und einen Auslaß (2a) für Gasbehälter, die an vorgebenen Positionen auf einer Drehscheibe (A) ausgestaltet sind;

wobei die Ein- und Auslaßkanäle jeweils mit einer Elektrowaage (3.4) versehen sind; Behälterträgerteile (6), auf die jeweils ein Gasbehälter (5) gestellt wird, damit der Gasbehälter mit einer vorgegebenen Menge an Gas auf der Basis eines Meßwertes gefüllt werden kann, der mit einer Elektrowaage am Einlaßkanal erhalten wird, und die in regelmäßigen Abständen auf demselben Umfang auf der Oberfläche der Drehscheibe angeordnet sind.

Revendications

1. Un équipement de remplissage de gaz de pétrole liquéfié, comprenant un bâti de machine (10) qui est disposé latéralement par rapport à une section d'appui de récipient (6) qui est destinée à recevoir un récipient à gaz (5) de façon à permettre le remplissage du récipient avec une quantité prédéterminée de gaz, sur la base d'une valeur mesurée obtenue par l'intermédiaire d'une électrobalance (3) ;

un élément de levage (12) qui est déplacé dans le plan vertical, en fonction de la hauteur du récipient, au moyen d'une unité de commande de levage (11), et agencé dans le bâti de machine ;

un ajutage de remplissage de gaz (14) capable de se déplacer dans le plan horizontal, destiné à s'avancer et à s'amarrer avec l'orifice de remplissage de gaz (5a) du récipient à gaz, au moyen d'une unité de commande d'avancement/de rétraction (13) qui est associée à l'élément de levage ;

et un mécanisme d'ouverture/de fermeture de soupape (16), également monté sur l'élément de levage, destiné à ouvrir et à fermer la soupape rotative (5b) dépassant de l'extrémité supérieure de l'orifice de remplissage de gaz du récipient, ledit mécanisme d'ouverture/de fermeture de soupape possédant une tête d'ouverture/de fermeture de soupape (49) positionnée sur un axe lequel est en intersection perpendiculaire avec le prolongement de l'axe de l'ajutage de remplissage de gaz, ladite tête d'ouverture/de fermeture de soupape étant déplacée dans le plan vertical puis tournée vers l'avant et vers l'arrière grâce à l'unité de commande de levage (47) intégrée à l'élément de levage, et grâce à l'unité de commande de rotation (51) soutenue par l'unité de commande de levage, afin, par cette action, d'ouvrir et de fermer la soupape rotative du récipient ;

caractérisé par un mécanisme de modification du sens de l'orifice de remplissage (15), destiné à effectuer le positionnement directionnel de l'orifice de remplissage de gaz sur le récipient à gaz, quand il se trouve sur la section d'appui de récipient, par rapport à l'ajutage de remplissage de gaz qui est associé à l'élément de levage ; et caractérisé en ce que ledit mécanisme de modification du sens de l'orifice de remplissage comprend une unité de serrage (27) sur l'une des positions de l'élément de levage en dessous de l'ajutage de remplissage de gaz, ladite unité de serrage possédant un moyen de rotation (26) qui est adapté de façon à pouvoir être ouvert et fermé par une unité d'ouverture/de fermeture (25), en fonction de l'épaisseur du récipient pour serrer et pour tourner le récipient, le mécanisme de modification du sens de l'orifice de remplissage étant également muni d'une unité de détection de direction (30) prévue sur un emplacement au-dessus de l'ajutage de remplissage de gaz, ladite unité de détection de direction (30) étant montée de façon à pouvoir être tournée entre une position avancée, au-dessus de l'orifice de remplissage de gaz du récipient, et une position d'attente, en retrait de la position avancée, grâce à une unité de commande de rotation (34), et étant déplacée dans le plan vertical en fonction de la hauteur de l'orifice de remplissage de gaz grâce à une unité de commande de levage (36), afin de détecter la direction de l'orifice de remplissage de gaz.

2. Un équipement de remplissage de gaz de pétrole liquéfié, selon les stipulations de la revendication 1, caractérisé par un poste d'entrée (1a) et un poste de sortie (2a) pour les récipients à gaz qui sont formés à des emplacements prédéterminés sur la plaque tournante (A) ;
les passages d'arrivée et de décharge sont chacun munis d'une électrobalance (3.4) ; de sections d'appui de récipient (6) destinées chacune à recevoir un récipient à gaz (5) afin de permettre le remplissage du récipient avec une quantité prédéterminée de gaz, sur la base d'une valeur mesurée obtenue par l'intermédiaire d'une électrobalance sur le passage d'arrivée, et qui sont agencées à intervalles réguliers sur la même circonférence de la surface supérieure de la plaque tournante.

FIG. 1

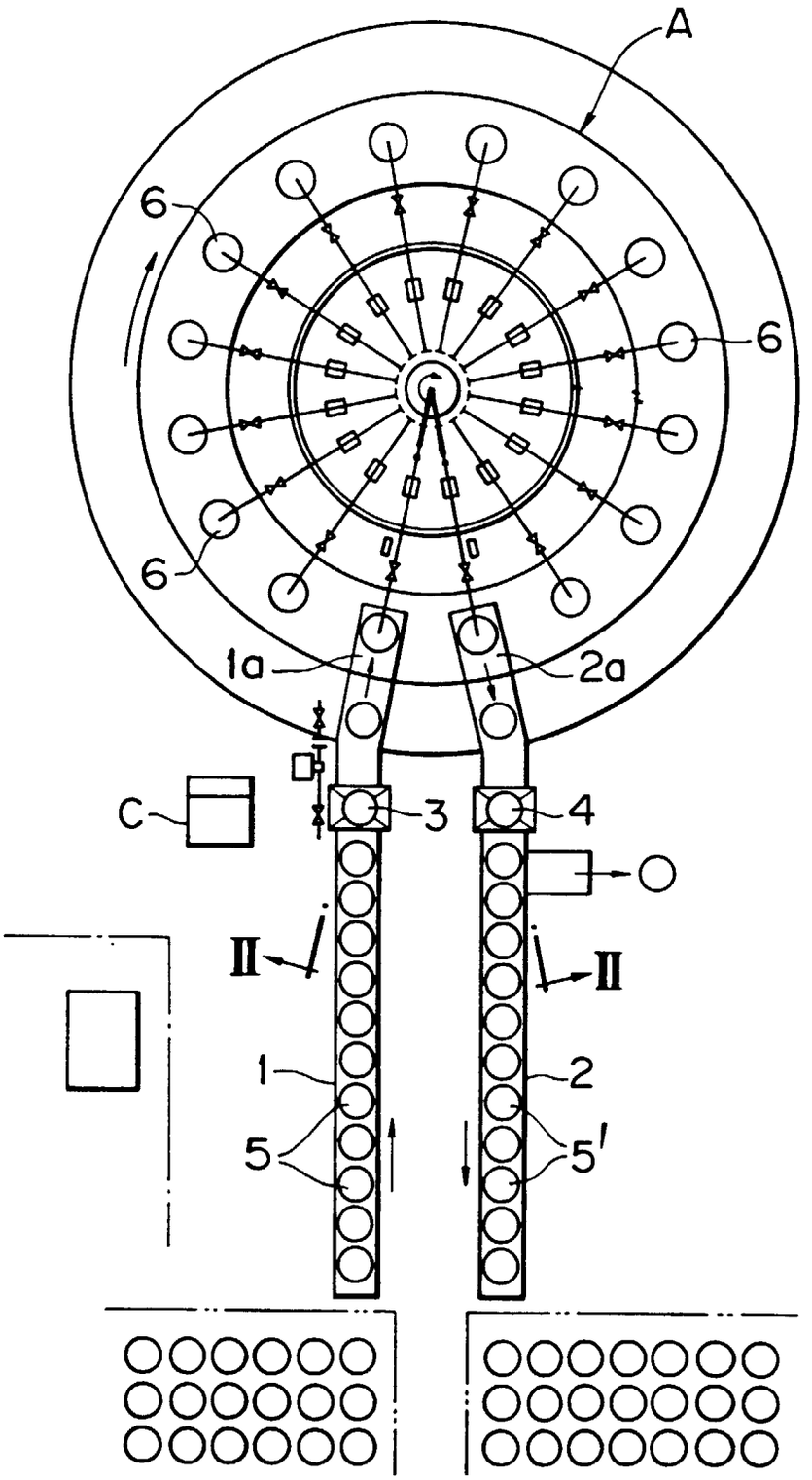


FIG. 2

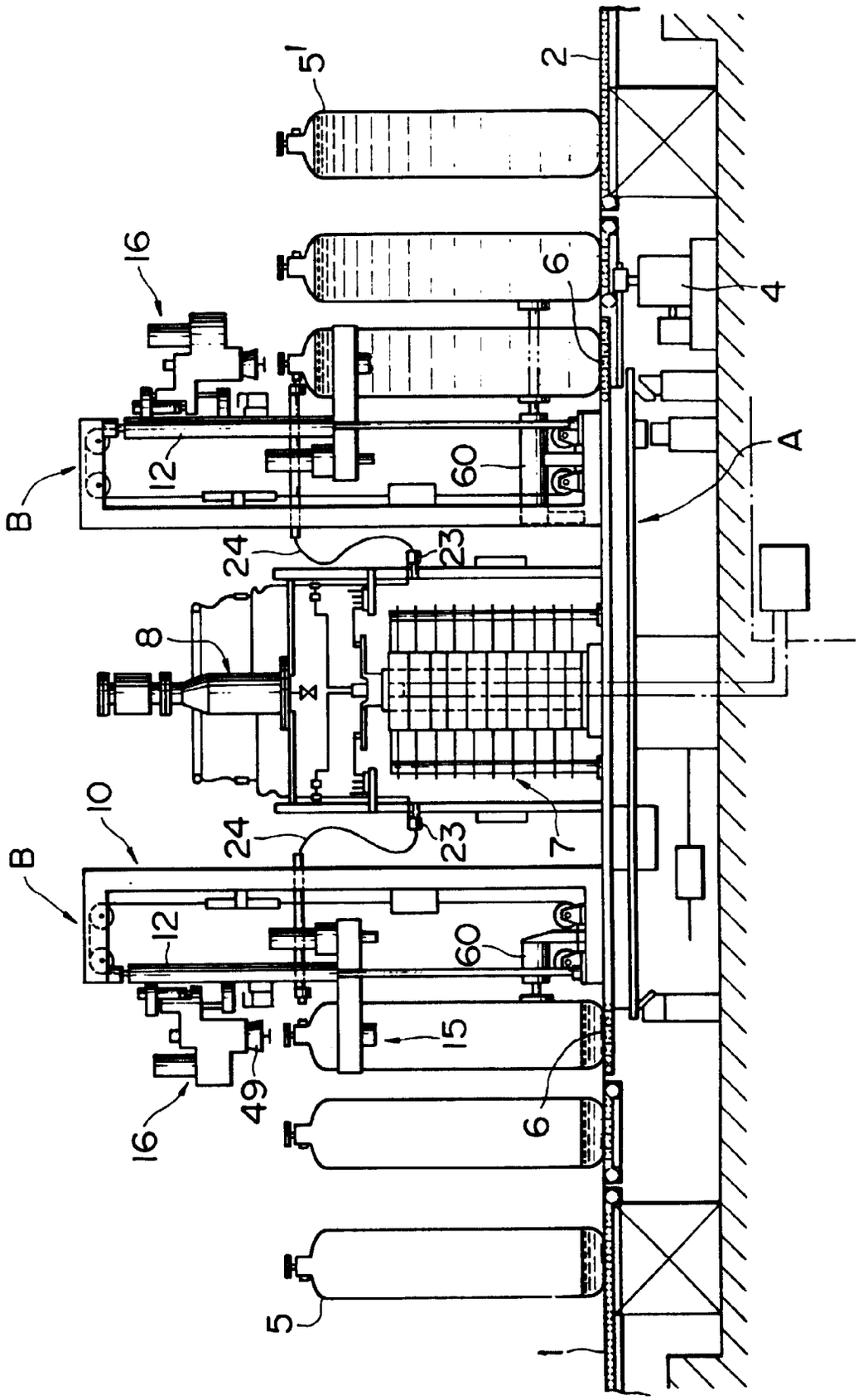


FIG. 3

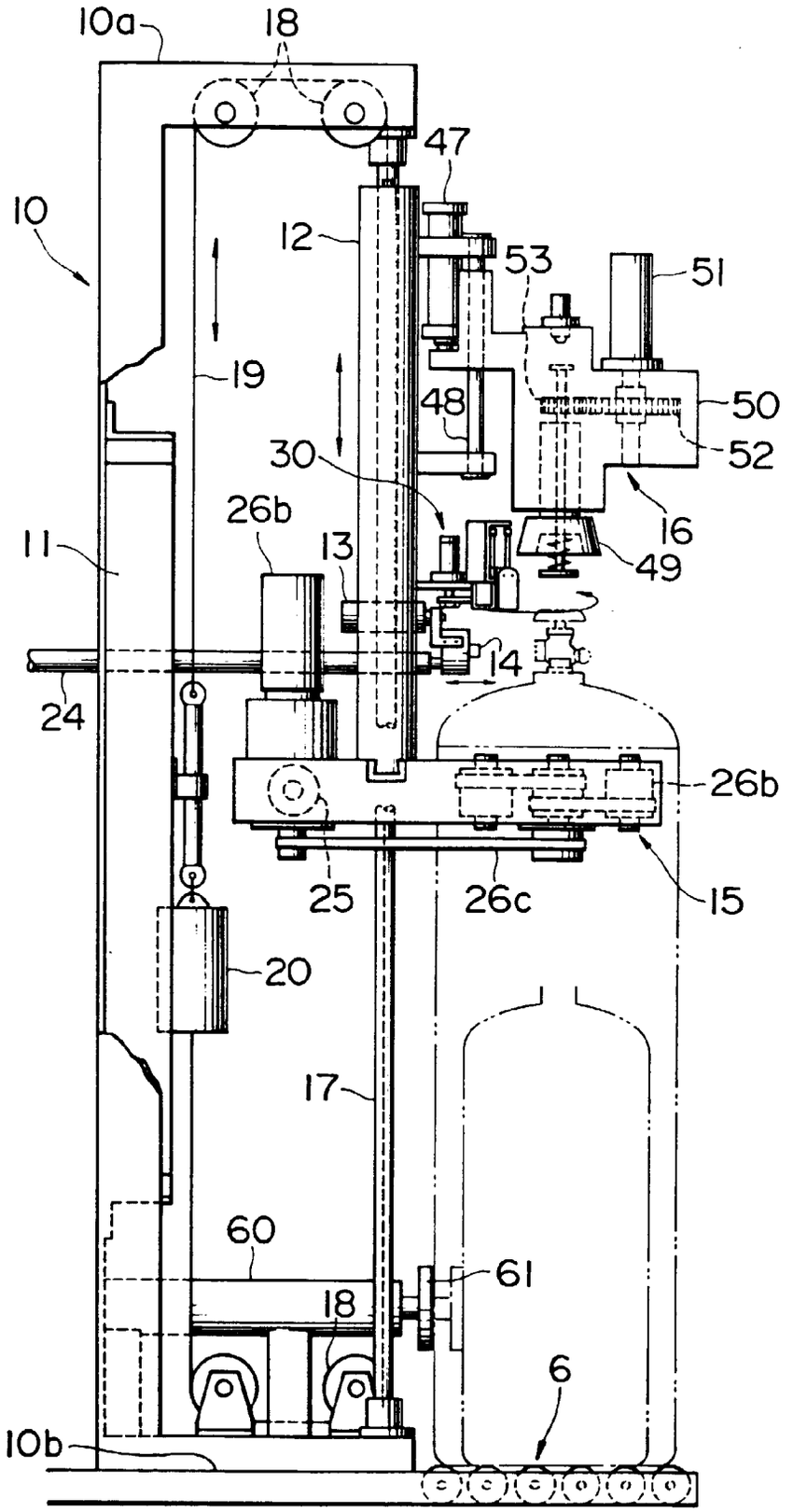

10a
18
47
10
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53
51
19
48
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52
26b
16
11
13
49
14
24
26b
25
26c
15
20
17
60
61
18
6
10b

FIG. 4

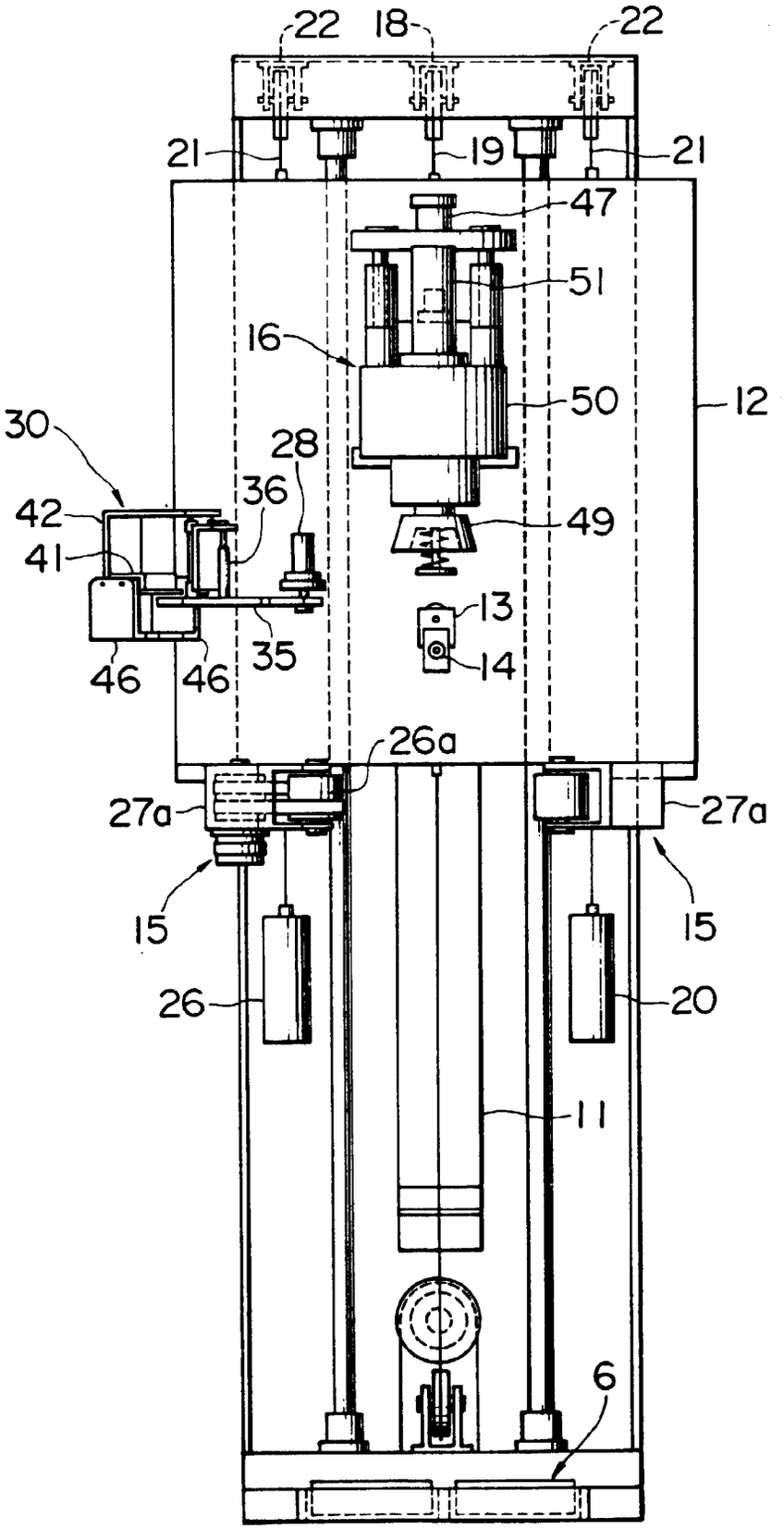

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26a
27a
27a
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11
6

FIG. 5

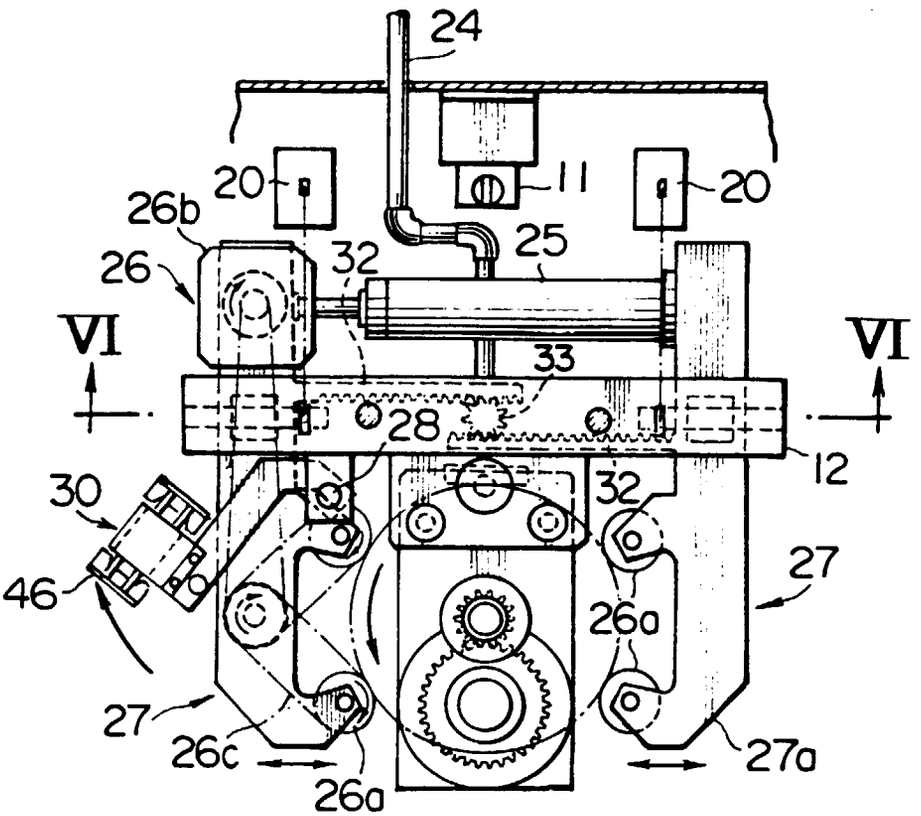

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11
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26b
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32
VI
VI
33
28
12
30
32
27
46
26a
27
26c
27a
26a

FIG. 6

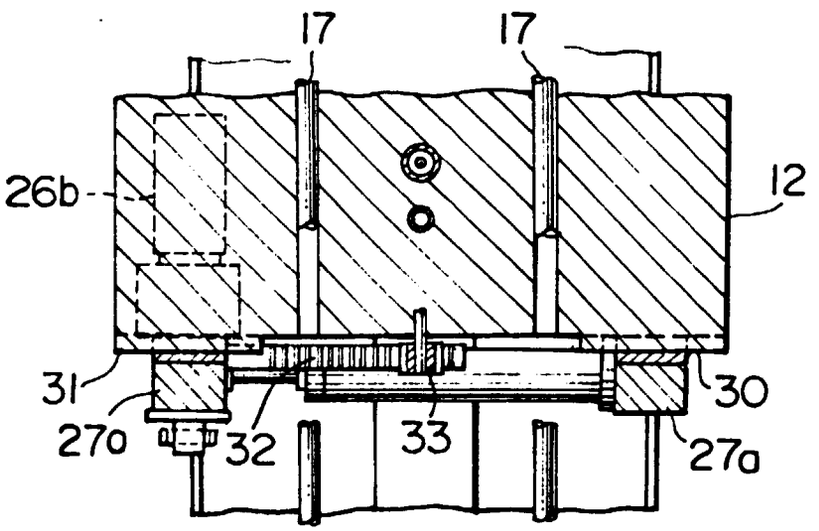

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26b
12
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30
27a
32
33
27a

FIG. 7

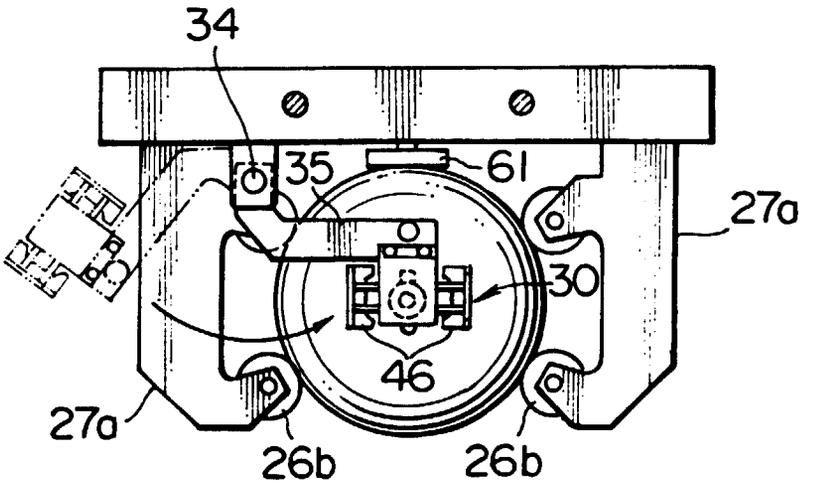

34
35
61
27a
30
46
27a
26b
26b

FIG. 8

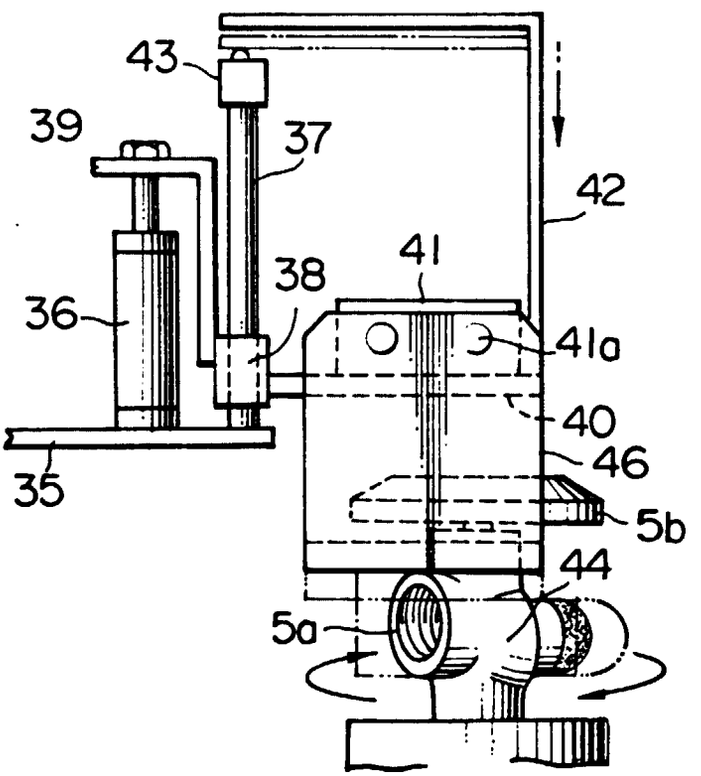

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37
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41
38
36
41a
40
46
35
5b
44
5a

FIG. 9

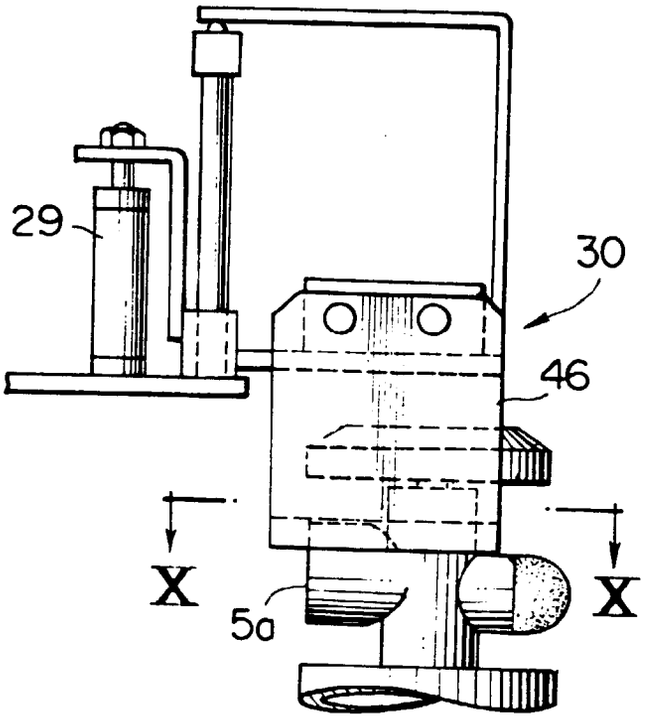


FIG. 10

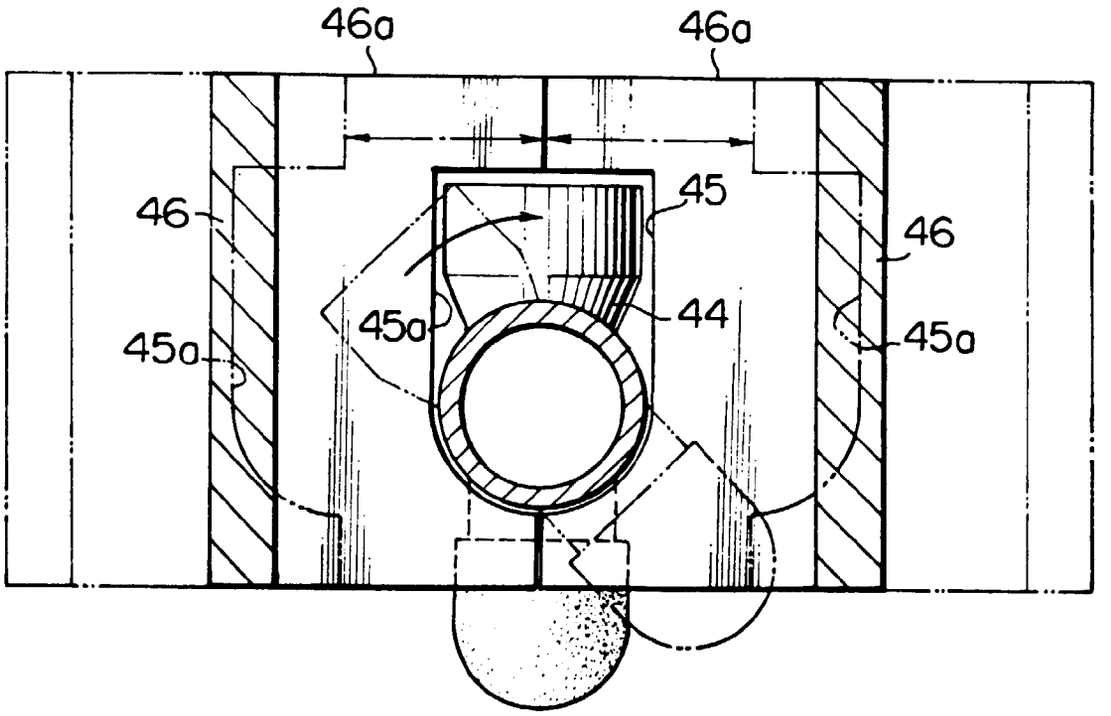


FIG. 11

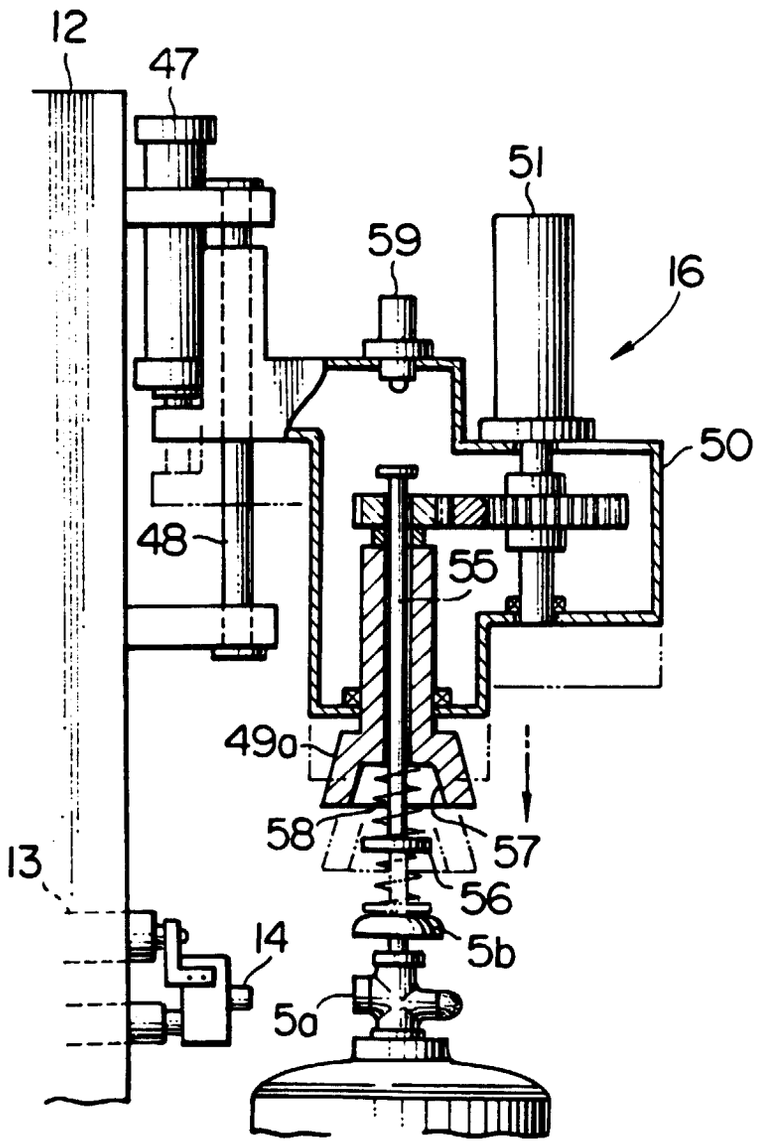


FIG. 12

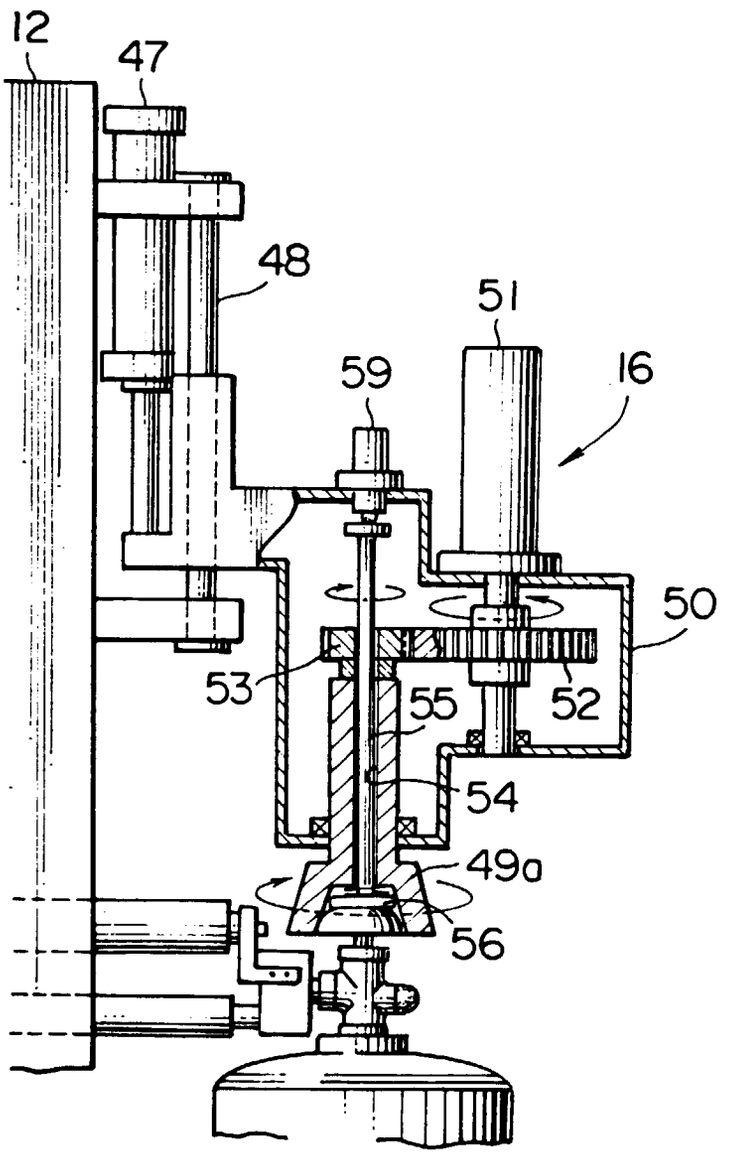


FIG. 13

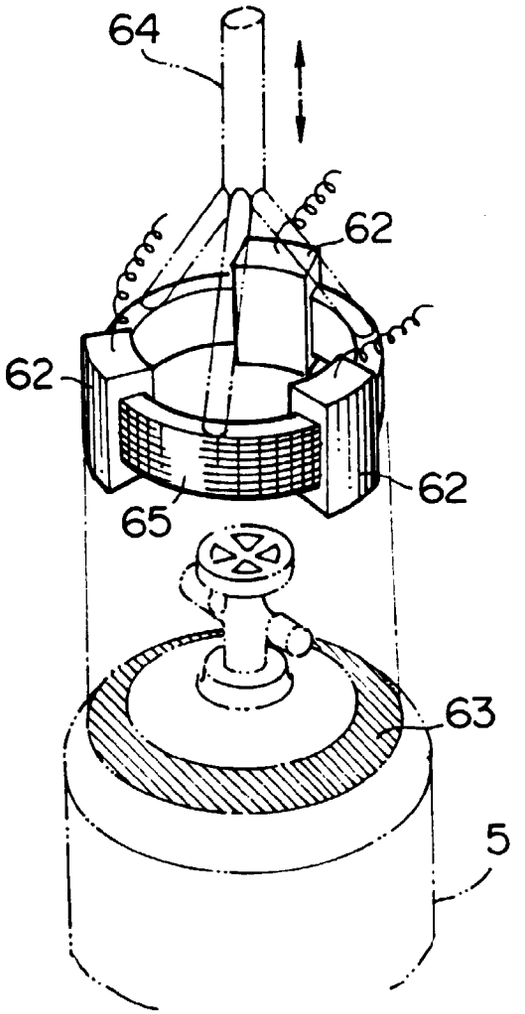


FIG. 14

