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(54) **Flow regulating device for the selective feeding of a dishwasher spraying-arms**

(57) Device for controlling a valve device (15) which regulates a flow of washing liquid and which is placed between means (43) for pumping the washing liquid and two feed pipes (30,44,31,45,) of two respective spraying rotors (46,47) of a dishwasher, for the selective feeding of said rotors (46,47), comprises means (1,4,5;20;1,4,39,28) for selecting the working condition of said valve device (15), housed in a control panel (2) of the dishwasher and operatively connected to said valve device (15) by mechanical transmission means (6,14,53,36).

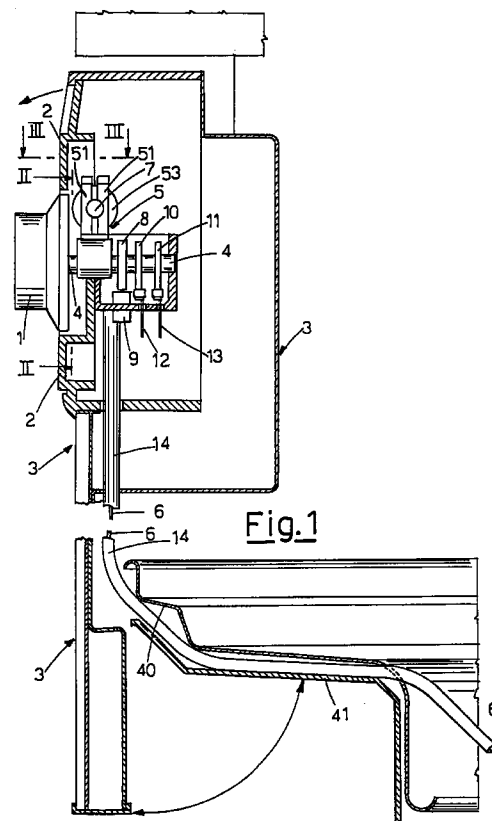


Fig.1

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Description

The present invention relates to a device for controlling a valve device which regulates the flow of washing liquid, for feeding the spraying rotors of a dishwasher machine selectively.

The constant efforts by producers of household appliances to find solutions which, on a par with performances, allow consumption rates of dishwasher machines to be reduced, are known.

It is likewise known that a reduction in consumption may be achieved by reducing the volumes of water which dishwashers require to perform a washing cycle: this reduction in water in turn leads to a reduction in the electrical energy required for heating it, and a saving in detergent.

In the Italian patent Application no. MI94A001602 a description is given of a device for controlling the flow of washing liquid, placed between the delivery of the washing pump and the feed pipes of the two spraying rotors (upper rotor and lower rotor), which pipes are positioned inside the washing tub of the dishwasher. This device comprises a membrane which is moved by an actuator between two working positions, in one of which both the pipes for feeding the rotors are open, while in the other position the pipe for feeding the lower rotor is closed, so as to allow feeding of the upper rotor alone.

In this way, when the load of dishes to be washed is low and can be contained in only one of the racks, the dishwasher can be programmed for feeding a smaller volume of water than that required for washing a complete load, without thereby giving rise to pressure drop problems or even cavitation of the washing pump, in that it is possible to feed only one of the rotors (preferably the upper one).

In view of the state of the art described, the object of the present invention is that of providing a device for controlling a valve device which regulates the flow of washing liquid feeding the spraying rotors.

In accordance with the present invention, this object is achieved thanks to a device for controlling a valve device which regulates a flow of washing liquid and which is placed between means for pumping the washing liquid and two feed pipes of two respective spraying rotors of a dishwasher, for selective feeding of said rotors, characterised in that it comprises means for selecting the working condition of said valve device housed in a control panel of the dishwasher and operatively connected to said valve device by mechanical transmission means.

Thanks to the present invention, a fully mechanical device is provided for controlling a valve device which regulates the feed flow of the rotors.

These and other features of the present invention will be made clearer from the following detailed description of some of its embodiments, illustrated by way of non-limiting examples in the accompanying drawings, in which:

Figure 1 shows, sectioned along a vertical plane, a door and part of a washing tub of a dishwasher provided with a control device according to a first embodiment of the present invention;

Figure 2 is a section along line II-II of Figure 1;

Figure 3 is a section along line III-III of Figure 1;

Figure 4 is a front view of the door of Figure 1;

Figure 5 shows, in a sectioned view similar to that of Figure 1, a control device according to a second embodiment of the present invention;

Figure 6 is a section along line VI-VI of Figure 5;

Figure 7 is a front view of the door with the control device of Figures 5 and 6;

Figure 8 shows, sectioned along a vertical plane, a tub of a dishwasher, with a valve device which regulates the flow of washing liquid feeding two spraying rotors;

Figures 9 to 11 are sectioned views of said valve device, in three different working conditions;

Figure 12 is a section along line XII-XII of Figure 10;

Figure 13 is a section along line XIII-XIII of Figure 10;

Figure 14 is a sectioned view, similar to Figure 3, of a control device according to a third embodiment of the present invention;

Figure 15 is a section along line XV-XV of Figure 14;

Figures 16 and 17 are similar views to Figure 15, showing the control device of Figure 14 in a further two working conditions;

Figure 18 is a front view of a door of a dishwasher incorporating the control device of Figure 14.

With reference to Figures 1-4, a control device according to a first embodiment of the invention comprises a knob 1 rotatably housed in a respective circular seat formed in a control panel 2, mounted in turn on a door 3 of a dishwasher.

The knob 1 is coupled to a small shaft 4 where to a fork lever 5 is integrally attached, between whose two prongs 51 a small wire 6 is slidingly inserted and ending in a small ball 7, greater in diameter than the distance between the aforementioned prongs 51 (Figs. 1-3). The lever 5 allows the rotational movement of the knob 1 to be transformed into the translational movement of the wire 6.

A first cam 8 is also attached to the shaft 4 and cooperates with an underlying positioning element 9 to determine three angular lock positions (indicated to a user by the alignment of one of three indices "A", "B" and "C" on the knob 1 with a reference notch 52 on the control panel 2, as can be seen in Fig. 4), and a further two cams 10 and 11, each of which determines, in a respective angular position of the knob 1, closure of an electrical contact between respective electrical terminals 12, 12' and 13, 13' (Figs. 1 and 3). The function of these electrical contacts is to be explained hereinbelow in the description.

The panel 2, near the knob 1, is also connected to a stretching device 53, which can be seen in a sectioned view in Figure 2. The stretching device 53 substantially

consists of a hollow cylinder 54, inside whereof a helical spring 55 is housed, which acts on a nut 56, integral with the wire 6, so as to force the wire 6 into a position of minimum extension (a position shown by an unbroken line in Figure 2): this guarantees that the wire 6 is always kept tight. The spring 55 also acts as a return spring for the wire 6 when, by rotating the knob 1, there is a change from a condition of maximum extension to a condition of minimum extension of the wire 6 itself (for example, from position "C" to positions "B" or "A"). The stretching device 53 is also provided with a regulation element 57 which can be screwed into the cylinder 54 and which acts as a contrast to the nut 56. By screwing or unscrewing the regulation element 57, the various tolerances can be compensated.

The wire 6 is slidably inserted in a sheath 14. As shown in Figure 1, the sheath 14 extends vertically along the wall of the door 3, and then is inserted in a gap between a washing tub 40 and a base surface 41 of the dishwasher, so as not to interfere with the door 3 during rotation through almost 90° for opening of the dishwasher.

The wire 6 is connected at the opposite end to a valve device 15 which regulates the flow of washing liquid, which device is placed between the delivery 42 of a washing pump 43 and two feed pipes 44 and 45 of two respective spraying rotors 46 and 47 positioned inside the washing tub 40 (Fig. 8). The rotor 46 (lower rotor) is placed substantially on the base of the washing tub 40, below a first loading rack (not shown), while the rotor 47 (upper rotor) is positioned approximately at mid-height of the tub 40, below a second loading rack (also not shown).

The valve device 15 substantially comprises a cylindrical conduit 48, divided internally by a baffle 49 into two semi cylindrical conduits 30 and 31 (Figs. 12 and 13), connected to the feed pipe 44 and to the feed pipe 45 respectively (Figs. 9-11). Inside of the cylindrical conduit 48, below the baffle 49, is a blade 16, integral with a rotary pin 17 (Figs. 9-11) where to a fork lever 18, similar to the lever 5, is attached (Figs. 8 and 12). The wire 6 is slidably inserted between the prongs 32 and 33 of the lever 18, and a small ball 19 is attached at its end, with diameter greater than the distance between said prongs. In the points of entrance and exit of the pin 17 from the conduit 48, two O-ring seals 34, kept pressed against the conduit 48 by two semicircular bands 35 and 35' tightened around the conduit 48, ensure tightness (Fig. 13). The band 35' also acts as a support for a stretching device 36, similar to the device 53. A torsion spring 37 forces the lever 18 into the position of maximum extension of the wire 6, shown in Figure 12 and by an unbroken line in Figure 8.

Rotating the knob 1 causes rotation of the shaft 4 and, consequently, that of the lever 5 integral therewith. The latter causes sliding of the wire 6 inside the sheath 14, and hence rotation of the lever 18. The three working positions "A", "B" and "C" of the knob 1 are translated

into the same number of angular positions of the blade 16.

More specifically, by rotating the knob 1 into the position "A", the blade 16 is brought into a vertical position (Fig. 10), thus allowing the flow of washing liquid, pumped by the washing pump 43, into both semicircular conduits 30, 31 and into both the feed pipes 44, 45 of the rotors 46, 47. This type of setting is useful when a complete load of dishes, distributed between the two racks (upper and lower), has to be washed.

By rotating the knob 1 into position "B", the blade 16 is brought into the position shown in Figure 11: in this position it closes the semi cylindrical conduit 30, preventing therefore the flow of washing liquid to the feed pipe 44 of the lower rotor 46. The entire flow rate and pressure of the pump 43 is thus exploited to feed the upper rotor alone. This type of setting is useful when a reduced load of dishes, arranged in the upper rack alone, has to be washed. With the knob 1 in this position, one of the contacts between the electrical terminals 12, 12' and 13, 13' closes so as to signal to a device (not shown) for measuring the volume of water to be fed that the dishwasher has been programmed to perform washing of a reduced load, and hence the volume of water to be fed is equal to the volume foreseen for this reduced load. Such a measuring device is for example described in the Italian patent Application no. MI94A001078.

By rotating the knob 1 into the position "C", the blade 16 is brought into the position shown in Figure 9: in this position it closes the semi cylindrical conduit 31, preventing therefore the flow of washing liquid to the feed pipe 45 of the upper rotor 47. The entire flow rate and pressure of the pump 43 is thus exploited to feed the lower rotor alone. As in the previous case, this type of setting is useful when a reduced load of dishes, arranged in the lower rack alone, has to be washed. Again, one of the contacts between the electrical terminals 12, 12' and 13, 13' closes to enable feeding of a volume of water calibrated to the reduced load.

The dishwasher can therefore be used traditionally for washing a complete load of twelve table settings, feeding both rotors, or it can be programmed to wash a reduced load, for example six table settings, using either the upper rack or the lower rack, according to needs, and quite simply by actuating the knob 1.

In a second embodiment of the present invention, shown in Figures 5-7, the knob 1 is replaced by a cursor 20, in plastic for example, housed vertically slidably in the control panel 2 of the door 3. The cursor 20 has a grip 21 projecting from the panel 2 through a slot 22. The wire 6 is restrained to the cursor 20 by means of the end ball 7. Unlike the first embodiment no lever is provided, in that the movement of the cursor 20 is already translational. The cursor 20 is provided with a lateral appendage 23 integral with the cursor 20 and relatively flexible, which can be engaged in three respective positioning notches 24 formed in the panel 2. Each of the notches 24 causes the cursor 20 to stop in a position wherein a reference notch 60, formed on the grip 21, is aligned with a respec-

tive index "A", "B" or "C" (Fig. 7). The cursor 20 is also provided with a pair of cams 25 which, following sliding of the cursor 20 itself, cause actuation of a lever 26 of a microswitch 27, whose function is that of closing the electrical contacts between the electrical terminals 12, 12' and 13, 13'.

The operating principle of the cursor 20 is the same as the knob 1, with the sole exception that the movement of selecting the position of the blade 16 is translational rather than rotational.

Figures 14-18 show a third embodiment of the present invention. As in the case of the first embodiment, a knob 1 is again provided, rotatably housed in a respective circular seat formed in the control panel 2. The knob 1 is integral with a shaft 4 of an electric motor 38. A cam 39 is also integral with the shaft 4. A tilting lever 28, with its fulcrum in 29 at the panel 2, is provided with a cog 70 which engages with the cam 39. The wire 6 is attached to the lever 28. The cam 39 is substantially a disk having a first segment 71 with a smaller radius, a second segment 72 with a larger radius and a third segment 73 with intermediate radius. The first and second segments 71, 72 have substantially equal width, while the third segment 73 has a much smaller width than the first two.

The control device according to this embodiment can operate both manually and automatically.

In manual mode, the operator rotates the knob 1 until a reference notch 74, located on the knob itself, is brought into one of three circular segments indicated as "A", "B" and "C" on the panel 2 (Fig. 18). When the notch 74 is inside the segment "A", the cam 39 is rotated so that the cog 70 of the lever 28 engages with the segment 73 with intermediate radius (Fig. 15). The lever 28 makes the wire 6 extend, and the blade 16 moves into the position of Figure 10. When the notch 74 is inside the segment "B", the cam 39 is rotated in such a way that the cog 70 engages with the segment 71 of smaller radius (Fig. 16). The lever 28 approaches the rotation axis of the cam 39, the wire 6 is released and the blade 16 moves into the position of Fig. 11. When finally the notch 74 is inside the segment "C", the cam 39 is rotated in such a way that the cog 70 engages with the segment 72 of greater radius. The lever 28 moves away from the rotation axis of the cam 39 and extends the wire 6. The blade 16 moves into the position of Figure 9.

In the automatic operation mode, which can be actuated for example by pressing a key (not shown) provided for this purpose on the dishwasher, the motor 38 is started up, and the cam 39 is made to rotate automatically: the static conditions described above become dynamic conditions. The cog 70 of the lever 28 engages in sequence with the three segments 71-73 of the cam 39, the time of permanence in each segment depending on the speed of rotation of the motor and of the width of the segment itself. Since the width of the segment 73 is much smaller than that of the segments 71 and 72, the phase of simultaneous opening of the two feed pipes 44 and 45 of the two rotors is a brief transition phase, and

substantially the upper rotor and the lower rotor are actuated alternately.

With a control device according to this third embodiment, therefore, not only is it possible to set washing of a reduced load using only the upper rack or only the lower rack, but it is also possible to wash a complete load using a reduced volume of water, feeding the lower rotor and the upper one alternately.

10 Claims

1. Control device for a valve device (15) which regulates a flow of washing liquid and which is placed between means (43) for pumping the washing liquid and two feed pipes (30,44,31,45) of two respective spraying rotors (46,47) of a dishwasher for feeding said rotors (46,47) selectively, characterised in that it comprises means (1,4,5;20;1,4,39,28), housed in a control panel (2) of the dishwasher and operatively connected to said valve device (15) by mechanical transmission means (6,14,53,36), for selecting the working condition of said valve device (15).
2. Device according to claim 1, characterised in that said mechanical transmission means (6,14,53,36) comprise a wire (6).
3. Device according to claim 2, characterised in that said wire (6) is slidably inserted in a covering sheath (14).
4. Device according to claim 2 or 3, said valve device (15) comprising a movable element (16) for intercepting the flow of liquid, characterised in that said wire (6) is operatively connected to said intercepting element (16), so that the movement of said selector means (1,4,5;20;1,4,39,28) causes, by traction or release of the wire (6), movement of said intercepting element (16).
5. Device according to claim 4, characterised in that said intercepting element (16) is integral with a pin (17), where to the wire (6) is attached in an eccentric position, so that traction of the latter causes rotation of the pin (17) and hence movement of the intercepting element (16).
6. Device according to claim 5, characterised in that said selector means (1,4,5;20;1,4,39,28) comprise a knob (1) rotatably housed in said panel (2) and integral with a lever (5) where to said wire (6) is hooked.
7. Device according to claim 6, characterised in that it comprises means (8,9) suitable for facilitating positioning of the knob (1) in three separate angular positions, a first angular position determining movement of the intercepting element (16) into a position of closure of one of the feed pipes (30,44,31,45) of the

two rotors (46,47), a second angular position causing movement of the intercepting element into a position of closure of another of the feed pipes (30,44,31,45) of the two rotors (46,47) and a third angular position determining opening of both feed pipes (30,44,31,45) of the two rotors (46,47). 5

8. Device according to claim 5, characterised in that said means of selection (1,4,5;20;1,4,39,28) comprise a cursor (20) slidably housed in said panel (2) and whereon said wire (6) is hooked. 10

9. Device according to claim 8, characterised in that it comprises means (23,24) for facilitating positioning of said cursor (20) in three separate positions, a first position determining the movement of the intercepting element (16) into a position of closure of one of the feed pipes (30,44,31,45) of the two rotors (46,47), a second position determining the movement of the intercepting element into a position of closure of another of the feed pipes (30,44,31,45) of the two rotors (46,47) and a third position determining opening of both feed pipes (30,44,31,45) of the two rotors (46,47). 15
20

10. Device according to claim 5, characterised in that said means of selection (1,4,5;20;1,4,39,28) comprise: a knob (1) rotatably housed in said panel (2) and integral with a shaft (4) of an electric motor (38); cam means (39) integral with said shaft (4); a lever (28) with fulcrum in said panel (2) and whereon said wire (6) is hooked, said lever being provided with a cog (70) which co-operates with said cam means (39). 25
30

11. Device according to claim 10, characterised in that said cam means (39) comprise a disk (39) having a plurality of segments (71-73) of different radius, which determine respective angles of rotation of said lever (28) around said fulcrum (29). 35
40

12. Device according to claim 11, characterised in that said plurality of segments comprises three segments (71,72,73), a first segment (71) determining a first angle of rotation of said lever (28) which in turn determines movement of the intercepting element (16) into a position of closure of one of the feed pipes (30,44,31,45) of the two rotors (46,47), a second segment (72) determining a second angle of rotation of said lever (28) which in turn determines movement of the intercepting element (16) into a position of closure of another of the feed pipes (30,44,31,45) of the two rotors (46,47) and a third segment (73) determining a third angle of rotation of the lever (28) which in turn determines movement of said intercepting element (16) into a position of opening of both feed pipes (30,44,31,45) of the two rotors (46,47). 45
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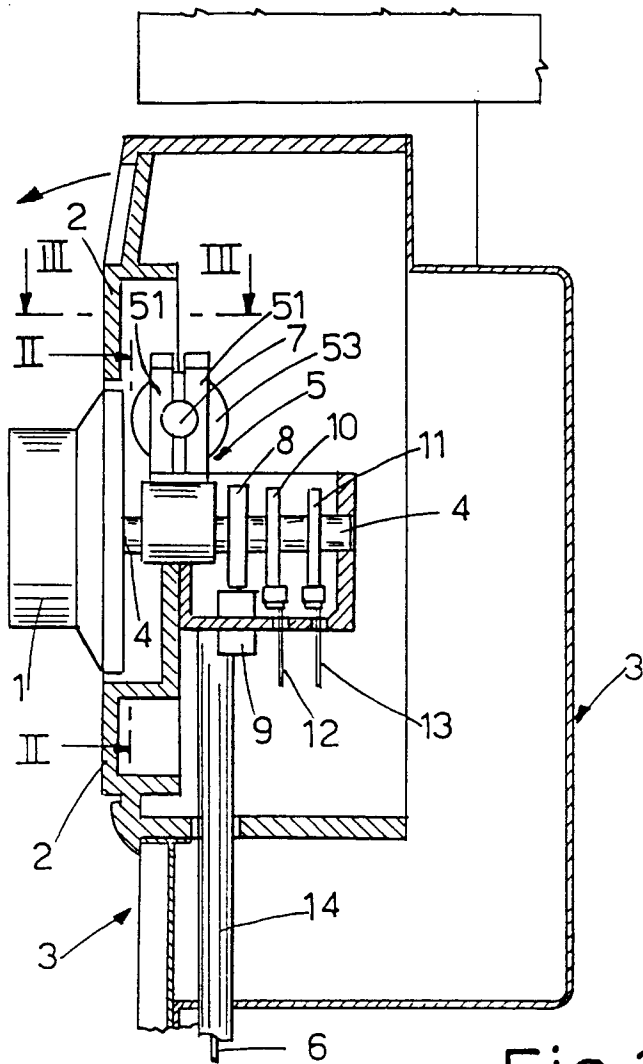


Fig. 1

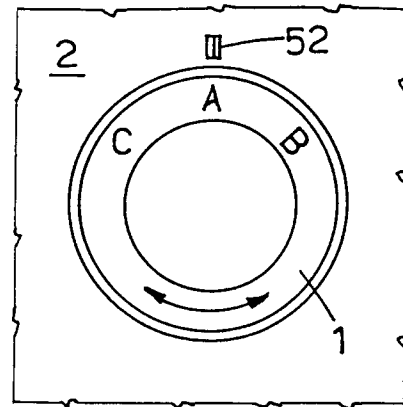


Fig. 4

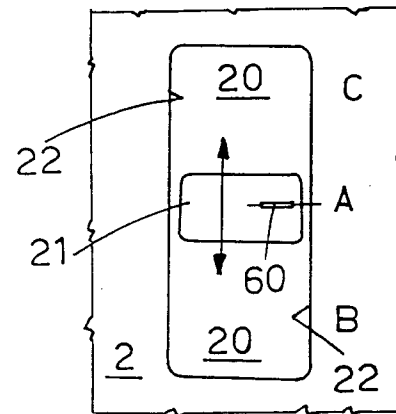
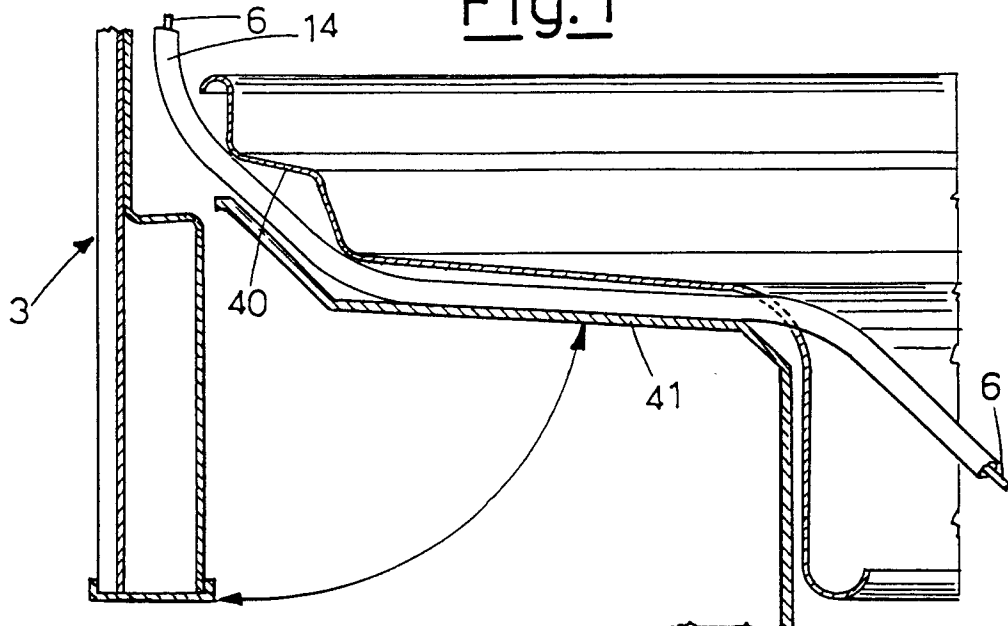


Fig. 7



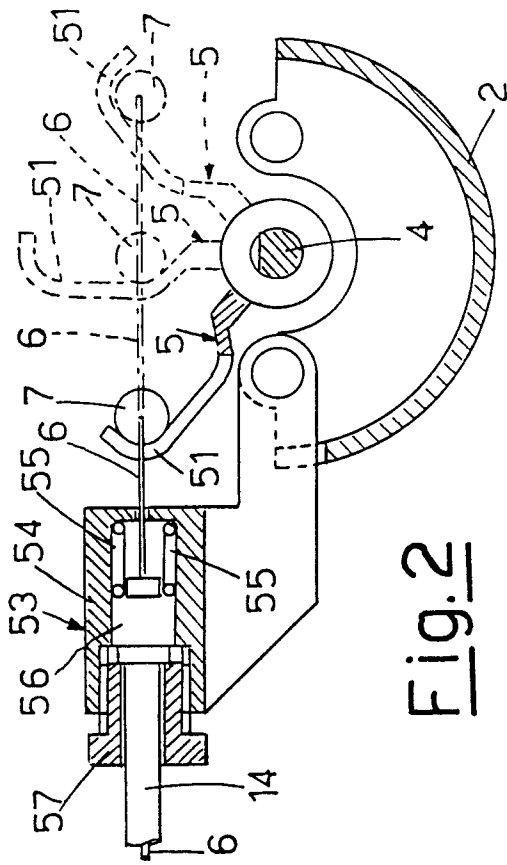


Fig. 2

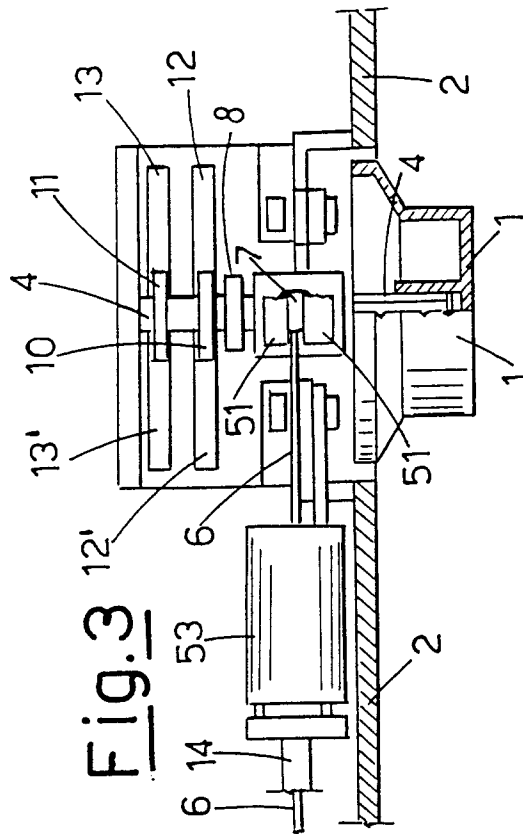


Fig. 3

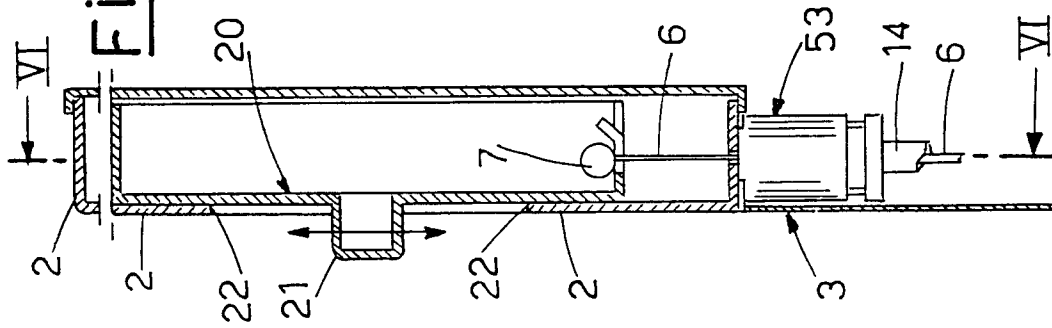


Fig. 5

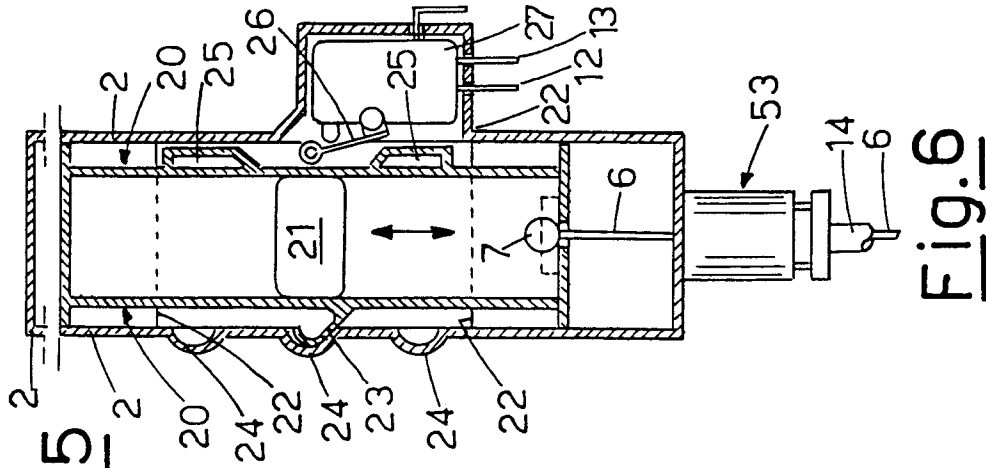
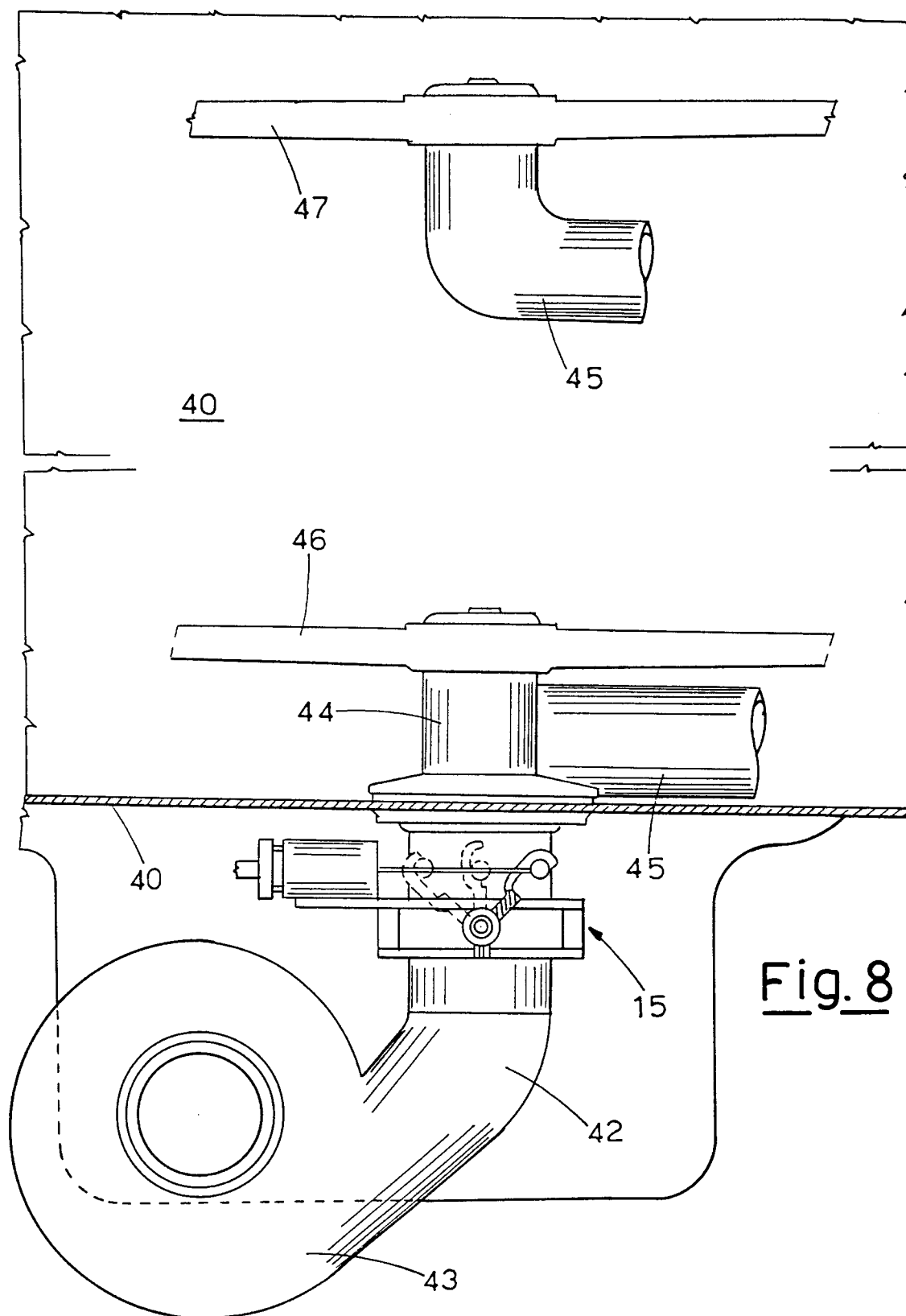
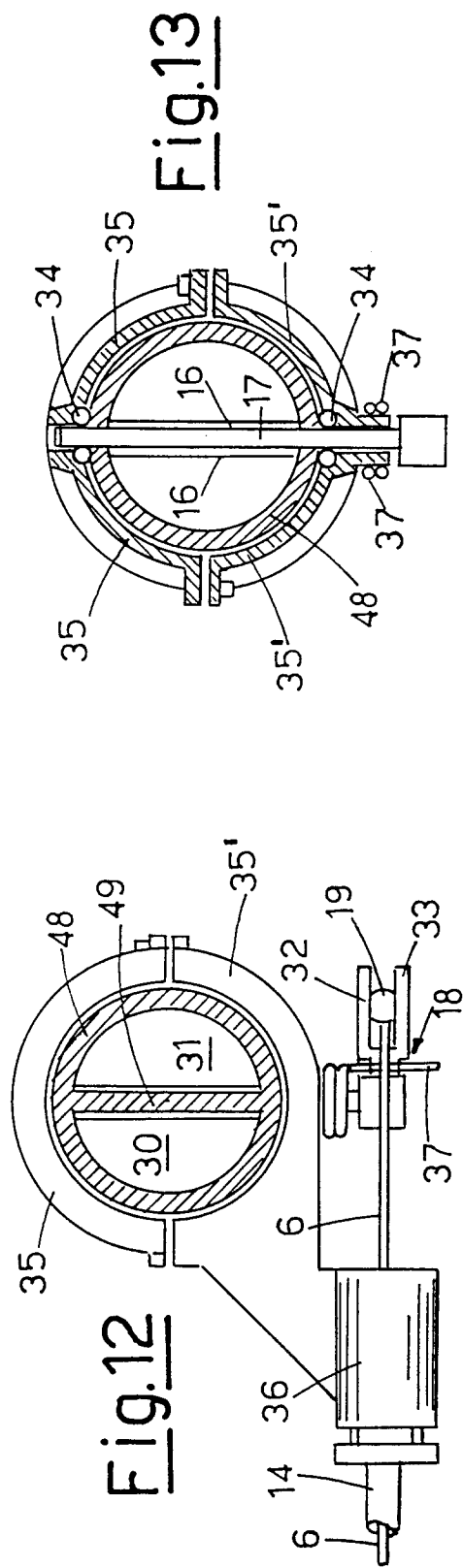
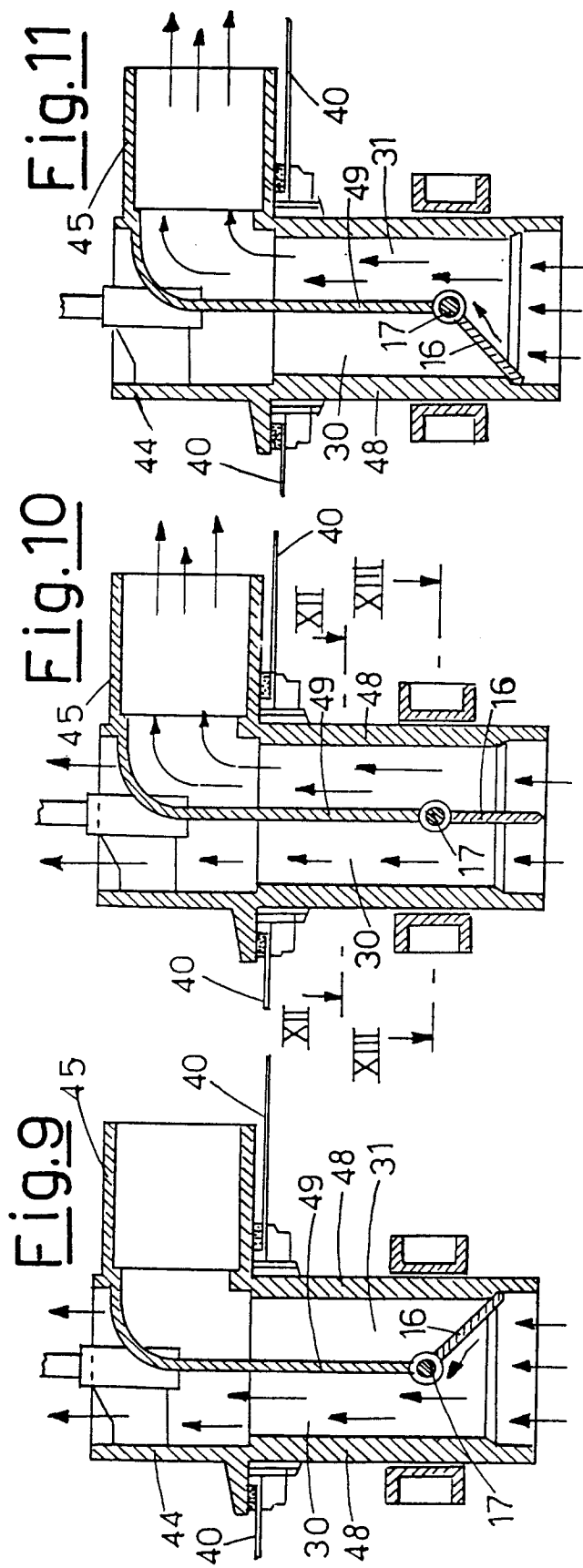


Fig. 6





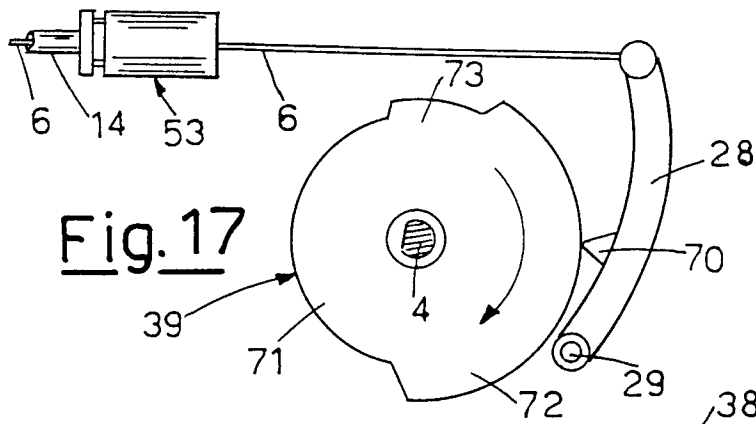
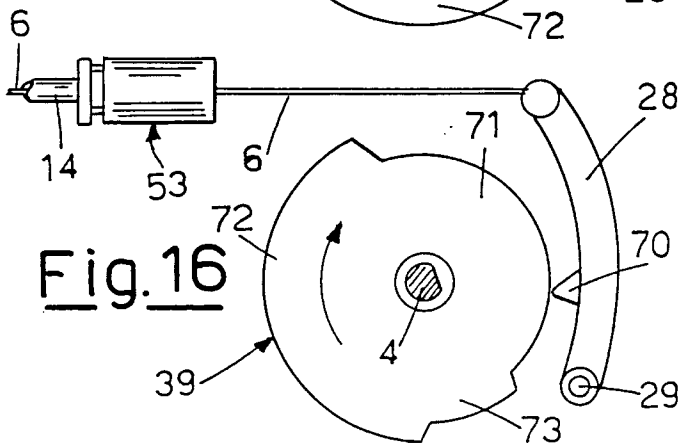
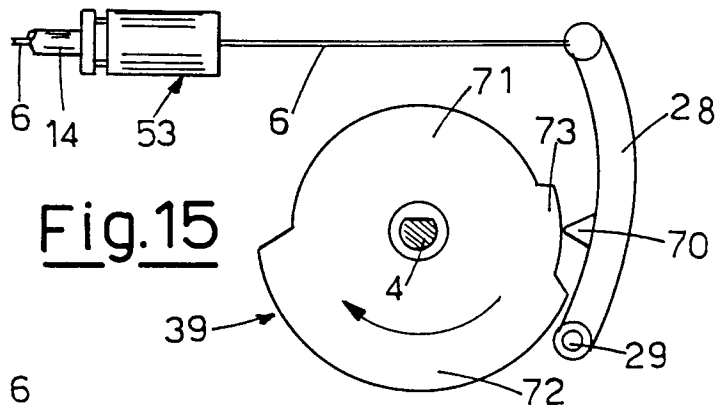
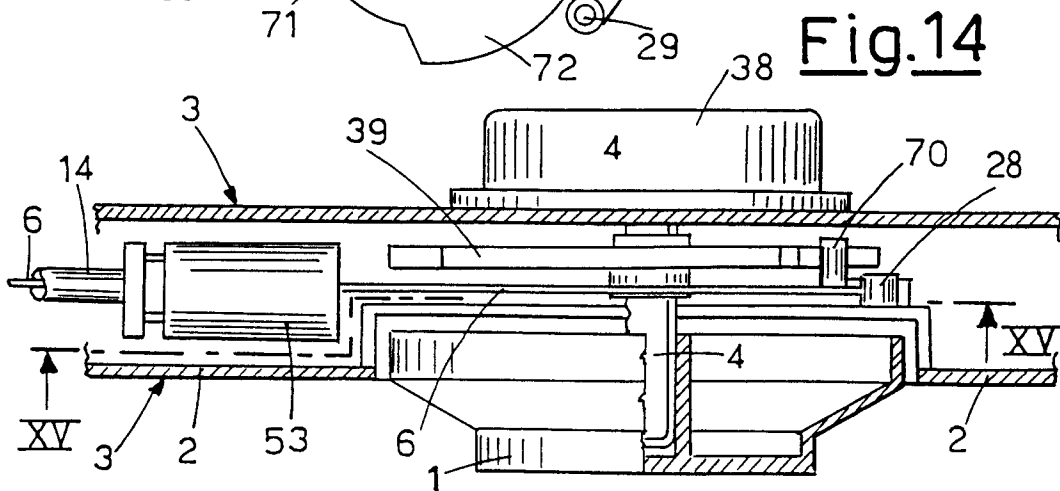
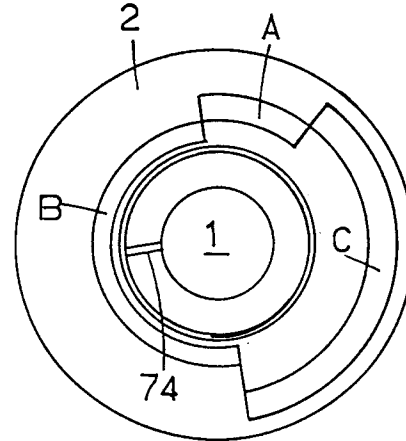


Fig. 18





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EUROPEAN SEARCH REPORT

Application Number
EP 95 20 2604

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	FR-A-2 443 231 (ESSWEIN SA) * page 4, line 12 - page 6; figures * ---	1	A47L15/42
A	EP-A-0 054 448 (ESSWEIN SA) * page 2, line 34 - page 8; figures * ---	1	
A	FR-A-2 431 278 (LICENTIA PATENT-VERWALTUNGS-GMBH) * page 1 - page 3; figures * ---	1	
A	FR-A-2 505 643 (INDUSTRIE CANDY SPA) * claims; figures * ---	1	
A	FR-A-2 523 430 (BOSCH-SIEMENS HAUSGERAETE GMBH) * page 3 - page 5; figures * ---	1	
A	EP-A-0 095 446 (INDESIT INDUSTRIA ELETTRODOMESTICI ITALIANA SPA) * page 3, line 5 - page 8; figures * ---	1	
A	EP-A-0 237 994 (INDUSTRIE ZANUSSI SPA) * abstract * -----	1	TECHNICAL FIELDS SEARCHED (Int.Cl.6) A47L
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 12 January 1996	Examiner Vanmol, M
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