



(12) **EUROPEAN PATENT APPLICATION**

(21) Application number : **92830052.4**

(51) Int. Cl.⁵ : **D06F 39/00, A47L 15/42**

(22) Date of filing : **05.02.92**

Priority, IT 060291 MI91000307.

(30) Priority : **06.02.91**

(43) Date of publication of application :
12.08.92 Bulletin 92/33

(84) Designated Contracting States :
CH DE ES FR GB LI SE

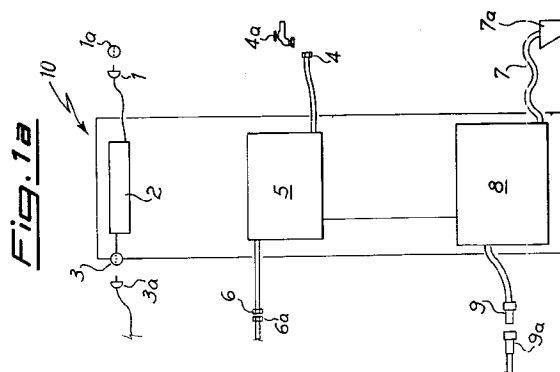
(71) Applicant : **SMEG S.p.A.**
Via Circonvallazione Nord, 36
Guastalla (Reggio Emilia) (IT)

(72) Inventor : **Bertazzoni, Roberto**
Via Maldotti, 2
Guastalla (Reggio Emilia) (IT)

(74) Representative : **Adorno, Silvano et al**
c/o SOCIETA' ITALIANA BREVETTI S.p.A. Via
Carducci, 8
I-20123 Milano (IT)

(54) **Apparatus connectable in-series to a washing machine, particularly of domestic type.**

(57) It is described an apparatus 10 connectable, as one in-series unit, on one side to a washing machine 11, and on the other side to the water supply system 4a and the power mains 1a, as well as to the drain 7a. While flowing through said apparatus the water from the washing machine comes in contact with a set of sensors suitable to determine, by detecting some of its own characteristics, whether it must be discharged or it has a purity sufficient for its recovery, in which case it is conveyed towards a storage tank 15 wherefrom it may be taken for a following washing cycle. If the water level inside the tank is higher than a predetermined maximum value, the water coming from the washing machine is anyhow forwarded to the drain, while if said level is lower than a predetermined minimum value, the washing machine is supplied with water coming from the water supply system instead of the tank.



The present invention relates to an apparatus connectable in-series to a washing machine, particularly of domestic type, as a laundry-washing machine or a dish-washing machine, having ecological purposes, with regard especially to the saving of water, and possibly of cleansing agent.

It is known that commonly used household appliances as laundry-washing machines and dish-washing machines, which are present nowadays in almost all houses of the industrially developed countries, constitute a considerable cause of water consumption, with all the consequent problems of waste water pollution. As water is no more considered an unlimitedly available good but a precious good to be safeguarded, some attempts have been made to economize on the water used by these machines during each washing cycle thereof.

As a common domestic washing machine uses about 20 liters of water in each of the five or six rinsings provided during a washing cycle, for instance a program has been provided which recovers the last rinsing water, employing it later for the pre-washing stage of a following cycle, considering that usually the last rinsing water is almost completely clean. Thus it is a matter of saving only 20 liters of water for each washing cycle, moreover obtained without any check to verify the actual purity conditions of the recovered water.

Now an apparatus has been conceived, forming the object of the present invention, capable to recognize the purity conditions of the water successively discharged by the washing machine, for possibly storing it inside a tank provided to the aim of subsequent use as an alternative or addition to the water provided by the supply system. It is as well an object of the present invention to provide an apparatus connectable in-series to a washing machine of known type, thereby causing the latter to be connected through said apparatus to the power mains, to the water supply system and to the drain without requiring any particular modification of the structure or the electric and hydraulic connections on the laundry-washing machine or the dish-washing machine.

Thereby considerable advantages may be obtained in the consumption of water, which will be partially recovered, in an amount even greater than the sole last rinsing, after a check of the actual clearness and adequateness of the requirements necessary for its re-using during a following washing cycle. The parameters providing a generally acceptable measurement of the adequateness degree of the water to the re-using thereof are detected by suitable sensors, properly calibrated, possibly included in a single block. These detect some water characteristics suitable to determine whether it is re-usable or not, e.g. temperature, muddiness and electric conductivity, then sending the corresponding signals to a unit for controlling and driving the apparatus, capable to

properly drive, depending on the enabling signals received, the valves provided to direct the water flow from the washing machine towards the drain or a storage tank. Level detecting sensors provided inside said tank, connected to said control and drive block as well, cause the latter to stop the flow towards the tank when the water therein has reached a predetermined level, conveying the water towards the drain irrespective of the results of the water check accomplished by said sensors. A supply pump, driven by said block as well, draws the water contained in the tank and conveys the same to supply therewith the following washing cycle of the washing machine until reaching the water amount required by the program of the latter, possibly integrated by the direct water supplying from the supply system.

According to a particular aspect of the present invention also a certain saving of cleansing agent may be obtained, by simply providing a decalcifier or a demineralizer at the washing machine water inlet, possibly inside the economizing unit.

It should be noted that any commercial washing machine may be connected to the economizing apparatus according to the present invention, through the provision of only some simply modifications to the hydraulic and electric connections which any apparatus installer or even the user himself can accomplish. In fact it will be sufficient to put the washing machine plug in a corresponding socket provided on the economizing apparatus, which is in turn provided with a plug for the connection with the power mains, and to connect the water inlet and outlet pipes of the washing machine to corresponding pipe-fittings provided on the apparatus, which has a supply pipe to be connected to the water supply system and a discharge pipe. The main switch is mounted on the apparatus and the connections are such that in case of failure of the economizing unit, this may be easily disconnected, thus allowing the normal use of the washing machine, once this has been directly connected to the power mains and to the water supply system, as well as to the drain, after having been disconnected from the apparatus according to the invention.

These and other objects, advantages and characteristics of the invention will be more clear from the following detailed description of one preferred embodiment thereof, given as a non-limiting example with reference to the annexed drawings in which:

FIGURE 1 shows a schematic and perspective view of an apparatus according to the present invention, arranged close to a domestic washing machine thereby showing the connections with said machine and the outside;

FIGURE 1a shows a schematic sectional view of said apparatus, in which the blocks schematizing the internal devices comprised between the external hydraulic and electrical connections are

shown;

FIGURE 2 represents a logical diagram of respectively the water discharge and water supply functions of the washing machine through the apparatus according to the present invention; and FIGURE 3 is a block schematic representation of one preferred embodiment of the means suitable to accomplish said functions.

In fig. 1 an apparatus or unit 10 according to the present invention has been represented, installed close to a washing machine 11 consisting in this case of a domestic laundry-washing machine, but which could possibly be also a different machine, e.g. a dishwashing machine. The apparatus or unit 10 is connected to the power mains by means of a single-phase plug 1 pluggable in a socket 1a, and to the water supply system by means of a pipe 4 to be connected to a tap 4a. Moreover a pipe 7 conveys the waste water through a conduit 7a connected to the drainage system.

The unit 10 is further connected (see particularly fig. 1a) to the washing machine 11 by a plug 3a for the voltage supply thereof pluggable in a socket 3 mounted on the unit itself, by a pipe 6 for the water supply connectable to the pipe 6a of the washing machine, as well as by a pipe 9 suitable to receive the waste water from the washing machine through pipe 9a with which the latter is provided for the discharge, easily connectable to each other. Referring again to fig. 1a the devices inside unit 10 have been schematized, distributed in three distinct blocks 2, 5 and 8, connected on one side to the washing machine 11 and, on the other side, respectively to the power mains and to the water supply system, as well as to the drain to the outside. In particular the electric control block 2 comprises a set of circuits and connections which will be better described in the following with regard to their functions of driving the various apparatuses, at the same time allowing the voltage supplying of the washing machine 11 by plug 3a thereof, through socket 3. The water supply block 5 comprises electro-valves, pumps and pressure meters as it will better described with reference to fig. 3, suitable to ensure the water supplying to the washing machine 11 by pipes 6 and 6a, coupled to each other, combined with block 8 arranged between the washing machine outlet pipe 9a and the drain 7 to the outside, whose elements as well will be described more in detail with reference to fig. 3.

To sum up there is seen how the apparatus or unit 10 forms an interface connected in-series to the washing machine, by which the latter communicates with the outside, both for the voltage and water supplies and for the discharge. By inhibiting unit 10 through an action on a main switch 20 arranged thereon, the washing machine 11 is turned off and, in case of failure of the unit itself, this can be easily disconnected, thus allowing a normal use of the washing machine

after having restored its connections with the outside.

Even by a simple sight to the logic diagram in fig. 2 the fundamental characteristics of the invention may be understood. As far as the washing machine drain is concerned, the waste water is caused to flow through a check unit 12 suitable to recognize whether it has certain predetermined conditions for the possible re-use thereof. In the negative case (NO OK) the water is directly discharged through pipe 7 while, if the check is positive (OK) the water is forwarded to a tank 15, on condition that the level thereof, detected by a pressure meter 16, is lower than a predetermined maximum, otherwise the water is anyhow discharged to the outside. As far as the washing machine water supply is concerned, if pressure meter 16 detects a water level inside the tank lower than a predetermined minimum, the water is directly supplied by the supply system by means of pipe 4, otherwise if the level is higher than said minimum, the water is injected into pipe 6, for instance by a pump 17 which draws it from the tank.

Referring to fig. 3 a preferred embodiment of the apparatus according to the present invention is shown more in detail, even if still schematically. Starting from drain 9 of the water coming from the washing machine, this water is caused to flow through said check unit 12 preferably after having flown through a filter 13. The whole 12 may be advantageously formed by three sensors connected in-series 12a, 12b, 12c suitable to detect respectively temperature, clearness (optic sensor) and electric conductivity of the water. If all three output signals received from sensors 12a, 12b and 12c are positive a diverter 14 is driven by any electric or electromagnetic device powered by control block 2, to reach the position B represented in dashed lines in the figure, thereby injecting the waste water, filtered in 13, into a tank 15 of block 8. The tank 15 is provided with a pressure meter 16 suitable to detect the level reached by the water inside the tank, particularly determining if this level is higher than a predetermined maximum level or lower than a minimum level. The first kind of signal influences a contact 16' arranged in-series with the sensing elements of check unit 12, so that diverter 14 is placed in B for injecting water into tank 15 only if there is the enabling signal of contact 16', i.e. if pressure meter 16 senses a level lower than the predetermined maximum. If instead this level is exceeded, contact 16' is switched in such a way to hold diverter 14 always in A for discharging to the outside the water in 7, whatever the resulting of the detections accomplished by check unit 12.

The washing machine water supplying through pipe 6 occurs, as evidenced in fig. 2, from either tank 15 by a supply pump 17 or the water supply system by pipe 4 depending on whether the water level inside the tank is higher or lower than a predetermined minimum value. In this latter case a second contact 16''

enables in fact an electrovalve 19, provided with a check valve, to cause the water supplying from the external tap 4a, at the water supply system pressure, until reaching pipe 6, 6a for entering the washing machine. At the same time supply pump 17 at the outlet of tank 15 is inhibited, as well as electrovalve 18, connected in-series to the pump, is closed with the check valve preventing the water coming from the outside to direct towards the tank. By the same way as soon as the level inside tank 15 exceeds the minimum value and the pressure meter contact 16" blocks the electrovalve 19, the operating of pump 17 and contemporaneous opening of electrovalve 18 allow to supply water towards pipe 6 from tank 15.

Although they have not been described in detail, the necessary connections of a drive and control block 2, as represented in fig. 1a, with diverter 14, pressure meter 16, pump 17 and electrovalves 18 and 19 are obviously provided.

From the above the advantages deriving from the apparatus according to the present invention with regard to the water consumption are clear, taking into account that the tank can contain, with reduced emcumbrances of unit 10, for instance about 30 liters of water, possibly re-usable for many times, while each rinsing cycle, of the five or six foreseen in a common domestic washing machine, consumes about 20 liters of water. As far as the consumption of cleansing agent is concerned, a considerable reduction may be obtained by providing, at the washing machine water inlet, a decalcifier already known for dish-washing machines, or a demineralizer available on sale, included for instance in block 5 of the economizing unit.

Besides it should be appreciated that the washing cycles of machine 11 are still driven by the usual automatic programmer 22 thereof, while the functions of unit 10 are driven by an automatic programmer or block 2 having no external control. In fact on the unit front panel, besides the main switch 20, only light indicators 21 of the working condition appear, as shown in fig. 1.

Finally it should be noted that the arrangement of check unit 12 is such to allow an easy access for cleaning the elements thereof by simply removing from unit 10 the discharge pipe 9 of the washing machine. The above mentioned sensors, of known type, preferably consist of a contact thermostat with fixed calibration (12a), two insulated dip electrodes (12b) and an optical system of proper intensity (12c), suitable to measure the water clearness.

Possible additions and/or modifications may be brought by those skilled in the art to the above-described and illustrated embodiment of the apparatus according to the present invention without exceeding the scope of the invention itself. In particular each component device thereof may be replaced by equivalents and the arrangement may be varied, on con-

dition that the logic diagram in fig. 2 is fulfilled.

Claims

1. An apparatus connectable in-series to a washing machine, particularly of domestic type, comprising a voltage supply plug (1) connected to a control and drive block (2), as well as to a socket (3) for plugging a voltage supply plug (3a) of the washing machine (11), a water inlet pipe (4) from the water supply system, connected by a water supply block (5) to pipe (6) suitable to be fitted with the corresponding supply pipe (6a) of the washing machine (11), and a discharge pipe (7) at the outlet of a path (8), parallel to a tank (15), of the water flowing through a pipe (9) from the discharge pipe (9a) provided for said washing machine, characterized in that it comprises along said waste water path (8) a unit (12) for checking the water clearness suitable to enable the diversion of the water flow towards the tank (15), in case of sufficient purity, instead than towards the discharge pipe (7).
2. An apparatus according to claim 1, characterized in that said tank (15) has a pressure meter (16) suitable to detect the exceeding of a predetermined maximum level by the switching of one contact (16') thereof, included in the check unit (12) to nullify the enabling effect of the latter and anyhow drive the diverting of the water flow towards the discharge pipe (7).
3. An apparatus according to claim 1 or 2, characterized in that it further has a water supply pump (17) at the outlet of said tank (15) and in turn connected to said pipe (6) in parallel with said water supply pipe (4) connected to the supply system.
4. An apparatus according to claims 2 and 3, characterized in that said pressure meter (16) has further a contact (16'') switchable, when a level lower than a predetermined minimum value is reached, to close an electrovalve (18) arranged in-series to said pump (17) and contemporaneously open a second electrovalve (19) arranged on the water supply pipe (4), thereby allowing the water supplying from the supply system and preventing it from the tank (15).
5. An apparatus according to the previous claims, characterized in that said water supply block (5) comprises said water supply pump (17) and said two electrovalves (18, 19) each of them having a check valve, and said path (8) comprises said unit (12) for checking the water purity having in-series the enabling (16') given by the maximum level

pressure meter (16), as well as a diverter (14) suitable to divert the water flow from a position (A) towards the discharge pipe (7) to a position (B) towards the tank (15) by corresponding to an enabling signal received from the check unit (12) and said contact (16'). 5

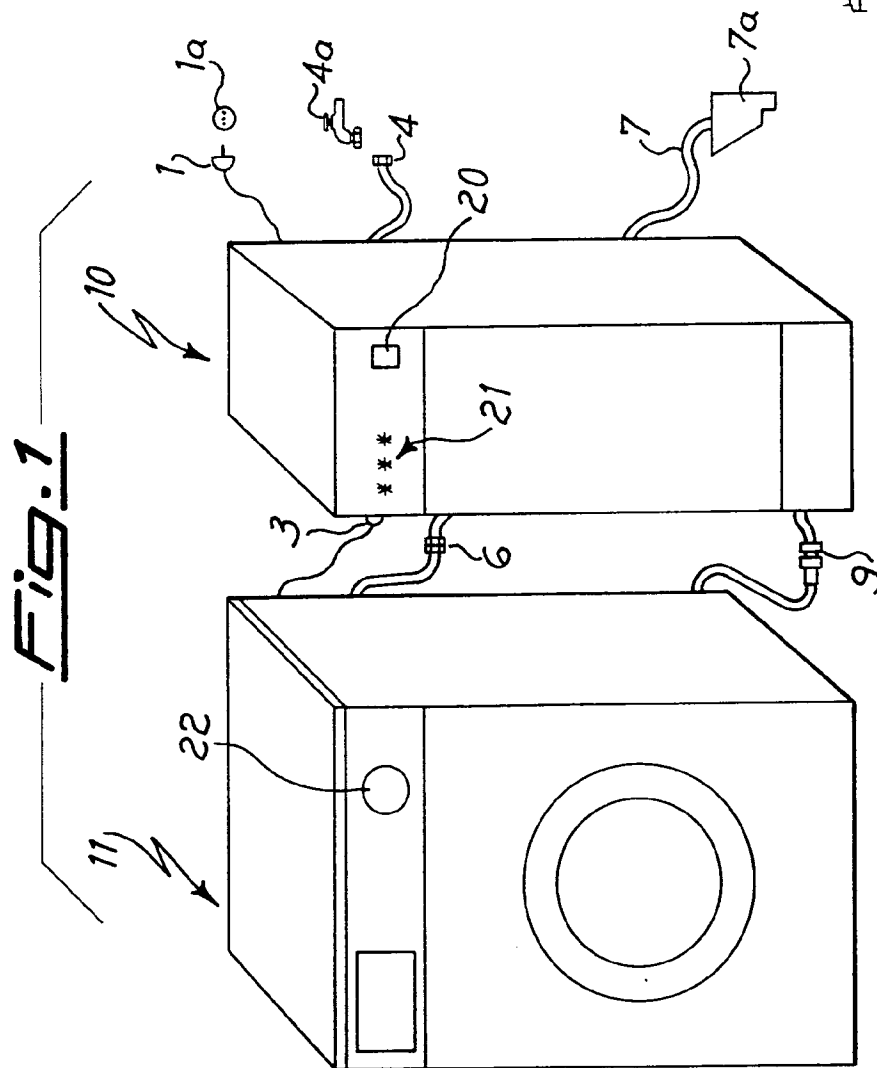
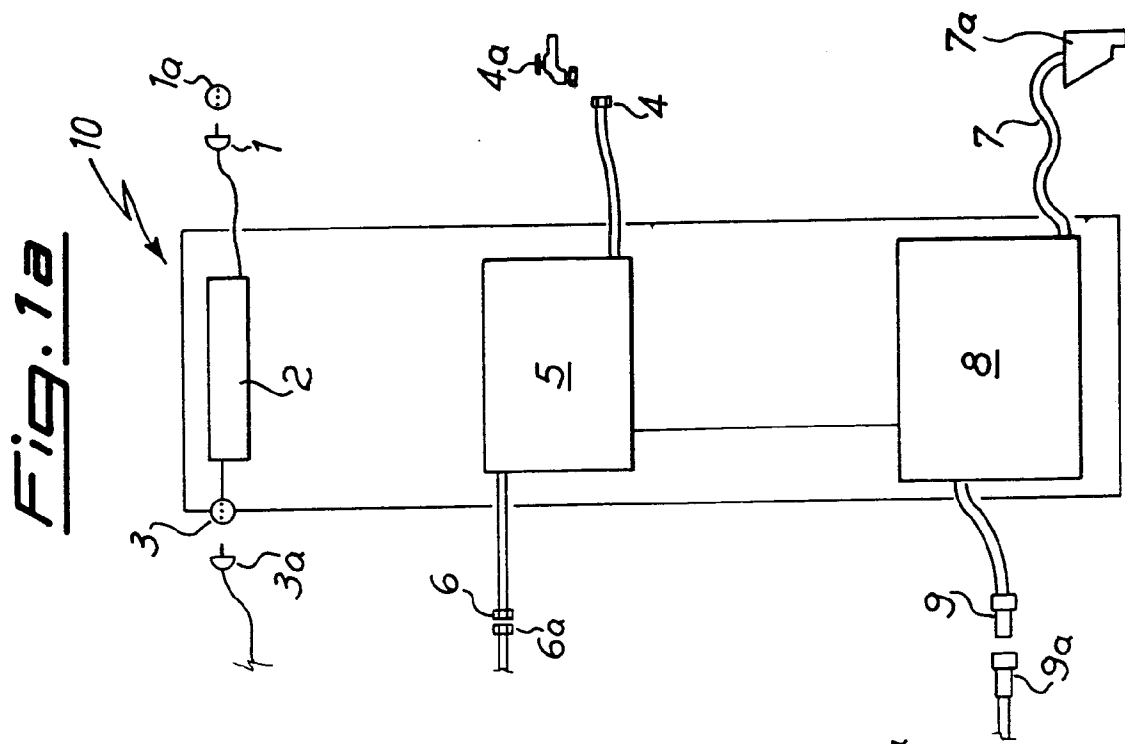
6. An apparatus according to one or more of the preceding claims, characterized in that said check unit (12) consists of three elements connected in-series, and namely: a contact thermostat with fixed calibration (12a) for temperature measurement, two insulated dip electrodes (12b) for electric conductivity measurement and an optical system (12c) suitable to measure the water clear-ness. 10 15
7. An apparatus according to one or more of the preceding claims, characterized in that upstream of said check unit (12) a water filter (13) is provided along said path (8). 20
8. An apparatus according to one or more of the preceding claims, characterized in that its functions are driven by said block having no external control, a main switch (20) being provided externally on the apparatus (10) suitable to inhibit also the washing machine (11), and light indicators (21) of the working condition, while a usual automatic programmer (22) arranged on the washing machine (11) drives the washing cycles thereof. 25 30
9. An apparatus according to one or more of the preceding claims, in which said water supply block (5) comprises a decalcifier or a demineralizer. 35

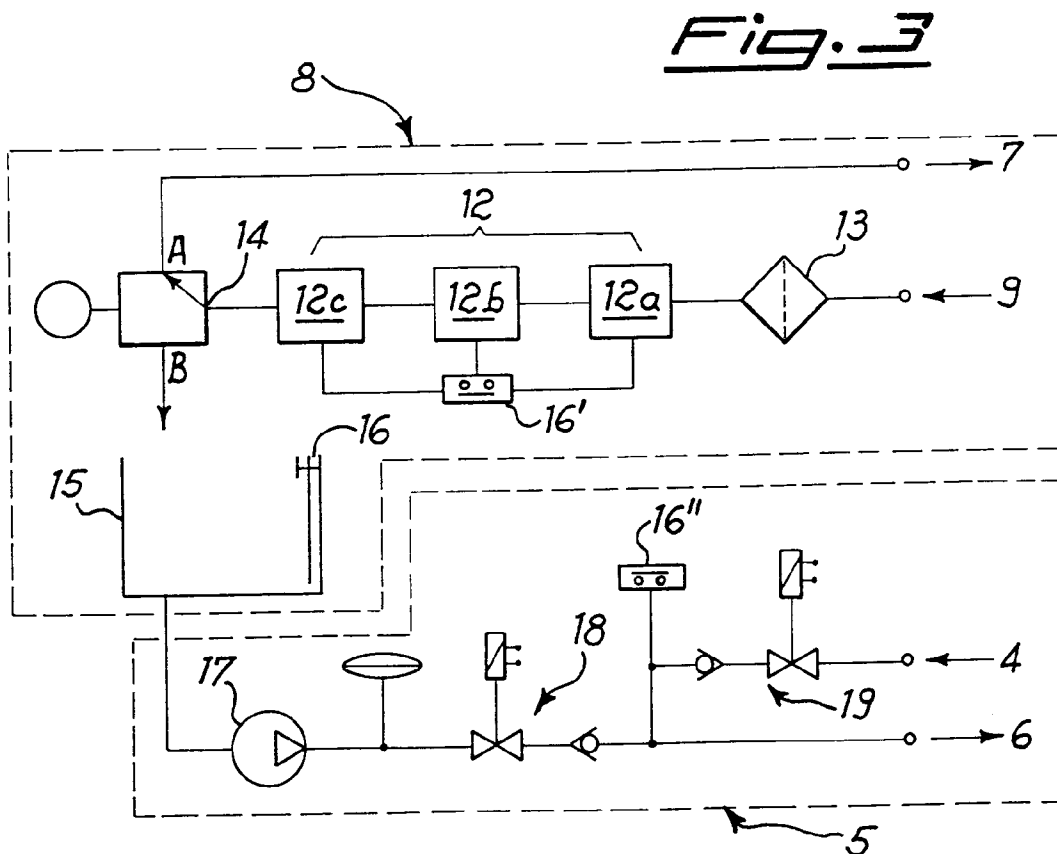
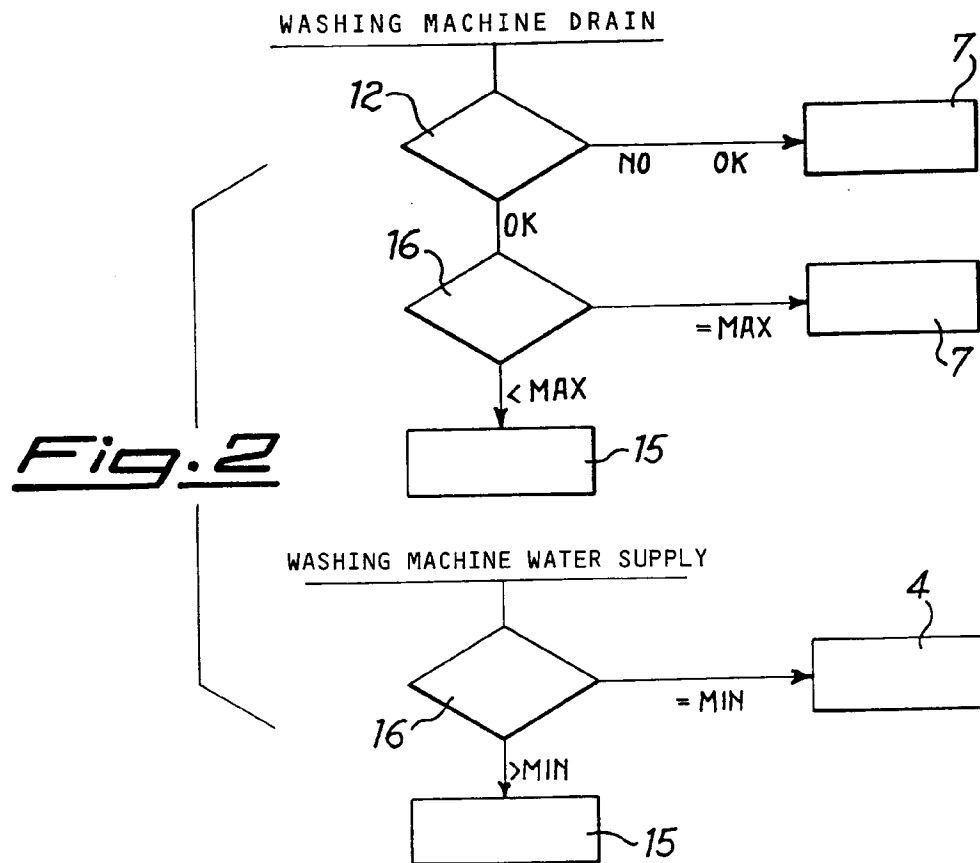
40

45

50

55







European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 83 0052

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.5)
X A	FR-A-2 539 611 (A.C.A. LE GUEVEL) * the whole document *	1-4, 8 6	D06F39/00 A47L15/42
A	FR-A-2 289 658 (BOSCH-SIEMENS HAUSGERATE GMBH) * claims; figures *	1-3, 5, 6	
A	DE-A-4 004 057 (MIELE & CIE. GMBH.) * claims 1,2,8,20,21 * * claims 26,31; figures *	1-4, 7, 9	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			D06F A47L
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 08 MAY 1992	Examiner COURRIER G. L. A.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 01.82 (P0401)