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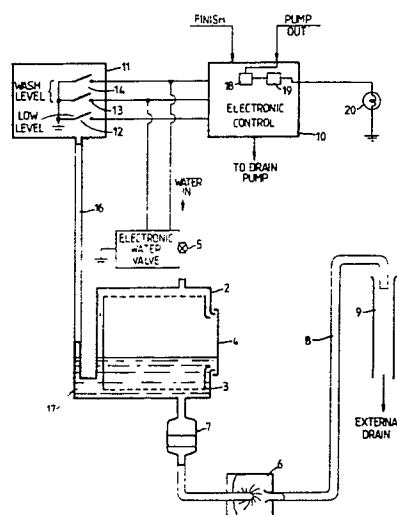
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54 **Washing machine having drain blockage indicator.**

57 A washing machine is provided with means to detect when a drain filter (7) connected to the outlet of the washing chamber (2) is blocked. A low-level water sensor (12) used during normal operation of the machine for normal control of the machine is monitored during a drainage operation and the controller (10) is arranged to establish whether the water sensor (12) has operated a predetermined time after the drain pump (6) is started. If the switch (12) does not change state, then it is assumed that the filter is blocked and, either immediately or at the end of the wash programme, a warning light (20) is illuminated.



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DESCRIPTION"WASHING MACHINE HAVING DRAIN BLOCKAGE INDICATOR".

The present invention relates to washing machines.

In conventional clothes washing machines, clothes are agitated in a drum in a washing chamber filled with water to remove soil; they are then rinsed with clean
5 water several times before being spun to remove excess water prior to drying. During this process small particles of lint and other material are dislodged from the clothes. Prior to each refilling of the drum, the soiled water is pumped from the drum to an external drain. One of the
10 difficulties which arises is that large pieces of lint and other particles possibly removed during the washing cycle such as buttons, paper, hair pins etc., may jam or otherwise damage the impellor of the drain pump. In order to avoid this problem a filter, usually in the form of
15 a plastics mesh, is fitted between the drain pump and the drum of the washing machine. It is necessary periodically to remove this filter and clean away any lint, hair, paper etc., to allow a free passage for the easy flow of used water to the drain. If periodic cleaning
20 is not carried out, the flow of soiled water to the drain gradually gets restricted and the draining process slows down. This means that during the time allowed to drain away only a percentage of the soiled soapy wash water is removed prior to rinse water entering the machine. At
25 each rinse stage, dilution of the soapy water takes place but some remains and then an unsatisfactory wash results. In some cases, where the build-up of material is severe, the flow of drain water slows to a trickle and therefore in the time allotted to the draining period, the water
30 level does not drop sufficiently to enable the level

sensing switch conventionally provided to operate to admit clean rinse water to the drum. This gives an unsatisfactory wash and is unhygienic. Also, automatic washing machines require a venting arrangement from the drum to allow steam to escape during high temperature washes. When the filter is fouled by excessive lint thus not allowing the drain water to escape as already described, then it is possible for the machine to go into the spin mode with water still in the drum. If this happens, soiled water is then thrown out of the venting arrangement and flooding of the floor will occur.

It is, of course, known to provide one or more water level sensors cooperating with the programmer of a machine to control filling and draining operations. During other programme steps to which a predetermined amount of time can be allotted, the programmer acts as a timer so that these steps are allotted fixed times (which may however be varied between different selected wash programmes). However various factors dictate that draining and filling cannot be allotted fixed times so that during those steps the programmer awaits signals from the water level sensor(s) before continuing with the next programme step.

According to the present invention we avoid the above problem of blockage of the chamber outlet by monitoring the water level during a draining operation and use this to determine whether the filter is in need of cleaning. If the water does not drain to a particular level in a given time, it can be taken that the filter is blocked. Of course, slow drainage may also be due to a faulty pump or a blockage elsewhere in the machine but checking the filter will at least eliminate that as the source of the difficulty.

Thus the present invention is characterised by

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a device, operative during a draining step, to monitor the water level sensor to provide a signal indicating that the outlet is blocked. This signal may be used, for example, to operate an indicator such as a lamp
5 mounted on the fascia of the machine to alert the user to the need to check the filter. The operation of the lamp or whatever other indicator is used, may be immediate or it may provide the "check filter" signal at the end of the complete operating cycle of the machine.
10 This latter will be satisfactory where progressive blockages are expected.

In one embodiment, a timer is activated at the same time as the drain pump during the period in which proper drainage or otherwise is to be detected and the
15 level sensor is subsequently monitored. If the level sensor does not indicate that the level has dropped below the operating point of the sensor before the timer times out, this is taken as indicating improper drainage and the "check filter" indicator is activated, either
20 immediately or at the end of the machine cycle.

The invention will be further described with reference to the accompanying drawing in which the sole figure is a somewhat schematic block diagram of one embodiment of the present invention.

25 In the figure, an automatic washing machine 1 comprises a casing 2 defining a wash chamber in which is mounted a horizontal cylindrical wash tub 3 connected to an appropriate drive (not shown) for the various operations of the machine such as wash, spin, etc. Clothes or other
30 articles to be washed are placed in the wash tub via an access door 4.

Associated with the washing chain within the casing 2 are an electronic water valve 5 and a drain pump 6 to fill and drain the chamber, respectively. As indicated

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above, between the drain pump 6 and the chamber is located a filter 7 which prevents material which might jam the impellor of the drain pump 6 from reaching it. Water from the drain pump is pumped via a pipe 8 to an external
5 drain 9.

The operation of the machine is controlled by a controller 10 which may comprise a microprocessor or a more conventional electromagnetic arrangement and this controller controls, inter alia, the drive motor of the
10 wash tub, the water valve 5 and the drain pump 6. The controller is suitably arranged so that the user can select the appropriate one of a number of programmes according to the articles to be washed. At various stages in the wash programme selected by the user, the drain pump
15 6 is operated to drain the water from the wash chamber and then the water valve 5 opened to refill the wash chamber for a subsequent wash for rinse. Of course, at the end of the wash/rinse part of the programme, the drain pump is operated to drain the wash chamber and the water
20 valve 5 subsequently held closed during the spin operation or operations.

Water levels within the wash chamber are monitored by the controller by means of a pressure switch arrangement 11. Essentially, this comprises a closed housing in which
25 is located a pressure-responsive diaphragm which controls closure of three sets of contacts 12, 13 and 14. One side of the diaphragm is communicated via a tube 16 with an air bell 17 which is open to the interior of the wash chamber. As the water level changes, the pressure in the
30 wash chamber increases or decreases as appropriate, so the pressure difference acting on the diaphragm changes causes the contacts 12, 13 and 14 to open or close. The contact 12 is arranged to open when the level of water in the wash chamber has increased to a given minimum level

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while contacts 13 and 14 close, respectively, when the wash chamber is half full and full. There is some hysteresis between the switching level for increasing and decreasing water levels so that, for example, the contacts 13 and 14
5 open when the water level has decreased to $\frac{1}{3}$ and $\frac{2}{3}$ full respectively.

The switch 12 is used by the controller 10 to indicate when a desired minimum level of water is in the wash chamber and, in view of the hysteresis involved in
10 its switching, is also taken to indicate during draining that the wash chamber is empty. Similarly, the switches 13 and 14 are used by the controller 10 to indicate that the wash chamber is half and completely full respectively during filling to control the operation of the water
15 valve 5.

In operation, the machine operates in a conventional manner except as will be described below.

At the end of the wash/rinse part of the programme, a "pump-out" signal is applied to controller 10 to energise
20 the drain pump 6. This signal also starts a timer 18 within the controller 10. During this period controller 10 monitors the switch 12 and if the latter does not close during the timing period of the timer 18, this indicates that the filter is blocked and a register 19 is set. At the end
25 of the programme, the controller checks the content of the register 19 and, if set, illuminates a warning light 20 which indicates that the filter needs to be removed by the user and cleaned.

The controller may alternatively illuminate the
30 lamp immediately or abort the remainder of the programme and continue pumping out past the low level switch operating point, for example continuing for a predetermined time.

Rather than on completion of the wash/rinse cycles,

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the controller 10 could operate to start the timer 18 during each drain period.

The "pump-out" signal may be generated by the controller itself, in software in the case of a
5 microprocessor or by an associated, separate programmer.

It will be appreciated that although the invention has been described with reference to a clothes washing machine it is equally applicable to other washing machines such as dish washers.

C L A I M S

1. A washing machine comprising a washing chamber having an outlet and a water level sensor associated with the washing chamber characterised by a device, operative during a draining step, to monitor the water level sensor and to provide a signal indicating that the outlet is blocked.

2. A machine according to Claim 1 characterised in that the device is operative to determine whether the outlet is blocked on the basis of the time taken for the chamber to drain.

3. A device according to Claim 1 or 2 characterised in that the device comprises a timer activated at the start of the draining operation and arranged to produce the signal indicating that the outlet is blocked if draining is not completed within a predetermined amount of time.

4. A washing machine according to Claim 1, 2 or 3 characterised by a drain filter located in relation to the washing chamber such that the device will indicate whether the filter is blocked and a drain pump located downstream of the drain filter.

5. A washing machine according to any one of Claims 1 to 4 characterised by a warning light connected to the device to indicate that the outlet is blocked.

6. A washing machine according to any one of the preceding Claims characterised by a controller defining a number of programme steps of operation of the washing machine.

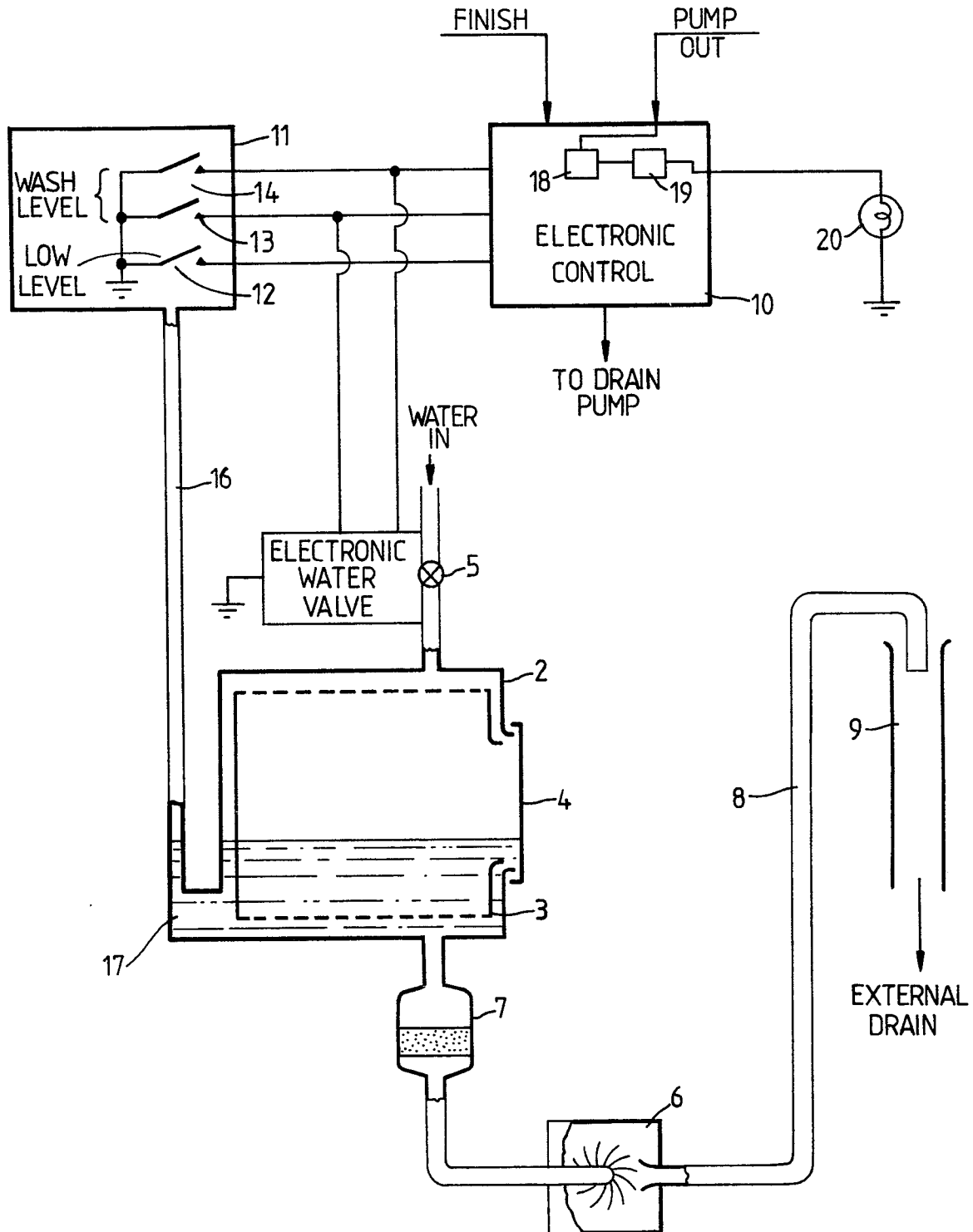
7. A washing machine according to Claims 5 and 6 characterised in that the warning light is arranged to be lit at the termination of a wash programme.

8. A machine according to Claim 6 or 7 characterised in that the programme is caused to abort in the event of

the device indicating that the outlet is blocked.

9. A washing machine according to any one of Claims 6 to 8 characterised in that there are a number of draining operations during a wash programme, the device only being operative during the final draining operation of the programme.

10. A washing machine according to any one of Claims 6 to 9 characterised in that the controller is arranged so as in normal operation to interrupt the draining operation when the water level falls below a predetermined level as sensed by the sensor and so that when the device indicates that the outlet is blocked the draining operation will continue to operate for a predetermined time after the water level falls below a predetermined level as sensed by the sensor.





European Patent
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EUROPEAN SEARCH REPORT

0028067
Application number

EP 80 30 3186.3

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.3)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X	US - A - 3 545 481 (A.R. FRATALIA) * fig. 1, 2 *	1,2, 4,5	D 06 F 39/08 D 06 F 37/42 A 47 L 15/42
P	DE - A1 - 2 818 286 (G. BAUKNECHT GMBH) * claims 5, 6 *	3,9,10	
	DE - A1 - 2 631 344 (PHILIPS PATENT- VERWALTUNG-GMBH) * claim 1 *	1,4,5	
	DE - U - 6 811 374 (SIEMENS-ELECTROGE- RÄTE GMBH) * claim 3 *	1,5	
			TECHNICAL FIELDS SEARCHED (Int. Cl.3)
			A 47 L 15/42 D 06 F 37/00 D 06 F 39/00
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
			&: member of the same patent family, corresponding document
X The present search report has been drawn up for all claims			
Place of search Berlin		Date of completion of the search 28-01-1981	Examiner KLITSCH