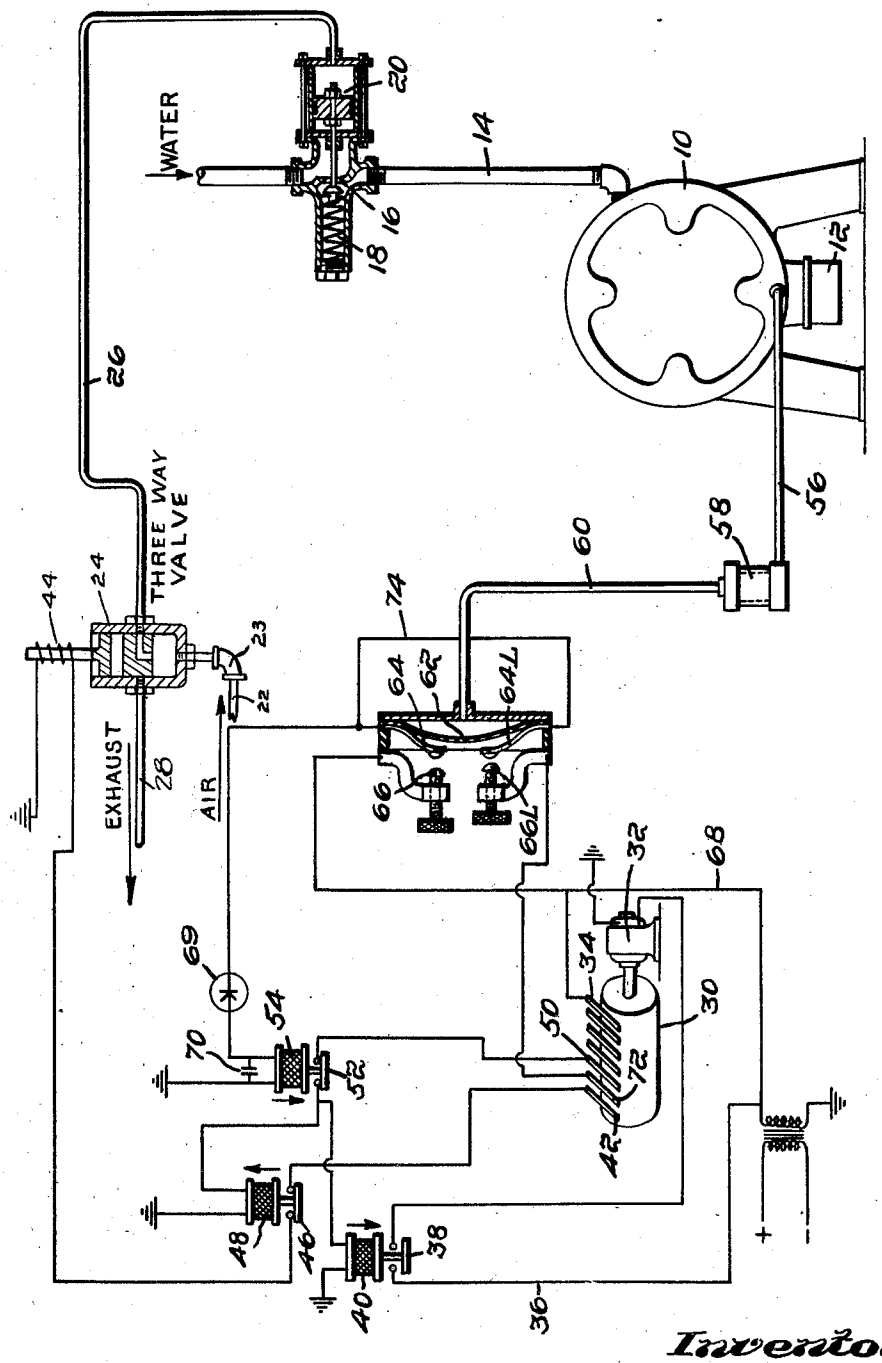
Jan. 21, 1958 F. W. A. HENRICI 2,820,357

LIQUID LEVEL CONTROL FOR LAUNDRY WHEELS AND THE LIKE

Filed March 8, 1954



Inventor:
Fritz Henrici,
By Emery, Booth, Townsend
Miller & Weidner Attys

United States Patent Office 2,820,357 Patented Jan. 21, 1958

2,820,357

LIQUID LEVEL CONTROL FOR LAUNDRY WHEELS AND THE LIKE

Fritz W. A. Henrici, Milton, Mass.

Application March 8, 1954, Serial No. 414,710

4 Claims. (Cl. 68—12)

This invention relates to a control for predetermining the level of liquid supplied to a container, more particularly when the liquid is in a state of agitation. An example is the so-called laundry wheel, the washing machine commonly used in commercial laundries, in which a rotor containing the clothes is rotated first in one direction and then in another in a body of liquid in the casing of the machine. As a major field of application of the invention is in connection with a laundry wheel, I will, in the following description, refer to such an application specifically.

It is desired at various times in the laundering process to fill the wheel to one or another predetermined level of liquid. A body of liquid at the desired level will exert a mean hydrostatic pressure which may be communicated to a sensitive device conveniently in the manner to be described. However, as the oscillating member of the washer is moving as the liquid is supplied, the body of liquid is agitated and pulsations in the nature of kinetic shocks are also transmitted, which will cause chattering of the responsive member adjacent its desired operating position corresponding to the water level. If the responsive device is used to govern the movement of valves, an objectionable hammering of the valves is caused. The present invention aims to obviate this difficulty.

The invention will be well understood by reference to the following description taken in connection with the accompanying drawing, which is a diagram of a controlling system associated with a laundry wheel. Only those parts of the electrical system which directly relate to the invention are illustrated, and the parts which are illustrated in an apparently realistic manner are also diagrammatic and their relative positions and relative sizes are not in fact realistic.

Referring to the drawing, I there show a laundry wheel 10, having a drain valve 12 and a liquid supply pipe 14. Water is admitted to the pipe through a valve 16, which in the present instance is normally closed by a spring 18, and opened against the spring by a pneumatic cylinder 20. Compressed air from an air line 22 is admitted to the cylinder through connection 23 to a three-way valve 24, schematically shown, which alternatively supplies air to the cylinder through pipe 26, and permits the cylinder to exhaust through outlet 28. The means for operating this valve will be later described.

In the construction of the diagram the mechanism which opens the valve and closes it when the wheel has been filled to a predetermined level, forms a part of an automatic control system utilizing a rotary timer 30, turned by an electric motor 32, and having contacts of varied circumferential extent which cooperate with a number of brushes, providing for energizing various control instrumentalities. I have not attempted to illustrate these contacts and I have shown seven brushes, only three of which enter into the operation of the mechanism diagrammed. It will be understod that the others may be utilized for governing various operations incident to the

washing process as known in the art. The control of the washing process, however, need not be entirely automatic, as many operations could be effected by manual control yet a control exemplifying the invention utilized in shutting off the water supply at the proper time. The contacts of the rotary timer 30 take current from the line through the brush 34 at the left. The motor 32 for turning the timer draws current from the line through the wire 36 through a normally closed switch 38, which may be moved to the open position shown when the relay coil 40 is energized, and thence to the motor.

At this point it may be helpful to state that the position of the various parts shown in the diagram is that assumed when the water valve 16 has been opened and the water is flowing into the wheel 10, but has not reached the desired height. At an earlier stage the timer was being turned by the motor and at the desired time the brush 42 engaged a contact to effect the opening of the water valve, this being effected mediately by opening of the air valve 24 by means of an electric motor device such as a solenoid 44. The three-way valve may be of any usual or desired construction and is not here shown in detail. The operation is as follows. When the solenoid 44 is energized its moves a valve head to uncover an air inlet port from line 22 and air flows through a suitable passage to outlet pipe 26. There is then no connection to exhaust pipe 28. When the solenoid is de-energized the inlet port is closed and the outlet pipe 26 put into communication with exhaust pipe 28 permitting cylinder 20 to exhaust to atmosphere, so that the valve 16 operated by the cylinder cuts off the supply of water through pipe 14 to wheel 10. The circuit for energizing the solenoid 44 leads from brush 42 through switch 46, which is normally open, but raised to the position shown by relay coil 48, to the motor device 44. This coil 48, and also the coil 44, is energized from brush 50 in parallel branches of a circuit controlled by normally closed switch 52, which may be opened by the energization of relay coil 54. The arrows beside the several relay coils indicate the direction of movement of their cores respectively when the coils are energized.

In the operation of the timer the brushes 42 and 50 engage contact simultaneously and the current through switch 52 energizes coils 48 and 40, closing switch 46 and opening switch 38 to the positions shown. The opening of switch 38 breaks the energizing circuit of motor 32, which turns the timer 30, and the timer stops. The filling of the wheel is not controlled by a time interval but continues until the desired level is reached. Current from the brush 42 passes through switch 46 to the motor coil 44 for the air valve. Air goes to the cylinder 20 and opens the valve 16, admitting water to the wheel 10.

A pipe 56 opens from the bottom of the water wheel and admits water to the bottom of the "air trap" 58 which is in communication through the small pipe 60 with a chamber formed beneath the yielding diaphragm 62, this being an example of a pressure-sensitive responsive device. A column of air is thus trapped in the parts 58, 60 and 62 and as the water level rises, this air is compressed and deflects the diaphragm. When this has reached a given position it moves a contact-carrying spring arm 64 against an adjustable contact 66, these two parts constituting a switch. The circuit of the switch leads through wire 68, through the adjustable contact 66, through the spring arm 64 to the relay coil 54, energizing the same and causing the switch 52 to be opened. Opening of switch 52 in turn de-energizes relay coil 48, interrupting the circuit to the motor coil 44, causing such movement of the air valve 24 as is effective in turn to exhaust cylinder 20 and permit the valve 16 to close. Opening of switch 52 also interrupts the circuit through

relay coil 40, causing the switch 38 to close and the motor 32 to start, again to turn the timer 30.

The movement of the arm 64 to a position corresponding to the mean level of water in the wheel can be accurately determined. However, the agitation of the water causes pulsations in the air column with chattering of the switch couple 64, 66, with the resultant make and break in its circuit and in the circuits controlled thereby, each time the valve 24 tries to reverse, and, in turn, the valve 16, with resultant objectionable hammering.

In accordance with the invention the coil 54 is energized by direct current. Since, in general, the electrical system available will be an alternating current one, and it is desirable not to provide an additional primary source of current, there is interposed in the circuit, between the switch couple 64, 66 and the coil 54, a rectifier 69, and bridged across the coil 54 is a condenser 70. When 64 and 66 make contact the condenser is charged and the coil 54 energized essentially simultaneously. If the circuit is broken at 66 momentarily by chattering of the switch contacts, the coil 54 is no longer supplied with current through the line, but the condenser 70 will discharge to the coil and prevent the opening of switch 52 during the brief period when the circuit is interrupted and before it is remade. Smooth action of the valves is thus provided for.

The construction described limits the height of water to a predetermined maximum level. To provide also for control at a lower level when desired a spring arm 64L movable by diaphragm 62 is provided. This cooperates with an adjustable contact 66L which is nearer the diaphragm than is 66. The connection to 66L is through brush 34 to a brush 72, which is brought into connection with brush 34 through the timer in the usual manner, and from brush 72 to 66L. 64L is connected through wire 74 to rectifier 69 and the relay coil 54. Additional "low" levels may be provided in like manner.

I am aware that the invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and I therefore desire the present embodiment to be considered in all respects as illustrative and not restrictive, as is in fact clear in several matters from the description itself. Reference is to be had to the appended claims to indicate those principles of the invention exemplified by the particular embodiment described and which I desire to secure by Letters Patent.

1. A control mechanism for establishing a predetermined level for a body of agitated liquid in a container comprising a liquid supply pipe leading to the container, a valve for controlling the flow of liquid to the pipe, means for operating the valve including an electric motor device operable by direct current which when energized effects the opening of the valve, a control element moving responsively to the pressure exerted by the body of liquid in the container, an electric switch operated by said member when the latter reaches a predetermined position, a direct current circuit through the motor device energized by the closing of the switch, there being a condenser in the circuit bridged about the motor device to delay de-energization of the device, whereby chattering of the switch due to pulsations caused by agitation of the body of liquid does not affect the operation of the valve.

2. In combination with a laundry wheel having a water admission valve and means for operating the same including an electrically governed device for causing movement of the same effective to turn on the supply of water, means for trapping a column of air between the water in the container and a yieldable diaphragm whereby the latter is moved responsively to the pressure of the air column effected by the hydraulic pressure of the body of liquid in the wheel, a first switch adapted to close on predetermined movement of the diaphragm, a second switch for said electrically governed device having normally a closed position and which, when it moves from that position causes the operation of the electrically governed device to shut off the supply of water, a motor device for moving the second switch, a circuit through the first switch and through said motor device supplying direct current to the latter, and means charged by the closing of the first switch and discharging to the motor device on opening of the latter, whereby chattering of the switch due to pulsations caused by agitation of the body of liquid does not affect the operation of the valve.

3. In combination with a laundry wheel having a water admission valve and means for operating the same including an electrically governed device for causing movement of the same effective to turn on the supply of water, means for trapping a column of air between the water in the container and a yieldable diaphragm whereby the latter is moved responsively to the pressure of the air column effected by the hydraulic pressure of the body of liquid in the wheel, a first switch adapted to close on predetermined movement of the diaphragm, a second switch for said electrically governed device having normally a closed position and which, when it moves from that position causes the operation of the electrically governed device to shut off the supply of water, a motor device for moving the second switch, a circuit through the first switch and the motor device, there being a rectifier between the first switch and the motor device whereby direct current is supplied to the latter and a condenser bridged around the motor device.

4. In combination with a laundry wheel, a rotary timer having contacts for cooperating with brushes to energize control circuits, an electric motor for rotating the timer, an energizing circuit therefor leading through a normally closed switch of a first relay, a filler pipe for the wheel having a valve, means for operating the valve including an electric motor device which when energized provides for opening of the valve, an energizing circuit therefor leading from a timer brush through a normally open switch of a second relay, a circuit for energizing said relays leading from a timer brush through a normally closed switch of a third relay, means movable responsively to the hydraulic pressure of the body of water in the wheel, a switch closed by said means when a predetermined pressure is attained, and a circuit through said switch supplying direct current for energizing said third relay and including a condenser bridged across the relay.

References Cited in the file of this patent

UNITED STATES PATENTS

2,168,068	Loewke	Aug. 1, 1939
2,296,262	Breckenridge et al.	Sept. 22, 1942
2,305,154	Gilbert	Dec. 15, 1942
2,328,073	Hanney	Aug. 31, 1943