Aug. 3, 1943. A. J. ROHR 2,326,067

LEVEL CONTROL FOR WASHING MACHINES

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FIG. 1

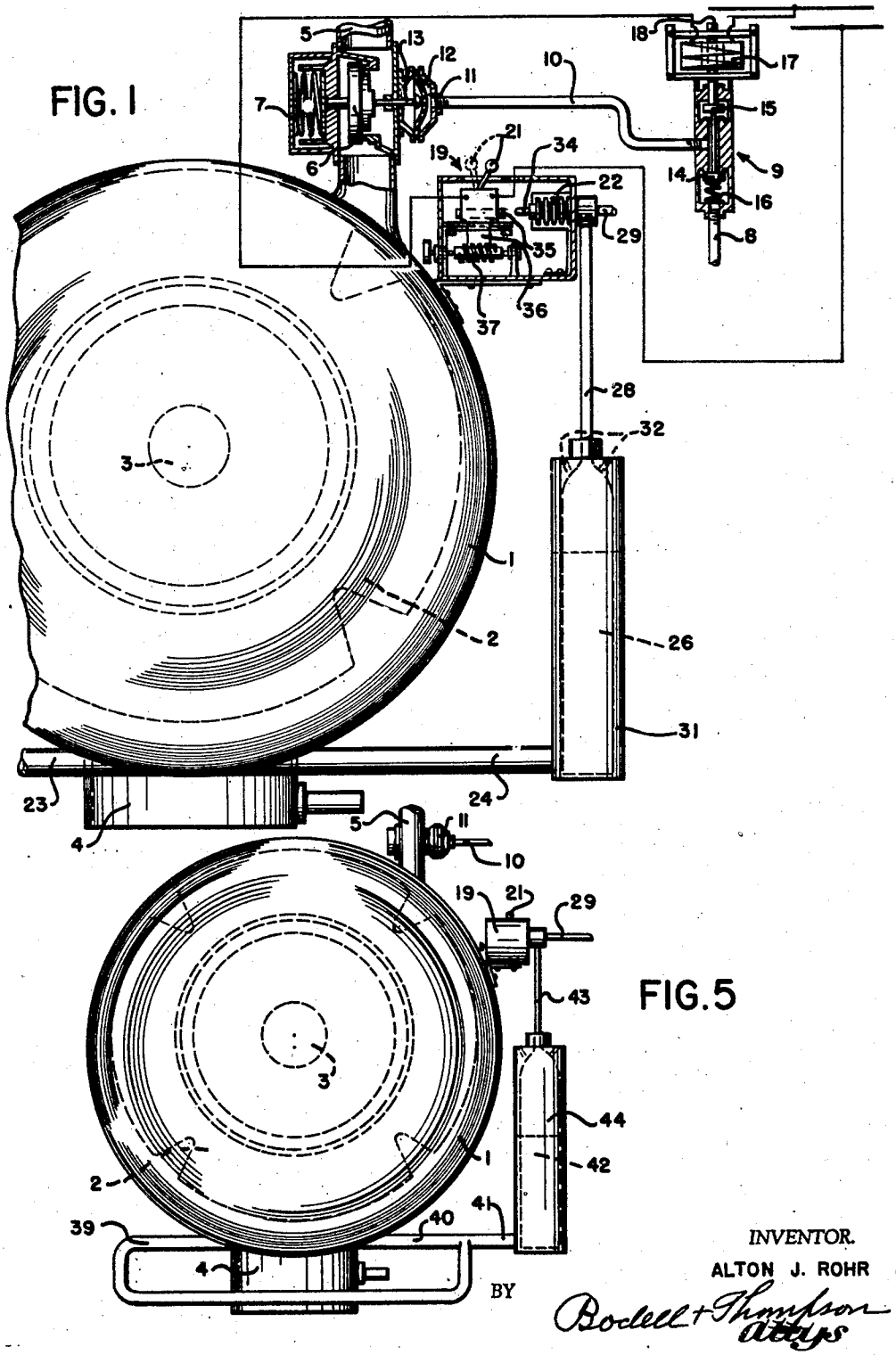

FIG. 5

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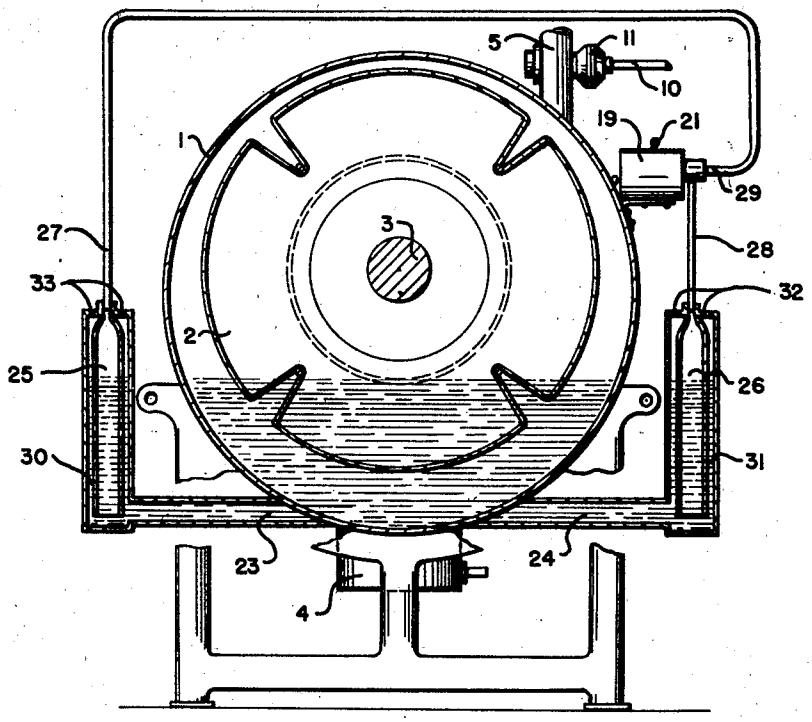

FIG. 2

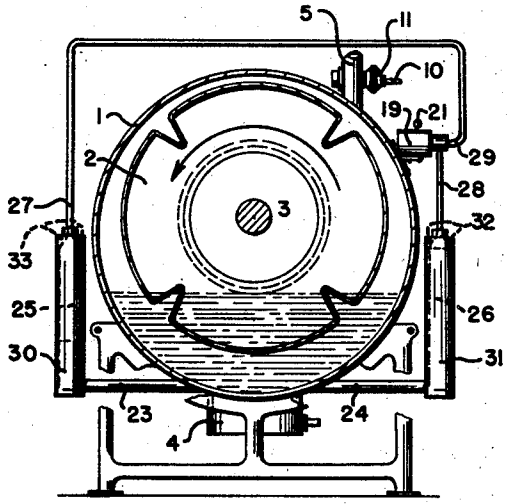

FIG. 3

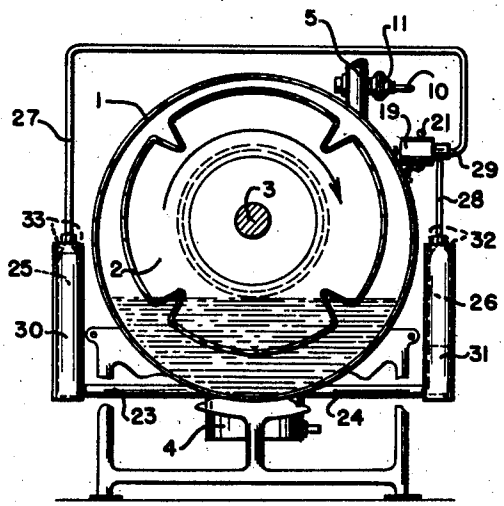

FIG. 4

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LEVEL CONTROL FOR WASHING MACHINES

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5 Claims. (Cl. 68—139)

This invention relates to liquid or water level controls for machines, as washing machines, in which the drum or container for the articles to be treated or washed, operates about a horizontal axis in an outer casing containing the cleansing liquid, and has for its object means operated by the quantity or level of the fluid in the casing for closing the inlet valve for the liquid in the conduit feeding into the casing, when a predetermined level is reached.

While the liquid is feeding into the casing, the container is in operation, and hence the liquid surges upwardly in the lower portion of the casing in the direction of rotation.

More specifically, the invention has for its object means operated by the average of the high and low pressures of the liquid during the surging, for closing the inlet valve when a predetermined quantity of water has fed into the casing during the operation of the drum or container. The pressure is high on one side and correspondingly low on the other of the casing or on one side of a radial vertical plane containing the axis of the container. The high pressure side is that up which the liquid surges under the rotation of the container. Usually the container is actuated through repeated cycles consisting of a given number of turns in one direction and a given number of turns in the reverse direction. Hence the high pressure side is on one side of the casing or said plane when the container is rotating in one direction, and on the other side when the container is rotating in the reverse direction.

The invention has for its object means for equalizing the effect of these high and low pressures on pressure-operated means for controlling the closing of the inlet valve when a predetermined quantity of water is filled into the casing.

The invention consists in the novel features and in the combinations and constructions hereinafter set forth and claimed.

In describing this invention, reference is had to the accompanying drawings, in which like characters designate corresponding parts in all the views.

Figure 1 is a fragmentary end elevation, parts being omitted, of a washing machine embodying this invention and showing in section the inlet valve, one form of operating means therefor being also shown.

Figure 2 is a sectional view through the washer through the pressure equalizing means for controlling the operation of the inlet valve.

Figures 3 and 4 are operation views on a reduced scale similar to Figure 2.

Figure 5 is a view similar to Figure 1 of a modified form of the invention.

1 designates the outer casing of a laundry washing machine, this being a horizontal cylinder. 2 designates a container for the articles or clothes to be treated or cleansed, this being mounted to rotate about a horizontal axis in the outer casing 1. It is shown as mounted on a shaft 3 located eccentric in an upward direction relatively to the axis of the cylindrical casing 1. This shaft is usually a trunnion at one or each end of the drum.

Washing machines of this type, and also the actuating mechanism for rotating the drum are well known, and therefore a detail description thereof is thought to be unnecessary,

4 designates a dump valve; 5 an inlet pipe for a cleansing fluid opening into the upper portion of the casing 1, 6 designates an inlet valve in the pipe 5, this being normally closed, as by a spring 7. It may be opened in any suitable manner. It is here shown as operated by compressed air, and the valve for controlling the flow of compressed air as controlled to open the liquid inlet valve by a hand lever.

8 designates a feed line for the supply of a motive fluid, as compressed air, this having a valve 9 therein, which controls the flow of air through a pipe 10 to a diaphragm chamber 11 having a diaphragm 12 therein, which thrusts against a stem 13 to open the inlet valve 6 against the action of the spring 7. The valve 9 is of the combined intake and exhaust type and includes a normally closed intake valve head 14 and a normally open exhaust valve head 15, these being connected together to act as a unit. The valve is held in its normal position by a suitable spring 16. It is here shown as operated against the spring 16 by an electro-magnet, as a solenoid 17, the core 18 of which thrusts against the exhaust valve head 15 to close the exhaust valve head and open the intake valve head, when the solenoid is energized. The windings of the solenoid are connected in an electric circuit having a normally open snap switch 19 of any well known type. The switch is the control member for the inlet valve 6. The switch has an operating lever 21 which may be operated by hand to close the circuit and open the intake valve. To open the intake valve, the operating lever 21 is moved to "on" position from the full line position to the dotted line position (Figure 1). When the switch is thrown into the dotted line position, the intake valve head 14 is open and the exhaust valve head 15 closed, so that air passes through the valve 9 and the pipe 10

to the diaphragm chamber 11 actuating the diaphragm therein to open the intake valve 6. The control member or switch 19 is normally in one, that is closed, position when the inlet valve is open and shifted into a second (on) position, to close the inlet valve. The control member or switch is mounted on an adjustable carriage for a purpose to be presently described.

The means forming the subject matter of this invention comprises means operating the control member or the switch when the predetermined level is reached, or a predetermined quantity of liquid is received in the container, this operating means being operated by the average of the pressures on opposite sides of a vertical radial plane containing the axis of the container 1 when the container is rotating. When the container is rotating in one direction, as counterclockwise, in Figure 3, the pressure will be greater on the right hand side of said plane than on the left hand, and when the container reverses and rotates clockwise (Figure 4), the pressure will be greater on the right hand side of said plane. The operating means for the opening of the switch or for closing the intake valve is controlled by the average of these high and low pressures.

This operating means comprises a pressure-operated member or motor, and means for transferring the average pressure to the pressure-operated means or motor. The pressure-operated motor is here shown as an expansible device, as a bellows 22, this being known commercially as a Sylphon. The pressure created in the casing 1 is transferred to the member 22 through transfer pipes communicating with the lower part of the casing on opposite sides of a radial plane containing the axis of the container, and means in which air is compressed by the action or surging of the liquid in the casing, and the pressure transferred to the member or Sylphon 22.

In Figures 1, 2, 3 and 4, 23 and 24 designate pipes communicating with the lower portion of the casing 1 on opposite sides of a radial plane containing the axis of the container 2 and leading from the casing substantially tangential to the lower portion thereto. 25 and 26 designate air compression chambers, in which the air is compressed by the action or surging of the liquid in the casing 1, these being dome-shaped at their upper ends, and communicating through branch pipes 27 and 28 of a pipe 29 leading into one end of the bellows or Sylphon 22. These chambers 25, 26 are open at their lower ends to receive the liquid from the pipes 23 and 24. As here shown, these chambers 25 and 26 are located in stand pipes 30, 31 which communicate with the outer ends of the pipes 23 and 24 respectively. The stand pipes are spaced apart from the periphery of the chambers 25, 26 and vented at 32 and 33 at their tops to the outer air. During the movement of the container 2 about its axis counterclockwise, as in Figure 3, and while the intake valve is open, the surging of the liquid in the casing 1 builds up a pressure in the dome of the chamber 26, while there is less pressure, or a drop in pressure in the chamber 25. These high and low pressures are, however, equalized through the pipes 27 and 28, so that the effective pressure on the Sylphon 22 through the pipe 29 is the average of these high and low pressures. As the quantity of water or liquid increases in the casing 1, the pressure in the chambers 25 and 26 becomes greater and approach each other and build up such pressure in the Sylphon 22 to overcome the resistance of the springs of the snap switch and open the switch 19; or the pressure in the member or bellows 22 gradually builds up great enough to overcome the springs of the switch and effect the snapping of the switch to "off" position. During the action or the surging of the liquid, some of the liquid surging in the stand pipes 30, 31 up around the chambers 25 and 26, and the air compressed in the stand pipes 30, 31 vents to the outer air through the vent openings 32 and 33. Thus, when a predetermined high level is reached, the intake valve is automatically closed. The desired level or quantity of liquid may be varied by varying the distance between the switch 19 and the Sylphon or bellows 22. As shown, the bellows 22 are provided with a stem or nose 34 which, as the bellows expand, engages a switch operating member or push button 35 and depresses the same until the spring of the snap switch mechanism is overcome. By varying the distance between the push button 35 and the nose 34, the timing of the throwing off of the switch may be varied. For a higher level the distance is increased. To effect this adjustable timing, the switch 19 is mounted on a shiftable carriage 36 shiftable, as by a manually operated worm 37 coacting with a worm or worm teeth on the carriage. The shifting of the lever 19 sets the push button to "on" or "off" position.

In the form shown in Figure 5, 39 and 40 designate the equalizing pipes corresponding to the pipes 27 and 28, these communicating through a single pipe 41 with the lower end of a compression chamber 42, the dome of which communicates through a pipe 43 with the bellows 22, the air compression chamber being located in the stand pipe 44 communicating with the pipe 41. In the form shown in Figure 5, there is but one compression chamber and stand pipe, but the high and low pressures of the liquid on opposite sides of the radial plane containing the axis of the container 2 are equalized through the pipes 39, 40 and the pressure so equalized or the average pressure effective in the single compression chamber 42.

In the form shown in Figures 1 to 4 inclusive, in which there are two compression chambers 25, 26, the pressure of the air from the compression chambers is equalized through the pipes 27, 28. In either case, while the liquid is filling into the casing, and the container is moving about its axis, the intake valve is closed by means operated by the average of the high and low pressures in the opposite portions of said casing 1.

What I claim is:

1. A liquid level control for washing machines of the type including an outer casing, a container rotatable about a horizontal axis in the casing and an inlet conduit for a cleansing fluid having a valve therein, means for opening said valve, and means for closing the valve when a predetermined level is reached, said level control including a control member normally in one position when the valve is open and shiftable into a second position to close the valve, pressure-operated means for operating the control member into second position, upright air compressor chamber means, conduit means connecting the same and the pressure-operated means, enclosing means in which the chamber means is located, the enclosing means communicating through conduit means with the bottom portion of the

casing of the washing machine, the air compressor chamber means being open at its lower end into its enclosing means.

2. A liquid level control for washing machines of the type including an outer casing, a container rotatable about a horizontal axis in the casing and an inlet conduit for a cleansing fluid having a valve therein, means for opening said valve, and means for closing the valve when a predetermined level is reached, said level control including a control member normally in one position when the valve is open and shiftable into a second position to close the valve, pressure-operated means for operating the control member into second position, upright air compressor chamber means, conduit means connecting the same and the pressure-operated means, enclosing means in which the chamber means is located, the enclosing means communicating through conduit means with the bottom portion of the casing of the washing machine on opposite sides of the vertical plane of the axis of the container.

3. A liquid level control for washing machines of the type including an outer casing, a container rotatable about a horizontal axis in the casing and an inlet conduit for a cleansing fluid having a valve therein, means for opening said valve, and means for closing the valve, when a predetermined level is reached, said level control including a control member normally in one position when the valve is open and shiftable into a second position to close the valve, pressure-operated means for operating the control member into second position, a stand pipe located with its lower end on approximately the level of the bottom portion of the casing, a substantially horizontal conduit connecting the lower end of the stand pipe and the bottom portion of the casing, an air pressure chamber in the stand pipe opening thereinto at its lower end, and a conduit connecting the upper end of the air compressor chamber and said pressure-operated means.

4. A liquid level control for washing machines of the type including an outer casing, a container rotatable about a horizontal axis in the casing and an inlet conduit for a cleansing fluid having a valve therein, means for opening said valve, and means for closing the valve, when a predetermined level is reached, said level control including a control member normally in one position when the valve is open and shiftable into a second position to close the valve, pressure-operated means for operating the control member into second position, a stand pipe located with its lower end at approximately the level of the bottom portion of the casing, conduit means connecting the lower end of the stand pipe and the bottom portion of the casing on opposite sides of the vertical plane of the axis of the container, an air compressor chamber in the stand pipe and opening thereinto at its lower end, and a conduit connecting the upper end of the air compressor chamber and said pressure-operated means.

5. A liquid level control for washing machines of the type including an outer casing, a container rotatable about a horizontal axis in the casing and an inlet conduit for a cleansing fluid having a valve therein, means for opening said valve, and means for closing the valve, when a predetermined level is reached, said level control including a control member normally in one position when the valve is open and shiftable into a second position to close the valve, pressure-operated means for operating the control member into second position, a pair of stand pipes arranged with their lower ends at approximately the level of the bottom portion of the casing, horizontal conduits connecting the lower ends of the stand pipes and the casing on opposite sides of the vertical plane of the axis of the container, air compresser chambers located in the stand pipes and opening at their lower ends thereinto respectively, and conduits connecting the upper ends of the air compressor chambers and the pressure-operated means.

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