

April 7, 1970

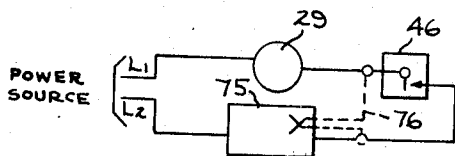
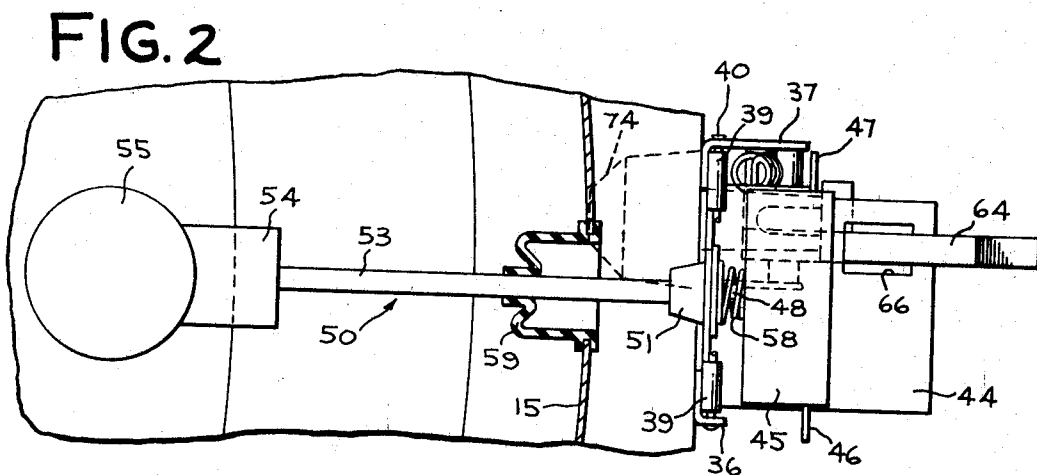
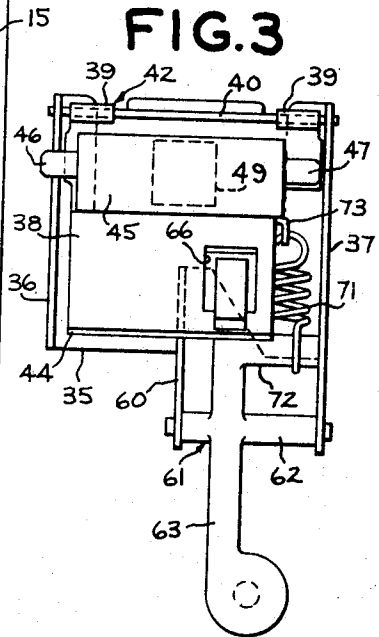
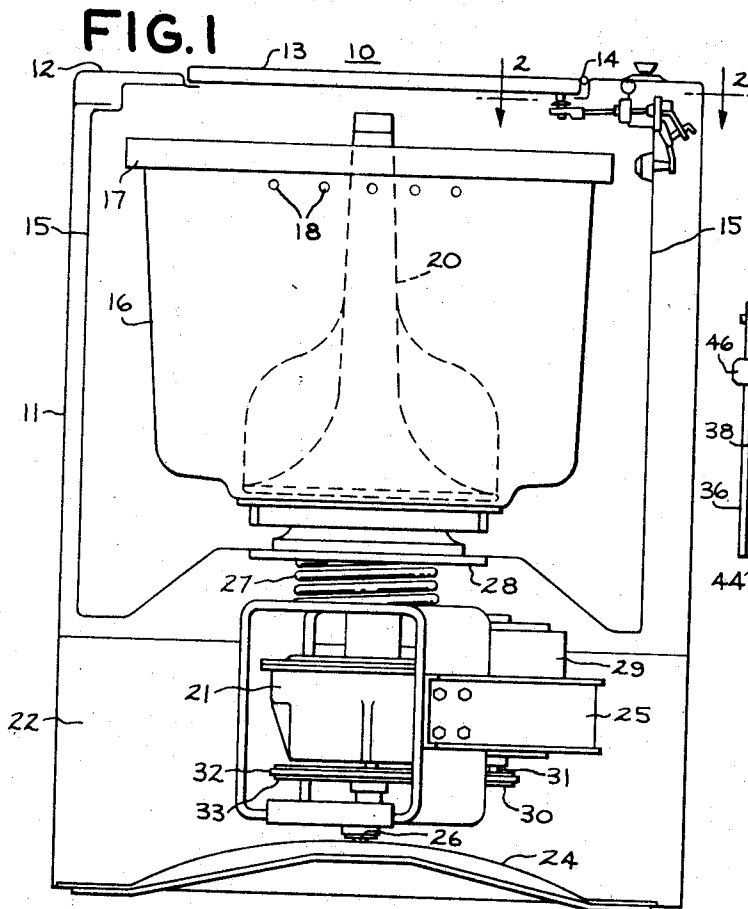
R. A. WAUGH

3,504,777

COMBINED UNBALANCE AND LID SWITCH

Original Filed March 28, 1968

2 Sheets-Sheet 1



INVENTOR.
RICHARD A. WAUGH
BY *Radford M. Reama*
HIS ATTORNEY

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R. A. WAUGH

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2 Sheets-Sheet 2

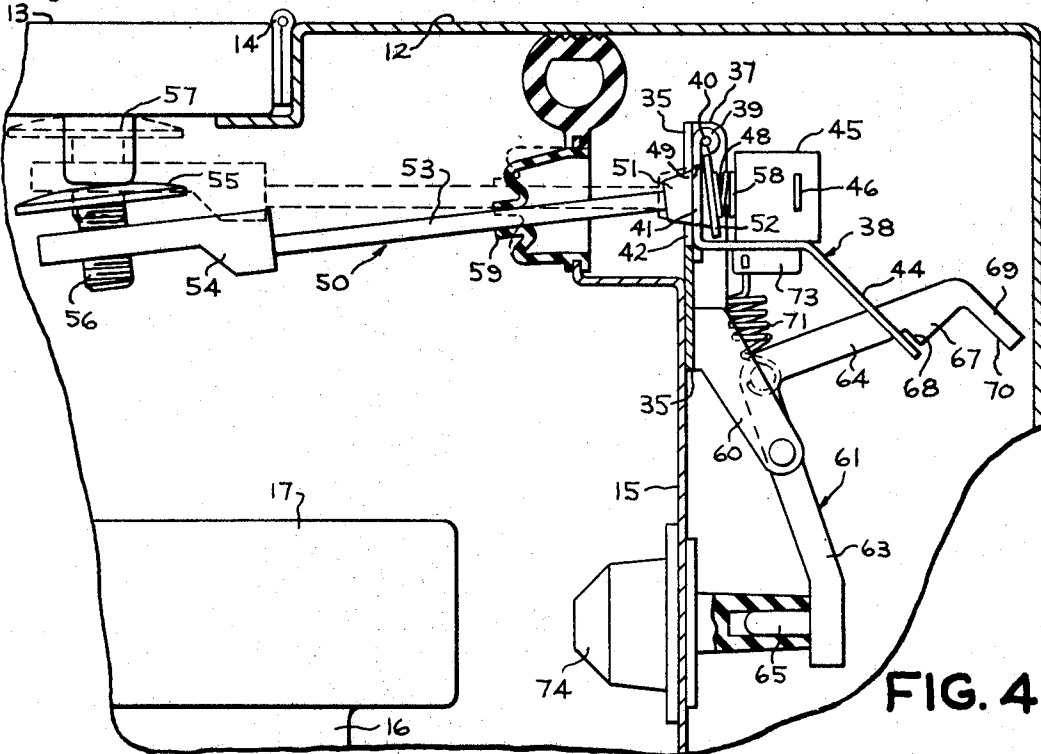


FIG. 4

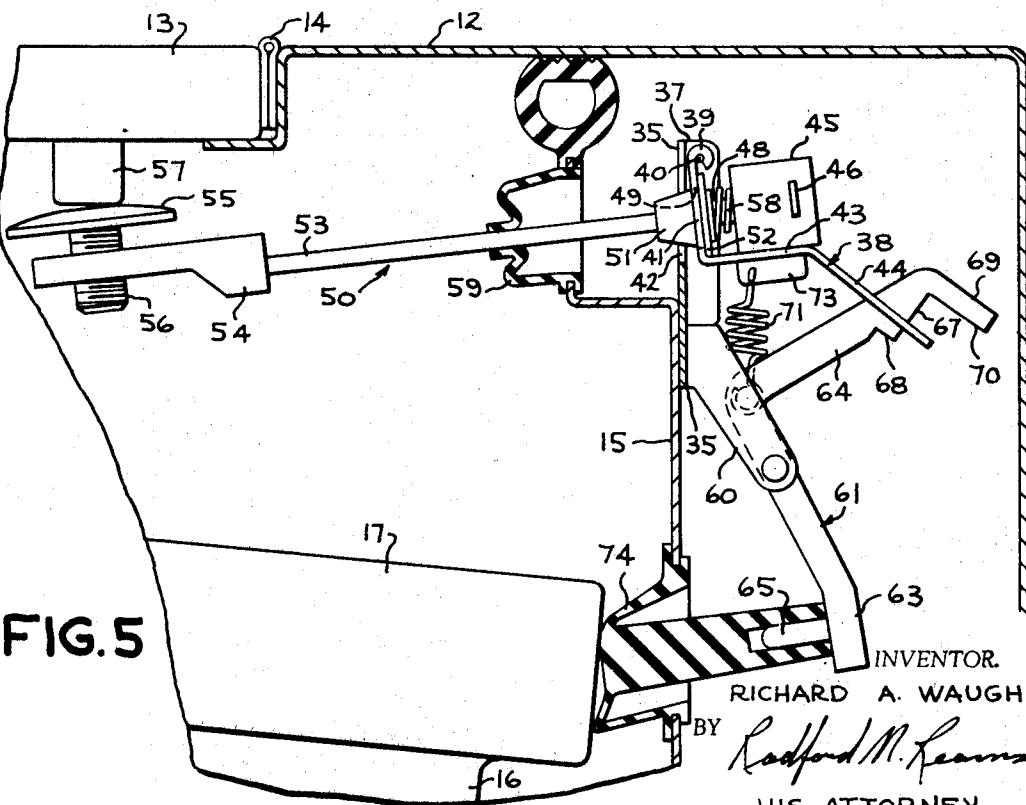


FIG. 5

INVENTOR.
RICHARD A. WAUGH

BY *Radford M. Leanna*
HIS ATTORNEY

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3,504,777

COMBINED UNBALANCE AND LID SWITCH

Richard A. Waugh, Lyons, Ill., assignor to General Electric Company, a corporation of New York

Continuation of application Ser. No. 716,844, Mar. 28, 1968. This application June 6, 1969, Ser. No. 835,879

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U.S. Cl. 192—136

6 Claims

ABSTRACT OF THE DISCLOSURE

A support frame is mounted in the cabinet of a washing machine with a bracket pivotally mounted on the frame. A switch is fixedly attached to the bracket and a link is mounted on the bracket for free pivotal movement and extends between the switch actuator and the lid of the machine. A first spring is mounted between the switch mechanism and the like to bias these elements apart. A latch is pivotally mounted on the frame. The latch has a first arm disposed for engagement by the washing machine but upon gyrations of the tub beyond a predetermined limit and a second arm normally engaging the bracket to restrain it from movement. The latch and bracket are interconnected by a second spring. Closing the lid pivots the link to depress the switch actuator and stress the first spring. Gyration of the tub beyond a predetermined limit moves the latch to release the bracket for pivotal movement by the first spring to release the actuator and stress the second spring. Opening the door releases the link so that the second spring is effective to return the bracket and latch to their first positions.

This is a continuation of application Ser. No. 716,844, filed Mar. 28, 1968, and now abandoned.

Background of the invention

This invention relates to a control mechanism for use in machines, such as fabric washing machines, which execute a centrifugal extraction step. It is well known that such machines exhibit a tendency to gyrate or vibrate excessively when the articles being centrifuged agglomerate in some portion of the tub, thus unbalancing the tub. This excess vibration frequently causes the rotating tub to strike and possibly damage the surrounding structure. Also the entire machine tends to vibrate and shake. Normally, once the situation has been sensed and reacted to, the operator will open the lid, rearrange the articles and restart the machine for further centrifugal operation. It is customary to provide such machines with a "lid switch" which is closed when the machine lid or access door is closed and is open to inactivate the machine when the lid is open. It also is customary to provide an "unbalance switch" to inactivate the machine in the event of excess vibration resulting from an unbalanced load. It has been proposed, in Stelli Patent 3,145,818, for instance, to combine an unbalance sensing switch with a lid switch. One advantage of such arrangements is that the control circuit for the machine will be automatically reset by opening and closing the lid, as the operator must do to rearrange the load. Thus there need be no reset button or the like which the operator must actuate in order to resume operation. This invention is directed to an improved form of such an assembly or mechanism.

Summary of the invention

The present invention relates to a combined unbalance and lid switch arrangement for use in a washing machine having an outer cabinet. This cabinet encloses operative structure including a tub subject to gyration during operation of the machine. A lid provided in the cabinet is movable between a first position, blocking access to

the tub, and a second position, allowing access to the tub, and an electric circuit is included in the machine for providing power to the operative structure. In carrying out the invention in one form thereof, a switch assembly is supported in the cabinet and is responsive to both gyrations of the tub beyond a predetermined limit and to movement of the door to its second position to de-energize the electrical circuit. The switch assembly includes a switch mechanism pivotally movable between a first and a second position, and having an actuator depressible to close the switch. A link extends between the actuator and the lid and is pivotable in response to movement of the lid to its first position to depress the actuator and to stress a first spring associated therewith. A latch is provided, normally in a first position restraining the switch mechanism in its first position and pivotally movable to a second position in response to gyrations of the tub beyond a predetermined limit for releasing the switch mechanism; the first spring thereupon causing the switch mechanism to pivot to its second position away from the link, freeing the actuator so that the switch will open. A second spring is connected between the switch mechanism and the latch is stressed upon movement of the switch mechanism to its second position. The second spring is effective upon release of the link by movement of the lid to its second position to return the switch mechanism and the latch to their first positions, thereby resetting the switch assembly.

Various objects and advantages from the invention will become evident from the detailed description of the presently preferred embodiment of the invention taken in conjunction with the drawings.

Brief description of the drawings

FIGURE 1 is a somewhat schematic side elevational view of a conventional washing machine utilizing the invention;

FIGURE 2 is a view taken along lines 2—2 of FIGURE 1 and showing the switch assembly of the invention in more detail;

FIGURE 3 is an end view of the switch assembly shown in FIGURE 2;

FIGURE 4 is a partial side elevational view of the machine of FIGURE 1 with the switch assembly illustrated in two operative conditions, the solid lines indicating the condition with the lid closed and the dash lines indicating the condition with the lid open;

FIGURE 5 is a partial side elevational view similar to FIGURE 4 but illustrating the positioning of the various elements of a switch assembly when the washer lid is closed and the washer tub is gyrating an amount greater than the predetermined limit; and

FIGURE 6 is a circuit diagram schematically showing a simplified control circuit for the machine of FIGURE 1, embodying the switch assembly as an essential control component thereof.

Description of the preferred embodiment

Turning now to FIGURE 1, there is shown a conventional clothes washing machine 10 of the well known agitator-wash and spin-extraction type. In such a machine there is an outer appearance cabinet indicated generally by the numeral 11, which encompasses a generally rectangular structure including an upper, generally horizontal cover wall 12. Within the upper wall 12 there is a lid 13 hinged at one side on the upper wall. The lid is pivotal about the hinge 14 from the horizontal, closed position of FIGURE 1 to an open position (not shown) allowing access to the machine interior.

Within the outer cabinet there is mounted an inner wall 15. Extending vertically within the cabinet and spaced from the wall 15 is a rotatable basket or tub 16 within

which fabrics such as articles of clothing (not shown) are washed and the water extracted therefrom by centrifuging. The tub 16 is made rotatable about a vertical axis and may include about the periphery of its open top an annular balance ring 17 of high density material. The tub is provided with a plurality of apertures 18 arranged in a row about the circumference of the tub and, during the extracting operation, the washing or rinsing liquid discharges through these apertures. Purely by way of illustration, the washing machine is illustrated as being of the vertical axis type, in which an agitator 20 is arranged to be oscillated by a conventional mechanism (not shown) within a transmission casing 21. Also by way of this conventional mechanism, the basket 16 is rotated at a relatively high speed to effect extraction of liquid from the tub. The drive mechanism is disposed within the machine compartment 22 below the tub 15. The base structure 24 at the bottom of the machinery compartment supports a structure 25 on a wrist action mechanism 26 which forms the base or pivot about which the mechanism and tub can gyrate during the extraction operation. This gyration is resisted by the damping effect of a relatively heavy coil spring 27 which is bottomed on the structure 25 and presses a disc 28 of friction material against the bottom wall of the container 15. Any suitable drive motor 29, carried by the structure 25 is arranged to power the washing and centrifuging operation through a suitable connection such as by the drive sheave 30 affixed to the motor shaft 31 and a belt 32 connecting the drive sheave with the driven sheave 33 of the mechanism within housing 21. It will be appreciated that these mechanisms and structures are well known in the art, and that this mechanism and structure forms no part of the present invention.

During the washing operation the clothing or other fabrics may become unevenly distributed within the tub, whereupon, when the tub is rotated at high speed to centrifugally extract the water, the tub may oscillate or gyrate about its mounting 26 beyond the capability of the balance ring 17 and spring 27 to exert a stabilizing influence, and it is expedient that the machine be either slowed down or stopped before excessive gyration can damage the structure. Further, if the lid 13 is open to inspect the machine interior, whether it be to view the cause of unbalance or for any other reason during the centrifuging operation, it again becomes desirable to slow down or stop the rotation of the tub.

The present invention embodies an improved switch arrangement which will control the power to the centrifuging drive motor by opening a switch in the power switch in the power circuit as the result of excessive gyration of the tub or of the opening of the lid, and, in each case, will prepare the assembly upon opening of the lid to restore the switch to its closed circuit condition upon subsequent closing of the lid.

Referring now to FIGURES 2-5 there is shown the details of such an improved switch arrangement for use with a machine such as that shown in FIGURE 1. The assembly includes a frame 35 which is fixedly attached to the stationary vertically disposed inner wall 15 of the machine and includes a pair of outwardly extending side walls 36 and 37. A bracket 38 is formed at its top with a pair of bent over, spaced apart ears 39 which are pivotally mounted around a pin 40. The pin spans the bracket 35 and is received in cooperating openings in the side walls 36 and 37. Thus the bracket is pivotally mounted on the frame for movement between the position shown in FIGURE 4 and the position shown in FIGURE 5. The bracket includes a first portion 41 which, in the position shown in FIGURES 2-4, extends across a slot or opening 42 in the upper portion of frame 35. The bracket also includes a second portion 43 disposed generally perpendicularly to the first portion 41 so as to extend outwardly from the wall 15 when the switch assembly is installed in the machine. A third portion 44 of the bracket extends generally outwardly and downwardly from the second portion 43.

A switch mechanism, generally indicated at 45, is fixedly attached to the second portion 43 of the bracket and includes a pair of terminals 46 and 47 by which the switch mechanism may be connected into an appropriate control circuit for the machine 10. The switch mechanism is of a type well known in the art, which includes an actuator 48 extending outwardly from the body of the switch mechanism toward the first portion 41 of the bracket. As is common in the art the actuator is spring loaded to its outward position, in which case a set of contacts within the switch (not shown) are open and is movable inwardly to close the contacts and complete a circuit from terminal 46 to terminal 47. With the fixed attachment of the switch mechanism to the second portion 43 of the bracket, the switch mechanism moves between a first position and a second position as the bracket moves between its first position shown in FIGURE 4 and its second position shown in FIGURE 5.

The first portion 41 of the bracket 38 defines a centrally disposed opening 49 to receive a link, generally indicated at 50, which extends between the switch actuator and the lid 13 of the machine. To this end the link includes a base member 51 which is mounted in the opening 49 and has a flange 52, which is larger than the opening so as to engage the first portion 41 of the bracket and thereby prevent the base from slipping through the opening 49 out of the assembly. The main portion of the body, which extends through the opening, is tapered in shape so that the link is freely pivotal within the opening about the engagement of the flange with the bracket. A rod 53 of suitable material is press fit into the base 51 and extends therefrom and supports a mounting block 54 at its inner end. A generally mushroom shaped pad 55 is mounted in the mounting block 54 by means of a threaded shaft 56 which extends from the pad and is engageable in a cooperating threaded opening in the mounting block. Thus the pad is vertically adjustable. The pad is disposed in alignment with a bumper 57 formed integrally with or attached to the lid 13 so that, as the lid is moved to its closed position, the bumper will engage the pad and deflect the link mechanism to the position shown in solid lines in FIGURE 4. When the lid is raised to its open position the bumper releases the pad and the link moves to the dash line position of FIGURE 4.

To this end the link is biased to the dash line position of FIGURE 4 by means of a wound spring 58 that is mounted around the switch actuator 48 and bears against the main body of the switch mechanism and against the base member of the link. This biasing action could be provided by means of a spring integral with the switch mechanism, however, the bias springs normally provided in switches are relatively weak and, as a matter of economics, it is better to provide a separate spring 58 than to alter the design of the switch mechanism. In order to protect the switch assembly from any deleterious effect of the atmosphere within the walls 15 a flexible seal member 59 is mounted on the upper portion of the wall 15 and closely surrounds the rod 53 of the link 50.

The side wall 37 of the frame 35 extends downwardly and outwardly of the main portion of the frame and a depending tang 60 is formed extending downwardly and outwardly of the body of the frame parallel to the side wall 37 and spaced therefrom. A latch 61 is mounted therebetween by means of a pivot bar 62 which extends between the side wall 37 and the tang 60 and is pivotally received in cooperating openings formed therein. The latch also includes a pair of angled, extending arms 63 and 64. The arm 63 extends generally downwardly from the frame 35 and is formed at its lower end with a finger 65 which is disposed to be engaged for moving the latch upon gyration of the tub beyond a predetermined limit (as will be explained in more detail below). The arm 64 extends generally upwardly and outwardly so as to pass through an opening 66 formed in the third portion 44 of the bracket 38. This arm 64 is provided with a first off-

set portion 67 to provide a bearing surface 68, which normally engages the bracket below the opening 66 to retain the bracket in the position shown in FIGURE 4. The arm 64 is further provided with a second offset portion 69, downwardly and outwardly of the offset portion 67, providing a second bearing surface 70 which prevents any possibility of the bracket overriding the arm 64 when the bracket is released. A spring 71 is mounted between a second bar 72, formed on the latch 61 to extend parallel to and spaced from the pivot bar 62, and a second tang 73, which depends from the second portion 43 of the bracket. This spring serves to bias the latch and bracket to the positions shown in FIGURE 4.

In order to move the latch against the biasing force of the spring 71 and release the bracket in response to gyrations of the tub 16 beyond a predetermined limit, a flexible button 74 is mounted in the wall 15 in a fluid tight relationship thereto and receives the finger 65. As illustrated in FIGURE 5, when gyrations of the tub 16 exceeds a predetermined limit, the balance ring 17 strikes the button 74, which in turn moves the finger 65 to rotate the latch 61 about its pivot bar 62. This moves the bearing surface 68 out of interfering relationship with the bracket and thus releases the bracket.

Considering particularly FIGURES 4 and 5 the various positions and relationships of the parts of the switch assembly will be described with reference to the various conditions of the machine 10. With the lid 13 open the link will be in the position shown in dash lines in FIGURE 4 so that the base member 51 of the link is not depressing the actuator 48 of the switch and is not stressing the spring 58 by compression. Since the actuator is free to be in its extended position the internal contacts of the switch mechanism 45 are open and they can prevent energization of any associated circuitry. The remaining portions of the switch assembly are generally as shown in FIGURE 4. When the lid 13 is moved to its closed position the bumper 57 will engage the pad 55 and cause the link to pivot about the engagement of the flange 52 with the bracket 38 to the position shown in solid line in FIGURE 4. This causes the base member 51 of the link to depress the actuator 48 of the switch and close the internal contacts of the switch mechanism. It also causes the spring 58 to be stressed. In its stressed condition the spring 58 biases the switch assembly and bracket to their second positions.

It is now possible to energize the machine through the switch mechanism and, assuming a normal operation with no excessive gyrations of the tub due to an unbalance condition, the contacts of the switch 45 will remain closed and the machine will proceed through the operation. After the conclusion of the operation, or at any time during the cycle of operation, if the lid 13 is opened the link will move back to the dash line position of FIGURE 4 and the contacts of switch mechanism 45 will open to prevent energization of the machine through the switch mechanism.

During normal operation of the machine the bearing surface 68 of latch 61 engages bracket 38 and prevents the bracket from moving. In any event of excessive gyration, the tub 16 will move to a position of the general character indicated in FIGURE 5 so that the balance ring 17 strikes the button 74 and moves it outwardly, thus moving the finger 65. This causes the latch 61 to pivot about the axis of the pivot bar 62, moving the latch arm 64 upwardly so that the bearing surface 68 becomes aligned with the opening 66 in the bracket. This allows the bracket to move. The force which had previously been stored in the spring 58 by the pivoting movement of the link 50 now causes the switch mechanism 45, and thus the bracket 38 to move with respect to the link, with the bracket pivoting about the mounting formed by the ears 39 and pin 40. In this regard it will be noted that this movement is accomplished because the spring 48 is constructed to be stronger than the spring

71. When the assembly has moved to this position (as shown in FIGURE 5) the actuator 48 is in its extended position so that the internal contacts of the switch are open to interrupt power to any circuit therethrough and the spring 71 has been stressed by tensioning it.

It is not necessary that the bracket remain in a tilted position as shown in FIGURE 5. When the tub moves away from the button 74 the assembly will remain in the position shown in FIGURE 5 because the spring 48 is holding the bracket in this position relative to the link, against the force of the spring 71, and the lid is holding the link in the position shown. When the operator returns to the machine and opens the lid the link becomes free to return to the position shown in dash lines in FIGURE 4. This removes the restraining force opposing the spring 71 and this spring causes both the bracket 38 and the latch 61 to rotate about their pivotal mountings and return the entire assembly to its original configuration. Thereafter when the lid is again closed the switch actuator 48 will be depressed to close the internal contacts of the switch so that the machine again may be energized through the switch mechanism. Thus, it will be seen that the switch assembly is responsive to both the opening of the lid of the machine and gyrations in the tub beyond a predetermined limit to de-energize the machine and that the act of opening the lid resets the switch assembly so that a subsequent closing will close the switch contacts without the necessity of any further action, such as the depression of a separate start button.

Referring now to FIGURE 6, there is shown, in schematic form, a simplified control circuit utilizing the switch assembly. There is shown leads L1 and L2 leading to a conventional source of electrical power. The circuit may be traced from lead L1 through the drive motor 29 and through the switch mechanism 46 and then to conventional control equipment shown in a rectangle 75, representing any conventional washing machine control such as a timer operated cam network or the like. From the equipment 75 the circuit is completed to lead L2. In the form shown in full line, the switch mechanism 46 is in series with the drive motor and control equipment and would open the circuit to the motor and control equipment on any raising of the lid or striking of the button 74, whether this occurred during agitation or centrifugal extraction. By including the auxiliary circuit shown in dotted lines at 76, which auxiliary circuit would be placed in the main circuit during agitation but not during centrifugal extraction, the switch mechanism 46 can be placed in control of the machine during spin or centrifugal extraction only so that the operator may, if desired, open the lid during agitation for any purpose such as adding detergent bleaches, etc. However, during the centrifugal extraction or spin cycle any opening of the lid or excessive gyration of the tub would cause the machine to be de-energized.

The foregoing is the description of illustrative embodiments of the invention and it is applicant's intention to cover all forms which fall within the scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. For use in a washing machine having an outer cabinet enclosing operative structure including a tub subject to gyrations during operation of the machine, a lid movable between a first position blocking access to the tub and a second position allowing access to the tub and an electrical circuit for providing power to the operative structure; a switch assembly supported in the cabinet and responsive both to gyrations of the tub beyond a predetermined limit and to movement of the lid to its second position to de-energize the electrical circuit;

(a) said switch assembly including a switch mechanism pivotally movable between a first and a second position, and having an actuator depressible to close said switch;

- (b) a first spring effective, when stressed, to bias said assembly toward its second position;
- (c) a link extending between said actuator and the lid and pivotable in response to movement of the lid to its first position to depress said actuator and to stress said first spring;
- (d) a latch normally in a first position restraining said switch mechanism in its first position and pivotably movable to a second position releasing said switch mechanism in response to gyrations of the tub beyond a predetermined limit, said first spring thereupon causing said switch mechanism to pivot to its second position away from said link, freeing said actuator to open said switch; and
- (e) a second spring connected between said switch mechanism and said latch to be stressed upon movement of said switch mechanism to its second position and effective upon movement of the lid to its second position to return said switch mechanism and said latch to their first positions, thereby resetting said switch assembly.
2. The invention as set forth in claim 1; wherein said first spring is mounted around said actuator, between said link and said switch assembly, and is compressed by said link upon movement of said lid to its first position.
3. The invention as set forth in claim 1; further including a pivotally mounted bracket, said switch mechanism being fixedly attached to said bracket so that the first and second positions of said switch mechanism correspond to first and second positions of said bracket; said bracket defining an opening therein in alignment with said actuator; said link extending through said opening and engaging an adjacent portion of said bracket for free pivotal movement thereabout.
4. The invention as set forth in claim 3; wherein said switch assembly includes a stationary support frame;

said bracket being pivotally mounted on said frame so that said first spring causes said bracket to pivot about its mounting on said frame and thus move with respect to said link to free said actuator in response to gyrations of the tub beyond the predetermined limit.

5. The invention as set forth in claim 4; wherein said latch is pivotally mounted on said frame; said latch including a first arm disposed to be moved and thus move said latch to its second position in response to gyrations of the tub beyond the predetermined limit; said latch also including a second arm engaging said bracket to restrain said bracket and said switch in their first position, said second arm releasing said bracket upon pivotal movement of said latch in response to gyrations of the tub beyond the predetermined limit.

6. The invention as set forth in claim 5 further comprising a button disposed so as to be engaged by said tub when said tub gyrates beyond the predetermined limit and wherein said first arm has a finger extending therefrom and received within said button whereby movement of said button, upon engagement by said tub, causes movement of said first arm.

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MARK M. NEWMAN, Primary Examiner

A. D. HERRMANN, Assistant Examiner

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