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Baker

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[54] **LID LATCH OFF-BALANCE SWITCH**

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[52] **U.S. Cl.** .....**68/12 R**, 68/23.3

[51] **Int. Cl.**.....**D06f 33/02**, D06f 37/24, D06f 37/42

[58] **Field of Search** .....68/12 R, 23, 23.3; 210/144

[56] **References Cited**

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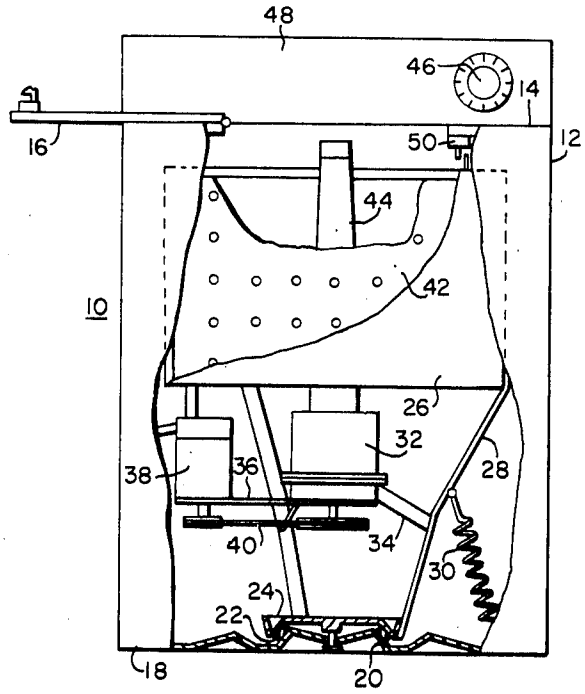
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[57] **ABSTRACT**

The invention provides an unbalance switch for a centrifugal extraction washing machine which deenergizes the machine when sufficient unbalance occurs to cause undesirable gyrations. The switch is associated with a lid latch which prevents the user from merely opening the machine to redistribute the load and first requires shutting off the main switch and moving the timer out of the spin extraction mode before the lid can be opened and the load accessible.

7 Claims, 4 Drawing Figures



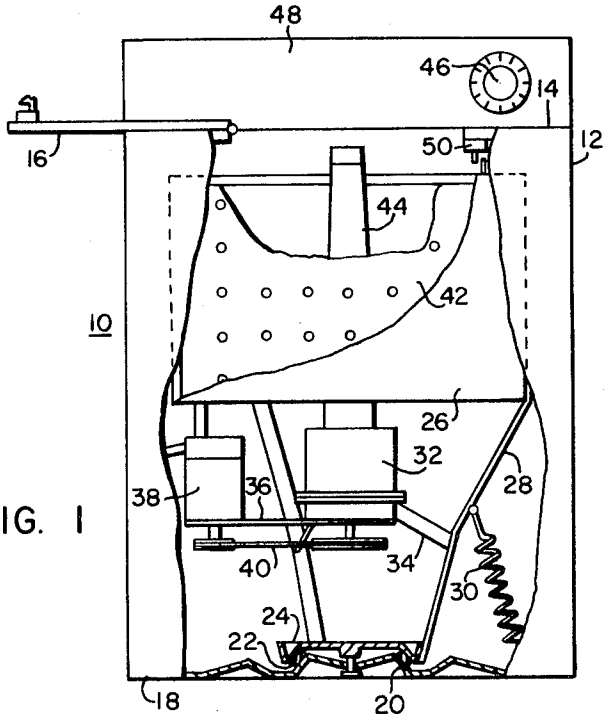


FIG. 1

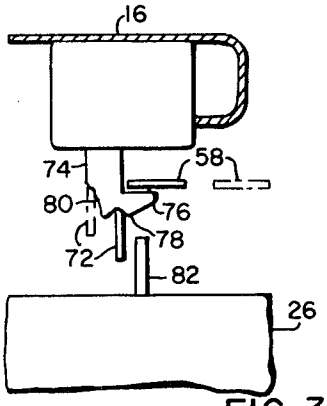


FIG. 3

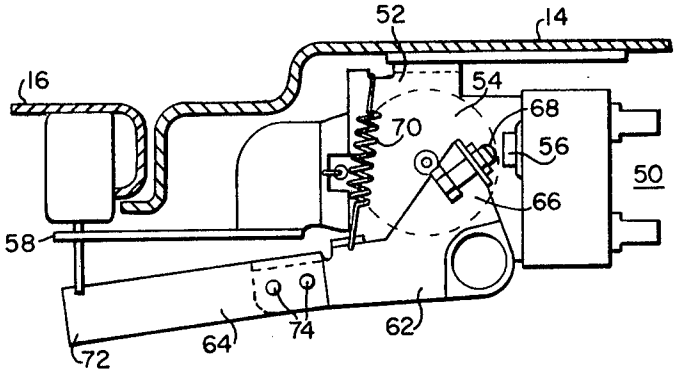


FIG. 2

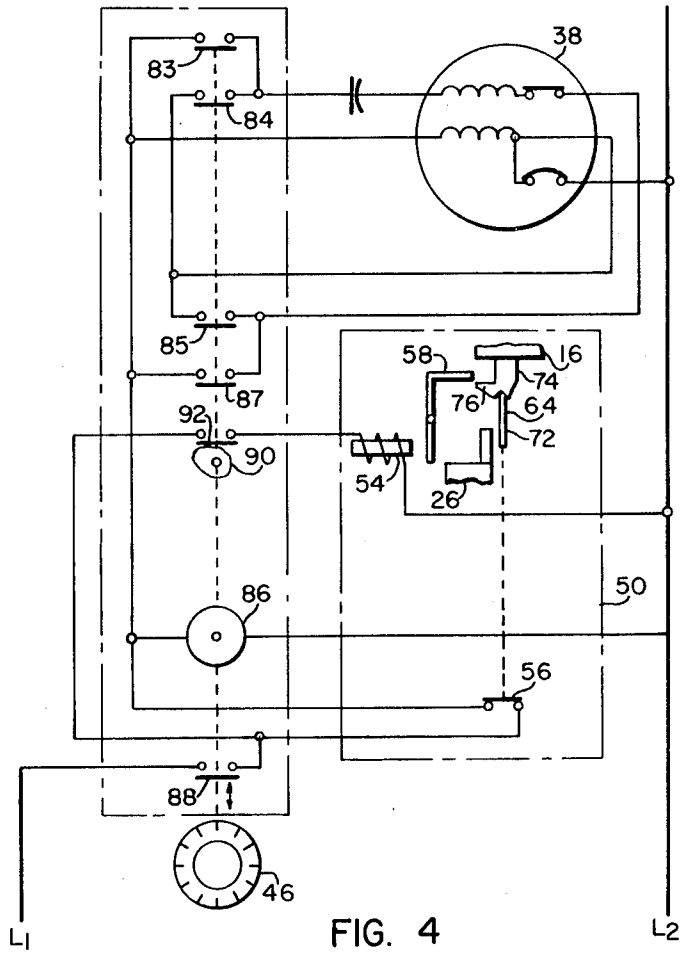


FIG. 4

LID LATCH OFF-BALANCE SWITCH

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a safety switch and latch mechanism for laundry apparatus and more particularly to a lid actuatable switch which is also responsive to an off-balance condition in the apparatus.

It is generally well known that the clothes containing tub of center-post agitator washers having a centrifugal water extraction cycle has a definite tendency to gyrate during the high speed spin because of inherent uneven distribution of the clothes therein. If the distribution is such that too great an unbalance occurs the gyrations become quite violent causing the tub and its interior supporting structure to knock against the cabinet housing the tub and to also cause extreme vibrations which otherwise damage the apparatus.

2. Description of the Prior Art

Unbalance switches for centrifugally extracting washing apparatus are well known in the art and are primarily designed to open the circuit controlling the apparatus so it is deenergized providing the user an opportunity to open the lid to the machine and redistribute the clothes.

It has previously been proposed to combine an off-balance switch with a lid switch which will open the circuit during excess gyration of the clothes containing tub and also as a result of manually opening the lid (see, for example, D. E. Stelli U.S. Pat. No. 3,145,818). However, such devices only require the switch to be reset to the position it would assume when the lid is closed to reenergize the apparatus, thus permitting accidental deenergization if the switch is bumped or placed in such position as by clothes falling thereon. And, as redistributing the clothes requires the user's hands and arms to be in the clothes containing tub, such accidental reenergization could lead to injury.

SUMMARY OF THE INVENTION

The present invention is embodied in a lever arm, pivotally mounted adjacent the access opening, for movement in a vertical direction to control a switch associated therewith in response to the lid position such that with the lid closed, the lever is depressed by an abutment member on the lid, closing the switch to permit actuation of the machine. The lever arm includes a spring metal portion which provides rigidity in the vertical direction but flexure in the horizontal direction so that a striker, responsive to the gyrations caused by unbalance, can contact the lever arm and flex it sufficiently to disengage it from the abutment member on the lid, which in turn permits the lever to pivot and deactuate the machine.

A lid latch is also associated with the switch to prevent opening the lid to redistribute the clothes until the timer, controlling the sequence of operation, has been moved to a mode of operation other than the spin extraction cycle.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a front elevational view partially broken away of a clothes washing machine;

FIG. 2 is an enlarged side elevation view of a latch and switch mechanism constructed in accordance with this invention;

FIG. 3 is a front elevation view of the latch and switch mechanism of FIG. 2; and

FIG. 4 is a partially diagrammatic and partially schematic diagram illustrating the electrical aspects of the switch.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, there is shown a conventional centerpost agitator clothes washing machine **10** of well known construction generally having a completely automatic cycle, including agitation during wash and rinse portions and appropriately timed centrifugal extraction during drain portions. Typically there is an outer cabinet housing **12** of generally cubical configuration having a top wall **14** defining an access opening to the interior and a lid **16** hinged at one side to the top wall for movement between an open and closed position therewith.

The housing has a bottom wall **18** providing a planar portion generally containing adjustable legs (not shown) for resting on the floor and a centrally disposed globular support surface **20** formed therein. A mating globular bearing surface **24** is disposed adjacent support surface **20** and separated therefrom by a latitudinal strip of friction material **22.**

The housing contains two concentrically disposed tubs comprising an outer non-rotatable tub **26** supported for pivotal movement within the housing as by struts **28** (there being preferably three) extending from the base of the tub, generally at its periphery, to the globular bearing surface **24.** Coil tension springs **30** are connected from the struts to the base to yieldingly restrain the tub in its centered upright position yet permit pivotal movement thereof by the bearing surface **24** moving on the support surface **20.**

A transmission **32,** also of well known construction, is axially mounted on the bottom of tub **26** and braced against lateral movement as by webs **34** extending from the transmission housing to the struts **28.** A support plate **36** is also attached to the transmission housing to support a well known reversible motor and pump assembly **38** with the motor drivingly engaging the transmission through a drive belt **40.**

Two concentric drive shafts (not shown) extend from the transmission **32** axially into the outer tub **26** with the outermost shaft drivingly connected to a perforated concentrically disposed rotatable clothes receiving tub **42.** The inner shaft is drivingly connected to the center post agitator **44** situated within rotatable tub **42.**

The operation of the apparatus through a complete washing cycle is controlled by a timer (shown schematically in FIG. **4**), which is manually activiated by a control knob **46** mounted on a back splasher panel **48** secured to the top wall of the machine. This operation includes an oscillating motion of the agitator whenever the motor is driven in one direction during the wash and rinse portion of the cycle and a high speed spin of the inner tub **42** whenever the motor is driven in the opposite direction during the water extraction portion of the cycle. During this latter portion the water is centrifugally extracted from the clothes in the inner perforated tub and collected in the non-rotatable outer tub **26** and pumped therefrom to a drain.

It is during this centrifugal extraction that any unbalanced distribution of the clothes in the inner tub causes gyrations. If there is only a slight unbalance, the gyra-

tory motion of the outer tub can be absorbed by the frictional material 24 and the springs 30 without transmitting it to the outer cabinet; however, if sufficient unbalance is present the gyrations become quite violent permitting the outer tub to strike the cabinet and also causing damaging vibrations throughout the machine.

To alleviate the damage caused by such violent gyrations it has been common practice to include an unbalance switch in the machine circuitry which can move to an off position upon the gyrating structure bumping it.

In addition to producing excessive vibration and gyrations whenever sufficient unbalance occurred, the spin portion of the cycle is also the most dangerous as the spinning motion can cause injury if the user should attempt to redistribute the clothes while the machine is running or if the motor can be accidentally energized while the user is redistributing the clothes during a period of deenergization. For this reason, it is also common to provide a lid latch that is actuated by the timer, whenever it reaches a spin portion of its cycle, and will thereupon prevent the lid from being opened unless the main power source is moved to an off position and the timer moved to a portion at the washing cycle other than spin.

The present invention, shown schematically by numeral 50 in FIG. 1 and more specifically in FIGS. 2 and 3 can function as both a lid latch and unbalance switch. In this embodiment the door is automatically latched during the spin sequence as is known in the art; however, if an unbalance occurs, sufficient to bump the switch off, the access door still cannot be opened until the main switch is deenergized, and the timer moved to another position so that even if the unbalance switch should accidentally be depressed or moved to an on position while the clothes are being redistributed the machine cannot start.

The switch and latch 50 of the present invention is similar to a well known door latch switch disclosed in U.S. Pat. No. 3,272,935 and generally comprises a support frame 52 having means for mounting the switch adjacent the door and generally supporting a coil and core assembly 54 and an electric switch 56 of well known structure having a spring biased plunger normally held in the "on" position.

The switch and latch 50 includes two lever arms 58 and 62 pivotally mounted on the support frame. Lever arm 58 is pivotally mounted for generally horizontal movement between two operative positions, shown in solid and broken lines in FIG. 3, as controlled by a spring (not shown) connected between the lever arm 58 and the support frame 52, and the coil and core assembly 54 which is disposed adjacent one end of lever arm 58 (See FIG. 4). The spring normally maintains the lever arm 58 in the position shown by broken lines in FIG. 3 but upon energization of the coil and core assembly as discussed below, lever arm 58 is moved to the solid line position.

The other lever arm 62, in the form of a bell crank lever, is pivotally mounted on the support frame 52 for generally vertical movement between two operative positions. One leg 64 of the lever arm 62 extend horizontally to a position generally within or close to the access opening whereas the other leg 66 of the lever arm extends to a position generally adjacent electric switch 56. An adjustable abutment member 68 is attached to leg 66 and a spring 70 is connected between the lever arm 62 and support frame 52 to normally bias the arm to a position where abutment member 68 contacts the plunger of electric switch 56 and depresses it, against the bias of its own spring, to an "off" position.

That portion of leg 64 which extends to a position adjacent the access opening comprises a strip of spring metal 72, which can be attached as by rivets 74, or made an integral part of lever 62, so disposed as to permit flexure in the horizontal plane and rigidity in the vertical plane, for purposes to be discussed, and accomplished by a relatively thin horizontal dimension and a relatively wide vertical dimension.

The lid 16 has a catch and abutment member 74 attached to its underside (i.e., when in the closed position) generally adjacent the periphery and so disposed that in the lid closed position member 74 will normally contact and depress leg 64. Abutment member 74 is generally in the shape of a hook having a horizontally extending latching surface 76. The bottom of member 74, being that portion which normally contacts leg 64, is notched out as at 78 to receive the edge of strip 72. The contour of notch 78 is generally rounded to provide a relatively smooth camming surface. Terminating on the side opposite the latching surface is an escapement notch 80. (See FIG. 3)

A strike member 82 is attached generally to the top of the non-rotatable outer tub 26 and so disposed thereon that it can contact strip 72 when the unbalance load causes the maximum permitted pivotal movement or gyrations of tub26 about globular surface 20.

Referring now to FIG. 4, the operation of the switch 50 will be explained in conjunction with the controlled energization of the machine through the schematic wiring diagram. As is there seen, the main motor 38 is energized through lines L_1 and L_2 commonly connected to a source of house power (not shown). The operation of the motor is controlled through various cam controlled switches such as 83, 84, 85 and 87. The cams (not shown) which determine the position of the switches 83, 84, 85 and 87 are driven by a timer motor 86 which is also coupled to the control knob 46, as is well known in the art to permit manual adjustment.

To initiate operation of the machine it is seen that the electric switch 56 must be closed. As previously explained, this switch is closed by closing the door and depressing leg 64 of lever arm 62 by abutment member 74. Also, the main switch 88, associated with the control knob 46, must be closed as by pushing the control knob axially inwardly. Thereupon, in this abbreviated wiring diagram, the main motor is energized to run in a direction as controlled by the aforementioned switches 83, 84 and 85.

In this preferred form of the invention, timer motor 86 also controls a latch cam 90 associated with a latch switch 92 which controls energization of the coil and core assembly 54. The cam 90 is designed such that switch 92 is closed during the spin operation of the machine and for approximately one minute afterwards. As previously explained, energization of coil and core assembly pivots lever arm 58 to place it in latching position over the latching surface 76 of abutment member 74 holding the lid closed.

If an unbalance condition exists such that the outer tub 26 moves sufficiently for strike member 82 to bump the spring metal arm 72 of leg 64 and disengage it from notch 78, which is easily permitted by the rounded contour of notch 78, and displaces it to the escapement

notch **80**, (shown in dotted line in FIG. 3), the vertical upward movement of leg **64** as biased by spring **70** is sufficient to open electric switch **56** and the operation is stopped. However, because the cam **90** is maintaining switch **90** closed, the coil and core assembly remain energized across lines L_1 and L_2 and the lid remains safely latched in the closed position.

The user, before being able to open the lid to redistribute the clothes, must first pull the control knob **46** to open main switch **88** and then manually advance the control knob, and thereby the latch cam **90**, to a position corresponding to at least one minute after spin, whereupon cam **90** permits switch **92** to open, deenergizing coil and core assembly **54** and releasing lever arm **58** from its latching position.

Thus with the user required to disengage the main switch **88** to the motor prior to being able to open the lid there is no danger that once the lid is opened the main motor could accidentally be energized in the spin portion of the cycle by accidentally closing electric switch **56**.

To renew the cycle once the clothes have been redistributed, the user merely has to close the lid, thereby again closing switch **56** (the spring strip naturally returning to proper position for abutment with member **76**), manually advance the control to the proper spin sequence, and again push the control knob to close main switch **88** whereupon the lid is again latched and the machine is again operating normally.

I claim as my invention:

1. In a washing machine having an outer housing enclosing a rotatable tub operative for centrifugally extracting water from clothes therein and support structure for said tub subject to gyrations caused by an unbalanced clothes distribution within said tub, a lid hingedly mounted on said housing for movement between a first position allowing access to said tub and a second position blocking access to said tub, an electrical circuit for providing power to the operative structure and including a timer for controlling the mode of operation of said structure, and further including a switch assembly supported in said housing and responsive both to gyrations of the support beyond a predetermined limit and to movement of the lid from its second position to deenergize the electrical circuit, said switch assembly including:

a. switch means operative between a circuit energization position and a circuit deenergization position;

b. an arm mounted for movement between a first position permitting said switch means to assume said circuit deenergization position and a second position placing said switch means in said circuit energization position, said arm including a portion which is flexible in a plane generally transverse to said movement between said first and second positions;

c. means normally biasing said arm to said first position;

d. abutment means mounted on said lid for contacting said arm and moving said arm from said first position to said second position in response to said door moving to its second position;

e. means movable in accordance with a predetermined degree of tub gyration to flex said arm sufficiently to release it from said abutment means and permit said biasing means to return said arm to said first position and deenergize the machine.

2. The structure of claim **1** wherein said arm is mounted for pivotal movement relative to said switch means and is relatively rigid in the plane of its pivotal movement.

3. The structure of claim **1** wherein at least a portion of said arm comprises a sheet of spring material having a relatively thin dimension in said direction of flexure and a relatively large dimension in said plane of pivotal movement.

4. The structure of claim **1** including latch means associated with said switch means and comprising:

a. a lever pivotally mounted for movement between a latching position and a free position;

b. means projecting from said abutment means to interfere with said lever when in said latching position; and

c. means for moving said lever from said free position to said latching position as controlled by said timer, whereby said lid is latched in said closed position whenever said lever is in latching position and said lid is closed.

5. The structure of claim **4** wherein said means for moving said lever is electrically actuated through said electrical circuit independent of the position of said switch means.

6. The structure of claim **5** wherein said arm is relatively rigid in the plane of movement between said first and second positions.

7. The structure of claim **6** wherein at least a portion of said arm comprises a sheet of spring material having a relatively thin dimension in said plane of flexibility and a relatively large dimension in said plane of movement between said first and second positions.

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