Aug. 25, 1964 D. E. STELLI 3,145,818

SWITCH MECHANISM

Filed June 27, 1961 3 Sheets-Sheet 1

FIG. 1

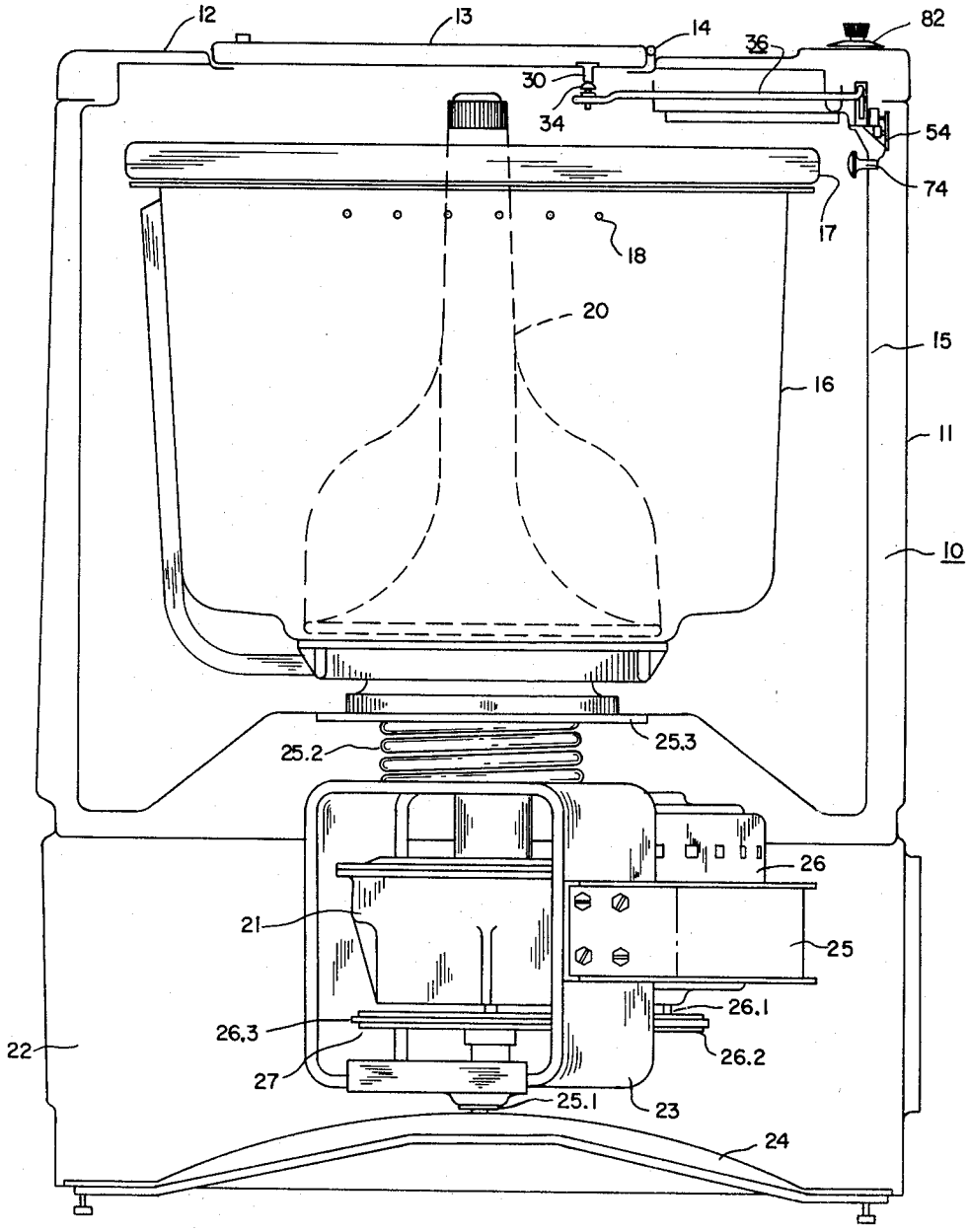

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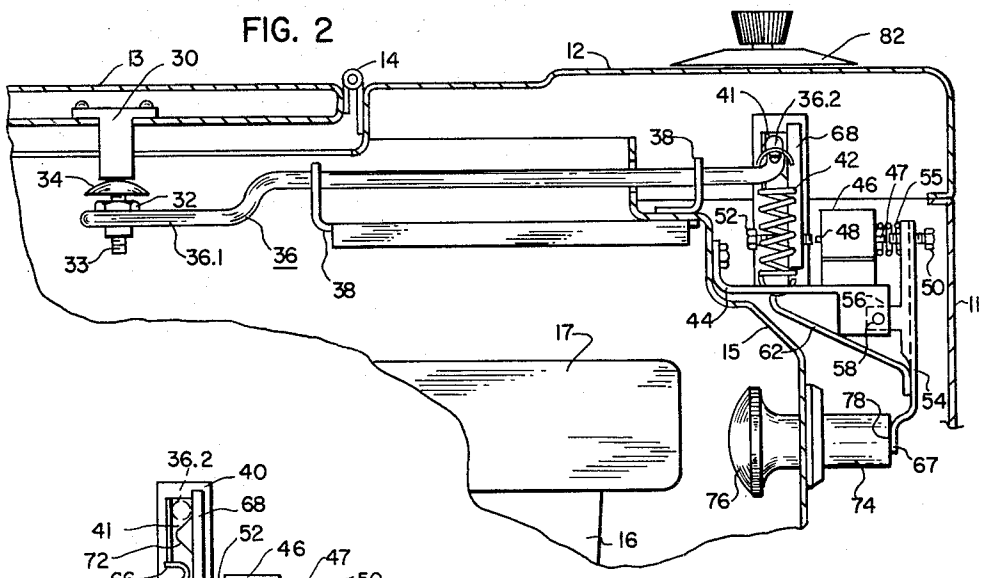
FIG. 2



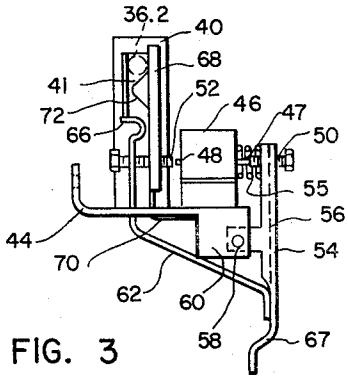


FIG. 3

FIG. 4

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FIG. 5

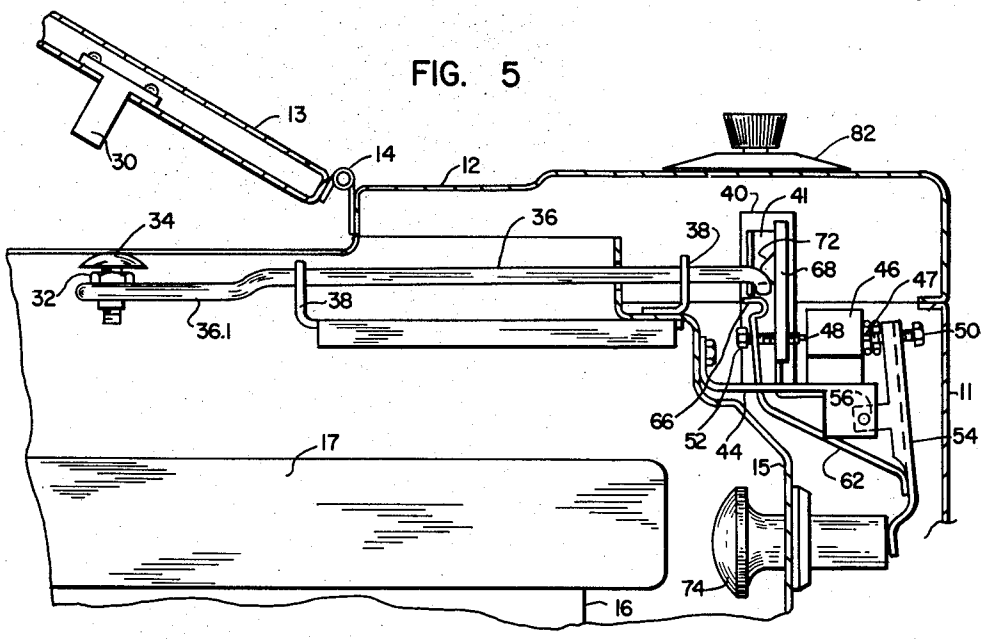


FIG. 6

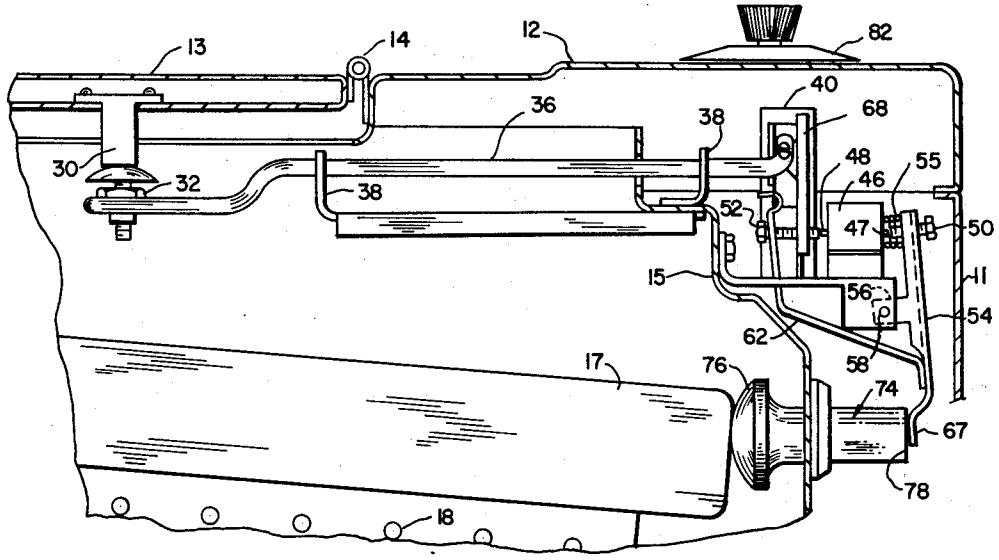
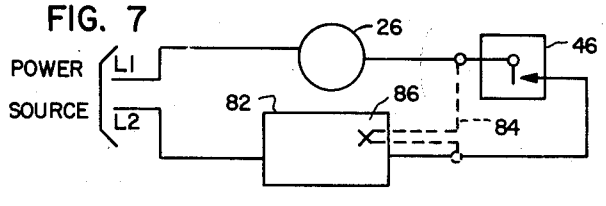


FIG. 7



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SWITCH MECHANISM

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3 Claims. (Cl. 192—136)

The present invention relates to control mechanisms and more particularly to those for controlling the operation of a centrifugal extractor or the like.

It is generally well-known that centrifugal extractors exhibit a tendency to oscillate or vibrate excessively when the articles being centrifuged become unbalanced. This excess vibration frequently causes the rotating body to strike and damage the surrounding structure. To alleviate this difficulty, various forms of unbalance sensing or limit switches have been used to slow down or completely stop the centrifuge. In the usual situation once the unbalance has been sensed and reacted to, the machine operator opens the lid, manually rearranges the articles, and resets the machine for further operation of the centrifuge. It is customary to provide centrifugal extractors with a lid which is closed during the operation of the extractor and to provide a "lid switch" in the extractor power supply; whereby opening the lid will deenergize the drive motor of the apparatus. It has been proposed, in Smith et al. 2,612,766, for example, to combine an unbalance sensing switch with a lid switch, thus providing a mechanism which will open a control circuit on the occurrence of excess vibration, and also open the circuit as a result of manually opening the lid. An advantage of this arrangement is that the circuit will automatically restore on closure of the lid; that is, there are no resetting buttons or the like which the operator must actuate in order to resume operation. It is an improved form of this type of mechanism to which this invention is directed.

It is an object of the present invention to provide as an extractor control mechanism, a single double-acting switch which assumes one control condition in response either to opening of the machine lid or to another predetermined condition, and which can be reset to another control condition by the simple act of opening and closing the lid.

It is a further object of the invention to provide a switch actuating mechanism which actuates a switch device to a first circuit controlling position on the occurrence of either of two predetermined, mechanically unrelated, conditions, and which actuates the switch to an opposite circuit controlling position by duplication of one of said conditions.

It is a still further object of the invention to provide a lid-equipped centrifuging apparatus with a switch mechanism which is spring biased to pivot in a direction to open a switch in a control circuit on opening of the machine lid, or in the circumstance of excessive vibration of the centrifuge during operation. To restore the switch in either instance, the lid is raised and then reclosed, during which operation the mechanism will pivot in a direction effective to reclose the switch.

Other objects, features and advantages of the present invention will become apparent from the detailed description of the presently preferred embodiment of the invention taken in conjunction with the drawings of which:

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

FIG. 2 is a partial side sectional view of the machine of FIG. 1 with the mechanism in the operative condition;

FIG. 3 is a side elevational view of the switch assembly of FIG. 1 enlarged to show the structure in greater detail;

FIG. 4 is a fragmentary top plan view of the machine

of FIG. 1, with portions of covering structure removed to reveal underlying parts;

FIG. 5 is a partial view of the machine of FIG. 1 showing the operation of the mechanism with the lid in open position;

FIG. 6 is a partial section as FIGS. 1 and 3 showing the operation of the mechanism resulting from an excessive gyration of the extractor; and

FIG. 7 is a simplified diagram showing schematically the circuit embodying the switch mechanism as an essential control component.

Turning now to FIG. 1 there can be seen the conventional clothes washing machine **10** of the generally known agitator-wash and spin-extract type. In such a machine there is an outer appearance cabinet indicated generally by the numeral **11** and encompassing a generally rectangular structure including an upper generally horizontal cover wall **12**. Within upper wall **12** there is a lid **13** hinged at one side to the upper wall. The lid is pivotal about the hinge **14** from the horizontal closed position of FIG. 1, through an infinite series of partially open positions (i.e., FIG. 5) to a fully open position (not shown) allowing access to the machine interior.

Within the outer cabinet there is mounted an inner tub wall shown partially as **15** extending vertically within the cabinet and spaced from the tub wall a rotating basket **16** within which the articles of clothing (not shown) are washed and the water extracted therefrom by centrifuging. Basket **16** is therefore made rotatable on a vertical axis and may include about the periphery of its open top, an annular balance ring **17** of high density material. The basket 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 agitate type, in which the agitator **20** is arranged to be oscillated by conventional mechanism (not shown) within a transmission casing **21**. Also by way of said conventional mechanism, the basket **16** is rotated at a relatively high speed to effect the extraction of liquid as above noted. The drive mechanism is disposed within the machinery compartment **22** below the tub **15**; the base structure **24** at the bottom of said compartment supports structure **25** on a wrist-action mechanism **25.1** 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 **25.2**, which is bottomed on the structure **25** and presses a disk **25.3** of friction material against the bottom wall of the tub. Any suitable drive motor **26**, carried by the structure **25** is arranged to power the washing and centrifuging operations, as by the drive sheave **26.2** affixed to the motor shaft **26.1** and the belt **26.3** connecting said drive sheave with the driven sheave **27** of the mechanism within housing **21**. It will be appreciated that these mechanisms and structures are well known in the art, and that the mechanisms and structures form no part of the present invention.

During the washing operation the clothing may become unevenly distributed about the basket, whereupon when the basket is rotated at a high speed to centrifugally extract the water, the basket may oscillate or wobble about its mounting **25.1** beyond the capability of the balance ring and spring **25.2** 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 opened 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 imperative to slow down or

stop the rotation of the basket to ensure safety of the operator.

The present invention embodies mechanism which will control the power to the centrifuging drive motor (purely by way of example, the mechanism will open a switch in the power circuit) as a result of excessive gyration or of opening the lid; and it is a feature of the invention that opening the lid will in each case prepare the switch to restore to closed circuit condition, and closing the lid will actuate the switch to reenergize the power circuit.

Depending from the lid into the machine interior is a bumper **30** which actuates this lid control function. The bumper preferably is of resilient material and is positioned directly above (in the closed position) a rigid actuator member **32**. The actuator member as shown is mushroom shaped to provide a comparatively large contact surface **34** adjacent bumper **30**, and is mounted on or integral with a threaded shank **33** to afford vertical adjustability. This actuator **32** is mounted on and extends upwardly of a lever **36** which may be formed from stainless steel rod. Lever **36** is arranged substantially below the lid and the casing cover **12**, horizontally positioned, and extends from its one end **36.1** to which the actuator is mounted, through a dual bearing **38** fixed to the structure as shown. It follows an approximately 90° bend in the horizontal plane to terminate at an end **36.2** in an area comparatively remote from the basket and its contents. As shown, the end of the rod is in a location which is protected by the wall **15** of the tub, from water which overflows the basket during centrifuging. Adjacent its remote end **36.2**, the lever is constrained to vertical motion by a slide guide **40** which comprises a stationary bar having a vertically extending slot **41**. The width of the slot is sufficient to receive lever **36** and its height allows a restricted amount of motion vertically. Inwardly of this constraint, the end **36.2** is normally biased downwardly by tension spring **42** which circles the rod at its upper loop and is anchored to stationary platform **44** at its lower end. (The showing of spring **42** has been omitted in FIGS. 5 and 6 to show with greater clarity the elements of the switch assembly structure.)

Stationary platform **44** is mounted to the tub wall **15** to extend horizontally outwardly of the tub wall within the outer cabinet enclosure in the section just below top wall **12**. This platform also serves as the mounting for previously mentioned slide guide **40**. In addition, there is mounted to the platform a switch mechanism **46** (FIG. 2) which comprises a bistable snap action switch. This switch is a generally known type which could be called a mechanical flip-flop and has respective actuating buttons **47** and **48** at two opposed sides. Depression of button **47** opens the switch internal circuit and depression of button **48** closes the internal circuit. The switch once actuated to either condition remains in that condition until the opposing button is actuated to reverse the switch condition. Positioned adjacent each button is a switch actuating plunger in the form of an adjustable screw. At "Off" button **47** there is positioned a plunger screw **50** and adjacent "On" button **48** there is positioned an actuating screw or plunger **52**.

Screw **50** actuates the button **47** as the result of excessive gyration or the opening of the lid **13**. This is accomplished by mounting the screw on an Off-lever mechanism seen best in FIG. 3. This mechanism includes a vertically extending rigid carrier member **54** mounted for rotation relative to the fixed switch **46**, as by pivot arms **56** carried by the pivot rod **58** extending through depending structure **60** of the platform **44**. Circumposed about the plunger portion of screw **50** is a compression spring **55** which is constrained between carrier **54** and the adjacent wall of the switch **46** to rotate the carrier clockwise of FIG. 1 and remove the end of the screw from the button **47**. Secured to and extending from the lower section of carrier member **54** is a resilient striker **62**. Striker **62** is angled upwardly from the carrier member to reach under, and then extend vertically upwardly through an opening **64** in the platform **44**. The striker terminates in a recurved section **66** positioned normally in alignment with slot **41** in slide guide **40** and with the lever end **36.2**. With this form of construction, the off button may be depressed by either of two actions, (1) movement to the right of the stepped lower end **67** of carrier **54** as indicated in FIG. 5 or (2) by depression of recurved section **66** resulting from the engagement thereby of the lever operating end **36.2** as said end moves downwardly.

For operating the On button **48**, the horizontally disposed actuator screw **52** is secured to the rigid vertical bracket **68**. The lower end of the bracket is mounted on the stationary platform by a resilient cantilever spring **70**, which permits the bracket to move forward or away from the button **48**, but normally establishes the bracket in a position substantially parallel to the right hand edge of slot **41**, as viewed in FIG. 2. Protruding from the side of bracket **68** away from the switch is an emboss **72** which extends above recurved section **66** in the area traversable by lever end **36.2**. In this way, the On button may be depressed by movement of the lever in either direction past emboss **72**, thereby striking the emboss and deflecting the bracket and its screw **52** toward switch mechanism **46**.

For actuating the switch by excess vibration of the basket, while seating the tub against water leakage, I use a resilient bumper mechanism **74** extending through tub wall **15**. Resilient integral mounting flanges fit against the tub wall in watertight engagement. The enlarged knob **76** of the bumper is thus positioned to lie adjacent the basket balance ring **17**, sufficiently spaced therefrom to be out of the path of basket gyration during a normal centrifuging operation. The opposite end **78** of the bumper forms a stop against which the lower stepped end **67** of carrier **54** is urged by the spring **55**. In this normal position of the bumper and the carrier **54**, the screw **50** is withdrawn from the Off button **47**. However, the bumper is arranged and positioned to be deflected outwardly on excess vibration of the wash basket resulting from an unbalance condition during centrifuging. This deflection of the bumper will drive the carrier **54** into counterclockwise rotation to actuate the Off button **47**, as presently explained.

Now considering operation of the mechanism, it will be assumed as a starting condition that the lid is in the open position of FIG. 5 and the switch mechanism **46** is now in its open circuit or off condition. (It will be shown subsequently that opening the lid will actuate the switch mechanism to the off condition.) Assuming, further, that the user has the washing machine ready for operation and has set the time switch or control mechanism **82** to accomplish the desired washing cycle, the lid is then moved to the closed position of FIG. 2. As the lid closes, bumper **30** contacts the adjacent top surface **34** of actuator **32** and depresses the actuator, rotating the lever **36** within the dual bearing **38**. The operating end **36.2** of the lever is thus driven upwardly against the bias of tension spring **42**. This movement brushes the end **36.2** past emboss **72** moving bracket **68** toward switch mechanism **46**. Due to this bracket movement, actuate screw **52** is driven toward the switch to strike On button **48** thereby actuating the switch to its closed circuit condition, to complete the power circuit to the drive motor **80** through the obvious circuit of FIG. 7.

The machine proceeds through its operating cycle until the mechanism **82** sets up the conditions for centrifuging the water from the basket and clothes. This mechanism is old and well-known in the art and description thereof is unnecessary. If the clothes had worked themselves into an eccentric distribution during the washing operation, the rapid spinning of the basket during centrifuging (usually about 500 r.p.m.) will cause the basket to gyrate excessively, and the ring **17** will strike and deflect bumper **74**. Deflection of the bumper moves its end **78** to rotate the carrier **54** into counterclockwise rotation, driving actu-

ator screw **50** against Off button **47**, which snaps the switch to the open circuit condition. The motor **26** will, of course, come to a stop, and the snubbing and centering spring 25.2 of the washing machine will bring the basket to a sufficiently vertical position to permit bumper **74** to restore and remove the striking pressure against lower stepped end **67** of carrier **54**. However, switch **46**, being bi-stable, remains open. Spring **55** is a light spring which does not impede the operation of carrier **54** but is sufficient to return the carrier to normal on release of the pressure of the bumper on the carrier lower end.

To restore the machine to operation, the operator will usually lift the lid and rearrange the articles within the basket. When the lid is raised, lid bumper **30** releases its downward pressure on actuator **32**, whereupon operation end **36.2** is pulled down by the action of bias spring **42**, which is under tension when the lid is closed. As the lever end **36.2** moves downwardly in slide guide slot **41**, the lever traverses emboss **72**. This has the momentary effect of driving bracket **68** and its screw **52** to the right of FIG. 3, to reclose the switch **46**; but the lever end **36.2** continues downwardly under the effect of the tension spring and finally contacts recurved section **66** impelling the striker arm **62** downwardly. Carrier **54** is rotated counterclockwise driving its actuating screw against Off button **47** shutting off the mechanism. Bracket **68** is free to yield, because of its spring base **70**. The mechanism is now in its FIG. 4 position. To insure this action, it is necessary that tension spring **42** be stronger than compression spring **55** so that lever end **36.2** on depression will be deflected sufficiently to cause the Off button to be struck, immediately deenergizing the motor. The user can then safely rearrange the clothes, and closing the lid will rotate the lever to move its end **36.2** upwardly. This releases arm **62**, permitting spring **55** to restore the carrier **54**, and as the end **36.2** re-passes the emboss **72**, the deflection of the bracket **68** reactuates the On button **48** and the machine resumes operation.

In FIG. 7 is shown a simplified control circuit utilizing the mechanism. There are shown leads **L1** and **L2** leading to a conventional power source. The circuit may be traced from lead **L1** through drive motor **26** of the conventional appliance type through switch mechanism **46** to the conventional control equipment shown as a rectangle **82** representing any conventional timer-operated cam network or the like. From equipment **82** the circuit is completed to lead **L2**. Thus, the control equipment operates the circuit through its various cycles. In the embodiment shown in full lines, switch mechanism **46** is in series with the control equipment and would open the circuit to the motor on all raising of the lid or striking of the unbalance bumper **74** during agitation of a clothes washing machine. This action shown diagrammatically by dotted lines **84** and contacts **86** could by conventional contact means place the combined lid and unbalance shut-off mechanism in control only during the extraction by opening shunt switch **86** during spin and by maintaining switch **86** closed during agitation. An advantage of this alternative is that during the washing (agitation) cycle, the user may open the lid to add articles of clothing, etc., or merely to observe the washing operation, without stopping the machine. During the centrifuging cycle, however, when it may be dangerous to have the lid open while the basket is spinning at high speed, the act of opening the lid will inevitably open the drive motor circuit and bring the machine to a halt.

What is claimed is:

1. In a centrifuging device having a casing structure, a basket mounted therein for rotation, said basket mounting permitting gyration of said basket during rotation thereof, means including a motor and an energizing circuit for rotating said basket, and a cover adapted to be moved between open and closed positions to control access to said basket; the combination of a switch for connection into said motor circuit, said switch being of a bistable type which retains an actuated condition until operated to a different condition, means for mounting said switch in a fixed position remote from said cover, first and second pushbuttons for actuating said switch respectively to open and closed circuit conditions, a first switch operation means arranged for actuating said first pushbutton, a second switch operation means arranged for actuating said second pushbutton, a lever pivotally mounted relative to said first and second switch operation means and having one end portion operatively associated with each of said first and second switch operation means for selective operation thereof and an opposite end portion in the path of movement of said cover, means initiated by the closing of said cover to cause said lever to interact with said second switch operation means for operation of said switch to closed circuit condition, and means initiated by the opening of said cover to cause interaction of said lever and said first switch operation means to effect operation of said switch to open circuit condition.

2. The combination as set forth in claim 1, in which each of said first and second switch operation means is spring biased to disengage from its associated pushbutton upon closure of said cover.

3. The combination as set forth in claim 1, in which said lever is maintained inactive relative to said first and second switch actuating means when said cover is closed and said first switch actuating means has an element disposed to be actuated into switch-operating position by engagement by said basket upon excessive gyration thereof.

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