Sept. 15, 1964 T. R. SMITH 3,149,212

LID AND UNBALANCE SWITCH DEVICE

Filed Aug. 22, 1962 3 Sheets-Sheet 1

Fig. 1

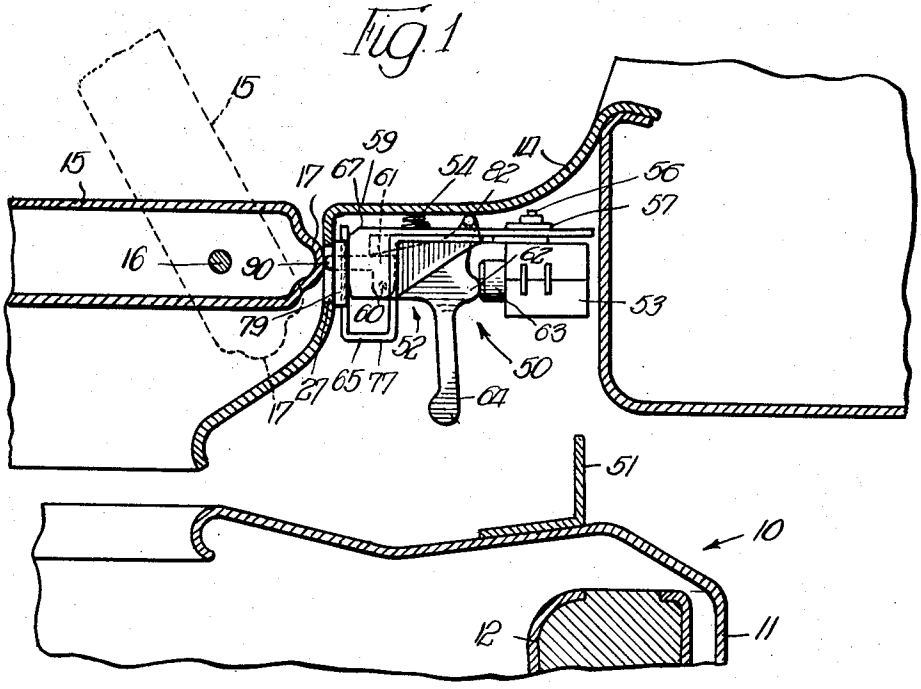
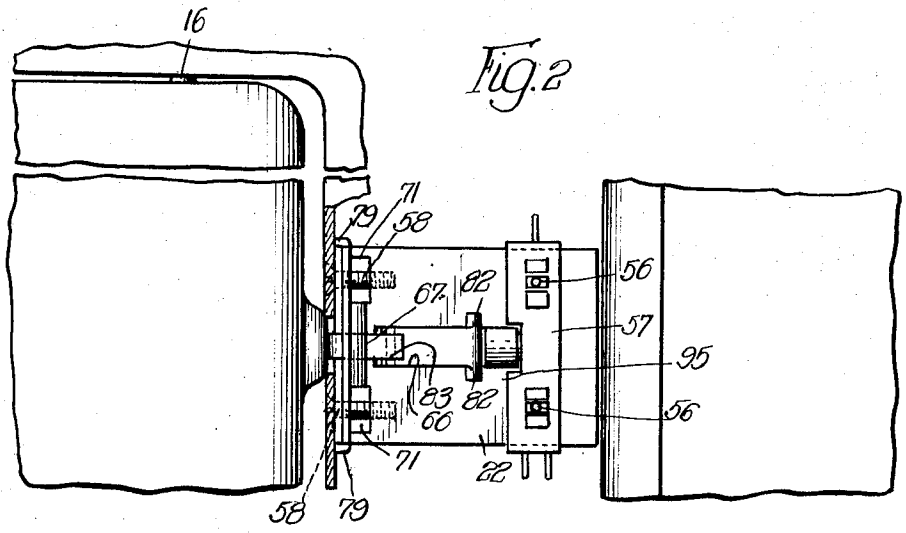


Fig. 2



INVENTOR.
Thomas R. Smith,
BY
William R. Landwier
AGENT

Sept. 15, 1964 T. R. SMITH 3,149,212

LID AND UNBALANCE SWITCH DEVICE

Filed Aug. 22, 1962 3 Sheets-Sheet 2

Fig. 3

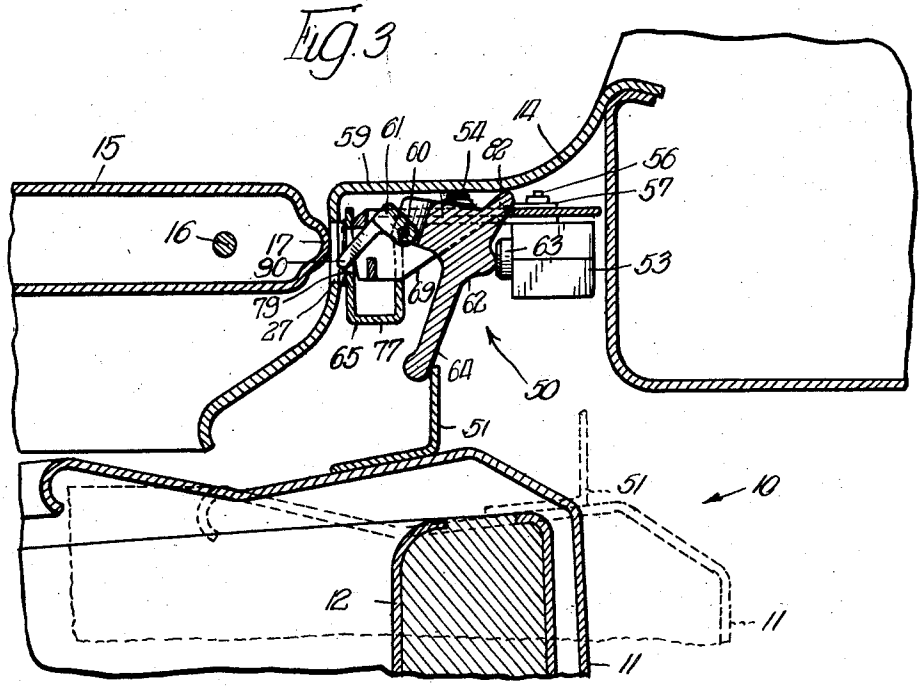
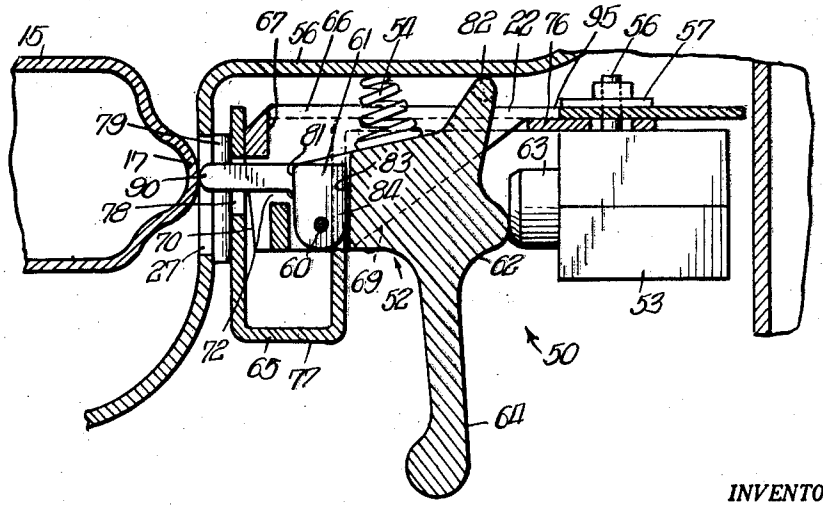


Fig. 4



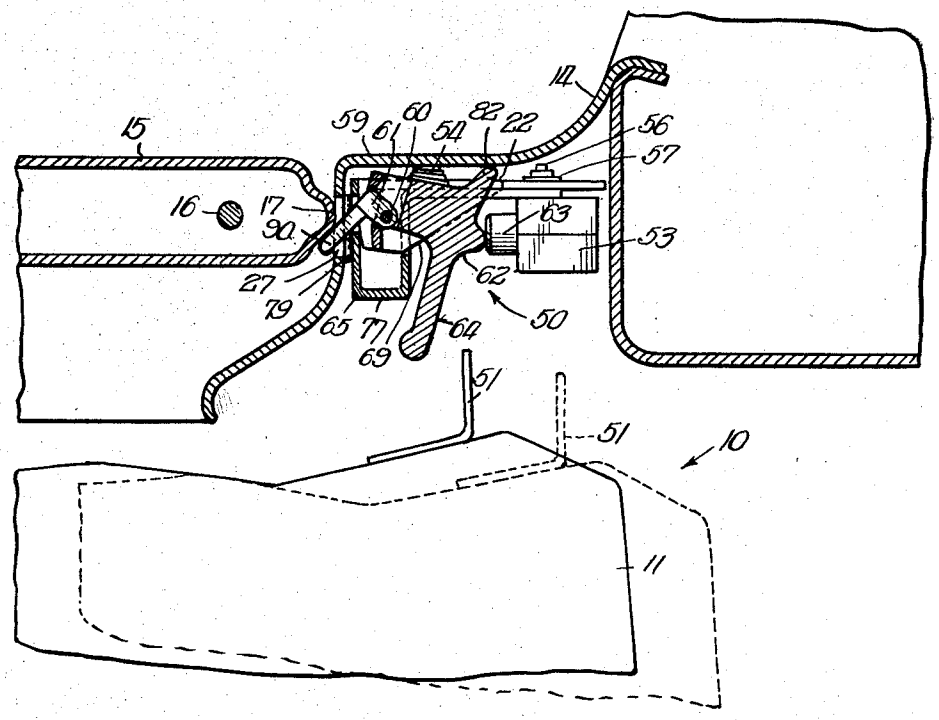
INVENTOR.
Thomas R. Smith,
BY
William G. Landwier
AGENT

Sept. 15, 1964 T. R. SMITH 3,149,212

LID AND UNBALANCE SWITCH DEVICE

Filed Aug. 22, 1962 3 Sheets-Sheet 3

Fig. 5



INVENTOR.
Thomas R. Smith,
BY
William G. Landvier
AGENT

United States Patent Office 3,149,212 Patented Sept. 15, 1964

3,149,212

LID AND UNBALANCE SWITCH DEVICE

Thomas R. Smith, Newton, Iowa, assignor to The Maytag Company, Newton, Iowa, a corporation of Delaware

Filed Aug. 22, 1962, Ser. No. 218,582
8 Claims. (Cl. 200—61.7)

This invention relates to a control mechanism for stopping and starting electrically controlled devices and more particularly to an unbalance switch for centrifugal extractors.

Many different types of unbalance switches have been designed for centrifugal extractors, such as in washing machines operable through wash and spin dry cycles. During the spin dry operation, if an extreme unbalance condition occurs due to the uneven distribution of clothes, the tub may gyrate violently. Unbalance switches are designed generally to open the circuit controlling the appliance so that the machine is de-energized. The operator can then redistribute the clothes and restart the operation.

It is an object of the present invention to provide an unbalance switch that will de-energize an electrically controlled device under predetermined conditions.

It is a further object of the invention to maintain an electrically controlled device in a de-energized condition after shut-off due to unbalance conditions until restarted by the operator.

It is a still further object of the invention to provide a control mechanism that is automatically reset upon opening of the lid after the machine has been de-energized.

It is another object of the invention to provide a switch control that serves to function both as a door interlock and as an unbalance switch, which can be reset upon the opening of the door, as when the operator redistributes the clothes to remedy the conditions which cause the unbalance.

It is still another object of the invention to provide an unbalance mechanism that is positive and reliable in operation.

It is yet another object of the invention to provide a control device that is inexpensive to manufacture because of its simple arrangement.

Briefly, in the preferred embodiment of the invention, an unbalance switch mechanism is provided that is responsive to an unbalance condition in a centrifugal extractor, such as a washing machine operable through wash and dry cycles. The unbalance switch mechanism is positioned in the circuit controlling the extractor and whenever excessive gyration occurs in the extractor, the switch mechanism is activated to interrupt the operation of the extractor. Lifting of the lid for example, to rearrange and redistribute the clothes in the extractor, and the subsequent re-closing of the lid allows the extractor to continue operation. The unbalance switch mechanism is so constructed that the opening of the lid of the extractor at any time will interrupt the operation of the extractor.

Further objects, advantages and details of this invention will become evident as the description proceeds and from an examination of the accompanying drawings which illustrate one embodiment of the invention and, in which, similar numerals refer to similar parts throughout the several views.

In the drawings:

FIGURE 1 is a fragmentary elevational view of a washing machine in which the side wall of the cabinet is broken away to show the control mechanism of the invention;

FIGURE 2 is a fragmentary top plan view taken of the washing machine illustrated in FIGURE 1 in which

the top wall of the cabinet is broken away to show the control mechanism of the invention;

FIGURE 3 is a view similar to FIGURE 1 illustrating the action of the control mechanism during conditions of unbalance;

FIGURE 4 is an enlarged view of a portion of FIGURE 1 illustrating the control mechanism of the invention in clearer detail; and

FIGURE 5 is a view similar to FIGURE 1 illustrating the position of the control mechanism after a period of unbalance and before the resetting of the control mechanism.

Referring now to the drawings, there is shown a centrifugal extractor **10** such as employed in an upright clothes washing machine, which includes a tub **11** within which is journalled a clothes basket **12**. The entire washing machine is supported on a frame and enclosed in a cabinet **14**.

The access opening to the clothes basket **12** may be closed by lid **15**. The lid **15** is pivoted in the extractor for opening and closing about a fulcrum **16**. The unbalance switch mechanism **50** is positioned in an operative relationship with the end **17** of the lid **15** and normally the closing of the lid **15** will cause the extractor to be energized.

Positioned on the tub **11** is a bumper **51** and the bumper **51** moves with the tub **11** and therefore the position of the bumper **51** with respect to the unbalance switch mechanism **50** is determined by the gyration of the tub **11** when the extractor is energized. Normally, the bumper **51** is spaced from the unbalance switch mechanism **50** as illustrated in FIGURE 1. However, when a predetermined unbalance condition occurs causing the tub **11** to excessively gyrate, the bumper **51** mounted on the tub **11** is moved so as to cause the extractor to be de-energized, and such a position is illustrated in FIGURE 3 in solid lines.

The unbalance switch mechanism **50** is mounted in the extractor so that it can be operably effected by both the lid **15** and the bumper **51**. The unbalance switch mechanism **50** comprises: a pivotable follower member **52** capable of having its effective length shortened, as will be seen later, a normally open spring loaded switch **53**, a guide bracket **22**, a spacing bracket **65**, and a reset spring **54**.

The unbalance switch mechanism **50** is assembled by first assembling the somewhat L-shaped guide bracket **22** and the somewhat "dipper" shaped spacing bracket **65** and then positioning the pivotable follower member **52** in both bracket **22** and bracket **65**. Next, the spring loaded switch **53** is attached to both bracket **22** and bracket **65** by a plurality of machine screws **56** and a machine screw retaining strip **57**. The assembled unbalance switch mechanism **50** is then secured to the cabinet **14** of the extractor by means of a pair of machine screws **58** extending through the left wall, as viewed in the drawings of the somewhat "dipper" shaped spacing bracket **65** and threadably secured in provided tapped holes in the somewhat L-shaped guide bracket **22**. The unbalance switch mechanism **50** is positioned adjacent the substantially horizontal section **59** of the cabinet wall **14** and the reset spring **54** is positioned between the section **59** of the cabinet wall **14** and the upper portion of the pivotable follower member **52**, as clearly illustrated in the drawings.

The pivotable follower member **52** is adapted for both linear and rotational movement in the unbalance switch mechanism **50**. The pivotable follower member **52** is jointed or knuckled at **60** and comprises two pivotable parts, the follower part **61** and the switch actuator part **62**. Under normal circumstances, the pivotable follower member **52** merely moves back and forth responsive to the

position of the lid 15 and specifically the position of the end 17 of the lid 15. The movement back and forth of the pivotable follower member 52 closes and opens the spring loaded switch 53, and in the preferred embodiment of the invention, the energizing circuit of the extractor is in a closed condition when the spring loaded switch plunger 63 is in a depressed position (moved to the right as illustrated in the drawings and specifically as illustrated in FIGURES 1 and 4).

The switch actuator part 62 of the pivotable follower member 52 is provided with an integrally formed unbalance arm 64. The integrally formed unbalance arm 64 extends downwardly, as viewed in the drawings, so as to be engageable by the bumper 51 positioned on the tub 11 under predetermined unbalance conditions. Rotation of the switch actuator part 62 in a clockwise direction, as viewed in the drawings, occurs when the bumper 51 positioned on the tub 11 pushes the integrally formed unbalance arm 64 to the left, as viewed in the drawings. Rotation of the switch actuator part 62 in a clockwise direction causes the follower part 61 to pivot in a counter clockwise direction, as viewed in the drawings, and thereby causes the switch actuator part 62 to move to the left, as viewed in the drawings, if the spring loaded switch plunger 63 is in a depressed position to thereby open the energizing circuit to the extractor.

More specifically, the somewhat L-shaped guide bracket 22 comprises a substantially flat body section 95, having provided therein a longitudinal guide slot 66 extending from adjacent mounted spring loaded switch 53 to adjacent front wall section 67 of the guide bracket 22. The width of the guide slot 66 is slightly wider than the width of the switch actuator part 62 of the pivotable follower member 52. The depth of the guide slot 66 follows the contour of the bottom of the somewhat L-shaped guide bracket 22, as viewed in the drawings, and as can be seen, the bottom contours from the body section 95 first on an angle defining portion 69 and then extends horizontally to the left hand end, as viewed in the drawings of the guide bracket 22.

The front depending wall 70 of the bracket 22 is substantially solid and is provided with a pair of mounting screw recesses 71 positioned on each side of the front wall section 67 previoously mentioned. An aperture 72 is provided in the front wall section 67 through which the follower part 61 of the pivotable follower member 52 protrudes. Tapped holes are provided in the pair of mounting screw recesses 71 so as to engage the mounting machine screws 58 for attaching the unbalance switch mechanism 50 to the cabinet 14.

A somewhat "dipper" shaped spacing bracket 65 is provided in the illustrated embodiment of the invention and the function of the spacing bracket 65 is to position the guide bracket 22 and consequently the follower part 61 of the pivotable follower member 52 so that the follower part 61 does not protrude too far through an aperture 27 provided therefore in the cabinet 14. The spacing bracket 65 comprises a substantially flat portion 76 positioned continuous with the bottom of the guide bracket 22 as viewed in the drawings, and a substantially U-shaped or "cup" shaped portion 77. The spacing bracket 65 is slotted so as to permit the ready insertion of the pivotable follower member 52 and is provided with a front aperture 78 through which the follower part 61 also protrudes. The spacing bracket 65 is adapted to fit the bottom contours of the guide bracket 22, and a flared spacing section 79 is provided on each side of the spacing bracket 65, as best illustrated in FIGURE 2. The spacing sections 79 space the guide bracket 22 and consequently the pivotable follower member 52 from the cabinet 14. A pair of mounting holes are provided in the spacing bracket 65 so as to permit the insertion therethrough of the mounting machine screws 58.

A spring loaded pressure actuated switch 53 is mounted on the guide bracket 22 and the spacing bracket 65, as shown. In the preferred embodiment of the invention, the switch 53 is in a closed position when the switch plunger 63 is depressed or moved to the right as viewed in the drawings. The switch 53 is in an opened condition when the spring loaded plunger 63 is in an extreme outward position, or all the way out towards the left, as viewed in the drawings.

A return spring 54 is shown positioned between the upper portion of the switch actuator part 62 and the bottom part of the horizontal section 59 of the cabinet 14. The function of the return spring 54 is to tend to rotate the switch actuator part 62 in a counter clockwise direction, but as will be seen, the return spring 54 also functions to help move the switch actuator part 62 in a lateral direction. The return spring 54 may be securely fastened to both the bottom portion of the horizontal section 59 of the cabinet 14 and the upper portion of the switch actuator part 62, in any convenient manner.

Operation

Assume that the lid 15 is moved to an open position as indicated in the dotted lines in FIGURE 1. In this condition, two forces are initially exerted on the pivotable follower member 52, one force is the strictly lateral force, or the force directed to the left as viewed in the drawings, and this force is exerted by the spring (not shown) positioned within the spring loaded switch 53, and this force is exerted on the pivotable follower member 52 through the spring loaded plunger 63 of the switch 53. Therefore, force is exerted on the pivotable follower member 52 to move the pivotable follower member 52 outwardly or to the left as viewed in the drawings, and the pivotable follower member 52 moves to the left as viewed in the drawings until the spring loaded plunger 63 is all the way out or to the left as viewed in the drawings. The front end 81, or the end furthest to the left, as viewed in the drawings of the switch actuator part 62, can under any circumstances only move to left until the front end 81 intersects the lower wall of the aperture 72 positioned in the guide bracket 22.

The second force exerted upon the pivotable follower member 52 is the rotational and downward force exerted on the switch actuator part 62 by the return spring 54. A pair of guide slot studs 82 are positioned at the uppermost part of the switch actuator part 62, and the function of the guide slot studs 82 is to prevent the switch actuator part 62 from being pushed downwardly through the guide slot 66. This is accomplished inasmuch as the guide slot studs 82 overlap the guide slot 66, as best seen in FIGURE 2. Under normal circumstances, the switch actuator part 62 is in its maximum counter clockwise position. If not, the return spring 54 forces the actuator part 62 to its maximum counter clockwise position. However, under certain circumstances, gravity itself will accomplish this purpose, and the return spring 54 is not absolutely necessary for this purpose.

Movement of the switch actuator part 62 in a rotational direction will cause the opposite rotational movement of the follower part 61 unless the follower part 61 is positioned within the mounting slot 83 in the switch actuator part 62, as shown in FIGURE 4. The follower part 61 is somewhat "hammer" shaped and the slot 83 is a straight slot forming a bottom wall and two sides. The follower part 61, and the switch actuator part 62 are pivotable with respect to one another around the pivot 60. The follower part 61 is rounded properly in the hammerhead section 84 thereof so as to be able to rotate freely in the counter clockwise direction as viewed in the drawings. However, the hammerhead portion 84 of the follower part 61 is so designed that the slot 83 and the upper portion of the hammerhead 84 intersect so as to prevent relative rotational movement between the follower part 61 and the switch actuator part 52 after the two have rotated relative to one another a predetermined distance. This position can be viewed in FIGURE 4.

Assume now that the lid **15** is moved to its closed position as viewed in solid lines in FIGURE 1. The end **17** of the lid **15** engages the end portion **90** of the follower part **61** and tends to cause the follower part **61** to rotate in a clockwise direction, as viewed in the drawings. The follower part **61** cannot rotate in a clockwise direction, as viewed in the drawings, and the only direction of free movability for the follower part **61** is in the lateral direction, or to the right, as viewed in the drawings. Therefore, the end **90** of the follower part **61** moves toward the right as viewed in the drawings. The switch actuator part **62** has a tendency to be driven to the right by the return spring **54** and therefore, there is no resistance to movement to the right from the return spring **54**. The only resistance to the movement to the right is that of the spring (not shown) in the spring loaded switch **53**. The closing of the lid **15** easily provides enough force to overcome the resistance of the spring (not shown) in the spring loaded switch **53** and therefore the spring loaded plunger **63** of the switch **53** is moved toward the right thus closing the contacts (not shown) within switch **53** for energizing circuit of the extractor causing the extractor to begin operation.

Subsequent opening up of the lid **15** causes the unbalance switch mechanism **50** to return to the previously described position to de-energize the extractor.

Assume now that an unbalance condition occurs. During unbalance, gyrations of the tub **11** of the extractor occur and the bumper **51** moves back and forth in response to these gyrations as best seen in FIGURE 3 wherein the gyrations of the tub **11** are shown.

When the tub **11** of the extractor has gyrated past a tolerable point as determined by the positioning of the bumper **51**, the bumper **51** engages the bumper engaging arm **64** of the switch actuator part **62** and rotates the switch actuator part **62** in a clockwise direction. The return spring **54** tends to prevent the switch actuator part **62** from rotating in a clockwise direction and therefore keeps the guide slot studs **82** positioned continuous with the substantially flat surface **95** of the guide bracket **22** during rotation of the switch actuator part **62**. During rotation of the switch actuator part **62**, the guide slot studs **82** slide across the substantially flat surface **95** of the guide bracket **22** towards the right, as viewed in the drawings. The follower part **61** cannot rotate in a clockwise direction with the switch actuator part **62** inasmuch as the follower part **61** is prevented from rotating by the top wall of the aperture **72** provided in the front section **67** of the guide bracket **22**. The follower part **61** and the switch actuator part **62** therefore rotate in opposite directions with the follower part **61** rotating in a counter clockwise direction and the switch actuator part **62** rotating in a clockwise direction.

The result is that the end **90** of the follower part **61** rotates counter clockwise and slips off the end **17** of the lid **15** and the unbalance switch mechanism assumes the position illustrated in FIGURE 3. The bumper **51** momentarily maintains the pivotable follower member **52** in the rotated position illustrated in FIGURE 3 against the working action of the return spring **54** and the spring (not shown) positioned within the spring loaded switch **53**. The tub **11** in accordance with its gyratory motion moves from the position illustrated in solid lines in FIGURE 3 towards the position as illustrated in dotted lines in FIGURE 3. The spring positioned within the spring loaded switch **53** pushes the pivotable follower member **52** to the left, as viewed in the drawings, and pushes the pivotable follower member **52** far enough to the left to open the switch **53** to thereby open the energizing circuit of the extractor. At this time, the return spring **54** tends to rotate the switch actuator part **62** in a counterclockwise direction, as viewed in the drawings. However, this is not entirely possible inasmuch as the end **90** of the follower part **61** is now positioned under the hump of the end **17** of the lid **15**, as clearly shown in FIGURE 5, and rotation in the clockwise direction by the follower part **61** and in the counterclockwise direction by the switch actuator part **62** is inhibited by the end **17** of the lid **15**.

This condition will prevail until someone lifts the lid **15** of the centrifugal extractor **10** and subsequently recloses the lid **15**. When the pivoted lid **15** is moved to its open position as illustrated in dotted lines in FIGURE 1, the return spring **54** rotates the switch actuator part **62** in a counterclockwise direction and consequently the follower part **61** in a clockwise direction until they have resumed the position illustrated heretofore in FIGURES 1 and 4, with the exception that the lid **15** will not be in a closed position, and therefore, the end **90** of the follower part **61** will be extended to the left.

What has been described is what is believed to be the preferred embodiment of the invention. However, alterations and modifications may be made in the illustrated embodiment of the invention without departing from the scope of the invention. Therefore, it is intended that the appended claims include all such modifications and alterations.

What is claimed in the United States Letters Patent is:

1. In combination: biased switch means mounted in a predetermined position, switch actuator means positioned adjacent said switch means capable of rotational and linear movement, follower means attached to said switch actuator means capable of rotative movement with respect to said switch actuator means and movably mounted for causing said switch actuator means to hold said switch means in a first condition, means for causing rotational movement of said switch actuator means and relative movement of said follower means with respect to said switch actuator means under predetermined conditions for allowing said switch means to assume a second condition.

2. In combination: biased switch means mounted in a predetermined position, switch actuator means positioned adjacent said switch means capable of rotational and linear movement, follower means attached to said switch actuator means and capable of rotational movement with respect to said switch actuator means and movably mounted for causing said switch actuator means to hold said switch means in a closed condition, means for causing rotational movement of said switch actuator means and relative rotational movement of said follower means with respect to said switch actuator means under predetermined conditions for allowing said switch means to assume an open condition.

3. In combination: biased switch means mounted in a predetermined position, switch actuator means positioned adjacent said switch means capable of rotational and linear movement and capable of assuming at least a first position, a second position, and a third position, follower means connected with said switch actuator means and capable of relative movement with respect to said switch actuator means and movably mounted for causing said switch actuator means to move to a first position to hold said switch means in a first condition, means for causing rotational movement of said switch actuator means and relative rotational movement with respect to said switch actuator means of said follower means under predetermined conditions for moving said switch actuator means to a second position for allowing said switch means to assume a second condition, biasing means for urging said switch actuator means to a third position when said switch actuator means is in said second position and movable stop means for preventing said biasing means from moving said switch actuator means into said third position.

4. In combination: biased switch means mounted in a predetermined position, switch actuator means positioned adjacent said switch means capable of rotational and linear movement and capable of assuming at least a first position, a second position, and a third position, follower means connected with said switch actuator means and

capable of relative rotational movement with respect to said switch actuator means and slidably mounted for causing said switch actuator means to be moved to a first position to hold said switch means in a closed condition, means for causing rotational movement of said switch actuator means and relative rotational movement of said follower means with respect to said switch actuator means under predetermined conditions for moving said switch actuator means into a second position for allowing said switch means to assume an open condition, biasing means for urging said switch actuator means to a third position when said switch actuator means is in said second position and movable stop means associated with said follower means for selectively preventing said biasing means from moving said switch actuator means to said third position.

5. In an electrically controlled centrifugal extractor: a frame, a lid member for the extractor mounted on said frame for opening and closing movement, switch means for controlling the extractor mounted on said extractor in a predetermined position and having a contact affecting means movable between a first position and a second position, switch actuator means positioned adjacent said contact affecting means capable of rotational and linear movement, follower means pivotably connected to said switch actuator means movably mounted between said lid member and said switch actuator means capable of causing said switch actuator means to hold said contact affecting means in said first position when said lid member is closed, means mounted on said centrifugal extractor for causing rotational movement of said switch actuator means during conditions of unbalance allowing said contact affecting means to move to said second position, and releasable means for maintaining said switch actuator means in a rotated condition.

6. In an electrically controlled centrifugal extractor: a frame, a lid member for the extractor mounted on said frame for opening and closing movement, switch means for controlling the extractor mounted on said extractor in a predetermined position and having contact affecting means movable between a first position and a second position, switch actuator means positioned adjacent said contact affecting means capable of rotational and linear movement, follower means pivotably connected to said switch actuator means movably mounted between said lid member and said switch actuator means capable of causing said switch actuator means to hold said contact affecting means in said first position when said lid member is closed, means mounted on said centrifugal extractor for causing rotational movement of said switch actuator means during conditions of unbalance for allowing said contact affecting means to move to said second position, and stop means for keeping said switch actuator means in a rotated condition.

7. In an electrically controlled centrifugal extractor, a frame, a lid member for the extractor mounted on said frame for opening and closing movement, biased switch means for controlling the extractor mounted on said extractor in a predetermined position, switch actuator means positioned adjacent said switch means capable of rotational and linear movement and capable of assuming at least a first position, a second position and a third position, follower means connected to said switch actautor means and capable of relative movement with respect to said switch actuator means movably mounted between said lid member and said switch actuator means capable of moving said switch actuator means to a first position to hold said switch means in a closed condition when said lid member is closed, means mounted on said centrifugal extractor for causing rotational movement of said switch actuator means to a second position during conditions of unbalance for allowing said switch means to assume an open condition, biasing means operable when said switch actuator means is in said second position for urging said switch actuator means to said third position, and releasable means for keeping said switch actuator means in said seocnd position.

8. In an electrically controlled centrifugal extractor, a frame, a lid member for the extractor mounted on said frame for opening and closing movement, biased switch means for controlling the extractor mounted on said extractor in a predetermined position, switch actuator means positioned adjaecnt said switch means capable of rotational and linear movement and capable of assuming at least a first position, a second position, and a third position, follower means pivotably connected to said switch actuator means and slidably mounted between said lid member and said switch actuator means capable of causing the linear movement of said switch actuator means to a first position to hold said switch means in a closed condition when said lid member is closed, means mounted on said centrifugal extractor for causing rotational movement of said switch actuator means to a second position during conditions of unbalance for allowing said switch means to assume an open condition, means mounted adjacent said follower means for causing rotational movement of said follower means with respect to said switch actuator means responsive to the movement of said switch actuator means to said second position, stop means provided on said lid member, biasing means for urging said switch actuator means to a third position upon opening of said lid member when said switch actuator means is in said second position, said stop means preventing the movement of said follower means and thereby preventing movement of said switch actuator means to said third position prior to opening of said lid member.

References Cited in the file of this patent

UNITED STATES PATENTS

2,612,766	Smith et al.	Oct. 7, 1952
2,882,360	Sisson	Apr. 14, 1959
2,895,023	Blum	July 14, 1959
3,016,435	Schwartz	Jan. 9, 1962