Sept. 24, 1968 J. C. MELLINGER 3,402,819

SAFETY CONTROL MECHANISM

Filed June 22, 1964 3 Sheets-Sheet 1

Fig. 1

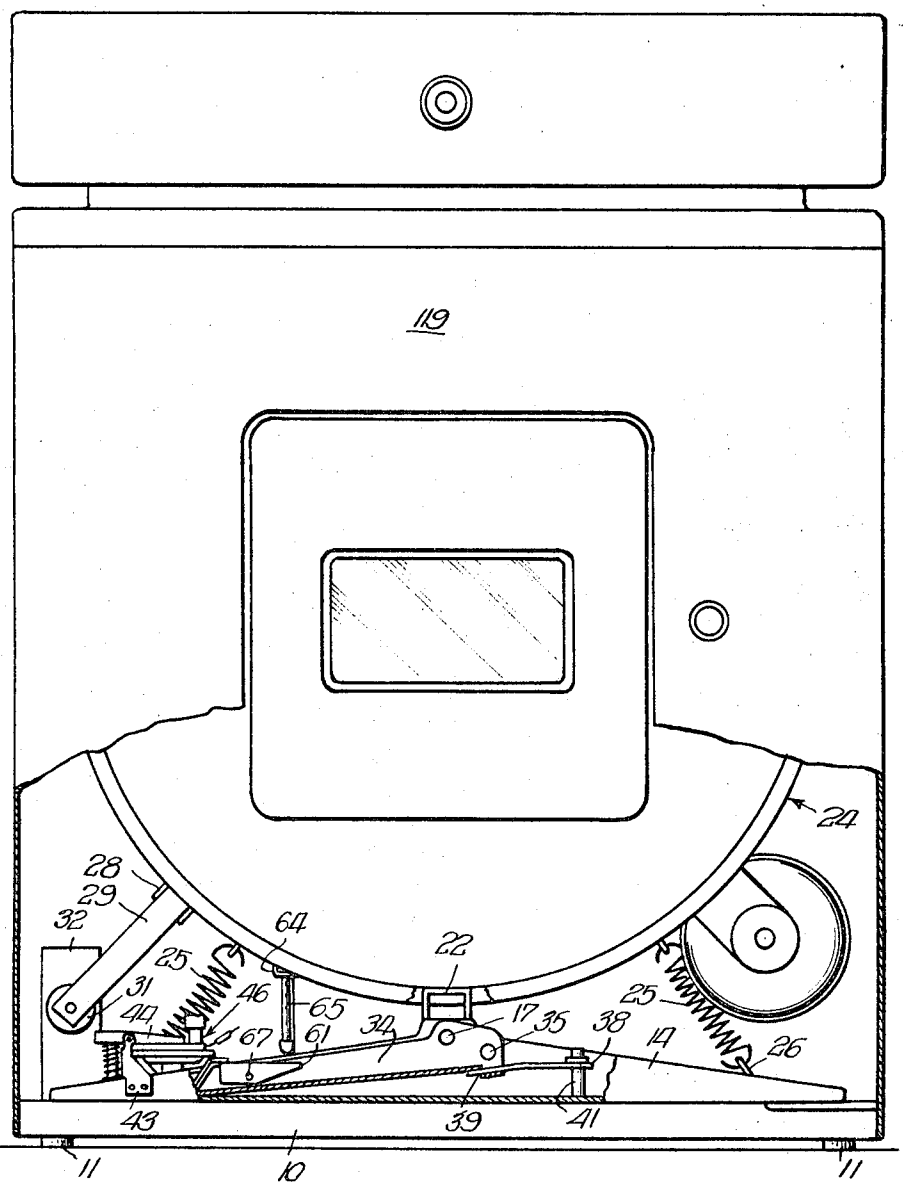
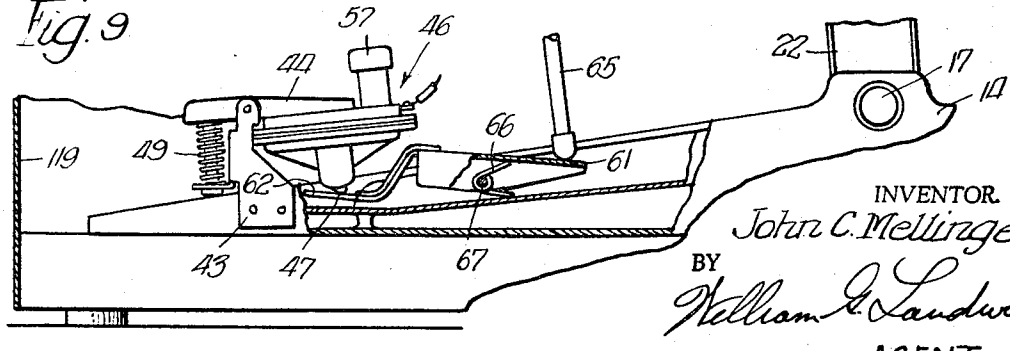


Fig. 9



INVENTOR.
John C. Mellinger
BY
William A. Landwer
AGENT

Sept. 24, 1968 J. C. MELLINGER 3,402,819

SAFETY CONTROL MECHANISM

Filed June 22, 1964 3 Sheets-Sheet 2

Fig. 3

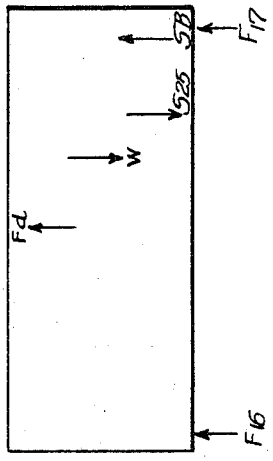
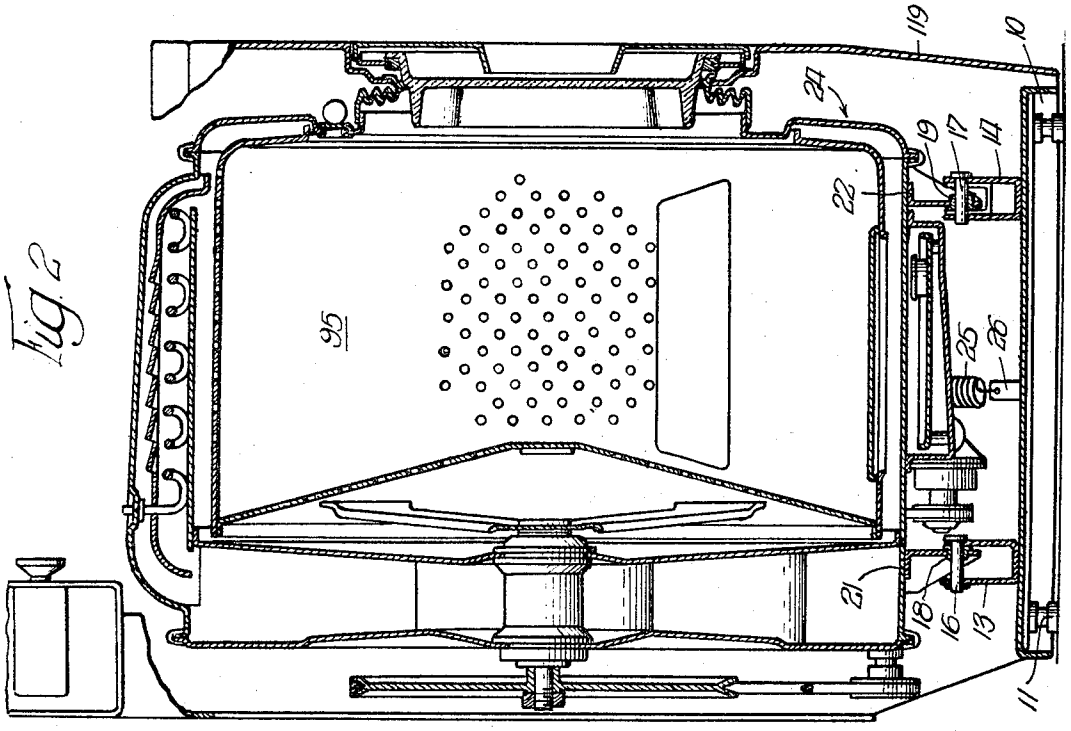


Fig. 2



INVENTOR.
John C. Mellinger,
BY
William A. Landwier
AGENT

Sept. 24, 1968 J. C. MELLINGER 3,402,819

SAFETY CONTROL MECHANISM

Filed June 22, 1964 3 Sheets-Sheet 3

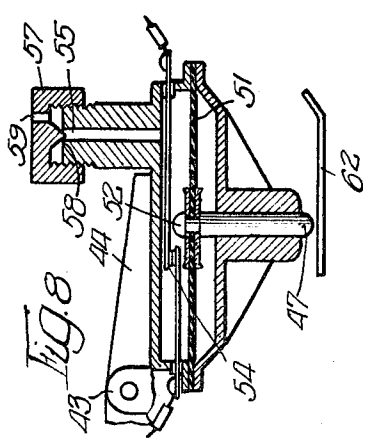


Fig. 8

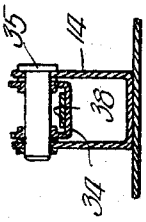


Fig. 7

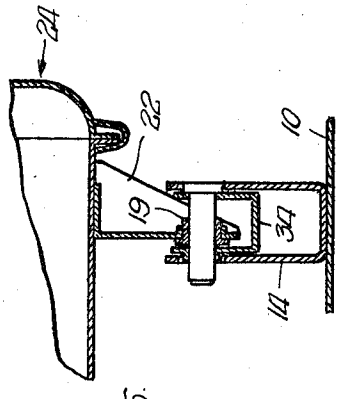


Fig. 6

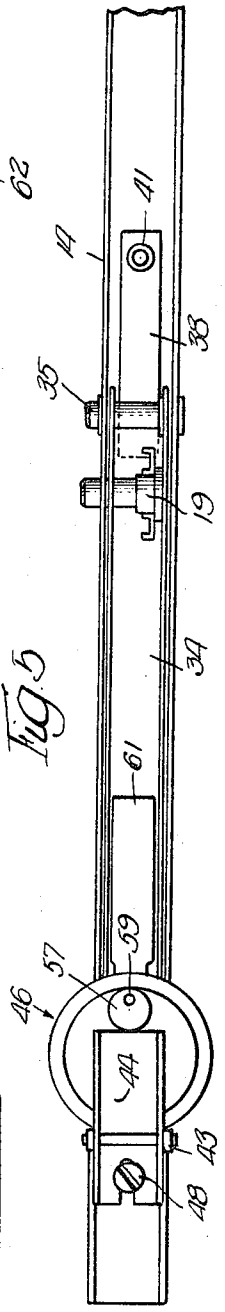


Fig. 5

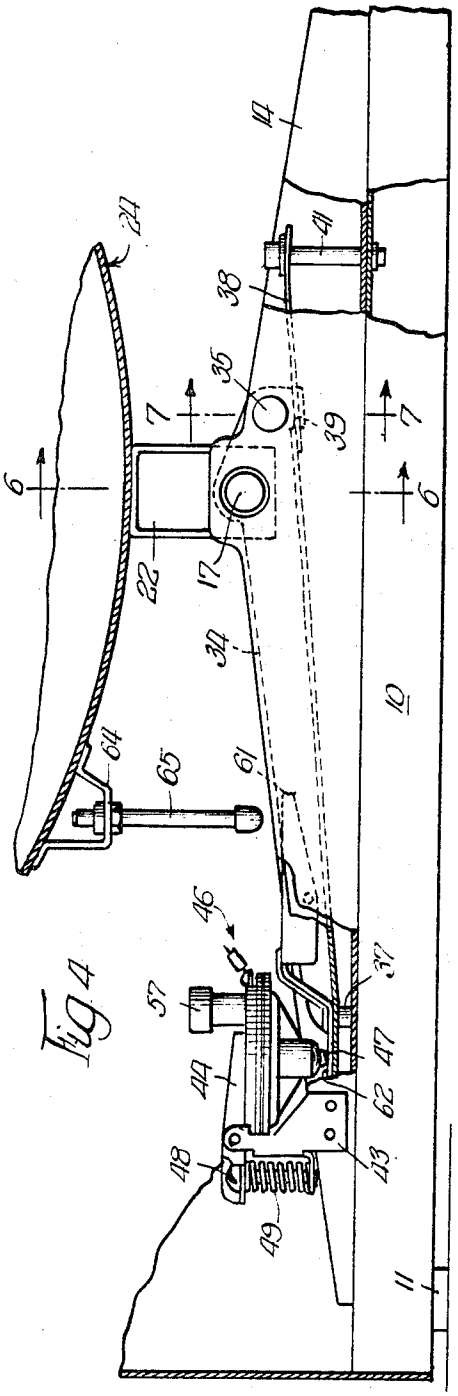


Fig. 4

INVENTOR.
John C. Mellinger,
BY
William G. Landwier
AGENT

United States Patent Office 3,402,819 Patented Sept. 24, 1968

3,402,819

SAFETY CONTROL MECHANISM

John C. Mellinger, Newton, Iowa, assignor to The Maytag Company, Newton, Iowa, a corporation of Delaware

Continuation-in-part of application Ser. No. 686,450, Sept. 26, 1957. This application June 22, 1964, Ser. No. 377,000

The portion of the term of the patent subsequent to Apr. 9, 1980, has been disclaimed

5 Claims. (Cl. 210—144)

This application is a continuation-in-part of application Ser. No. 686,450, filed Sept. 26, 1957, and now abandoned.

This invention relates to a control for preventing a horizontal axis combination washer-drier, washing machine or fluid extractor from sliding on, lifting from or moving relative to its supporting floor surface in response to centrifugal forces developed by high speed rotation of acentric or unbalanced clothes loads within this type machine.

This invention relates specifically to a combination washer-drier unit capable of sensing a predetermined maximum unbalanced centrifugal force generated by the rotation of an unbalanced clothes load within this combination unit during its fluid extraction operations. The mechanism sensing this predetermined force controls a safety switch which in turn controls a transmission regulating the rotational speed of a revoluable clothes receptacle capable of retaining such unbalanced clothes loads so that upon the generation of such a predetermined centrifugal force, the drive to the clothes receptacle is automatically interrupted and the receptacle's rotational speed substantially lowered to effect a redistribution or rearrangement of the clothes load within the receptacle in an effort to eliminate the unbalance before automatically shifting the transmission back into a higher range of speeds for further centrifuging. The actuation of this safety switch prevents movement of the entire combination unit relative to its supporting floor surface by preventing the generation of even greater disturbing forces which would be created by a continued acceleration of such unbalanced clothes loads.

This sensing mechanism is used in conjunction with a force isolating system which partially isolates from the units such unbalanced clothes loads. This sensing mechanism is not, however, affected by the resonant characteristics of this force isolation system. Therefore, unlike the operation of previously disclosed safety mechanisms, the clothes receptacle within this combination washer-drier may be rotated at speeds below, equal to or above the force isolation system's resonant frequency without triggering its safety switch as a result of any effects of the resonant characteristics of that force isolation system on the vibratory movements of the receptacle. This is due to the fact that the unique receptacle mounting system disclosed hereinafter is capable of not only isolating in one mode of vibration those vibrations created by the rotation of acentric loads but is also capable of sensing in a second mode of vibration the centrifugal forces which create those vibrations. The force isolating system is thereby made independent of the sensing system for controlling the centrifugal forces.

Safety controls responsive to the disturbing centrifugal forces generated in horizontal axis washing machines have previously been devised. However, to my knowledge these machines have either utilized no force isolating systems thus limiting their top spin speeds or have utilized effective force isolating systems whose resonant characteristics have adversely influenced the most efficient operation of the safety control devices used in conjunction with this latter type machine.

It will, therefore, be appreciated that the relatively low

speed triggering of the high speed tumbler drive by means of an amplitude type sensing control may tend to prevent unbalanced clothes loads from being sufficiently accelerated to high enough speeds to effect substantial moisture extraction prior to tripping of the sensing mechanism. Coupled with this tendency is the possibility that as a result of the failure to materially reduce the moisture content of the clothes load during the first extraction attempt, the saturated fabrics may continue to present an unbalanced load condition capable of triggering the sensing mechanism of successive attempts at tumbler accelerations with the possible end result being the failure to eliminate a substantial perventage of the retained fluids by the end of the extraction period even though the unbalanced centrifugal forces generated during these tumbler accelerations may not have even approached the magnitude necessary to produce walking, shifting or sliding of the machine on its supporting floor surface.

It is, therefore, the primary objects of this invention to provide a sensing mechanism for a horizontal or generally horizontal axis centrifugal extractor, washing machine or combination washer-drier which is responsive to a predetermined magnitude of centrifugal force generated by the rotation of an unbalanced clothes load within this particular type of machine in order to limit and prevent the development of even greater disturbing forces which would be capable of moving such a machine relative to its supporting floor surface.

Another object of this invention is to provide a sensing mechanism capable of accomplishing this primary function independently of any effects of the force isolation system used in isolating unbalanced centrifugal forces from the base frame of this type machine.

Another object is to provide such a sensing mechanism capable of accomplishing this primary function at centrifuging speeds which are less than, equal to or even greater than the resonant frequency of the force isolation suspension system chosen without causing the safety switch sensing an unbalanced centrifugal force of predetermined magnitude to be prematurely actuated merely as a result of the receptacle's passing through its critical speed.

Another object of this invention is to provide a clothes receptacle mounting system for a laundry centrifuge so that the vibrations produced by the rotation of unbalanced loads in the receptacle can be isolated from its supporting frame in one mode of vibration while the unbalanced centrifugal forces produced by the rotation of such unbalanced loads can be sensed in a second mode of vibration and controlled independently of the force isolating system used to isolate the clothes receptacle in the first mode of vibration.

These and other objects, features, capabilities and advantages are effected by the instant invention as will later appear from an inspection of the following description and claims taken in accordance with the accompanying drawings in which:

FIGURE 1 is a front elevation of a combination washer-drier, partially broken away, showing the safety control system forming the subject matter of this invention;

FIGURE 2 is a longitudinal sectional view of the machine shown in FIGURE 1, the lower half in a vertical plane and the upper half deviating therefrom to pass through the heater housing;

FIGURE 3 is a free body diagram showing the relative direction of the forces acting on the tub assembly of the illustrative combination washer-drier;

FIGURE 4 is an enlarged fragmentary view of the lower front portion of the combination washer-drier unit shown in FIGURE 1;

FIGURE 5 is a fragmentary plan view of the front support shown in FIGURE 4;

FIGURE 6 is a cross sectional view taken through line 6—6 of FIGURE 4;

FIGURE 7 is a cross sectional view taken on line 7—7 of FIGURE 4;

FIGURE 8 is an enlarged diagrammatic representation of the safety switch incorporated in the illustrated washer-drier; and,

FIGURE 9 is an enlarged fragmentary view showing the actuation of the safety switch by the amplitude sensing device also incorporated in this washer-drier unit.

Referring now to the accompanying drawings in detail, it will be seen that the combination washer-drier unit shown in these drawings includes a substantially flat surfaced base frame **10** mounted on legs **11**. Mounted upon base frame **10** are the channel members **13** and **14** which are welded or securely affixed in some suitable manner to base frame **10** to form the two major supports for the washer-drier unit illustrated in the accompanying figures.

Referring to FIGURE 2, the rear channel member **13** is generally triangular in elevational configuration and receives a single pivot pin **16** about which the rear portion of the machine is free to pivot in an arcuate movement. Similarly, FIGURES 1 and 4 show the front channel support **14** as being of identical configuration to rear channel member **13** and receiving a similar pivot pin **17** for supporting the front portion of the combination washer-drier unit for an identical rocking movement.

It will be seen that these pivot pins **16** and **17** are journalled in flanged bearing sleeves **18** and **19**, respectively, which form a two point support for tub brackets **21** and **22**, respectively. This allows the tub or casing which is generally indicated by the arrow **24**, and which is fastened to brackets **21** and **22** to oscillate back and forth on pins **16** and **17** in an arcuate movement in response to various forces generated within that tub.

Tub **24** is maintained in an upright position on pins **16** and **17** by two centering springs **25** connected between tub **24** and base **10** through the spring anchor brackets **26** fastened to the latter member. FIGURE 1 shows the tub **24** as being provided with a tab damper bracket **28** which forms a support for the damper leaf spring **29** carrying the damper pad **31** in a ball and socket joint at the end of damper spring **29**. Base frame **10** is provided with an upstanding damper plate **32** which is engaged by damper pad **31** to absorb and dissipate the energy imparted to the tub **24** causing it to oscillate on the supporting pivot pins **16** and **17**.

While the rear channel member **13** actually receives and supports directly the rear pivot pin **16**, an inspection of FIGURE 6 will indicate that the same is not true as to the connection between front channel **14** and front pivot pin **17**. That cross sectional view indicates that front pivot pin **17** is actually suspended in a floating pivot in front channel member **14** and, in practice, has a clearance of approximately one-sixteenth of an inch from the closest point of channel **14**. While the front end of tub **24** is supported on the front tub bracket **22**, on the front bearing sleeve **19** and on the front pivot pin **17**, the latter pin is in turn supported by a lever arm **34** nested within front channel **14** and supported on the pivot pin **35** penetrating channel member **14** as clearly shown in FIGURES 4, 5 and 7. Movement of the long lever arm **34** about pin **35** determines whether or not the front pivot pin **17** moves relative to the front channel member **14**. It will be noted that, in any event, front pivot pin **17** may move only a short distance, in the case of this illustrated embodiment approximately one-sixteenth of an inch, before the head of pivot pin **17** will contact channel member **14** and limit further movement of that pin, and consequently, tub **24**, in a vertical plane. While this limit stop for pin **17** prevents tub **24** from separating from channel **14** when the entire machine is tipped over or upended, it is not necessary in the basic operation of the control device forming the basis for the instant invention due to degree of control maintained by this safety mechanism.

Three forces acting on lever arm **34** establish a condition of equilibrium about pin **35** in order to produce the described floating pivot about front pivot pin **17**. The first of these three forces is applied upwardly through the supporting foot **37**, preferably formed of rubber or some other cushioning material, located at the end of arm **34**. The weight of tub **24** and the parts supported by that casing provide the second force which is applied directly to lever arm **34** through pin **17**. The third force acting on member **34** is exerted downwardly on the end of the leaf spring **38** which is inserted into opening **39** of lever arm **34** so as to form an extension of the latter member. The adjustable machine screw **41** which passes through the base of channel **14** and base frame **10**, as well as the end of leaf spring extension **38**, provides the means of varying the force exerted downwardly on leaf spring extension **38**. In other words, as the end of leaf spring **38** is moved closer toward base frame **10** by tightening the adjustable screw **41**, the lever arm **34** will have a greater tendency to move in a clockwise direction as viewed in FIGURE 4. It should, therefore, be apparent that the weight of tub **24** and all parts supported by it tends to move lever arm **34** in a counterclockwise direction about pin **35** whereas the flexed leaf spring extension **38** tends to move it in a clockwise direction thereby producing a floating pivot action for front pivot pin **17** relative to the front channel member **14**.

Now, with reference to the safety switch mechanism actuated by the movement of lever arm **34**, it will be seen that front channel member **14** is provided with a bracket member **43** which pivotally mounts on its upper end a small lever member **44**. Lever **44** is rigidly connected to the safety switch mechanism, generally indicated by the arrow **46**, which with its actuating plunger **47**, is movable toward and away from the longer end of lever **34** by tightening or loosening the adjustable machine screw **48** penetrating the left end of lever **44** (FIGURES 4 and 5) and threaded into a lower extension of bracket **43**. For example, tightening the adjustable screw **48** to compress the spring **49** moves the safety switch mechanism **46** in a counterclockwise direction so as to move plunger **47** away from the left end of member **34** whereas loosening of the adjustable screw **48** will allow the compression spring **49** to move plunger **47** closer to lever arm **34**.

While the precise details of switch **46** are not shown, the diagrammatic sketch illustrated in FIGURE 8 is capable of indicating the function performed by that particular switch assembly. FIGURE 8 shows the switch mechanism **46** as including a resilient diaphragm **51** mounted across its housing so that it tends to maintain the horizontal position shown in FIGURE 8. In addition to plunger **47**, switch mechanism **46** is provided with an internal plunger **52** which is fastened to diaphragm **51** like plunger **47** and is capable of moving upwardly to separate the insulated resilient arms of switch **54** positioned within the switch assembly housing. This housing is provided with an air escape port **55** which allows movement of air into and out of that portion of the housing above diaphragm **51**.

From this it will be seen that when plunger **47** is moved upwardly against diaphragm **51**, the contacts of switch **54** will be separated by plunger **52** and air compressed on the upper side of diaphragm **51** thereby forcing air out through the air port **55**. When the force is removed from plunger **47**, diaphragm **51** will tend to return to its normal position thus allowing switch **54** to close and also allowing air to come back into the switch housing through port **55**. Since diaphragm **51** will not return to its normal position until a sufficient amount of air has returned through port **55** to equalize the pressure on opposite sides of that diaphragm, a variable time delay can be built into this switch mechanism by providing a presettable

valve for port **55**. In practice, this valve is diagrammatically shown in FIGURES 4, 5 and 8 as being provided with a needle valve **58** and vent hole **59**. A snap action switch may be substituted for switch **54** to prevent minor vibrations magnified through lever arm **34** from causing that switch to make and break in a hunting action.

It will also be noticed that lever arm **34** provides a support for the pivoted lever member **61** which includes a flat extension **62** abutting the extreme left end of lever arm **34**. Since there is normally a slight clearance between plunger **47** and extension **62**, the latter extension serves merely as a force transmitting member when lever **34** is moved toward plunger **47** by vertical movements of tub **24**.

Tub **24** is provided with a supporting bracket **64** from which depends a cushioned plunger member **65** capable of being adjusted toward and away from lever **61**. From FIGURE 4 it will be apparent that arcuate movement of tub **24** about it supporting pivot pins **16** and **17** toward switch **46** will cause plunger **65** to engage lever **61** and move it into the position shown in FIGURE 9 causing extension **62** to engage switch plunger **47** and open switch **54** independently of any movement of member **34**. A small coil spring **66** wound around the pivot pin **67** of lever **61** returns lever **61** to the position of FIGURE 4 after plunger **65** rocks away from its engagement with lever **61** as shown in FIGURE 9. Likewise, an upward movement of the left end of lever **34** will move plunger **47** upwardly to open switch **54** independently of any pivoting movement of lever **61** even though member **61** is itself supported on member **34** and, therefore, acts as a force transmitting member during this latter movement.

In other words, switch **54** may be opened either by a large arcuate movement of tub **24** or by an upward movement of that tub member. It is emphasized at this point that while each tub movement may open switch **54**, the controls sensing these two movements perform separate functions since an arcuate movement of tub **24** opens switch **54** to prevent contact between tub **24** and its cabinet **119** while vertical movement of tub **24** opens switch **54** to prevent movement of the entire machine relative to its supporting floor surface.

As indicated in other portions of this specification, switch **54** may be opened by either a large arcuate movement of casing **24** about its supporting pivot pins **16** and **17** independently of any vertical movement of tub **24** or it may be opened by a vertical movement of casing **24** independently of any rocking motion of that casing on pins **16** and **17**.

The arcuate movement of tub **24** is controlled in this illustrative machine to prevent contact between tub **24** and the sides of cabinet **119**. The tub carried plunger **65** and the amplitude sensing lever **61** could, therefore, be eliminated if this type control were not desired.

If this amplitude control were correlated to sense those centrifugal forces produced by high speed rotation of tumbler **95** with unbalanced loads in order to prevent movement of the machine relative to its supporting floor surface at its top spin speeds as has previously been done by others in this art, the amplitude sensing mechanism in this illustrative washer-drier would have to be set to sense a six pound unbalance as it passed through its critical speed which is approximately 65 revolutions per minute.

However, since the amplitude sensing mechanism incorporating elements **61** and **65** merely prevents contact between casing **24** and cabinet **119** and has nothing to do with the prevention of the entire machine walking, sliding or lifting on its supporting floor surface, the setting for the control, which is adjusted by adjusting the length of plunger **65**, is limited only by the cabinet dimensions so that this control actually is set to a value equivalent to a clothes load unbalance of between ten to eighteen pounds. The presence of such a large unbalance within receptacle **95** would, therefore, produce movement of the illustrative machine on its floor surface during the fluid extraction operations were it not for the centrifugal force sensing mechanism used in conjunction with this amplitude control device.

For an understanding of the mechanism preventing movement of the entire machine relative to its supporting floor surface, reference is made particularly to FIGS. 1, 2, 3 and 4. FIGS. 1 and 2 indicate that the weight of the tub or casing **24** and all elements journalled in or supported thereon is carried by pins **16** and **17** which represent the upwardly directed forces F_{16} and F_{17}, respectively, in FIG. 3. The weight of tub **24** and the mass supported by that container is shown as the force W, which is directed downwardly in FIG. 3 in which the rectangle represents tub **24**. Since the centering springs **25** include a downward component due to their angular positioning relative to base frame **10**, this downward component is represented in FIG. 3 by means for the symbol S_{25}. It is emphasized here that this downward component of these centering springs is not necessary for the operation of this centrifugal force sensing mechanism and that horizontally positioned springs capable of maintaining tub **24** in an upright position and having no vertical component at all can be considered to be their equivalent for this purpose.

Although the biasing of leaf spring **38** is in a downward direction on the right side of the pivot pin **35** as viewed in FIGS. 1 and 4, it tends to lift tub **24** on the opposite side of pin **35** so that its equivalent biasing force S_B is directed upwardly as it is shown in FIG. 3. The symbol F_d represents the centrifugal force or disturbing force tending to lift the entire machine from its floor surface at the instant when an unbalanced clothes load is carried to the top of receptacle **95** during the rotation of that latter member.

From this it can be seen that a given centrifugal force, F_d, will be represented by the sum of W and S_{25} less the sum of the forces F_{16}, F_{17} and S_B. By increasing the bias force S_B exerted by the leaf spring **38**, the disturbing force which can be tolerated without triggering the safety switch **54** by the slight vertical movement of tub **24** becomes smaller. This means that with an increase in this biasing force S_B, a smaller unbalanced load within receptacle **95** will be capable of causing the front end of tub **24** together with its pivot pin **17** and the bearing sleeve **19** to move upwardly within the slightly enlarged hole in front channel **14** receiving member **19** so as to lift the left end of arm **34** and open switch **54**.

It should, therefore, be apparent that this control may be preset to carry a predetermined maximum load unbalance within receptacle **95** by rotating that receptacle at its top spin speed and then adjusting screw **41** until the machine does not move relative to its supporting floor surface when a test weight slightly less than the predetermined maximum unbalance is rotated within receptacle **95**, but will move on that surface when a test weight slightly exceeding the predetermined maximum is carried within that receptacle.

In this embodiment of my invention, the upward movement of tub **24** in response to this predetermined maximum centrifugal force is reflected in a slight pivotal movement between the flanged bearing sleeve **18** and the rear channel member **13**. While it is more economical to use a single switch **54** actuated by the upward movement of one end of tube **24**, it should be apparent that a similar control may be applied to both major supports of this illustrative machine or to various support of other machines utilizing even a different type of tub support and still conform to the principles presented with reference to FIGURE 3.

As previously stated, the force S_{25} produced by the vertical component of centering springs **25** is not essential to the operation of this invention even though it must be considered whenever such diagonally positioned centering springs are used. Likewise, it is possible to provide a safety control mechanism without the refinement provided by

spring biasing force S_B as produced by leaf spring **38**. Such a biasing force could be reduced to zero or a simple two point support eliminating lever arm **34** could be provided without any spring biasing mechanism without departing from the basic theory of operation of my invention.

It will be seen from an inspection of FIGURE 3 that by reducing the forces S_{25} and S_B to zero and by controlling the magnitudes and application points of these various forces, the reactionary force at one end of the machine, F_{17} for example, can be reduced to zero causing the one end of the machine to lift and thereby actuate a switch whenever a predetermined disturbing force, F_d, is reached so as to produce a slight lifting movement of tub **24** about pin **16** in response to the resultant movement produced by forces W, F_d and F_{17} acting through their respective lever arms. It will also be seen that if forces W and F_d were permitted to act midway between pins **16** and **17**, the resultant tendency for tub **24** to move upwardly rather than pivotally about the rear pivot pin **16** could also be utilized to control one or more solenoid shifter switches or some similar control.

It will be noted that tube **24** has for all practical purposes, only one degree of freedom, i.e., an arcuate movement back and forth around pins **16** and **17** and that the slight, restricted upward movement of the tub **24** takes place in the same vertical plane, but in another mode of vibration so that the centrifugal force sensing device is entirely independent of the force isolation system used to isolate the disturbing forces generated within tub **24** from base frame **10**.

For example, the illustrative unit has a tumble speed of approximately 50 revolutions per minute, a partially damped isolation system provided by springs **25** with a resonant frequency of approximately 65 cycles per minute, and a spin speed of approximately 300 revolutions per minute. Without the force isolation system, it would be impossible to carry the prescribed unbalanced loads up to that top spin speed and yet the resonant point of this isolation system, which is far below the top spin speed, has no detrimental effect on the centrifugal force sensing mechanism interrupting the power to the drum **95** in case of an excessive unbalance within that latter receptacle.

With respect to the operation of the control mechanism, it should be apparent that tub assembly **24** may be filled to the desired fluid level for the washing operations by regulating the solenoid valve (not shown) controlling the fluid flow to the tub assembly. Following the conventional washing operations during which time drum **95** is rotated at a tumbling speed of approximately 50 revolutions per minute, tub **24** is drained preparatory to the subsequent centrifuging operations.

At the beginning of the centrifuging operations, the tumbler speed is shifted from 50 revolutions per minute to approximately 300 revolutions per minute to centrifugal separate most of the residual fluids from the fabrics carried within drum **95**. Should an excessively unbalanced load such as a fourteen pound unbalance or the torque reaction to this speed change cause a wide arcuate movement of the tub assembly **24** relative to the base frame **10** at speeds in the region of resonance, plunger **65** will rock lever **61** into the position of FIGURE 9 thereby opening switch **54** for a period dependent upon the setting of needle valve **58**. This amplitude type control will therefore reduce the rotational speed of drum **95** to its tumbling speed in order to prevent contact between tub assembly **24** and its enclosing cabinet **119** at rotational speeds just above the tumble speed. It will also permit a redistribution of the fabrics within drum **95** prior to subsequent tumbler accelerations.

As drum **95** is accelerated toward its top spin speed, any existing acentric loads within tumbler **95**, which are always present in some degree in all clothes loads, will generate a progressively increasing unbalanced centrifugal force, illustrated in FIGURE 3 as F_d, which may be of sufficient magnitude to warrant operation of switch **54** by lever **34** to prevent the entire machine from lifting or moving relative to its supporting floor surface. If the centrifugal force generated by the rotation of these acentric clothes loads is of such a value as to cause the front end of tub **24** to lift thereby causing lever **34** to also lift and open switch **54**, the rotational speed of tumbler **95** will be reduced to its tumbling speed for the period determined by the setting of needle valve **58** thereby allowing a redistribution of fabric to occur prior to the next tumbler acceleration. It will be noted that the chances for subsequent triggering of switch **54** by lever **34** is substantially lessened each time not only by the rearrangement of clothes loads within tumbler **95**, but also by the progressively decreasing weight of the fabrics themselves due to the partial moisture extraction achieved during each tumbler acceleration prior to the triggering of switch **54**.

The triggering of switch **54** by either lever **61** or lever **34** may normally occur several times in each centrifuging operation depending upon whether or not it is caused by a torque reaction or an acentric load rotated at high speed within tumbler **95**. If desired, the centrifuging operation may be interspersed with tumbler operations controlled by a timer to positively assure a number of redistribution steps in each such centrifuging operation. By the use of these controls, the fabrics will be efficiently centrifuged prior to the start of the drying operations.

In the drawings and specification there has been set forth a preferred embodiment of the invention, and although specific terms are employed, these are used in a generic and descriptive sense only, and not for purposes of limitation. Changes in form and the proportion of parts, as well as the substitution of equivalents are contemplated, as circumstances may suggest or render expedient, without departing from the spirit or scope of this invention as further defined in the following claims.

I claim:

1. Laundry apparatus for centrifuging fluid from fabrics comprising, a support, a casing, a clothes receptacle revolubly mounted within said casing on a non-vertical axis and adapted to receive said fabrics, drive means for rotating said receptacle, means mounting said casing on said support in one primary degree of freedom about a non-vertical primary axis for attainment of a force isolation system having a resonant frequency during the rotation of said receptacle, and means sensitive to a predetermined amount of centrifugal force measured by movement of said casing in a secondary degree of freedom relative to said support for decreasing the power supplied by said drive means to said receptacle.

2. Laundry apparatus for centrifuging fluid from fabrics comprising, a support, a casing, a clothes receptacle revolubly mounted within said casing on a non-vertical axis and adapted to receive said fabrics, drive means for rotating said receptacle, means pivotally mounting said casing on said support for arcuate movement about a pivotal axis positioned parallel to the axis of rotation of said receptacle for attainment of a force isolation system having a resonant frequency during the rotation of said receptacle, and means sensitive to a predetermined amount of centrifugal force measured by movement of said casing relative to said support and transverse to said pivotal axis for decreasing the power supplied by said drive means to said receptacle.

3. Laundry apparatus for centrifuging fluid from fabrics comprising, a support, a lever pivoted on said support, a casing pivoted on said lever, a receptacle revolubly mounted on a non-vertical axis within said casing and adapted to receive fabrics to be centrifuged, the weight of said casing and said receptacle urging said lever in a first direction, drive means for rotating said receptacle at a tumbling speed and at higher extraction speeds, and control means responsive to movement of said lever in a second direction for reducing the rota-

tional speed of said receptacle from said extraction speeds to said tumbling speed to effect a redistribution of said fabrics within said receptacle when centrifugal forces generated by rotation of unbalanced loads within said receptacle move said lever in said second direction.

4. Laundry apparatus for centrifuging fluid from fabrics comprising, a support, a lever pivoted on said support, a casing pivoted on said lever, a receptacle revolubly mounted on a non-vertical axis within said casing and adapted to receive fabrics to be centrifuged, the weight of said casing and said receptacle urging said lever in a first direction, drive means for rotating said receptacle at a tumbling speed and at higher extraction speeds, bias means urging said lever in a second direction, and control means responsive to movement of said lever in said second direction for reducing the rotational speed of said receptacle from said extraction speeds to said tumbling speed to effect a redistribution of said fabrics within said receptacle when the combined torque produced by said bias means and by centrifugal forces generated by the rotation of unbalanced loads within said receptacle moves said lever in said second direction.

5. Laundry apparatus for centrifuging fluid from fabrics comprising, a support, a first lever pivoted on said support for movement in first and second directions, a casing pivoted on said first lever, a receptacle revolubly

mounted on a non-vertical axis within said casing and adapted to receive fabrics to be centrifuged, the weight of said casing and said receptacle urging said first lever in a first direction, bias means urging said first lever in said second direction, drive means for rotating said receptacle at a tumbling speed and at a higher extraction speed, a second lever pivoted on said first lever, a plunger member connected to said casing and engageable with said second lever during arcuate movements of said casing on said first lever, and common control means including a time delay shifter mechanism for temporarily reducing the rotation speed of said receptacle from said extraction speeds to said tumbling speed upon either movement of said second lever by said plunger during arcuate movement of said casing or upon movement of said first lever in said second direction by the combined torque produced by said bias means and centrifugal forces generated by the rotation of unbalanced loads within said receptacle.

References Cited

UNITED STATES PATENTS

3,084,799	4/1963	Decatur	68—24 X
3,226,960	1/1966	Mellinger	68—23

SAMIH N. ZAHARNA, *Primary Examiner.*