Aug. 23, 1960 J. BOCHAN 2,950,010

UNBALANCE SENSING ARRANGEMENT FOR MACHINES HAVING A CENTRIFUGAL LIQUID EXTRACTION STEP

Filed Aug. 4, 1958 3 Sheets-Sheet 1

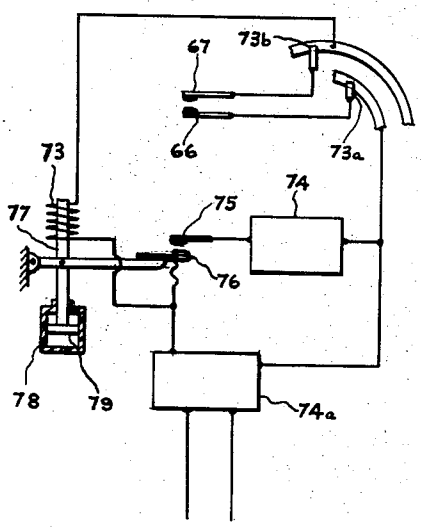
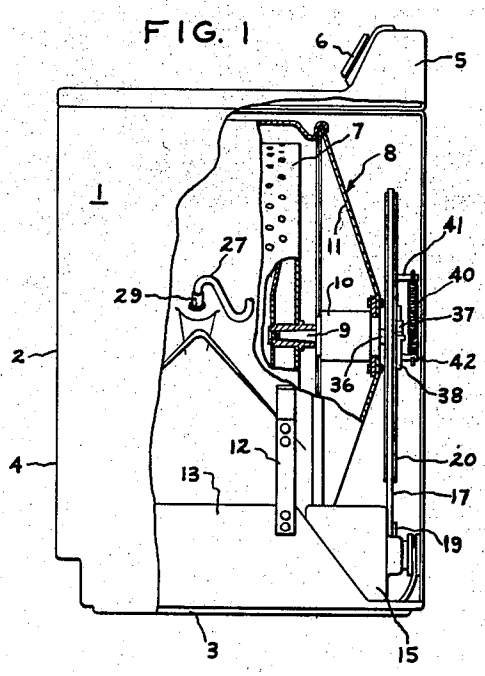


FIG. 5

FIG. 1



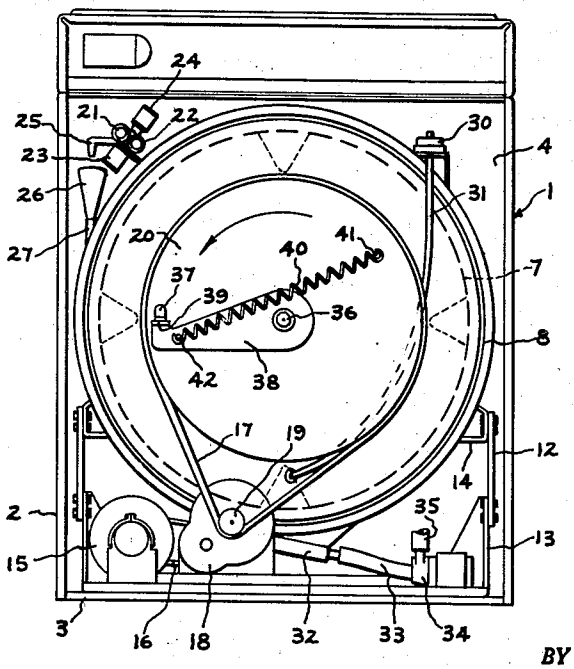


FIG. 2

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UNBALANCE SENSING ARRANGEMENT FOR MACHINES HAVING A CENTRIFUGAL LIQUID EXTRACTION STEP

Filed Aug. 4, 1958 3 Sheets-Sheet 2

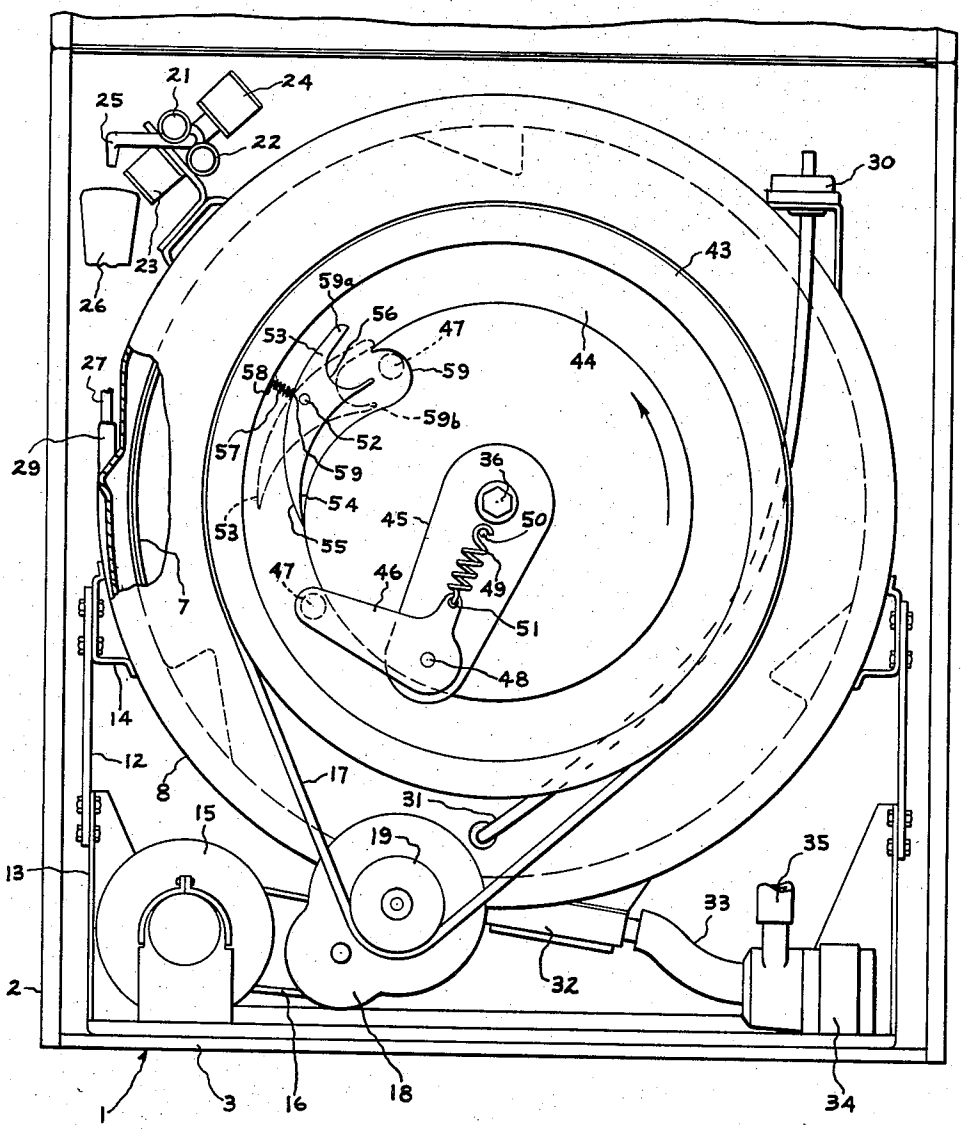


FIG. 3

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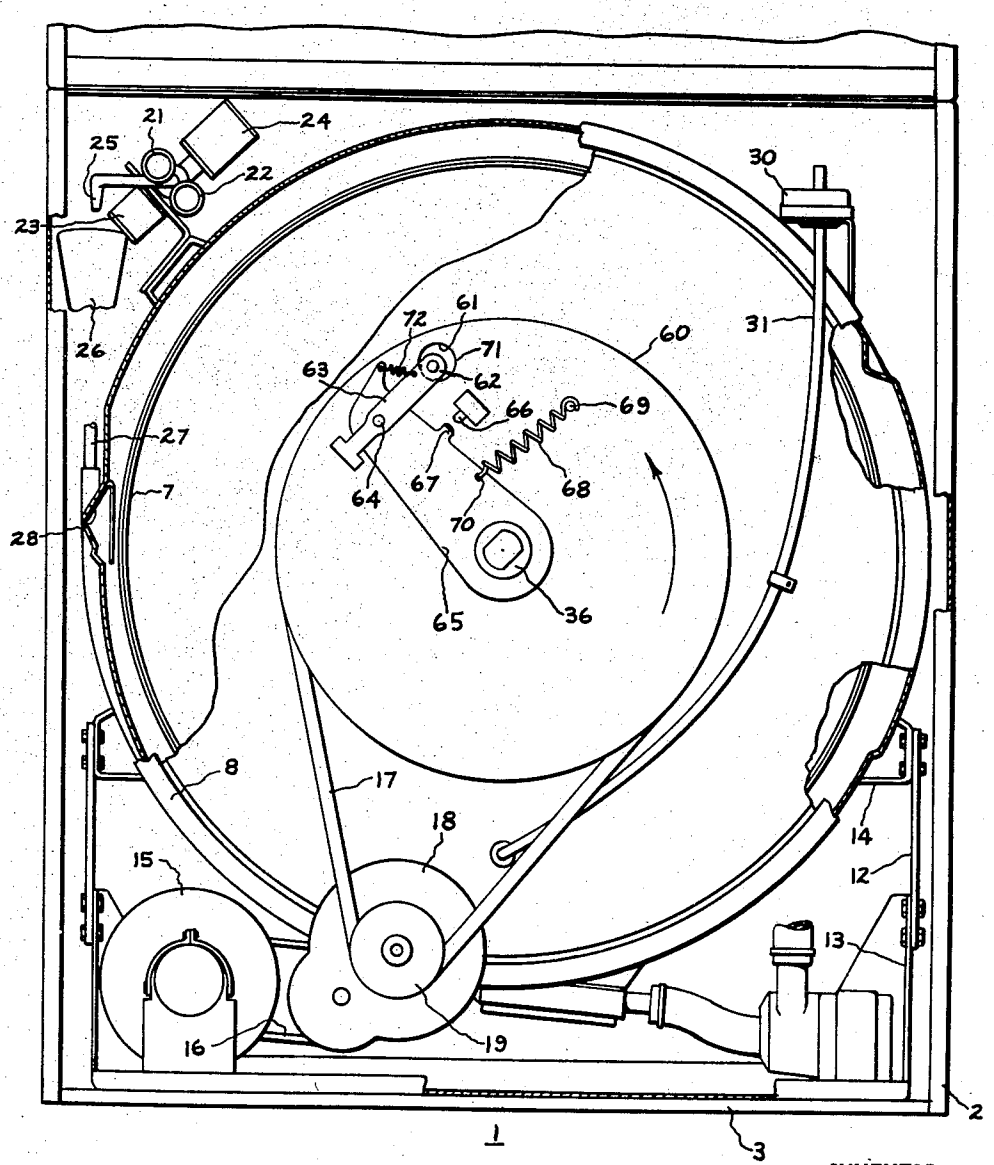
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UNBALANCE SENSING ARRANGEMENT FOR MACHINES HAVING A CENTRIFUGAL LIQUID EXTRACTION STEP

Filed Aug. 4, 1958 3 Sheets-Sheet 3

FIG. 4



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United States Patent Office 2,950,010
Patented Aug. 23, 1960

2,950,010

UNBALANCE SENSING ARRANGEMENT FOR MACHINES HAVING A CENTRIFUGAL LIQUID EXTRACTION STEP

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Filed Aug. 4, 1958, Ser. No. 752,727
12 Claims. (Cl. 210—144)

This invention relates to an improved unbalance sensing arrangement, intended primarily for use in automatic laundry machines of the type having a centrifugal liquid extraction step. More particularly, it relates to an improved unbalance sensing arrangement which utilizes the force of gravity acting upon an unbalance in the type of laundry machine having a container or basket rotatable on a substantially non-vertical axis.

When an automatic laundry machine of the type having a rotating basket proceeds from a washing or rinsing step into a centrifugal extraction step, vibration of the basket and of its enclosing tub structure may become quite substantial unless the clothes distribute themselves evenly around the basket. If this even distribution does not occur, the basket is dynamically unbalanced and, to whatever degree this condition exists, the vibration will occur. Actual harm may result to the machine from such vibration; this is particularly so where, because of the increasing demand for machines which take up a relatively small amount of space without any decrease in the load capacity of the machine, the clearance between the parts has been cut down as much as possible.

In the type of machine having a basket rotatable on a substantially non-vertical axis, any unbalance in the clothes distribution within the basket is acted on by the force of gravity. This force of gravity factor exists even before any perceptible amount of vibration has resulted from the unbalance. In other words, because of the gravity force, any unbalance in the basket tends to make the rotational speed of the basket increase when the unbalance is against the basket wall which is moving downwardly, and to decelerate the basket when the unbalance is against the wall which is moving upwardly.

It is an object of this invention to utilize this gravitational effect on the speed of rotation of the basket to provide means for sensing unbalances before any substantial vibrations have resulted therefrom.

A further object of the invention is to provide such a system in combination with means for correcting the unbalanced distribution of the clothes in response to the gravity sensing of an unbalance of predetermined magnitude.

A further object of the invention is to provide an improved washing machine of the type having a centrifugal liquid extraction cycle in which substantial vibrations during extraction are prevented by a gravity sensing system operative at or slightly above the speed at which the clothes become plastered around the periphery of the container.

A further object of the invention is to provide such a machine wherein, upon the sensing of an unbalance, the speed of the machine is decreased below centrifugal speed to permit redistribution of the clothes, and is then returned to the sensing speed.

In one aspect of my invention I provide, in a washing machine, a clothes container or basket rotatable on a substantially non-vertical axis. Multi-speed drive means are provided for rotating the basket. The drive means includes a drive member which is positioned to engage a portion of the basket so that operation of the drive member rotates the basket portion to drive the basket. The

engagement of the drive member with the basket portion is of the type which permits accelerations of the container portion other than those imparted from the drive member.

The drive means rotates the basket at a relatively low speed for washing clothes in the container, and at a relatively high speed when centrifugal extraction of liquid from the clothes in the container is desired. The basket is responsive to the force of gravity acting on any unbalance therein to provide intermittently a torque tending to accelerate the basket portion above the speed of the driving member. To give a specific instance of this, if the drive member is pushing the basket portion around in its rotary path at a speed sufficient to plaster the clothes around the basket, then in response to a descending unbalance in the basket it will tend to accelerate ahead of the drive member.

This phenomenon is made use of by providing means, responsive to a predetermined amount of gravity-caused accelerating torque on the container portion, for slowing the clothes basket below centrifuging speed. In this manner, a high speed operation with an undesirable amount of clothes unbalance in the basket is precluded at all times.

The features of my invention which I believe to be novel are set forth with particularity in the appended claims. My invention itself, however, may best be understood by the following description taken in conjunction with the accompanying drawings.

In the drawings:

Fig. 1 is a side elevational view of a domestic laundry machine incorporating one embodiment of my improved unbalance sensing arrangement, certain surfaces of the view being broken away in order better to illustrate details;

Fig. 2 is a rear elevational view of the machine of Fig. 1;

Fig. 3 is a rear elevational view of a laundry machine including a second embodiment of my improved unbalance sensing means, certain surfaces being broken away to illustrate details;

Fig. 4 is a rear elevational view of a laundry machine including a third embodiment of my improved unbalance sensing means, certain surfaces being broken away to illustrate details; and

Fig. 5 is a simplified schematic diagram of a circuit suitable for use with the construction of Fig. 4.

Referring now to Figs. 1 and 2, I have shown my invention in one form as applied to a domestic washing machine **1** which includes an outer cabinet **2** mounted on a supporting base structure **3**. Access to the machine for loading and unloading of clothes may be provided by a door (not shown) disposed in the front wall **4** of the cabinet. A backsplasher **5** mounted at the top of the cabinet serves as a mounting means for suitable operator controls for the machine, such as, for instance, rotatable dial **6**.

The machine **1** is of the type which includes a clothes basket rotatable about a non-vertical axis; specifically, it includes a perforated basket **7** which is disposed for rotation about a horizontal axis. Basket **7** is mounted within an imperforate tub structure **8** which encloses it on all sides, and is rotatably supported from the tub structure by a horizontally extending shaft **9** (Fig. 1) mounted in an elongated bearing **10** hung from the rear wall **11** of the tub structure. The shaft **9**, as well as supporting the basket, also serves as a means for turning it during operation of the machine. The tub and basket are generally provided with openings (not shown) suitably aligned with the opening in wall **4** to permit clothes to be placed into or removed from the basket.

Tub **8** is supported from base **3** by means of a plurality of brackets or arms **12** which are mounted on upstanding

plates 13 fixedly attached to base 3. While arms 12 can be secured directly to the wall of tub 8, they may also be attached thereto by means of suitable brackets 14 as shown (Fig. 2). During the operation of the machine, basket 7 is driven from an electric motor 15 through a drive including a pair of flexible belts 16 and 17. Belt 16 connects the output pulley (not shown) of motor 15 to the input pulley (not shown) of a multi-speed transmission assembly 18. Belt 17 connects the output pulley 19 of transmission assembly 18 to a basket drive pulley 20. The basket drive pulley 20 in turn imparts the rotation to basket 7 through a construction which is further described herebelow in specific connection with the illustrated embodiments of my inventive concept.

Machine 1 includes the other components normally provided in connection with domestic washing machines. Thus, for instance, the water supply means, whereby the water is admitted to and discharged from tub 8, may include connections 21 and 22 through which hot and cold water is supplied to the machine for the washing operation. A valve controlled by a solenoid 23 admits hot water to the machine and a valve controlled by solenoid 24 admits cold water to the machine. The hot and cold water valves under the control of the solenoids 23 and 24 discharge to a common outlet conduit 25, through a suitable air gap, and into funnel 26 which discharges into a line 27 leading to the interior of tub 8 through a suitable connection 29. The air gap provided by funnel 26 makes it impossible for water to be syphoned from the machine so as to contaminate the incoming water supply line. A pressure actuated water level control 30 connected to the interior of the tub 8 by a line 31 controls both solenoids 23 and 24 to maintain the proper water level in the machine during the washing operation. The wash and rinse water used during the washing operation is discharged from the machine through a sump 32 mounted at the bottom of the tub. A suitable discharge hose 33 leads from the sump to a motor driven drain pump 34 which discharges to the household drain through a suitable conduit such as hose 35.

With the apparatus shown, any suitable sequence derived from the basic sequence of washing, rinsing and spinning may be utilized to effect the washing operation. Transmission 18 is arranged so that it is capable of rotating pulley 20 at a speed appropriate to effect rotation of basket 7 at approximately 47 r.p.m., for instance, for a washing operation and at a suitable high speed, generally substantially upward of 200 r.p.m., for the centrifugal liquid extraction operation. Transmission 18 is also designed to provide yet a third speed for basket 7; this third speed may, where the usual 26 inch diameter basket is provided, be on the order of 70 revolutions per minute, which is slightly above the minimum speed at which all clothes in the basket are under the influence of centrifugal force and plastered against the basket wall.

In order to achieve rotation of basket 7 by transmission 18, pulley 20 is rotatably mounted on an end 36 of shaft 9 extending from the rear wall 11 of tub 8. Pulley 20 includes a projecting portion 37 which is in driving relationship to an arm 38 secured to shaft end 36 so as to rotate therewith. Since shaft 9 constitutes a driving connection to basket 7, rotation of pulley 20 in a counterclockwise direction (as viewed in Figure 2) causes driving member 37 to engage the end 39 of projecting arm 38 from behind relative to the direction of rotation, and through that arm and shaft 9 to rotate basket 7.

It will be noted that if the clothes load within basket 7 should be unbalanced, then at the time that the extra weight is descending on the left hand side of the basket (Fig. 2) the unbalance will give the basket a torque tending to accelerate it ahead of drive member 37 on pulley 20. This phenomenon occurs, with a washer construction of the type illustrated and described, substantially before there are any noticeable unbalance vibrations. The tendency of arm 38 to accelerate ahead of driving member 37 constitutes an indication of unbalance which may cause harmful vibration if not corrected.

To take advantage of this signal, suitable means are provided for causing the basket 7 to decelerate below centrifuging speed in response to a predetermined angular displacement of the basket ahead of the driving member 37. In the embodiment of Fig. 2, this means is provided by spring 40 secured at one end to a pin 41 on pulley 20 and at its other end to pin 42 on basket arm 38. As soon as the angular displacement between driving member 37 and arm 38 becomes great enough so that spring 40 is moved over center, as represented by shaft end 36, the force of the extended spring will exert a torque causing arm 38 on basket 7 to spin around at increased speed ahead of driving member 37. Arm 38 thus moves around so that it is almost a full circle ahead of the driving member 37; consequently, since there is no longer any operative connection between pulley 20 and basket 7 the basket starts to slow down. The basket continues to slow down until driving member 37 catches up with arm 38 to start once again to push it in its rotational path.

It is contemplated that during the sensing operation described, the transmission will be rotating the basket at "plaster" speed, i.e., at the minimum centrifugal speed. Therefore, the decrease in rotational speed of the basket causes some of the clothes to cease to be held by centrifugal force, and some redistribution of the clothes within the basket 7 takes place. If this redistribution effects substantial balance within the basket, then there will be little or no tendency for arm 38 to move angularly ahead of driving member 37. If, however, there is still an undesirable amount of unbalance present when member 37 again starts to drive arm 38, the arm will again move ahead of the driving member until spring 40 moves over center, at which time the entire cycle will be repeated. Thus, the construction described senses undesirable unbalance at the minimum centrifugal speed, where the vibrations are still so small as to be negligible, and causes the unbalance to be corrected before a higher speed is attained. After the sensing operation is complete, the transmission is caused to provide the high speed spin for centrifugal liquid extraction. This may be done, for instance, in the usual way by providing a standard timer control which allows a predetermined time interval for the sensing operation, and thereafter provides the extraction operation.

Referring now to Fig. 3 a second embodiment of the invention will be described, using like numerals for like parts. In this embodiment the pulley 43 which is driven by transmission 18 through belt 17 has an annular groove 44. As before, the pulley 43 is mounted to rotate freely on end 36 of the basket shaft.

An arm 45 is secured to rotate with shaft end 36. Arm 45 has an extension part 46, terminating in a projecting portion 47 which is pivotably mounted on a pin 48 secured on arm 45. A spring 49 having one end secured about a pin 50 and its other end secured in an opening 51 of extension part 46 is arranged to bias the extension part about pin 48 so that projecting portion 47, which extends into the annular groove 44 of pulley 46, has the position shown.

Pivotally mounted on a pin 52 secured on pulley 43, there is an irregularly shaped member 53 having a curved underside 54 and a curved upper side 55 which intersect each other to form the sharp end of member 53. The other end of member 53 is formed as a concavely curved portion 56. A spring 57 is provided, secured at one end on a pin 58 extending from pulley 43 and at its other end on a pin 59 extending from member 53. Spring 58 serves to bias member 53 either to the position shown in full outline or to the position shown in phantom outline, i.e., it precludes intermediate positions.

When motor 15 causes rotation of pulley 43 in a coun-

terclockwise direction, the first time that member 53 rotates past projecting portion 47 it forces its way thereunder. As portion 47 rides up surface 55 to the tip 59*a* thereof, the projection 47 forces the member 53 to move to the position shown in phantom. At this point, the pulley continues to rotate, still without imparting its rotation to the arm 45. The next time member 53 comes around to projection 47, the member 53 is in the position shown in phantom. Consequently, member 47 passes between surface 54 thereof and the inner surface of groove 44. Projection 47 rides up surface 54 until it engages tip 59*b* to force the member 53 to pivot to the position shown in solid outline. However, at this time projection 47 is already trapped beneath surface 54, and passes into a curved recess 59 formed in the inner part of pulley 43. At this point, the counterclockwise rotation of pulley 43 starts to be transmitted from the pulley recess 59 through the projection, extension 46 and arm 45 to the basket shaft.

In the event of an unbalance in basket 7, the basket will start to move ahead of the pulley 43 during each revolution when the unbalanced weight is plastered against the descending portion of the wall of basket 7. If the unbalance is large enough, then projection 47 will move far enough ahead of the recess 59 so that, being biased to an outward position by spring 49, it is guided by curved portion 56 of member 53 out of the recess 59, i.e., out of its connection with the drive means. At this point, the pulley continues its rotation with the basket 7 losing speed and projection 47 consequently falling behind the member 53. After the basket has fallen behind the pulley one full rotation, projection 47 will pass over the outer surface 55 of member 53, biasing it to the position shown in phantom outline. At this time the projection 47 is still not contained within recess 59, and therefore basket 7 continues to fall another full revolution behind the driving pulley 43 before projection 47 again moves around to the region of member 53. At this time, with member 53 in the position shown in phantom outline, the projection will pass into the recess 59 and into operative engagement with pulley 43. At the same time the projection 47 forces the member 53 to the position shown in solid outline in readiness for another operation. During the two full revolutions that the basket falls behind, it slows down, as before, to an extent where the clothes are no longer plastered against the wall and therefore redistribution of the clothes takes place. If the redistribution of the clothes is sufficient to provide a proper balance within basket 7, no further corrective action will take place, and the basket will, after a suitable period, be accelerated by transmission 18 to a relatively high spin speed. However, if the balance still should not be satisfactory, then the cycle will be repeated for another redistribution of the clothes. It will be seen that, as in the embodiment of Fig. 2, the torque resulting from the force of gravity is translated into physical displacement of the basket relative to the driving member to provide a signal to a mechanical "slow-down" arrangement; however, the arrangement of Fig. 3 permits substantially more redistribution of the clothes since the deceleration continues through two relative rotations rather than one.

Referring now to Fig. 4 of the drawings, a third embodiment of the invention will be described using like numerals for like parts. In this case, the belt 17 drives a pulley 60 in the same counterclockwise direction as for the other two embodiments. Pulley 60 is provided with a circular opening 61 in which is positioned a roller member 62 secured at the end of an extension part 63. Extension 63 in turn is pivotably mounted on a pin 64 secured adjacent the outer end of an arm 65. Arm 65 is secured to shaft end 36 as before, so as to be rigidly connected to rotate with basket 7; the pulley 60 is mounted in free rotational relationship to shaft end 36. A switch contact 66 is mounted on pulley 60 and is engageable with a contact 67 provided on arm 65. A spring 68, secured at one end about a pin 69 on pulley 60 and at its other end in an opening 70 formed in arm 65, biases the two contacts together. In operation, when pulley 60 starts to rotate, the back portion 71 of opening 61 engages the roller 62 thus forcing the roller in a counterclockwise direction. The movement of the roller to the back 71 of opening 61 is kept very quiet by the provision of a spring 72 which causes the roller to roll about the outer portion of opening 61 to reach its position in engagement with the back surface 71. At this point, with roller 62 being forced forward by pulley 60, the movement of the pulley 60 is imparted through roller 62, extension 63, arm 65 and shaft end 36 to the basket 7 so that the basket also rotates. At this time the contacts 67 and 66 are engaged and are being so held with a predetermined amount of force determined by the characteristics of spring 68.

As before, unbalances in the clothes plastered to the side of basket 7 provide a torque tending to make the basket move ahead of pulley 60 when the unbalanced weight is on the descending portion of the basket wall. In distinction to the arrangements of Figs. 1 and 2, and of Fig. 3, where the amount of movement of the basket relative to the pulley provided the determining factor as to whether the slowing down means was made effective to provide redistribution, the construction of Fig. 4 opens contacts 66 and 67 upon an almost imperceptible amount of movement. In other words, as soon as the unbalance force becomes greater than the force of spring 68, there will be a separation between contacts 66 and 67.

Referring now to Fig. 5 in connection with Fig. 4, there is shown a simplified electrical circuit to illustrate one typical electrical arrangement which may be provided to use the relationship of contacts 66 and 67 to effect clothes redistribution if the balance is unsatisfactory. In Fig. 5, there is shown a solenoid coil 73 in series relationship with contacts 66 and 67 across a source of power. Of course, due to their rotating nature contacts 66 and 67 are connected through appropriate slip ring and brush assemblies, schematically shown at 73*a* and 73*b* respectively, to the other stationary circuit components. In parallel with contacts 66 and 67, there is a speed control device 74, shown in block form since it may assume any one of several forms well known to those skilled in the art. When energized, control 74 provides "plaster" speed for basket 7; when de-energized, the control provides tumble speed for the basket. Both the solenoid coil 73 and control 74 are under the control of the usual timer control mechanism 74*a*, so that they are effective only at the proper times, as dictated by the timer.

In series with control 74, are two contacts 75 and 76. Contact 76 is controlled by the position of solenoid core 77; when core 77 is pulled up as a result of the energization of coil 73, contact 76 engages contact 75 to energize control 74 and provide plaster speed. Once coil 73 has been de-energized, a predetermined time lapse between re-energization of the coil and reclosing of the contacts 75 and 76 is provided by any suitable time delay means such as the schematically illustrated dash-pot mechanism 78 having a member 79 secured to solenoid core 77. It will be seen by reference to Figs. 4 and 5 that the opening of the contacts 66 and 67 de-energizes coil 73; this causes de-energization of the speed control 74 by opening contacts 75 and 76 thus causing basket 7 to return to tumble speed. As soon as the basket returns to tumble speed, the contacts 66 and 67 reclose because there is no longer a substantial continuing unbalance. This re-energizes solenoid coil 73, which, in cooperation with dash pot 78, recloses contacts 76 and 75 after a predetermined period provided for redistribution. Closing of contacts 76 and 75 again causes rotation of the basket at the intermediate speed. If there is no unbalance, the intermediate speed will after an appropriate time be caused by control 74*a* to give way to a high spin speed suitable for extracting liquid from the clothes. If the unbalance should still be unsatisfactory for per-

mitting a high spin speed, the cycle will be repeated, with the speed being returned to tumble for redistribution of the clothes and another attempt at the intermediate speed being made.

It will be seen that this third embodiment, as set forth in Figs. 4 and 5, provides a construction which is responsive to a very small amount of angular movement of the basket relative to the pulley, with a torque differential being substituted for the relatively large angular movement required in the embodiments of Figs. 2 and 3. It will further be observed that the roller construction set forth in the embodiment of Fig. 4 provides quiet operation of the construction by preventing impact between relatively moving parts.

It will be seen from the foregoing that my invention provides a construction whereby the gravitational effect on an unbalanced load in a basket rotating on a generally horizontal axis is utilized to provide an indication of the need for redistribution of the clothes. It will further be seen that this is achieved before any harmful vibrations can occur as a result of an increase to a relatively high speed with the unbalance still present.

While in accordance with the patent statutes I have shown what at present are considered to be the preferred embodiments of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and I therefore aim by the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

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

1. In a laundry machine, a clothes basket rotatable on a substantially non-vertical axis, multi-speed drive means for rotating said basket including a drive member positioned to rotate substantially coaxially with said basket, said basket having a portion engageable by said drive member, said drive member engaging said basket portion to rotate said basket at a relatively low speed for tumbling clothes in said basket and at a relatively high speed for centrifugal extraction of liquid from the clothes, said basket portion being angularly movable away from engagement with said drive member by the force of gravity in response to unbalanced distribution of clothes within said basket; and means responsive to a predetermined angular movement of said basket portion relative to said drive member for decreasing the basket speed for redistribution of the clothes.

2. The apparatus defined in claim 1 wherein said drive member engages said basket portion from behind relative to the direction of rotation, said drive member pushing said basket portion around to effect the driving of said basket, said basket portion being angularly movable ahead of said drive member in the direction of rotation by the force of gravity in response to unbalanced distribution of clothes within said basket.

3. In a laundry machine, a clothes basket rotatable on a substantially non-vertical axis; multi-speed drive means for rotating said basket including a belt driven pulley positioned to rotate substantially coaxially with said basket, a drive member secured on said pulley to rotate therewith, a shaft secured to rotate with said basket, an arm secured to rotate with said shaft, said arm being engageable from behind relative to the direction of rotation by said drive member, said drive member pushing said arm in a rotary path at a relatively low speed for tumbling clothes in said basket during washing operations and pushing said arm at a relatively high speed for centrifugal extraction of liquid from the clothes in said basket, said basket being subject to acceleration by the force of gravity in response to unbalanced distribution therewithin, said arm being angularly movable ahead of said drive member in response to acceleration of said basket by the force of gravity; and means responsive to a predetermined angular movement of said basket arm ahead of said driving member for decreasing the basket for redistribution of the clothes.

4. The apparatus defined in claim 3 wherein said drive means rotates said basket just fast enough to plaster the clothes around said basket subsequent to the washing operation, said means responsive to a predetermined angular movement of said basket arm first slowing said container below plaster speed to effect redistribution of the clothes and then causing engagement of said basket arm by said drive member for further rotation at plaster speed.

5. In a laundry machine, a clothes basket rotatable on a substantially non-vertical axis; multi-speed drive means for rotating said basket including a pulley rotatably mounted substantially coaxially with said basket; a drive member secured on said pulley; a shaft coaxially secured to said basket to rotate therewith; an arm extending radially from said shaft and secured thereto; said arm being engageable by said drive member from behind relative to the direction of rotation of said drive member, said drive member engaging said arm to rotate said basket at a relatively low speed for washing clothes in said basket, at a relatively high speed for centrifugal extraction of liquid from the clothes, and at an intermediate speed just high enough to plaster the clothes about said basket by centrifugal force for unbalance sensing, said basket being subject to acceleration and deceleration in response to the force of gravity on unbalanced loads within said basket during its intermediate speed rotation, said arm being angularly movable ahead of said drive member in response to basket acceleration by the force of gravity; and means responsive to a predetermined angular movement of said arm ahead of said drive member for slowing said basket below said intermediate speed for redistributing the clothes, said responsive means comprising an over-center spring secured at one end to said pulley and at the other end to said arm, said spring being positioned so that upon said predetermined angular movement of said arm said spring passes over the center of rotation of said arm whereby said spring pulls said arm around ahead of said pulley until it is substantially one full revolution ahead thereof, said basket then being free to slow down below said intermediate speed for redistribution of the clothes during the period in which said drive member is catching up to said arm, said drive member again pushing said arm in a rotary path at said intermediate speed after it catches up.

6. In a laundry machine, a clothes basket rotatable on a substantially non-vertical axis; multi-speed drive means for rotating said basket including a drive member, said basket having a portion engageable by said drive member, said drive member engaging said basket portion so as to permit accelerations of said basket portion other than those caused by said drive member, said drive member engaging said basket portion to rotate said container at a relatively low speed for washing clothes in said container and at a relatively high speed for centrifugal extraction of liquid from the clothes, said basket being responsive to the force of gravity acting on an unbalanced distribution of clothes within said basket to provide a torque tending to move said basket portion ahead of said drive member; and means responsive to a predetermined amount of said torque for decreasing the basket speed sufficiently to effect redistribution of the clothes.

7. In a laundry machine, a clothes basket rotatable on a substantially non-vertical axis; multi-speed drive means for rotating said basket including a drive member positioned to rotate substantially coaxially with said basket, said basket having a portion engageable by said drive member, said drive member engaging said basket portion to rotate said basket at a relatively low speed for washing clothes in said basket, at an intermediate speed just sufficient to plaster clothes around said basket by centrifugal force for sensing unbalances, and at a relatively high speed for centrifugal extraction of liquid from

the clothes, said basket being responsive to the force of gravity acting on clothes distributed in an unblanced fashion within said basket to provide a torque tending to move said basket portion ahead of said drive member, said drive member driving said basket at said intermediate speed for a predetermined period before going from said low speed to said high speed; and means responsive to a predetermined angular movement of said basket portion relative to said drive member during said intermediate speed drive for slowing said basket sufficiently to effect redistribution of the clothes.

8. The apparatus defined in claim 7 wherein means are provided to cause rotation of said basket by said drive member at said intermediate speed again after a predetermined period of rotation at clothes distributing speed in response to actuation of said responsive means.

9. In a laundry machine, a clothes basket rotatable on a generally horizontal axis, multi-speed drive means for rotating said basket including a belt driven pulley positioned to rotate substantially coaxially with said basket, a drive member secured to said pulley to rotate therewith, a shaft coaxially secured to said basket to rotate therewith, an arm secured to said shaft to rotate therewith, said drive member being arranged to engage said arm on the back side thereof with respect to the direction of rotation, said drive member engaging said arm to rotate said basket at a relatively low speed for washing clothes in said basket, at a relatively high speed for centrifugal extraction of liquid from the clothes, and at an intermediate speed just sufficient to plaster the clothes around said basket by centrifugal force for sensing unbalances, said pulley having an annular groove formed therein, a projecting portion on said arm biased to a position where it is arranged to rotate around in said groove, said pulley having a recess formed radially inward of said groove arranged to receive said projecting portion to be in driving relation thereto, and a member movably secured to said pulley adjacent said pulley recess, said movable member being biased to two alternative positions, said movable member guiding said projecting portion past said recess around in said annular groove in one of said positions, said movable member guiding said projecting portion out of said groove and into said recess in the other of its positions, said arm being angularly movable ahead of said drive member by the force of gravity in response to unbalanced distribution of clothes within said basket during said intermediate speed drive, said projecting portion being responsive to a predetermined angular movement of said arm relative to said pulley for moving out of said recess into said groove whereby said basket starts to slow down to permit redistribution of the clothes therein, said projecting portion rotating around in said annular groove in a direction opposite to the direction of rotation of said pulley during said slowing down, said movable member being positioned to guide said projecting portion past said recess for a second revolution in said annular groove the first time said projecting portion engages said movable member, said projecting portion in being so guided moving said movable member to its other alternative position, said movable member after the second revolution of said projecting portion guiding said projecting portion into said recess for a resumption of the driving relationship of said pulley and said basket, said projecting portion in moving into said recess forcing said movable member back to its one position in readiness for another redistribution cycle.

10. In a laundry machine, a clothes basket rotatable on a substantially non-vertical axis; multi-speed drive means for rotating said basket including a drive member positioned to rotate substantially coaxially with said basket, said basket having a portion engageable by said drive member, said drive member engaging said basket portion to rotate said basket at a relatively low speed for washing clothes in said basket, at a relatively high speed for centrifugal extraction of liquid from the clothes, and at an intermediate speed just above that necessary to plaster the clothes about said basket by centrifugal force, said basket being subject to torques resulting from the force of gravity acting on clothes distributed in unbalanced relationship within said basket, and means responsive to a predetermined amount of gravity-caused torque on said basket portion when said basket is being driven at said intermediate speed for slowing said basket below said intermediate speed for redistribution of the clothes, said responsive means comprising an electrical contact secured on said drive member, a second electrical contact secured on said basket portion, said contacts being movable relative to each other to open and closed positions, said contacts assuming one of said positions when the torque resulting from the force of gravity is below a predetermined value and assuming a second position when the torque resulting from the force of gravity is above the predetermined value, movement of said contacts from said one position to said second position controlling a circuit for slowing said basket below centrifuging speed for redistribution of the clothes, the slowing of said basket returning said contacts to their first position, and a circuit controlled by said contacts in their first position to return the speed of rotation of said basket to said intermediate speed for another unbalance sensing operation.

11. In a laundry machine, a clothes basket rotatable on a substantially non-vertical axis; multi-speed drive means for rotating said basket including a belt driven pulley positioned to rotate substantially coaxially with said basket, a drive member secured on said pulley to rotate therewith, a shaft secured coaxially to said basket to rotate therewith, an arm member secured to said shaft to rotate therewith, said arm being engageable by said drive member from behind with respect to the direction of rotation of said drive member, said drive member engaging said arm to rotate said basket at a relatively low speed for washing clothes in said basket, at a relatively high speed for centrifugal extraction of liquid from the clothes, and at an intermediate speed sufficient to plaster the clothes around the wall of said basket by centrifugal force, said basket being subject to torque resulting from the force of gravity acting on clothes distributed in unbalanced relationship within said basket, said torque acting in a direction to tend to move said arm angularly ahead of said drive member, spring means secured between said pulley member and said arm member and biasing said arm member into engagement with said driving member, said torque becoming greater than the biasing force upon a predetermined size of unbalance at said intermediate speed thereby to cause movement of said arm member ahead of said driving member, electrical contact means having a first relationship when said driving member engages said arm member and having a second relationship when said torque overcomes the biasing force, and a circuit including said contacts, said circuit controlling the speed of operation to cause return of the speed to said low speed in response to movement of said contacts to said second relationship and causing return of said speed to said intermediate speed in response to return of said contacts into said first relationship.

12. The apparatus defined in claim 11 wherein said contacts are electrically connected in said first relationship and are electrically separated in said second relationship.

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