July 5, 1960 D. J. PAINTER 2,943,472

UNBALANCE SENSING ARRANGEMENT FOR MACHINES HAVING A CENTRIFUGAL LIQUID EXTRACTION STEP

Filed May 18, 1959 3 Sheets-Sheet 1

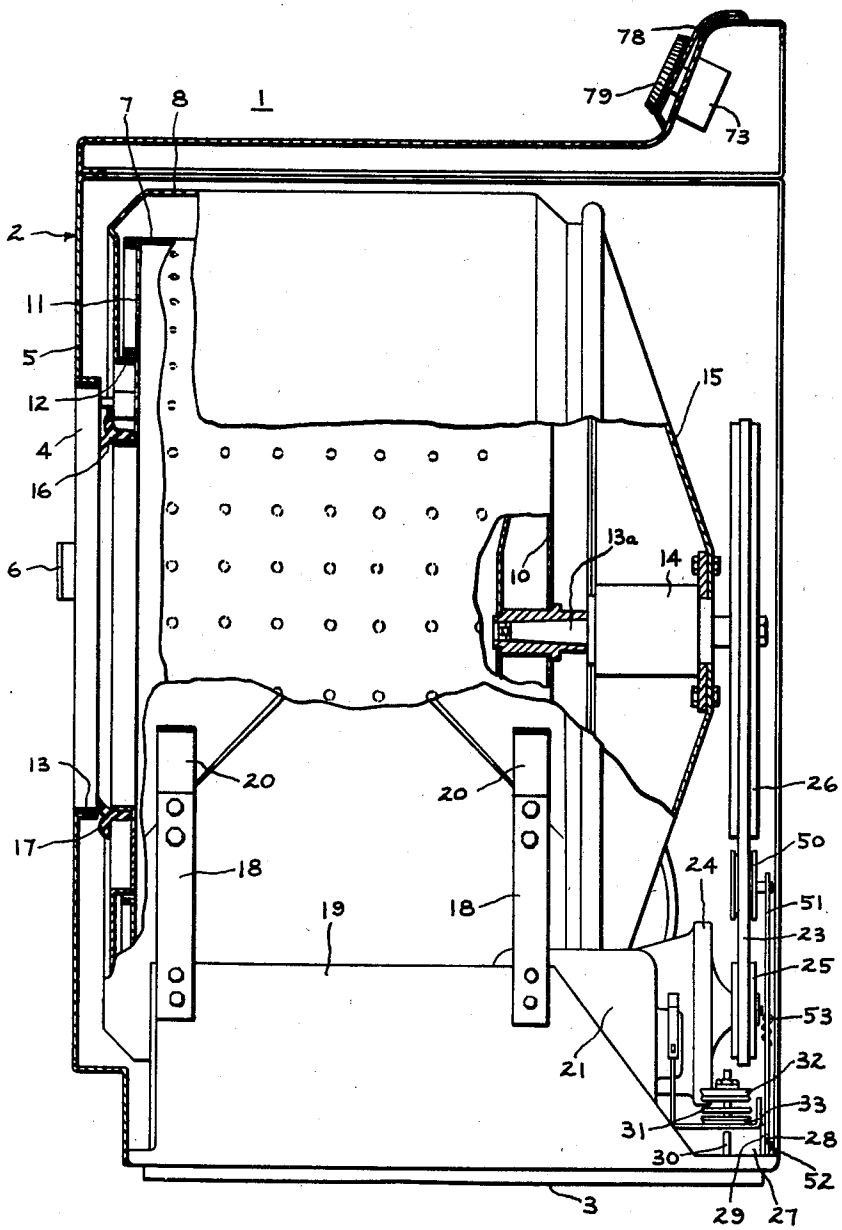

FIG. 1

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Filed May 18, 1959 3 Sheets-Sheet 2

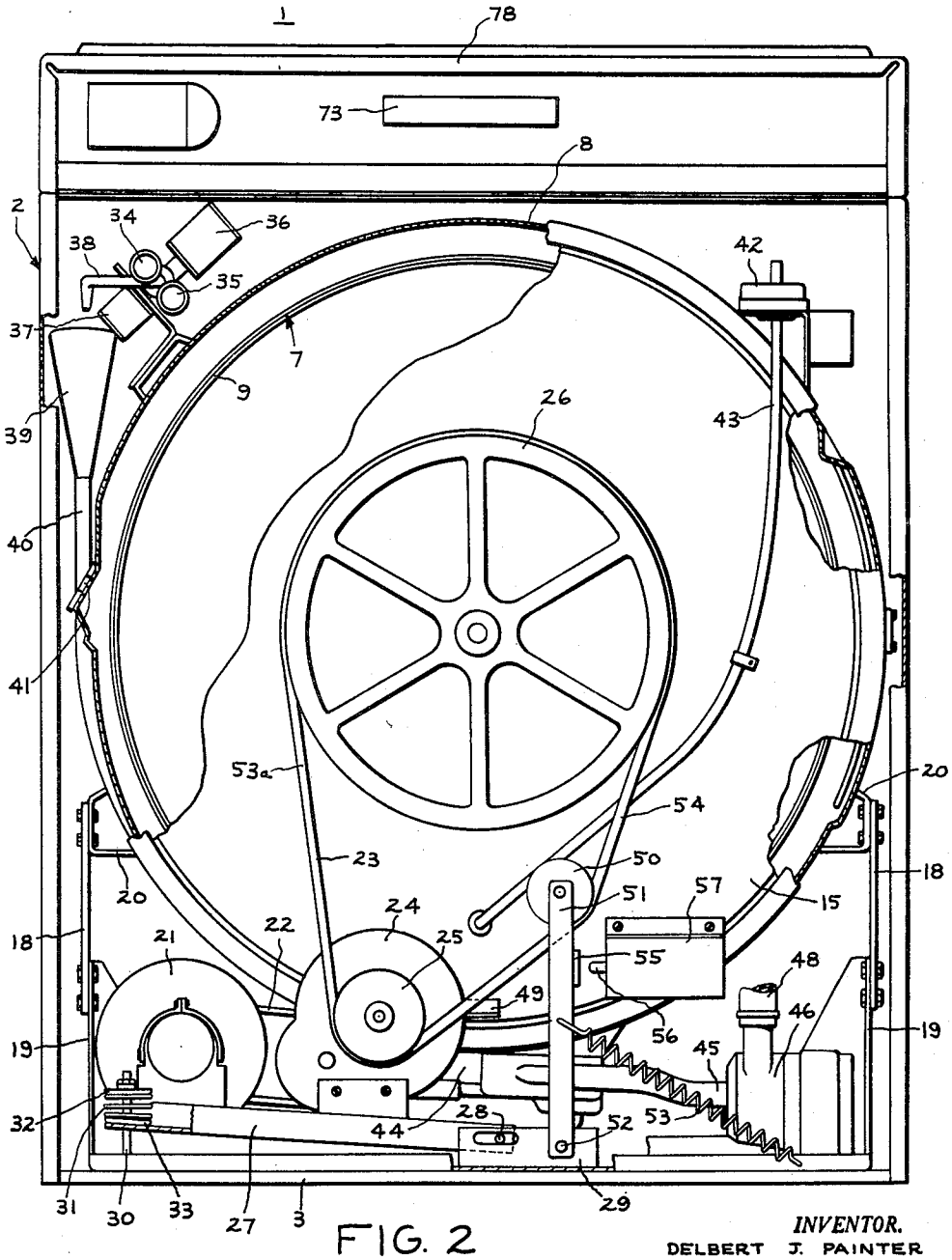

FIG. 2

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Filed May 18, 1959 3 Sheets-Sheet 3

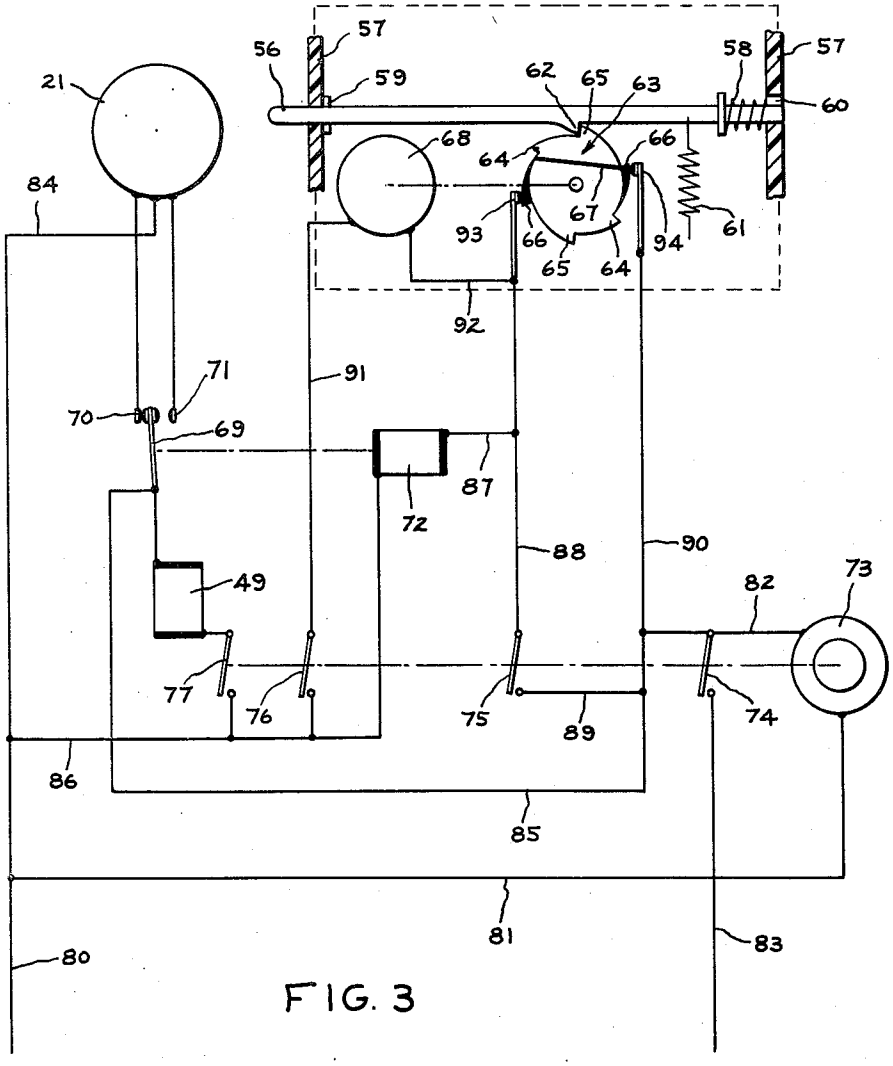

FIG. 3

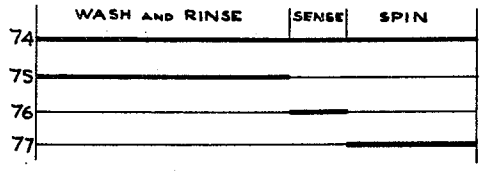

FIG. 4

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UNBALANCE SENSING ARRANGEMENT FOR MACHINES HAVING A CENTRIFUGAL LIQUID EXTRACTION STEP

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Filed May 18, 1959, Ser. No. 814,063

9 Claims. (Cl. 68—12)

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 and correcting arrangement which senses 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 at the high rotational speeds required for centrifugal extraction 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 create a torque in the same direction as the basket rotation when the unbalance is against the basket wall which is moving downwardly, and to create a torque opposing the rotation of 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 clothes in the basket to provide means for sensing unbalances before any substantial vibrations have resulted therefrom.

A further and more specific object of the invention is to provide, in a system where the rotating basket is operated through driving and driven pulleys connected by a belt, means which senses the variations in belt tension resulting from the gravitational effect on unbalances and actuates suitable corrective means.

A further object of the invention is to provide an improved washing machine of the type having a centrifugal liquid extraction cycle in which vibrations during extraction are prevented by a system sensitive to variations in belt tension when the machine is run at or slightly above the speed at which the clothes become plastered around the periphery of the container, and which in response to belt tension variations of predetermined magnitude effects a redistribution of the clothes in the container prior to high speed operation.

In one aspect of my invention I provide, in a laundry machine, a clothes container or basket which is rotatable on a substantially non-vertical axis. Multi-speed means, provided for rotating the basket, includes a driving pulley, a driven pulley connected to the basket to cause rotation of the basket, and an endless belt looped over both the pulleys so as to connect them together. The driving means is capable of rotating the basket at a relatively low speed suitable for washing clothes in the container and also at a relatively high speed in order to effect centrifugal extraction of liquid from the clothes; the speed provided is determined by electric control means.

The basket is responsive to the force of gravity acting on an unbalanced clothes distribution to provide a torque feed-back through the system which drives it. Since the tension of the driving belt is a function of, among other factors, the torque required to rotate the basket, any torque feed-back will modify the tension of the belt to an extent dependent upon the magnitude of the torque feed-back; this, in turn, is dependent on the magnitude of the unbalance in the basket. Idler means are arranged to resiliently engage the belt between the pulleys so as to be movable in response to variations in belt tension. When the variations are large enough they cause the idler means to transmit a signal to the speed control means to decrease the basket speed. This permits a redistribution of the clothes to take place; then the basket may again be increased in speed to determine again if the balance of the clothes in the basket is within the acceptable range or not. It is contemplated that, preferably, a suitable predetermined length of time prior to the high speed extraction will be provided for this sensing operation, and that thereafter the machine will proceed into high speed operation.

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,

Figure 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 to better illustrate details;

Figure 2 is a rear elevational view of the machine of Figure 1, with the rear panel removed to illustrate details;

Figure 3 is a simplified diagram of a control circuit for use with the construction of Figures 1 and 2 and which embodies the improved features of my invention; and

Figure 4 is a cam chart showing a control sequence for the circuit of Figure 3 appropriate for use in connection with my improved unbalance sensing arrangement.

Referring now to Figures 1 and 2, I show 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 is provided by a door 4 disposed in the front wall 5 of the cabinet. The door is conventionally mounted on concealed hinges and is opened by any suitable means such as a knee operated latch control 6.

Machine 1 is of the type which includes a clothes basket rotatable about a non-vertical axis; specifically, it includes a substantially cylindrical perforated basket or receptacle 7 mounted for rotation on a generally horizontal axis within an outer enclosing tub structure 8. Basket 7 comprises a cylindrical wall or shell 9 which is closed at its rear end by means of a suitable wall or plate 10. The basket also includes a front wall 11 formed so

as to define an access or loading opening 12 in registry with an opening 13 formed in wall 5 for door 4. The basket is rotatably supported by a shaft 13*a* mounted in elongated bearing 14 hung from the rear wall 15 of tub structure 8. Shaft 13*a*, as well as supporting the basket, also serves as a means for turning it during operation of the machine, being secured to the rear wall 10 of the basket as shown. The tub is also provided with an opening 16 aligned with openings 12 and 13 so that clothes may be placed into and removed from the basket when door 4 is opened. The door seals against a suitable gasket 17 during operation of the machine.

Tub 8 is supported on base 3 by means of a plurality of brackets or arms 18 which are mounted on upstanding plates 19 fixedly attached to the base. While arms 18 can be secured directly to the wall of tub 8, they may also be attached thereto by means of suitable brackets 20 as shown. During the operation of the machine, basket 7 is driven from an electric motor 21 through a drive including a pair of flexible belts 22 and 23. Belt 22 connects the output pulley (not shown) of motor 21 to the input pulley (not shown) of a multi-speed transmission assembly 24. Belt 23 connects the output driving pulley 25 of transmission assembly 24 to a basket drive pulley 26. The basket drive pulley 26 is secured on shaft 13*a* and imparts the rotation to basket 7 through the drive shaft.

The entire drive assembly including transmission 24 and motor 21 is mounted on a base member 27. At one end base member 27 is pivotally secured by a pin 28 formed integral with the base member to a support member 29 fixedly secured to the base 3 of the machine. A pin 30 is also secured to base 3 at the end of base member 27 which is remote from pin 28. A compression spring 31 is secured at one end to a retaining element 32 on pin 30 and at the other end to a retaining element 33 on base member 27 so that the base member 27, with all parts of the drive mechanism, is resiliently mounted and biased in a suitable direction to effect tensioning of the belt 23. The belt of course prevents the drive assembly mounted on base member 27 from pivoting farther downward than the illustrated position.

Machine 1 includes, of course, the other components normally provided in connection with domestic washing machine. Thus, for instance, the water supply means whereby water is admitted to and discharged from tub 8 may include connections 34 and 35 through which hot and cold water is supplied to the machine for the washing and rinsing operations. A valve controlled by a solenoid 36 admits hot water to the machine and a valve controlled by a solenoid 37 admits cold water to the machine. The hot and cold water valves under the control of the solenoids 36 and 37 discharge to a common outlet conduit 38, through a suitable air gap, and into a funnel 39 which discharges into a line 40 leading to the interior of tub 8 through a suitable connection 41. The air gap provided by funnel 39 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 42, connected to the interior of the tub 8 by a line 43, controls both solenoids 36 and 37 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 44 mounted at the bottom of the tub. A suitable discharge hose 45 leads from the sump to a motor driven drain pump 46 which discharges to the household drain through a suitable conduit such as hose 48.

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. The drive including motor 21 and transmission 24 is arranged so that it is capable of rotating pulley 26 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. The drive means is preferably designed to provide yet a third speed for the 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 the clothes in the basket are under the influence of centrifugal force and are plastered against the basket wall 9. While any suitable drive arrangement may be utilized to effect the necessary speed variations of basket 7, for illustrative purposes it is intended that motor 21 be of the two speed variety and that transmission 24 also have two different speed positions: low speed of both the motor and the transmission provides the tumbling speed of 47 r.p.m.; high speed of the motor with low speed of the transmission provides the 70 r.p.m. rotation desirable to effect "plaster" speed; and either low or high speed of the motor combined with high speed of the transmission provides a centrifugal extraction operation with the basket spinning at a relatively high speed. The transmission 24 may conventionally be shifted between high and low speed by any suitable control means such as for instance, a solenoid member 49 which, when actuated, puts the transmission into its high speed position and when not actuated causes the transmission to provide a lower speed to the basket 7. The control of this solenoid member 49, together with suitable control means for motor 21, will be fully explained in connection with Figure 3.

It will be noted that when the clothes load within the basket 7 is unbalanced, then at the time that the extra weight is descending on the left hand side of the basket (Figure 2) the unbalance will assist the driving torque and will give the basket a torque tending to accelerate it ahead of the pulley 26 driven by belt 23. By the same token, when the unbalance is rising on the right side of the basket, the unbalance torque feed-back will oppose the driving torque. This torque feed-back to the belt 23 which causes a modification in the tension of the belt, occurs, with a washer construction of the type illustrated and described, substantially before there are any noticeable vibrations. The variations in tension of belt 23, as caused by the unbalances within the rotating basket 7, are sensed by an idler pulley member 50 mounted on an arm 51 which is pivotably secured on a pin 52 extending from support member 29 and is resiliently biased against belt 23 by a spring member 53.

It will readily be observed that when the feed-back torque is assisting the driving torque, there will be less tension on side 53*a* of belt 23 and more tension on side 54 of belt 23. Conversely, when the feed-back torque is opposing the driving torque, there will be less tension on side 54 and more tension on side 53*a*. From this it can be seen that when the feed-back torque is opposing the driving torque and rises to a predetermined value, the decreased tension on side 54 of belt 23 reaches a point where, because of the biasing action of spring 53, projection 55 secured to arm 51 will engage a projecting member 56 of an arrangement enclosed in casing 57 secured to the back wall 15 of the tub. In other words, a predetermined amount of unbalance in basket 7 will, even before it causes vibrations to occur because of the effect of centrifugal force on the unbalance, cause the projecting member 56 to be engaged by part 55 of arm 51 because of the gravity caused torque feed-back resulting from the unbalance.

Referring now to Figure 3 in conjunction with Figure 2, it will be seen that when projecting part 56 is engaged by arm portion 55 it is moved against the bias of a light spring 58 which causes the member 56 normally to assume the position shown; the biasing action of spring 58 is limited by any suitable means such as a shoulder 59 which engages the inner surface of the casing 57. The right hand support for member 56 is provided by an open-

ing 60 which is larger than the member 56 so that a limited amount of vertical motion may take place. However, the member is biased to its downward position by a light spring member 61 as shown. When member 56 is thus mounted, a projecting portion 62 thereof acts as a pawl in relation to a ratchet member 63 which is rotatably mounted in casing 57, i.e., engagement of member 56 by member 55 causes pawl 62 to rotate ratchet 63. Ratchet member 63 is formed with three pairs of opposed teeth 64, 65 and 66. Teeth 64 and 65 are of non-conductive material, but teeth 66 are of conductive material and are connected by suitable conductive means 67. In addition to being movable by engagement of member 56 with arm portion 55 when a predetermined unbalance exists in basket 7, ratchet member 63 is rotatable upon energization of a small motor 68 which, as schematically shown, is connected to the ratchet so as to be in driving relation therewith.

Continuing to refer to Figure 3, it will be recalled that it was stated earlier that motor 21 is preferably a two-speed motor. In the present case, the two speeds of motor 21 are provided by engagement of a switch arm 69 with either one or two contacts 70 and 71. Switch arm 69 is controlled by a solenoid member 72, energization of the solenoid member causing engagement of arm 69 with contact 71 and de-energization of the solenoid causing engagement of arm 69 with contact member 70. When contact 70 is engaged, motor 21 operates at high speed whereas when contact 71 is engaged the motor operates at its lower speed.

A third motor provided in machine 1 is a conventional type timer motor 73 which is, in the usual manner, arranged to control a bank of cams (whose developed peripheries are shown in Figure 4, the heavy lines showing cam rises for closing switches, the light lines showing dwells for opening switches); the cams, in turn, control timer switch members 74, 75, 76 and 77. Referring briefly to Figure 1, the timer motor 73 is conventionally located in machine 1 in the backsplasher portion 78 which surmounts the casing 2. Backsplasher 78 is also generally provided with suitable manually operable controls such as member 79 which is used to preset the positions of the timer motor switches to provide a suitable sequence of operations in the machine, as is well known in the art.

Referring now particularly to Figures 2, 3 and 4, the operation of machine 1, including particularly the operation of my invention to provide suitable balance for the centrifugal extraction operation will be described. It will be understood at this point that the timer motor 73, in addition to controlling the specific components illustrated in the circuit in Figure 3, also controls the operation of the other operating parts of the machine such as valves 36 and 39, and pump 46. Thus, by properly presetting control 79 a suitable sequence of operations will take place. Conventionally, the sequence includes a washing operation, wherein solenoids 34 and 36 cause tub 7 to be filled to a predetermined level and pump 46 causes draining at the appropriate time, followed by one or more rinsing operations during which the same solenoid and pump operations are generally followed. At the end of the rinsing operations, and in order to extract as much liquid from the clothes as possible before they are removed from the machine (or, where the machine is a combination washer-dryer, where they are dried by heat in the machine), a centrifugal extraction operation is provided.

It will be understood that during all washing, rinsing, and centrifugal extraction operations, motor 21 is in substantially continuous operation so as to provide either the tumbling operation of the basket during washing and rinsing, the plastering action desired during sensing, or the high speed operation of the basket during centrifugal extraction. In the conventional type of cycle, switch 74 is closed from the beginning of the cycle through to the end thereof. Closing of this switch completes a circuit

for timer motor 73 which, starting at line conductor 80, proceeds through conductor 81 and the timer motor, conductor 82, switch 74, and back to the second line conductor 83. The circuit for the main motor is also completed through switch 74 by a circuit which proceeds, starting at conductor 80, through conductor 84, motor 21, either contact 70 or contact 71 depending upon the speed of operation of the motor, arm 69, conductors 85 and 82, switch 74, and conductor 83. Thus, the closing of switch 74 insures the operation of timer motor 73 and of operating motor 21 throughout the cycle of operations of the machine 1.

During washing and rinsing operations, the timer motor causes switch 75 to be closed; this energizes solenoid 72 through conductors 80 and 86, the solenoid 72 itself, conductors 87 and 88, switch 75, conductors 89, 90 and 82, switch 74, and conductor 83. This in turn causes switch arm 69 to engage contact 71 thereby providing for the low or tumble speed operation of motor 21. Also, during the washing and rinsing operations, switch 77 is maintained open so that the spin solenoid 49 is de-energized; as explained above, de-energization of this solenoid causes transmission 24 to provide a low speed transmission output. Switch 76 is also open during washing and rinsing operations so that ratchet motor 68 is de-energized and will not cause rotation of ratchet 63.

When the cycle reaches a point where the last rinse has finished and it is desired to centrifugally extract liquid from the clothes in the basket, switch 76 closes and switch 75 opens while switch 74 continues to remain closed and switch 77 continues to remain open. With switch 76 closed, energization of ratchet motor 68 then becomes dependent upon completion of a circuit from conductor 86 through switch 76, conductor 91, the ratchet motor itself, conductor 92, contact member 93, one ratchet tooth 66, conductive portion 67, the second ratchet tooth 66, and conductor 94, to conductor 90. With this arrangement, it will be clear that when contacts 93 and 94 are connected by ratchet teeth 66, a circuit is completed for the ratchet motor 68, but that when either ratchet teeth 64 or 65 are engaged by the contacts 93 and 94, the ratchet motor is not energized so long as switch 75 is open.

Assuming thus that the ratchet 63 is in the position shown at the instant switch 75 opens and switch 76 closes, motor 68 is energized and causes ratchet 63 to rotate until a circuit is no longer completed between contacts 93 and 94, that is, until the ratchet has moved around to the point where contacts 93 and 94 engage opposing teeth 65. It will be obvious that when ratchet motor 68 drives ratchet 63, member 56 will, due to the size of opening 60, ride over the ratchet teeth as the ratchet rotates always returning to its engaging position as shown because of the action of spring 61. It will further be seen that if the ratchet should be in the position where the contacts 93 and 94 engage teeth 65 when sensing is commenced, the ratchet motor will not operate and the ratchet will remain in its position. This is also true insofar as engagement of teeth 64 with contacts 93 and 94 is concerned.

At the same time that the above sequence of alternative events is occurring insofar as the ratchet motor 58 is concerned, the opening of switch 75 causes de-energization of solenoid 72, except when teeth 66 bridge contacts 93 and 94. When the solenoid 72 is de-energized, contact arm 69 moves into engagement with contact 70 to provide the high speed connections within motor 21, thereby causing the motor to increase the basket speed from 47 r.p.m. toward 70 r.p.m. The increase in the torque applied and required to accelerate the basket 7 causes side 53*a* of belt 23 to be under greater tension and side 54 to be under less tension so that projecting portion 55 of idler arm 51 engages member 56 to cause the ratchet member to move around one tooth. At this point it will be recalled that because of the action of ratchet motor 68 the ratchet member 63 either has teeth 64 or teeth 65 bridging contacts 93 and 94. In the event teeth 65 bridge the con-

tacts, the torque required for acceleration causes the ratchet to be moved around one tooth so that teeth **64** bridge the contacts. In the event teeth **64** were in bridging position, this then causes teeth **66** to move into bridging position and the ratchet motor is energized, moving the ratchet to the position where teeth **65** bridge the contacts; at this point as explained above, acceleration resulting from the change in connections of motor **21** causes slackening of belt side **54** to effect one more movement of the ratchet so that teeth **64** are in bridging position. Thus, regardless of the three possible positions of ratchet member **63** prior to the start of sensing, at the end of the basket acceleration from 47 to 70 r.p.m. the ratchet will be in a position where teeth **64** are in bridging position. It will further be recalled that in this position the ratchet motor **68** and solenoid **72** are de-energized since there is no electrical bridge between contacts **93** and **94**.

If there now is a properly balanced load within the basket then when the basket speed is at 70 r.p.m., there will be no substantial variations in the tension of belt **23**. As a result, ratchet **63** will remain in its same position, the basket will continue to rotate at 70 r.p.m. throughout the sensing period with the clothes being plastered as described above and thus not changing their relative positions. If, however, once the basket is rotating at 70 r.p.m., there should be a substantial unbalance present in the basket which would cause undesirable vibrations should it be present during high speed rotation, the feed-back as this unbalance is brought up on the right side of the basket (as shown in Figure 2), will cause a tensioning of side **53***a* of belt **23** and a loosening of side **54** of the belt. If the unbalance is of a predetermined magnitude, the loosening of side **54** is such that spring **53** causes engagement of projection **55** with member **56** thereby causing ratcheting action to occur. Since, as described, ratchet **63** always starts with teeth **64** in bridging position, a ratcheting action at this time will cause teeth **66** to move into bridging position thereby completing an electrical connection between contacts **93** and **94**. This effects two purposes: first, it completes an energizing circuit for solenoid **72** which moves contact arm **69** into engagement with contact **71** to return motor **21** to its tumbling speed of 47 r.p.m. At the same time, the energization of ratchet motor **68** is causing the ratchet **63** to progress around so that at the end of a predetermined length of time the ratchet is moved to the position where teeth **65** are in bridging position between contacts **93** and **94**. This of course opens the circuit both to the solenoid **72** and to the motor **68**, the ratchet stops, and the de-energization of the solenoid returns motor **21** to high speed. The basket is therefore accelerated again toward 70 r.p.m.; this acceleration, as described before, causes rotation of the ratchet one tooth width so that teeth **64** are in bridging position instead of teeth **65**. When the 70 r.p.m. speed is attained, the same sequence then follows as before: if the clothes are properly balanced after the redistribution which occurred at tumbling speed, there will be no torque feed-back on belt **23** sufficient to cause rotation of the ratchet, and rotation of the basket will continue at plaster speed throughout the sensing period. If, on the other hand, the redistribution was not successful in providing suitable distribution of the clothes for balancing purposes, then the torque feed-back will again cause rotation of the ratchet to the position where teeth **66** are in bridging position and the slowing down, redistribution, and reacceleration will again take place.

A predetermined amount of time, preferably on the order of two minutes, is allotted to the balancing operation as described above. It has been found that this period is sufficient with practically all types of clothes loads to provide a properly disturbed load.

At the end of the sensing period switch **76** opens and switch **77** closes, the other two switches remaining as before. The opening of switch **76** removes power from ratchet motor **68** regardless of the position of ratchet **63**. The closing of switch **77** energizes spin solenoid **49** to cause the transmission **24** to provide a high speed output. Since solenoid **72** is de-energized, thereby causing motor **21** to provide a high speed output, it will readily be seen that the combination of the motor high speed and the transmission high speed effects a centrifuging operation of several hundred r.p.m. basket speed, suitable for extraction of liquid from the clothes. This continues for a suitable period, such as for instance five minutes. At the end of this time switches **74** and **77** both open if the machine is simply a washing machine as illustrated, so that the cycle of operations is terminated, with the clothes being in a damp dry condition ready for removal from the machine.

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 non-vertical axis is utilized to provide an indication of the need for redistribution of the clothes. It will further be seen that this is achieved with very little modification to the regular drive system for the machine, and 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 is considered to be the preferred embodiment of my 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 clothes basket including a driving pulley, a driven pulley connected to said basket so that rotation of said driven pulley causes rotation of said basket, and an endless belt looped over both said pulleys in driven relation to said driving pulley and in driving relation to said driven pulley; said basket being responsive to the force of gravity acting on an unbalanced plastered distribution of clothes within said basket to provide a torque feed-back to said belt modifying the tension thereof; idler means resiliently engaging said belt between said pulleys and movable in response to variations in belt tension; electric speed control means having an energized condition and an unenergized condition, said control means being effective in one of said conditions to raise the speed transmitted to said basket, said drive means rotating said basket at a relatively low speed for tumbling clothes therein when said speed control means is in the other of said conditions; and means providing the other of said conditions in said speed control means in response to a predetermined magnitude of motion of said idler means to decrease the basket speed sufficiently to effect a redistribution of the clothes.

2. The apparatus defined in claim 1 wherein said multi-speed drive means is resiliently mounted, and means are provided biasing said drive means away from said driven pulley thereby to provide a predetermined tension on said belt.

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 driving pulley, a driven pulley connected to said basket so that rotation of said driven pulley causes rotation of said basket, and an endless belt looped over both said pulleys in driven relation to said driving pulley and in driving relation to said driven pulley, said drive means rotating 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 high enough to plaster clothes about the periphery of said basket for sensing unbalances; said basket being

responsive to the force of gravity acting on an unbalanced plastered distribution of clothes within said basket to provide a torque feed-back to said belt modifying the tension thereof; idler means resiliently engaging said belt between said pulleys and movable in response to variations in belt tension; electric control means for determining the speed transmitted to said basket; and means operating said control means during rotation of said basket at said intermediate speed upon a predetermined magnitude of motion of said idler means to decrease the basket speed sufficiently to effect redistribution of the clothes.

4. The apparatus defined in claim 3 wherein said means operating said speed control means includes switch means engaged and closed by said idler means when said predetermined magnitude of motion is reached.

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 driving pulley, a driven pulley secured to and concentric with said basket, and an endless belt looped over both said pulleys in driven relation to said driving pulley and in driving relation to said driven pulley, said drive means rotating 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 high enough to plaster clothes about the periphery of said basket for sensing unbalances; said basket being responsive to the force of gravity acting on an unbalanced plastered distribution of clothes within said basket to provide a torque feed-back to said belt modifying the tension thereof; idler means including an idler pulley engaging said belt between said driving and driven pulleys, an arm member secured to said idler pulley, means resiliently biasing said idler pulley against said belt whereby said idler pulley and said arm are movable in response to variations in belt tension; electric speed control means having an energized condition and an unenergized condition, said control means being effective when unenergized to raise the speed transmitted to said basket to said intermediate speed, said drive means rotating said basket at said relatively low speed when said speed control means is energized; and means operating said control means comprising switch means positioned to be engaged by said arm and closed upon a predetermined magnitude of motion of said arm during rotation of said basket at said intermediate speed thereby to decrease the basket speed to said relatively low speed to effect redistribution of the clothes.

6. The apparatus defined in claim 4 wherein said switch means includes a pair of stationary contact members and a rotatable member positioned between and in contact with said contact members, said rotatable member being rotatable a predetermined amount in response to said predetermined magnitude of motion of said idler means, said rotatable member effecting an electrical bridge between said contact members when rotated to one position thereof, and disconnecting said contact members in all other positions thereof.

7. The apparatus defined in claim 3 wherein meaus are provided to return the basket speed to said intermediate speed after a predetermined length of time of decreased speed for redistribution purposes.

8. In a laundry machine, a clothes basket rotatable on a substantially non-vertical axis; multi-speed drive means for rotating said basket including a driving pulley, a driven pulley connected to said basket so that rotation of said driven pulley causes rotation of said basket, and an endless belt looped over both said pulleys in driven relation to said driving pulley and in driving relation to said driven pulley, said drive means rotating 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 high enough to plaster clothes about the periphery of said basket for sensing unbalances; said basket being responsive to the force of gravity acting on an unbalanced plastered distribution of clothes within said basket to provide a torque feed-back to said belt modifying the tension thereof; idler means resiliently engaging said belt between said pulleys and movable in response to variations in belt tension; electric control means having an energized condition and an unenergized condition, said control means being effective when unenergized to raise the speed transmitted to said basket to said intermediate speed, said drive means rotating said basket at said relatively low speed when said control means is energized; and means operating said control means during rotation of said basket at said intermediate speed, said operating means including switch means comprising a pair of stationary contact members and a rotatable member positioned between and in contact with said contact members, said rotatable member being rotatable a predetermined amount in a response to a predetermined magnitude of motion of said idler means, said rotatable member effecting an electrical bridge between said contact members when rotated to one position thereof and disconnecting said contact members in all other positions thereof to energize said control means and thereby decrease the basket speed to said intermediate speed when said rotatable member is rotated to said one position thereof; and an electric motor arranged to rotate said rotatable switch member when energized, said motor being energized when said rotatable member is in switch closed position and being de-energized when said rotatable member is in switch open position whereby said motor rotates said rotatable member to switch open position subsequent to its being moved to switch closed position.

9. In a laundry machine, a clothes basket rotatable on a substantially non-vertical axis, multi-speed drive means for rotating said basket including a driving pulley, a driven pulley connected to said basket so that rotation of said driven pulley causes rotation of said basket, and an endless belt looped over both said pulleys in driven relation to said driving pulley and in driving relation to said driven pulley, said drive means rotating 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 high enough to plaster clothes about the periphery of said basket for sensing unbalances; timer means providing in sequence a low speed washing operation, an intermediate speed sensing operation, and a high speed extraction operation; said basket being responsive to the force of gravity acting on an unbalanced plastered distribution of clothes within said basket to provide a torque feed-back to said belt modifying the tension thereof; idler means resiliently engaging said belt between said pulleys and movable in response to variations in belt tension; electric control means for determining the speed transmitted to said basket; means operating said speed control means during said sensing operation upon a predetermined magnitude of motion of said idler means to decrease the basket speed sufficiently to effect redistribution of the clothes, means for limiting the decreased redistribution speed of said basket to a predetermined length of time during said sensing operation and then returning said basket to said intermediate speed; said timer means enabling said operating means during said sensing operation and disabling said operating means during said washing and extraction operations, said timer means terminating said sensing operation after a predetermined time and thereafter providing said high speed extraction operation.

No references cited.