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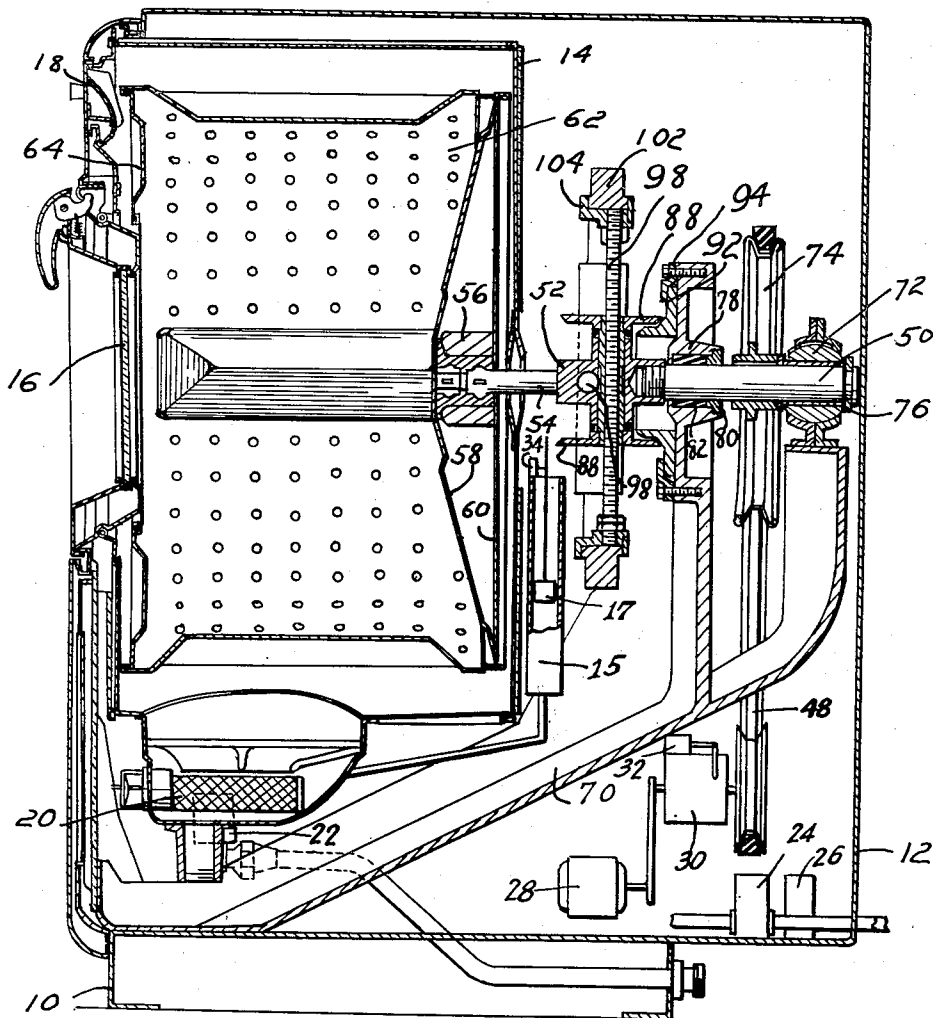
C. C. BRADBURY

2,230,345

CLEANING MACHINE

Filed April 25, 1938

4 Sheets-Sheet 1



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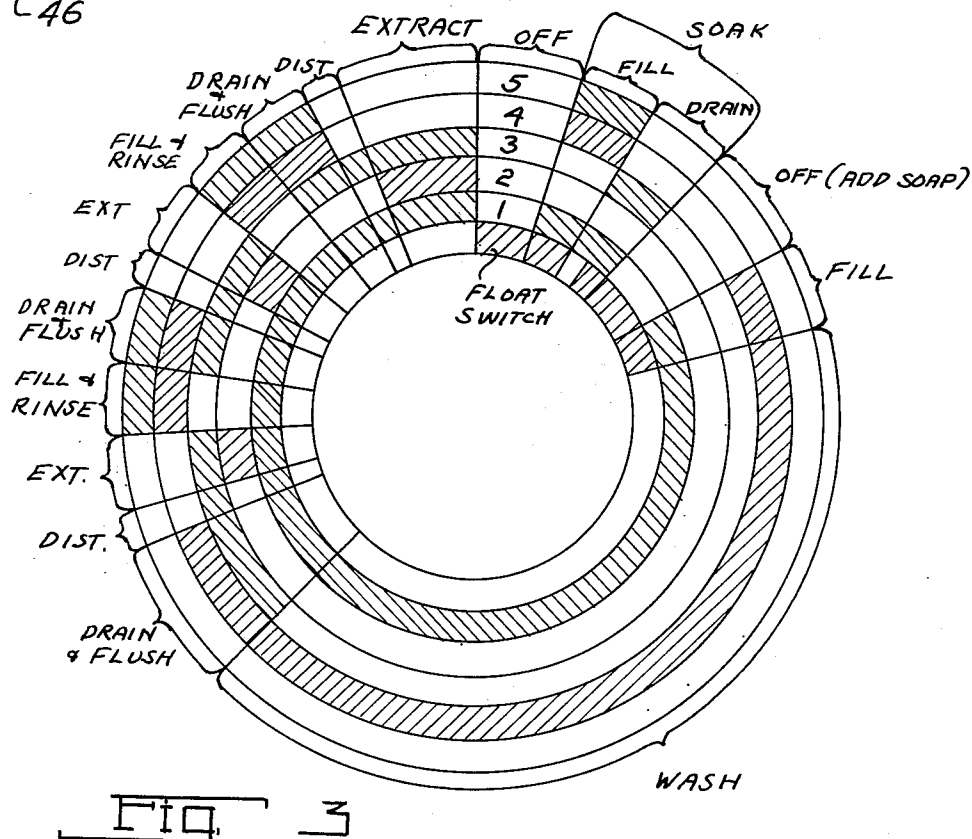
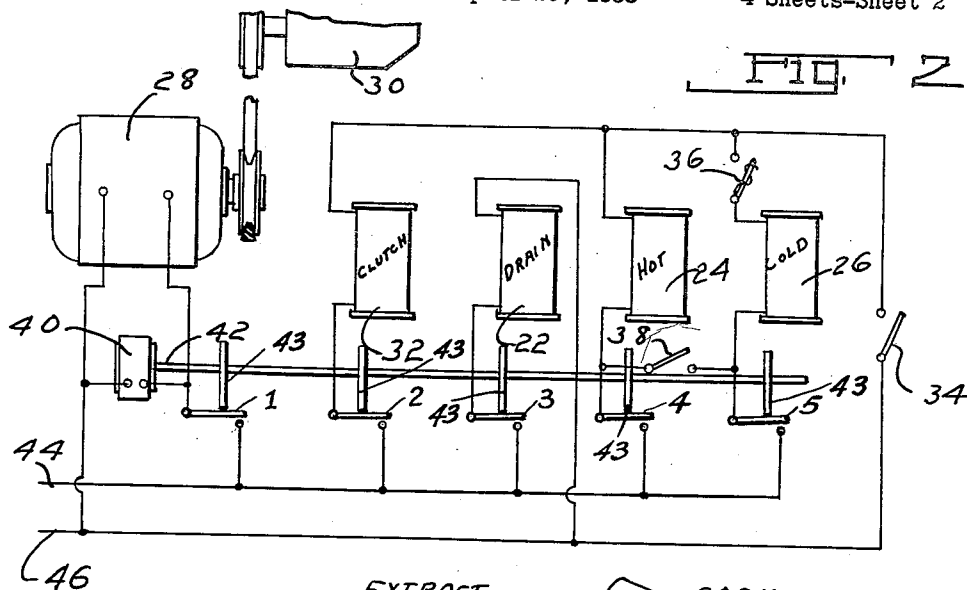
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4 Sheets-Sheet 2



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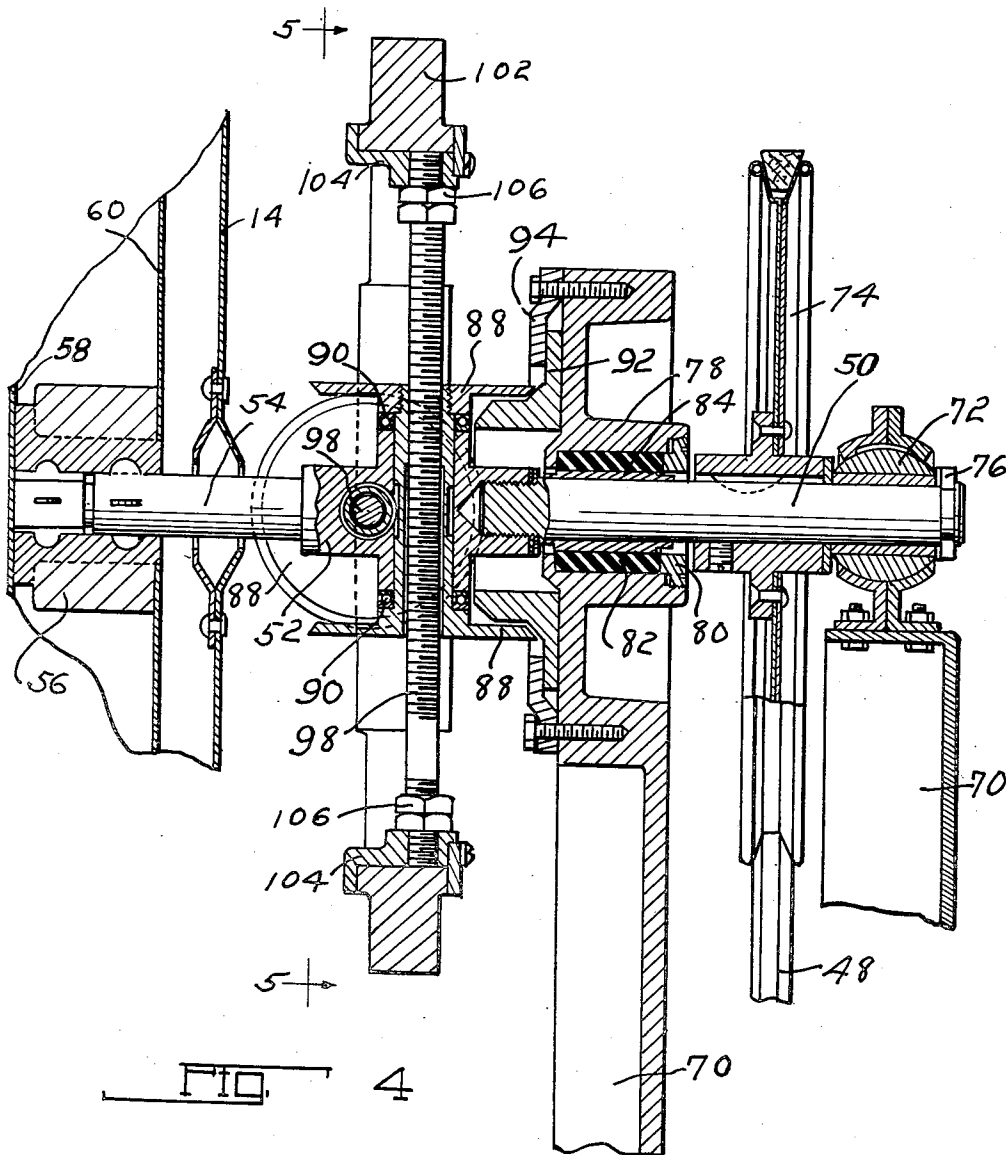
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CLEANING MACHINE

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4 Sheets-Sheet 3



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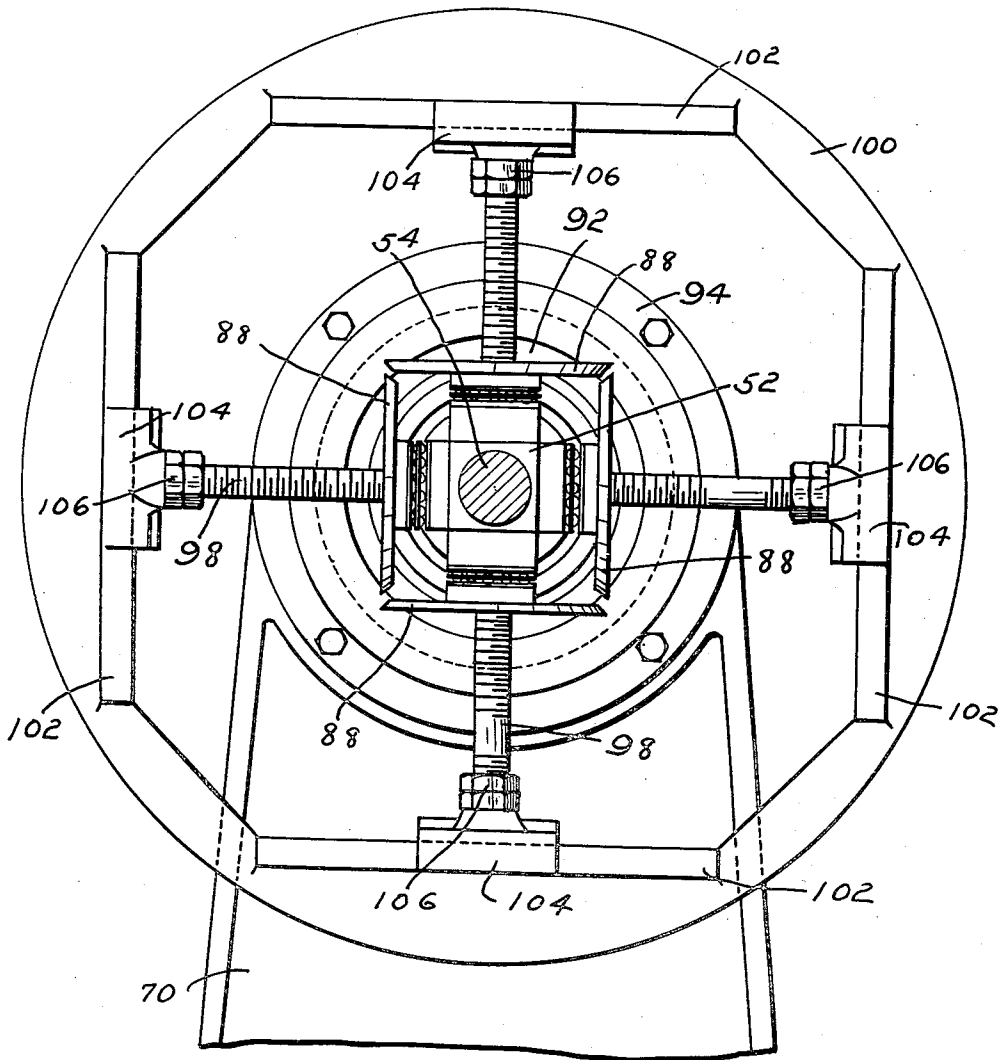


FIG. 5

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UNITED STATES PATENT OFFICE

2,230,345

CLEANING MACHINE

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Application April 25, 1938, Serial No. 203,999

1 Claim. (Cl. 68—24)

This invention relates to cleaning apparatus, and is illustrated as embodied in a machine operating automatically to wash and dry clothes or similar material to be cleaned.

5 An object of the invention is to provide a machine of this character which will operate efficiently at the relatively low speed desirable in a washing operation, and which can be driven without substantial vibration at high speed for effective centrifugal drying. Preferably this is accomplished by providing the machine with automatically operated means for balancing an unbalanced load, at least during high speed operation. The machine illustrated is provided with a balanced weight which is not affected by low speed operation, and an unbalanced load is permitted at high speed to impart a gyratory motion to the clothes receptacle or its equivalent, the weight being shifted by means operated by this
15 gyratory motion into a position where it balances the unbalanced load.

Various features of the invention relate to adapting this method of operation to an automatically controlled machine operating in a predetermined washing and drying cycle, and to balancing the high speed drying operation of a receptacle in which the clothes are first washed. The receptacle preferably has an intermediate stage of operation in which the load is distributed
25 approximately uniformly before the weight is shifted to give the desired final accurate balance.

The above and other objects and features of the invention, including various novel arrangements and desirable constructions, will be apparent from the following description of the illustrative embodiment shown in the accompanying drawings, in which:

Figure 1 is a central vertical section through the machine;

40 Figure 2 is a wiring diagram showing the controls for the automatic operation of the machine;

Figure 3 is a diagram showing the sequence and duration of the steps in the cycle of operation of the machine;

45 Figure 4 is a view, on a larger scale than Figure 1, showing in vertical section the automatic balancing means; and

Figure 5 is a section on the line 5—5 of Figure 4, showing some parts of the balancing means in elevation.

The machine shown in the drawings is of the general construction, and operates in the general manner, more fully described and (except as to the improvements hereinafter described) claimed in Patent No. 2,165,884, granted July 11,

1939, by Rex Earl Bassett, Jr., and John W. Chamberlin. It includes a base 10, supporting a cabinet 12, within which is housed a stationary horizontal cylindrical tub 14 having in its front an opening registering with an opening in the cabinet and normally closed by a glazed door 16. A second door 18 is provided for the introduction of soap or the like.

The tub 14 is provided with a drain 20, including a suitable drain valve operated by a solenoid 22 (Figure 2), as well as hot and cold water inlets having valves controlled by solenoids 24 and 26. The machine is driven by a motor 28, driving through a two-speed transmission 30 controlled by a solenoid 32 to give either low speed for washing or high speed for centrifugal extraction or damp-drying.

A suitable chamber 15 communicating with the tub 14 is provided with a float 17 controlling a float switch 34 which, as shown in Figure 2, is in series with the two solenoids 24 and 26 so that it shuts off the water at a predetermined level, and which is also in series with the solenoid 32 so that the machine cannot go into high speed until the water has drained out. A thermostatic switch 36, controlled by the temperature of the water entering the tub 14, may be arranged in series with the cold-water control solenoid 26, to bring the inlet water down to a predetermined temperature during such time as the circuit through solenoid 26 is closed. If desired, a manually operable switch 38 may be connected between the circuits through solenoids 24 and 26.

The machine is provided with a suitable automatic cyclic control switch including a constant-speed motor or timer 40, the shaft 42 of which drives a bank of cams 43 controlling a set of switches or contacts 1, 2, 3, 4, and 5, controlling circuits between lines 44 and 46 through:

1. Motors 28 and 40;
2. Solenoid 32 controlling the driving speed;
3. Solenoid 22 controlling the drain;
4. Solenoid 24 controlling the hot water supply; and
5. Solenoid 26 controlling the cold water supply.

The motor 28 drives, through the transmission 30 and a belt drive or the equivalent 48, at low or high speed a shaft 50 threaded or otherwise secured to a carrier 52 having a shaft extension 54 secured to a block 56 rigidly secured to and between disks 58 and 60 which are brought together at their peripheries and secured to a ribbed or baffled perforated cylindrical drum 62 having at its front end a head 64 formed with an

opening registering with the door 16, and through which clothes or other material to be washed can be introduced. The disks 58 and 60, the drum 62, and the head 64, form a receptacle to receive the material to be washed.

Figure 3 illustrates diagrammatically one cycle of operation of the machine, it being understood that this cycle can be varied by changing the cams which are driven by the shaft 42 and which operate the switches 1, 2, 3, 4, and 5. In the cycle illustrated, the cams are first advanced from the starting or "off" position, by turning them forward manually, whereupon the machine first fills to a predetermined level (determined by the setting of switch 34) with water at a predetermined temperature, the circuits being closed through both solenoids 24 and 26, to soak the clothes thoroughly. The inlet valves are then closed, and the drain valve opened by energizing solenoid 22, after which the machine comes to rest.

The cams are then advanced manually to start the machine again, by turning a suitable handle attached to shaft 42 as explained in the above-identified Chamberlin and Bassett patent, while soap is added, the remainder of the cycle then being entirely automatic. The machine first again fills with water, and then enters a relatively long washing stage of the clothes.

As explained in detail in the above-identified Bassett-Chamberlin application, the clothes receptacle in the illustrated machine is driven, during this washing stage, constantly in the same direction at a speed within a range which is high enough so that the clothes are lifted by the baffles to a point near the top of the receptacle and then drop back into the wash water with a very effective washing action, without tangling, but which speed is low enough so that when the machine is filled with wash water there is no tendency for the clothes to carry around for the entire revolution.

From this relatively restricted range of speeds, it has been found possible to select a particular speed at which the clothes are effectively washed when the wash water is in the tub and at which speed, when the water is drained out, the clothes will gradually distribute themselves approximately uniformly about the periphery of the receptacle 58-64 ready for high-speed extraction. For example, with a 20-inch receptacle such a speed would be 60 R. P. M. The other conditions affecting the washing and distribution of the clothes are fully set forth in the above-identified Bassett-Chamberlin patent.

Following the washing stage of the cycle, the drain valve opens with the inlet valves also open, giving a very effective flush rinse. There is then a short distribution period with the water drained out of the machine, followed by a short extraction period to get rid of most of the rinse water. Then follows a rinsing period, a flushing period, a second distribution of the clothes, and a second centrifugal high-speed extraction; these steps may if desired be repeated, whereupon the machine automatically shuts off. The final extraction period is prolonged sufficiently to leave the clothes dry enough to be hung out in the usual manner.

It has been found that, while the distribution described above balances the load sufficiently for extraction speeds leaving the clothes "damp-dry," if it is desired to extract at very high speeds, giving substantially completely dry clothes, severe vibrations are sometimes set up.

To avoid building the machine heavy enough to absorb these vibrations, according to the present invention the machine is designed to balance them out automatically.

To this end, one of the supporting brackets 70 carries a self-adjusting spherical member or support block 72 provided with a bearing bushing for end of the shaft 50 adjacent the pulley 74 for the belt drive 48. A C-washer 76 on the end of the shaft prevents axial movement. The bearing block 72, being self-aligning, does not prevent gyratory movement of the shaft 50.

The front bearing for the shaft 50 includes a yieldable mounting permitting slight centrifugal displacements or gyrations of the shaft when the machine is driven at high speeds. In the arrangement shown, one of the supports 70 carries an annular socket 78 surrounding the shaft, the socket being restricted at its front end and tapped at its rear end to receive an externally-threaded collar 80. Compressed into the socket by the collar 80 is a rubber sleeve 82 provided with a bearing bushing 84 for shaft 50 vulcanized thereto. By adjusting collar 80 the compression of the rubber sleeve 82, and thus the degree of yieldability of the shaft mounting, may be varied.

The head block or carrier 52 is screwed or otherwise secured on the end of the shaft 50 just in front of the above-described yielding mounting. On each of two journals passing through this block at right angles to each other are mounted two beveled rollers 88. Ball thrust bearings 90 are interposed between the inside surfaces of the roller hubs and the head block 52. The rollers 88 are driven during displacement of the shaft 50 and block 52 by rolling contact with two conical surfaces on a track 92 carried by the bearing support 78.

The arrangement of the two conical surfaces on the track 92, for the two sets of rollers 88, is such that the rollers 88 may all be of the same size. Two of the rollers are shown engaging the outer conical surface, and the other two engage the inner conical surface. The slope of each conical surface is such that an imaginary continuation of the cone would have its apex at the point of intersection of the axis of the drive shaft 50 with the axis of the rollers 88 engaging that surface. Thus there is true rolling contact of the beveled rollers 88 with these conical surfaces, without any slipping action. The track 92 may be constructed of fiber or molded composition, to minimize noise.

The track 92, in the arrangement shown, is held against a machined surface on the front of the bearing support 78 by means of an annular clamping ring or bracket 94, which has a machined surface bearing on the track 92, and which is screwed to the support 78. Shims may be inserted beneath the clamping bracket 94, also between the block 52 and the end of the shaft 50, if adjustment is necessary.

When the track 92 is mounted as described above, the rollers 88 automatically maintain it in centered position. Any gyration of the drive shaft around the axis of rotation causes certain of the rollers 88 to engage the track 92 and this contact continues until, as described below, the entire rotating mass becomes balanced and the rollers leave the track, with the track in its centered position.

The degree of compression of the rubber sleeve 82 is such that the rotating mass, when substantially unbalanced and turning at high (i. e. 75

extracting) speed can deflect only far enough to cause the beveled rollers to engage the track firmly. When the one or the other set of rollers 88 is so turned, they turn one or the other (or both) of two spindles threaded therethrough at right angles to each other. The spindle 98 so operated is shifted axially, in a direction opposite to the displacement of the rotating mass. Each of the spindles is driven in one direction when one of its rollers 88 engages the stationary track, and in the other direction when the other of its rollers 88 engages the track.

The shifting of the spindles 98 is utilized to shift a balance weight, shown in the form of an annular steel ring 100 having four straight inner surfaces 102 slidably engaged by metal friction shoes 104 on the ends of the spindles 98. The shoes 104 are attached to the spindles 98 in such a manner as to prevent the spindles turning with the rollers 88. If desired, to provide for ready adjustment of the distance between the shoes, the spindles 98 may have right and left threads at their ends, threaded into corresponding openings in the shoes and locked in adjusted position by means such as lock-nuts 106.

In operation, when the high speed stage, or extraction stage, of the cycle is reached if the clothes are not distributed with sufficient uniformity about the receptacle, the shaft 50 will gyrate sufficiently to cause one or another, or in some cases two, of the rollers 88 to roll on the track 92, automatically shifting the weight 100 to a position where it balances the load.

While one illustrative embodiment has been

described in detail, it is not my intention to limit the scope of the invention to that particular embodiment, or otherwise than by the terms of the appended claim. The above-described balancing means is claimed per se in my application No. 180,712, filed December 20, 1937, and equivalent balancing means is described in my applications Nos. 180,713 and 180,714, filed at the same time as application No. 180,712, all of said applications being divisions of my application No. 64,992, originally filed February 20, 1936.

I claim:

A washing machine comprising a tub, a receptacle for material to be washed mounted within said tub for rotation about a substantially horizontal axis and having a drive shaft upon which it is supported, means for resiliently supporting said shaft whereby an unbalanced normal load in said receptacle above a suitable washing speed will cause a gyratory movement of the shaft in addition to rotation about its axis the resilience being such that said means will prevent such additional movement at speeds suitable for washing, means for operating said machine to wash material in said receptacle and including means for driving said shaft at a suitable washing speed, means for thereafter driving said shaft above said washing speed to dry said material centrifugally, and means operated by said gyratory movement of the shaft at high speed for automatically balancing said receptacle.

CLIFFORD C. BRADBURY.