May 5, 1953 P. W. DOUGLAS 2,637,189

LAUNDRY MACHINE

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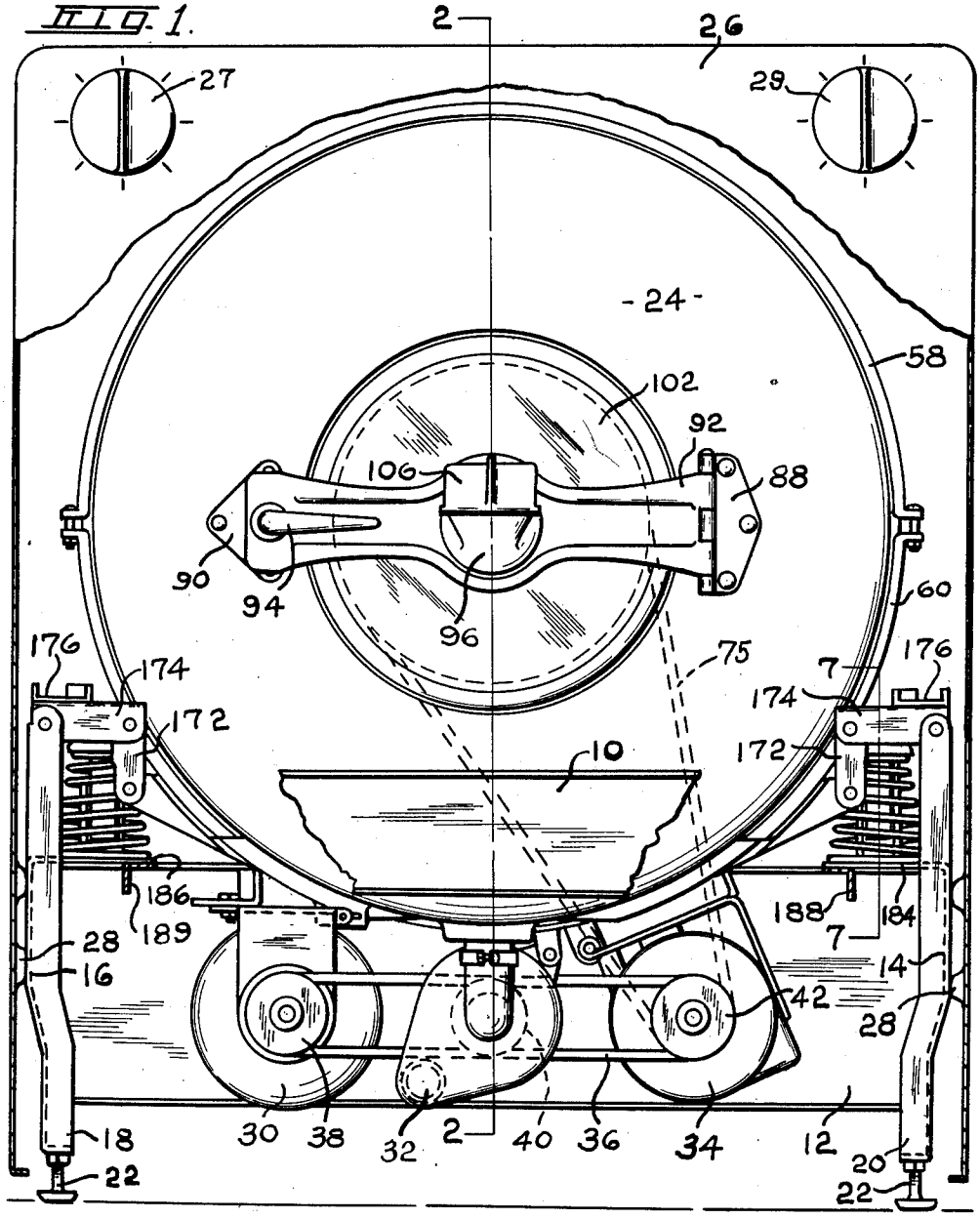
FIG. 1.



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LAUNDRY MACHINE

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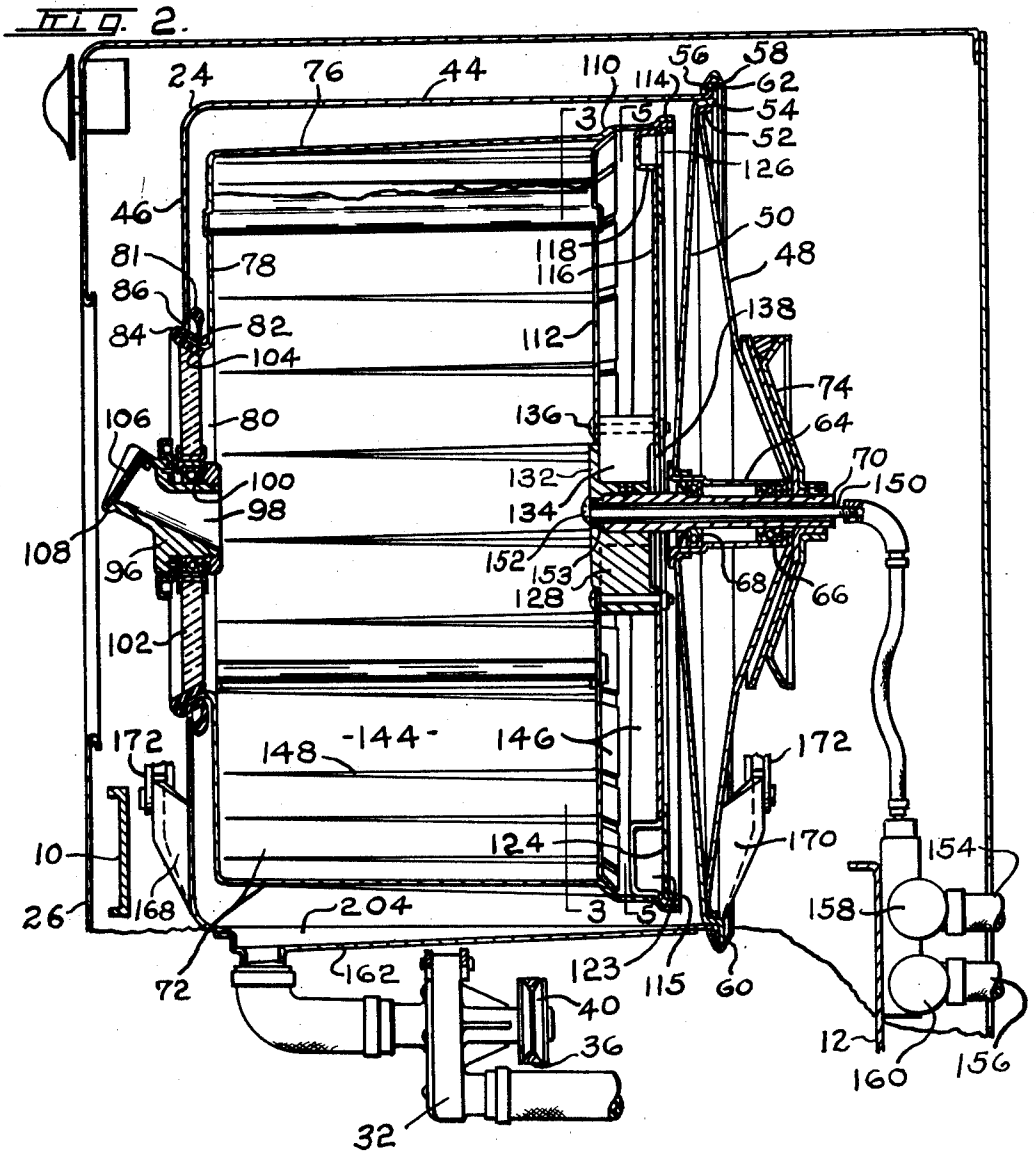
Fig. 2.



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LAUNDRY MACHINE

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FIG. 3.

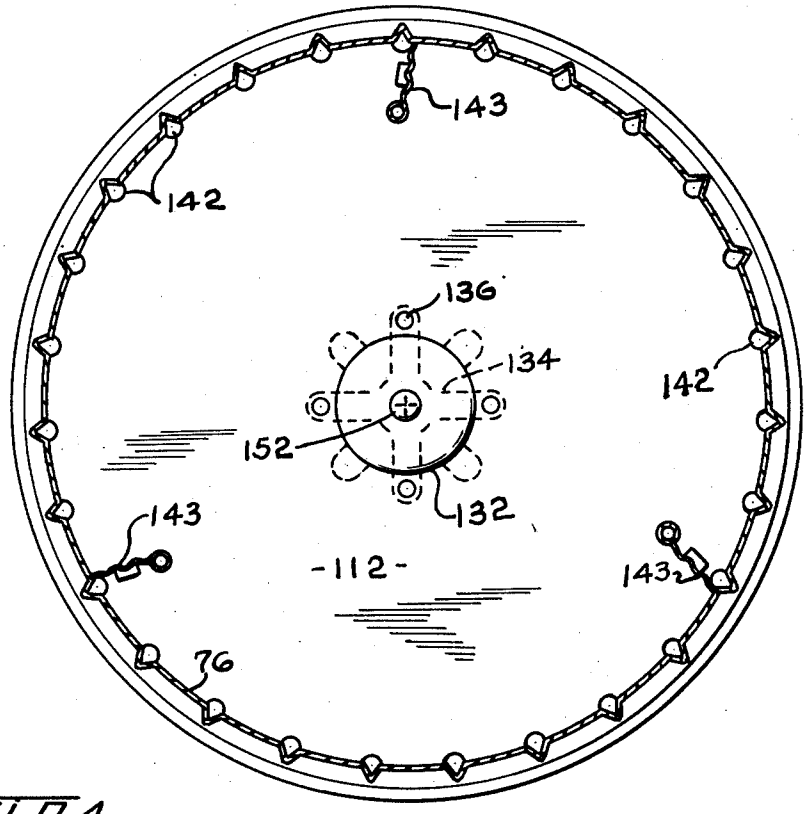
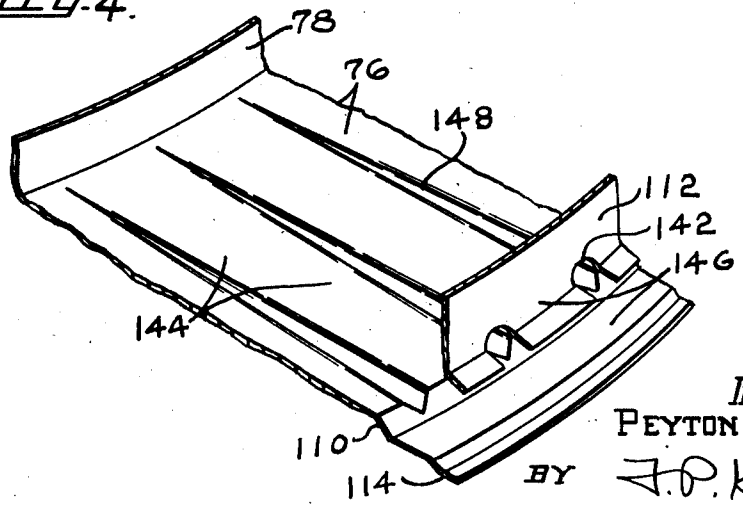


FIG. 4.



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LAUNDRY MACHINE

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FIG. 5.

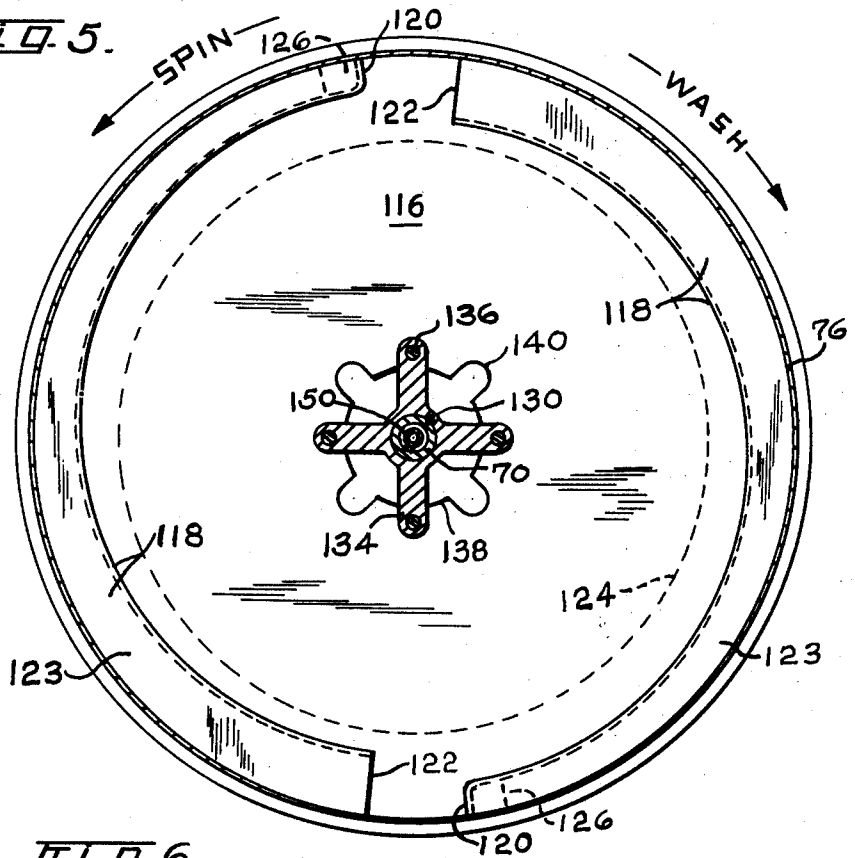
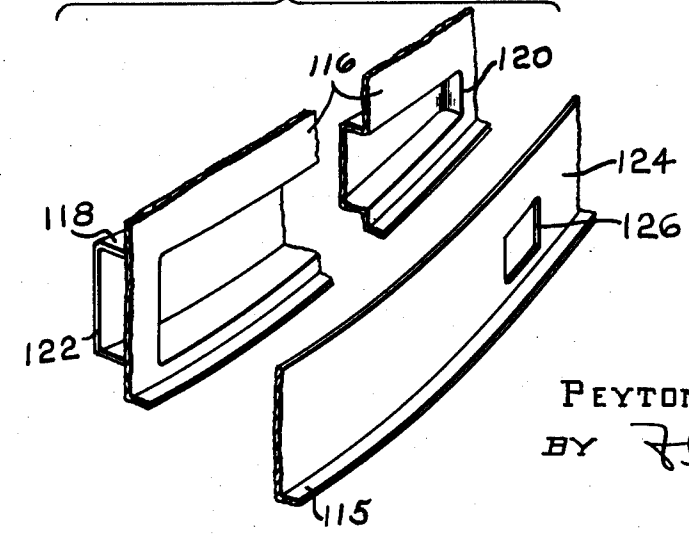


FIG. 6.



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LAUNDRY MACHINE

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FIG. 7.

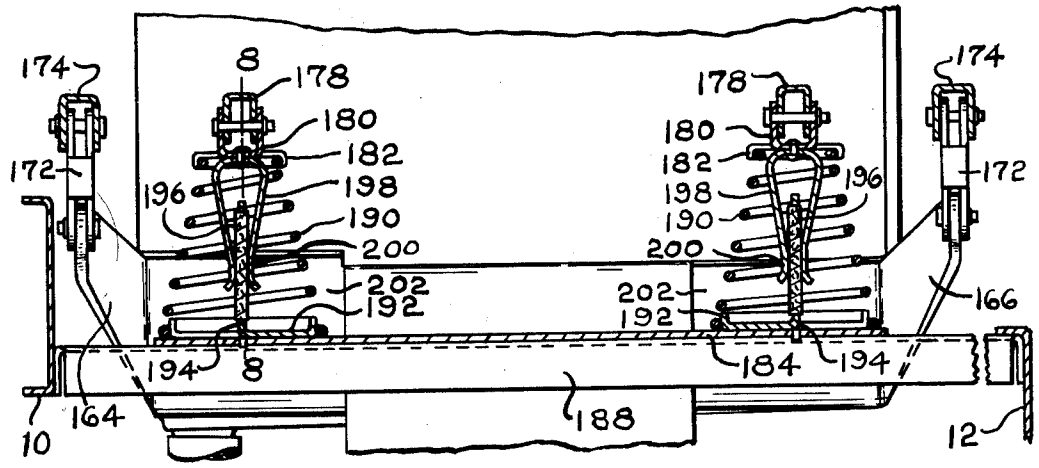
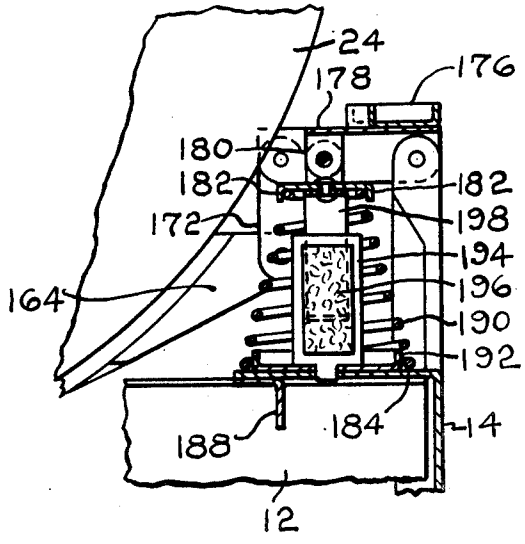


FIG. 8.



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Patented May 5, 1953 2,637,189

UNITED STATES PATENT OFFICE

2,637,189

LAUNDRY MACHINE

Peyton W. Douglas, Syracuse, N. Y., assignor to Easy Washing Machine Corporation, Syracuse, N. Y., a corporation of Delaware

Application September 20, 1947, Serial No. 775,237

20 Claims. (Cl. 68—24)

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This invention relates to laundry apparatus and more particularly to apparatus wherein washing, rinsing and damp drying may be accomplished in a common container without intermediate handling of the laundry.

In laundry apparatus of the classification indicated, there is generally provided a rotatable perforate drum enclosed within a stationary washing fluid container or tub. The difficulty of removing washing liquid from a rotating imperforate drum has in general dictated the use of such a combination, wherein washing fluid passes through the perforations of the drum into the stationary tub whence it may be drained through an ordinary drain valve. In such machines, the quantity of washing fluid required is increased by the difference between the volume of the perforate drum and the volume of the surrounding stationary tub. The difference in volume is considerable because of the required clearances between the laundry drum and the tub, especially where centrifuging is resorted to to provide against what is known as suds-lock and resultant resistance to high speed spinning and to provide adequate clearance due to relative vibration between drum and tub during high speed spinning. In such arrangements, there is inherent danger of flooding resulting from failure of the drain valve to operate. Such failure results from the accumulation of lint and other deposits, building up in the course of time and tending to cause moving parts to stick.

Where perforate drums are employed for washing and centrifuging, the perforation size must be a compromise, since if too small, ingress and egress of wash water is interfered with and a reduction in turbulence and washing efficiency results, and if too large, the clothes under centrifugal force become dimpled in the perforations, with consequent fibre stretching, and permanent injury to the fabrics centrifuged. Moreover, the outer tub, being exposed to atmosphere, chills the wash water causing deposits in the form of stearates, fats, albumen, and curds, which upon subsequent wash cycles, become suspended in the fresh hot soapy wash water, only to be transferred to the new laundry batch with resulting discoloration of the laundry upon subsequent ironings. Not only is the chilling effect of the exposed outer tub responsible for such deposits, but an important factor appears to lie in the partial isolation of the layer of wash water between the tub and cylinder and consequent reduced agitation, resulting from the screening effect of the perforate wash cylinder. Finally, the

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inner perforate cylinder so covers the inside tub wall as to prevent the removal of such inaccessible deposits, by cleaning without dismantling the apparatus. Where agitation is thus reduced, sudsing action is correspondingly reduced, requiring more soap, with consequent increase in the soap stearates, etc., present and available to form the deleterious deposits.

The present invention overcomes or minimizes the difficulties described through the use of a rotary drum having an imperforate, substantially cylindrical shell in which provision is made for removing washing liquid therefrom without the use of any valves or mechanical means whatsoever.

The invention further provides an arrangement whereby the draining of a rotary washing drum is accomplished solely by selection of the direction of rotation of such drum. Additionally, such control is effected without moving parts upon the drum, without any expensive construction, and without incurring any of the difficulties heretofore mentioned.

The invention additionally permits the surrounding stationary tub to be left open to drain continuously, so that flooding, sticking drain valves, etc., are eliminated. The construction is thus such that a layer of dead air space is in effect provided to insulate the washing cylinder against loss of heat.

Other features or objects of the invention are to provide a washing apparatus of the type described in which the washing fluid is confined to the rotary washing drum, thereby affording operation with a minimum of washing fluid and a maximum of agitation, with high washing efficiency. Because of the confinement of the fluid to the drum alone, the washing load may be reduced with a corresponding reduction in the amount of washing fluid required and a resultant saving in handling partial loads. Also, the agitation is such that sudsing action is enhanced, minimizing and saving in soap requirements.

A further object of the invention is to provide a laundering apparatus of the type described, wherein one or more stages of agitated or deep water rinsing may be resorted to with a minimum amount of rinsing fluid, and in which agitation is at a maximum.

A still further object of the invention is to provide a resilient support for such apparatus to absorb and prevent to a substantial degree the transmission of side forces to the supporting floor, resulting from unbalanced loads during spin drying. Further, the invention has to do with

providing a resilient support so constructed and arranged as to minimize resonant phenomena, and which may be provided with suitable damping means to absorb and dissipate a fraction of the energy resulting from the motion created by such unbalanced forces.

The above and other novel features of the invention will appear more fully hereinafter from the following detailed description when taken in conjunction with the accompanying drawings. It is expressly understood that the drawings are employed for purposes of illustration only and are not designed as a definition of the limits of the invention, reference being had for this purpose to the appended claims.

In the drawings, wherein like reference characters indicate like parts:

Figure 1 is a front elevation of a laundry machine with a portion of the forward cabinet wall broken away;

Figure 2 is a longitudinal section through the drum portion of the washing machine, its surrounding tub and cabinet, taken substantially on the line 2—2 of Figure 1;

Figure 3 is a transverse section taken substantially on the line 3—3 of Figure 2;

Figure 4 is a fragmentary perspective view of the inside drum construction;

Figure 5 is a section taken substantially on the line 5—5 of Figure 2;

Figure 6 is a composite fragmentary figure illustrating in perspective the annular passageway construction;

Figure 7 is a section taken on the line 7—7 of Figure 1, showing the resilient frictional support mechanism; and

Figure 8 is a section taken substantially on the line 8—8 of Figure 7.

Referring to Figure 1, there is shown a base frame composed of longitudinal forward and rear channel members 10 and 12 connected by side members 14 and 16, and provided with corner posts 18 and 20 with adjustable feet 22. By a resilient frictional suspension, to be described more in detail hereinafter, there is supported by the frame, a tub construction 24, the same being preferably housed within a cabinet 26, which may be secured to the frame members 14 and 16 by suitable fastening means such as screws at 28. Suitable timing and control devices 27 and 29 may be provided to regulate the quantity of water and to initiate automatic operation of the apparatus. Secured to the bottom side of the tub construction is a reversible electric motor 30, a drain pump 32 operative for either direction of rotation, and a two-speed transmission 34, the units being connected by a common belt drive 36 wrapped upon motor pulley 38, pump pulley 40, and transmission pulley 42.

As shown in Figure 2, the tub construction comprises a relatively stationary cylindrical drum 44 having an integral front end 46 and dished spaced rear bearing support plates 48 and 50 joined together by suitable flanges 52 and 54, which may be spot welded or riveted or otherwise secured as may be desired. The bearing support plates, as an assembly, are secured to the rear edge of the cylinder 44 by suitable outward extending flanges 56 and 58 on the cylinder 44 and the plate 50, respectively, a pair of V semi-circular clamping strips 60 and 62 being provided for this purpose. The plates 48 and 50 support a tubular bearing-receiving sleeve 64 containing spaced bearings 66 and 68, that in turn journal a trunnion 70, carrying at its forward end a washing cylinder 72, and at its rearward end a drive pulley 74. The drive pulley 74 is provided with a belt 75, extending to the transmission 34.

The washing cylinder 72 is formed from an open-ended drum-like member having a slightly tapered circular wall 76 and an integral front wall 78. The front wall is provided with a laundry-receiving aperture 80 bounded by an acute angle outwardly flared flange 82, to which is affixed an annular U-section gasket 84 of rubber-like yielding material. The gasket also is provided with an integral slinger ring 81, which may, if desired, lightly touch the inside of wall 46.

The front wall 46 of the stationary drum is provided with an aperture 86 corresponding with the aperture 80 of the revolving drum, on opposite sides of which are a hinge member and latch plate 88 and 90, respectively. Pivotally carried by the hinge member 88 is a transverse door support bar 92 adapted to carry a latch 94 for cooperation with the latch plate 90 when manually latched in the position shown in Figure 1. The bar 92 at its center point is enlarged in width and provided with an inwardly extending stud 96 of ample diameter to permit of an inclined soap dispensing passage 98 therethrough. The stud is also provided on its exterior with a ball bearing 100 upon which is rotatably supported a circular transparent disk or door member 102, having a chamfered edge 104 suitably shaped to form a sealing engagement with the resilient gasket 84. The soap dispensing channel 98 is provided with a hinged door 106, hinged at its lower end as at 108, so as to normally maintain the soap dispensing passage closed except when utilized for the purpose indicated.

The slightly tapered circular wall 76 of the laundry-receiving drum is annularly offset at 110 to receive a flanged partition 112 located a short distance inwardly from the end of the drum. The marginal edge of the drum is again offset or bell-mounted at 114 to receive the flanged edge 115 of an end plate 116. The end plate 116 has stamped therein two arcuate channels 118, the channels being diametrically disposed and adjacent the edge of the end plate 116. Each channel is closed at one end as at 120, the closure wall being formed or drawn from the metal of the end plate. The opposite end of the channel is slit as at 122 from the plate to provide a suitable opening into the channel from the forward side of the plate. An annular ring 124 may be employed to provide a wall for the channels in order to form closed conduits 123 therefrom, the annular wall 124 being provided with two apertures 126 so disposed as to provide a port at the end of each of the conduits opposite from the openings 122 previously described.

As shown in Figure 5, and also Figure 2, the radial and longitudinal dimensions of the conduits preferably increase toward the open end 122, so that liquid within the space between partition 112 and the end plate 116 will be scooped upon rotation of the drum in the spin direction, without substantial interference of the smaller cross section of the adjacent end of the other channel.

The partition 112 and the end plate 116 are provided with a hub block 128 to which the trunnion 70 is secured as by a set screw 130. The block is provided with a circular end flange 132 adapted to form a shoulder to be received in a corresponding aperture in the partition 112. Integral vanes 134 extend beyond the flange 132

and are provided with bolt-receiving apertures so that the partition 112 and end wall 116 may be clamped to the vanes as by bolts 136. The end wall 116, having an aperture 138 too small in diameter to receive the vanes, is notched as at 140 so that the vanes may be passed through the plate to the space between the partition and plate and thereafter rotated 45° for suitable positioning to receive the bolts 136. The construction thus described affords a positive drain for liquid within the space between the partition and end wall, as soon as such level approaches the opening 138.

To provide communication between the laundering compartment 144 and the space 146 between the partition 112 and end wall 116, a plurality of elemental grooves 148 are formed preferably uniformly spaced around the circumference of the drum 76, the grooves increasing in depth toward the partition 112, the radial depth closely approaching the radial offset 110 and so that the grooves may blend and drain, centrifugally, into the offset. (See Figure 4.) The partition 112 is suitably notched as at 142 to correspond with the grooves 148 and thereby permit fluid to flow from the compartment 144 to the compartment 146. Baffles 143, for example, three or such number as may be desired, may be spacedly arranged within the drum 76 to provide a degree of agitation to improve the washing action as a result. The shape and form of the baffles may be varied to suit conditions.

Water is fed to the drum 76 through the hollow trunnion 70 by means of a non-rotating pipe 150 having a rosette or spray 152 immediately inside the flange 132. Any suitable packing can be provided between the trunnion and pipe to prevent leakage, if desired, as at 153. The pipe 150 may be coupled to hot and cold water supply lines 154 and 156 provided with valves 158 and 160 magnetically and thermostatically or otherwise controlled to cause water of proper temperature to enter the drum 76 in a desired amount. A sump 162 for the drum 44 is arranged at the bottom of the drum 76, the same being coupled to the pump 32, which, in the arrangement shown, is continuously driven to assure drainage of any liquid entering into the drum 44, from whatever source.

The tub assembly 24, because subjected to vibratory forces resulting from the rotation of unbalanced loads within the drum 76, is suspended in a manner to permit a degree of constrained and damped movement. Such suspension forms the subject matter of a divisional application Serial No. 175,828, filed July 25, 1950. For this purpose, the drum portion 44 is provided with ears 164, 166, 168, and 170 at opposite corners which are suspended from short links 172, which in turn hang from substantially horizontally extending links 174, the latter being pivoted at one end to the upper ends of the legs 18. The fore and aft links 174 at either side of the apparatus are tied together by channel members 176, the stiffness of which is so chosen as to enforce substantially like angular movement of both the fore and aft links on either side of the machine. In addition, the channel members 176 are provided, intermediate the links 174, with arms 178 extending a short distance inwardly, at which point they are pivoted to yokes 180 having integral compression spring receiving cup-like members 182. The transverse members 14 and 16 are flanged as at 184 and 186 to provide a spring base beneath the spring cups 182, the flanges 184 and 186 being stiffened by angular members 188 and 189 extending between the longitudinal frame members 10 and 12.

In order to locate the coil springs 190 held in compression between the flanges 184 and 186 and cups 182 upon the bases so formed, flanged cups 192 secured to the bases 184 and 186 are provided. Each of the cups has a radial section 194 struck therefrom and extending axially of the spring to form an arm, the arms so formed having friction lining 196 molded thereabout. Each of the yokes 180 has affixed to the under side thereof and within their respective coil springs 190, a relatively stiff spring clip 198 having friction arms 200 adapted to frictionally engage the friction lining 196 with sufficient pressure to provide any desired damping effect to vertical movement resulting from force transmitted to the springs 190. The ears 164 may be integral extensions of a saddle member generally indicated as at 202 secured to the bottom of the drum. The drain sump 162 may be integrally formed from such saddle member, the drum 44 being provided with an opening 204 in alignment with the sump 162.

In operation, the transparent door 102 is swung open, and a suitable load of laundry inserted into the drum 76. The door is then closed, and a proper amount of water of the proper temperature is delivered to the drum from the spray rosette 152. A proper quantity of washing agent or other substance such as water softener and the like, is delivered to the drum through the soap dispensing channel 98. Rotation of the drum in a clockwise direction as viewed from the front, may be commenced prior to, during, or after completion of the filling operation. The washing operation may be permitted to continue for a suitable period of time, and it is to be noted that the wash water, although filling the compartment 146 as well as the washing compartment 144, cannot escape from the drum by reason of the direction of rotation and the arrangement of the arcuate conduits 123. It will be appreciated that, because of the relatively small volumetric dimensions of the compartment 146, a part of which volume is displaced by the conduits 123, washing is carried on with a minimum amount of water and soap as compared with machines in which the drum is perforate and rotates in a wash-water-containing outer stationary drum. Upon completion of the washing operation, the rotation of the drum may be reversed under which circumstances the conduits 123 are effective to drain the wash water from the drum 76 into the outer casing 44 whence it is drained by the continuously operating pump 32 or by gravity, as the case may be.

After draining off the wash water, rinse water may during such reverse operation be sprayed into the drum for a spray rinse, or the drum may be rotated clockwise and the drum partially filled with rinse water to thereby provide an agitated or deep water rinse. In the latter case, after a suitable rinsing period, the soapy rinse water may be again drained from the drum 76 by reversing the rotation to counterclockwise. Any number of rinse cycles as described may be performed to complete the rinsing operation, or a combination of agitated and spray rinsing may be resorted to, utilizing the proper rotation direction accordingly.

During the last cycle of rinse operation, when the drum is rotated in a counterclockwise direction to drain the rinse water therefrom,

the drum rotation may be increased as the draining off of the rinse water is completed, the two-speed transmission being provided for this purpose. At such time, the laundry within the tub tends to arrange itself in as nearly a balanced condition as is possible, while the speed of the drum increases to that sufficient to extract the water therefrom by centrifugal force. The water so extracted passes out of the drum 76 along the grooves 148, into the compartment 146, from whence it is eliminated by the bailing action of the conduits 123, rotation being in a proper direction (counterclockwise) for drainage. After a sufficient period of time has elapsed for extraction of a substantial portion of the water to produce laundry damp-dried, the spinning is discontinued and thereafter the damp-dried laundry may be removed from the machine.

It will be observed that during the spinning operation, the clothes may not arrange themselves within the drum in perfect balance, so that upon rotation of the drum at a high speed in the neighborhood of 600 R. P. M., considerable vibration of the drum may result. The drum 76 will transmit the vibratory forces to the outer drum 44 both through the rear bearings 68 and 66, as well as the front bearing formed by the door 182 rotating on its journal 108. Through the suspension shown and described, it will be observed that the stationary drum 44 being suspended upon links 172 may move sideways, and being resiliently supported by the coil springs 196, through the supporting links 174 arranged in substantially horizontal position, the drum may move vertically. The rocking action of the drum from side to side produces up and down movement, assuming that the links 174 be held rigid, because of the pendulum or arcuate movement of the short links 172. The up and down forces so created by the transverse movement of the drum 76 are thereby in turn transmitted in the form of vertical movements to the free end of the links 174 which through the channel members 176 and lever arms 178 rock and transmit such motion to the coil springs 196. At the same time, the vertical movement of the coil springs is damped by the friction existing between the wear-resisting friction lining 196 and the friction arms 198. It will be seen that the length of the links 172 determines to a large extent the amount of movement which will be permitted as a result of such unbalanced load within the drum 76 and determines the clearance required by the outer casing 26. If it be assumed that the links 172 were to swing to a 45° angle with the vertical, it will be observed that the lateral force transferred to it would under such circumstances be converted to a vertical force of substantially the same magnitude, which vertical force would then be absorbed by the coil spring and the friction device. The further the links 172 swing, the greater is the ratio between the vertical movement and the lateral movement, causing such vertical movement. The action of links 172 alone is in effect toggle-like. The action of links 174 is merely to constrain the upper ends of links 172 against lateral movement and to transmit the vertical components to the yielding spring support. Thus, the more violent the vibration due to unbalance, the greater is the effectiveness of the springs 196 to cope with such unbalance. The arrangement thus combines in a single vertically active resilient and frictional support, an arrangement for absorbing not only the vertical movements of a revolving drum but the transverse movements as well, together with an apparatus inherently able to variably resist the variable unbalanced loads likely to be presented.

The toggle-like action provides a variable ratio transmission for the forces created by the revolving mass to the resilient support, so that under no practical circumstances can the suspension respond in resonance, since the transmission continuously varies the force ratio with each increment of vibratory movement.

It will thus be seen that an apparatus has been provided which lends itself to automatic operation through the use of well-known timing apparatus. For example, after placing a load within the drum and applying a suitable quantity of soap, timing and control devices may be employed, first, to control by valves the amount of water and the temperature thereof admitted to the drum; second, to rotate the drum in one direction for washing; third, to subsequently reverse the rotation of the drum to drain the washing fluid; fourth, to admit rinsing water in a sufficient quantity while rotating the drum in the original direction; and thereafter, reversing the drum to drain off the rinsing water. Subsequently, the drum may be rotated for a short space of time at the washing speed, for example, to facilitate the arrangement of the drained clothes therein, whereupon the timing device may actuate the transmission to increase the speed of rotation for centrifuging; and following a prescribed period, the power may be shut off and the drum allowed to return to rest.

It will be seen that the interior of the drum is readily accessible to cleaning or flushing if desired, and that during the actual washing stage, the entire drum, including the end chamber, is subjected to the wash water and therefore maintained at a substantially uniform temperature, due to the insulating effect of the dead air space surrounding the drum and within the drain tub. Because of the imperforate washing drum, severe agitation of the washing fluid results with the laundry being repeatedly lifted and dropped with gentle but substantial force to effectively wash fragile fabrics in a minimum length of time.

While the embodiment of the invention has been described in some detail and in connection with a reversible electric motor, it will be understood that the transmission may have incorporated therein a reverse drive, so that a unidirectional motor can be employed. In such an arrangement, the pump need not be of the reversible type, that is, effective regardless of rotation direction.

Although a single practical embodiment of the invention has been illustrated and described, it is to be understood that the invention is not limited thereto. As various changes in construction, selection and arrangement of the parts may be made without departing from the spirit of the invention, as will be apparent to those skilled in the art, reference will be had to the appended claims for a definition of the limits of the invention.

What is claimed is:

1. A washing machine drum comprising a member having a front wall and a substantially cylindrical wall, said substantially cylindrical wall having an annular outward offset inwardly spaced from the rear edge thereof, a transverse partition seated on said offset, said cylindrical portion having one or more longitudinal grooves of increasing depth from said front wall to said offset, the amount of said offset being at least

as great as the maximum depth of said grooves, ports in said partition aligned with said grooves, a rear wall secured to the marginal edge of said cylindrical wall, an arcuate conduit positioned adjacent the periphery of said rear wall and being approximately semicircular in length, and having a port at one end connecting with the chamber formed by the rear wall and partition and a drain port substantially diametrically disposed from said other port, and a trunnion extending rearwardly of said drum and secured to said partition and rear wall.

2. A washing machine drum comprising a member having a front wall and a substantially cylindrical wall, said substantially cylindrical wall having an annular outward offset inwardly spaced from the rear edge thereof, a transverse partition having a flange seated on said offset, said cylindrical portion having one or more longitudinal grooves of increasing depth from said front wall to said offset, the amount of said offset being at least as great as the maximum depth of said grooves, ports in said partition aligned with said grooves, a rear wall secured to the marginal edge of said cylindrical wall, an arcuate conduit formed between said wall and partition of approximate semicircular length, and having a port at one end connecting with the chamber formed by the rear wall and partition, and a port leading through said rear wall at a point substantially diametrically disposed from said other port.

3. A washing machine drum comprising a member having a front wall and a substantially cylindrical wall, said front wall having a central loading aperture, and said substantially cylindrical wall having an annular outward offset inwardly spaced from the rear edge thereof, a transverse partition having a flange seated on said offset, said cylindrical portion having one or more longitudinally extending grooves of increasing depth from said front wall to said offset, the amount of said offset being at least as great as the maximum depth of said grooves, ports in said partition aligned with said grooves, a rear wall secured to the marginal edge of said cylindrical wall, said rear wall having an arcuate channel formed therein adjacent its periphery, said arcuate channel being approximately semicircular in length, and having a port at one end connecting with the chamber formed by the rear wall and partition, and a cover plate for said channel to form an arcuate conduit thereof, said cover plate having a port leading into said channel at a point approximately diametrically disposed from said other port.

4. In a laundering machine, a tub, a drum rotatable therein having end walls, one having an access opening, and the other a trunnion extending therefrom, said drum having a substantially cylindrical wall joining said end walls, said cylindrical wall having grooves of gradually increasing depth extending from front to back, and ports in said other end wall connecting with said grooves, an annular chamber adjoining said other end wall and connecting with said ports, and a semi-annular conduit substantially coaxially arranged with respect to said chamber and having openings at its opposite ends, one opening leading into said tub and the other into said annular chamber, and means for rotating said drum in opposite directions and in one direction at two different speeds, said one direction being in the direction from said tub port to said chamber port along said semi-annular conduit.

5. In a laundering machine, a tub, a drum rotatable therein having end walls, one having an access opening, and the other a trunnion extending therefrom, said drum having a substantially cylindrical wall joining said end walls, said cylindrical wall having grooves of gradually increasing depth extending from front to back, and ports in said other end wall connecting with said grooves, an annular chamber adjoining said other end wall and connecting with said ports, and a semi-annular channel substantially coaxially arranged in said chamber and having openings at its opposite ends, one opening leading into said tub and the other into said annular chamber, and means for rotating said drum in opposite directions to retain wash water within said drum or to drain said drum.

6. In a laundering machine, a tub, a drum rotatable therein having end walls, one having an access opening, and the other a trunnion extending therefrom, a door for said opening, and a tub-supported journal for said door, said drum having a substantially cylindrical wall joining said end walls, said cylindrical wall having grooves of gradually increasing depth extending from front to back, and ports in said other end wall connecting with said grooves, an annular chamber adjoining said other end wall and connecting with said ports, and a semi-annular channel substantially coaxially arranged with respect to said chamber and having openings at its opposite ends, one opening leading into said tub and the other into said annular chamber, and means for rotating said drum in opposite directions to retain wash water within said drum or to drain said drum.

7. In a laundering machine, a tub, a drum rotatable therein having end walls, a substantially cylindrical wall joining said end walls, said cylindrical wall having means for moving liquid contained therein from one end to the other in response to centrifugal force, and ports in one end wall to permit passage of such liquid therebeyond, an annular chamber adjoining said ported end wall and connecting with said ports to receive centrifugally moved liquid, and a semi-circular conduit substantially coaxially arranged with respect to said chamber and having openings at its opposite ends, one opening leading into said tub and the other into said annular chamber, and means for rotating said drum in opposite directions for retaining liquid within or draining liquid from said drum.

8. In a laundering machine, a tub, a drum rotatable therein having end walls, a substantially circular wall joining said end walls, said circular wall having at least portions thereof tapering outwardly from one end to the other, and peripheral ports in the end wall adjacent the other end, an annular chamber adjoining said ported end wall and connecting with said ports, and a semi-circular channel substantially coaxially arranged with respect to said chamber and having openings at its opposite ends, one opening leading into said tub and the other into said annular chamber, means supported upon the tub for rotating said drum in opposite directions for retaining liquid within or draining liquid from said drum, and a constantly open drain for said tub.

9. In a laundering machine, a tub, a drum rotatable therein having end walls, a substantially circular wall joining said end walls, said circu-

lar wall having portions thereof tapering outwardly from one end to the other, and peripheral ports in the end wall adjacent the other end, an annular chamber adjoining said ported end wall and connecting with said ports, and a semi-circular channel substantially coaxially arranged with respect to said chamber and having openings at its opposite ends, one opening leading into said tub and the other into said annular chamber, means supported upon the tub for rotating said drum in opposite directions for retaining liquid within or draining liquid from said drum.

10. In a laundering machine, a tub, a drum rotatable therein having front and rear walls, the front wall having a revolving access door journaled on said tub, and the rear wall having a trunnion extending therefrom, said drum having a substantially circular wall joining said front and rear walls, said circular wall having at least portions thereof of gradually increasing radial dimensions extending from front to back, and peripheral ports in said rear wall, an annular chamber adjoining said rear wall and connecting with said ports, and a semi-circular conduit substantially coaxially arranged with respect to said chamber and having openings at its opposite ends, one opening leading into said tub and the other into said annular chamber, means suspended from said tub for rotating said drum in opposite directions and in one direction at two different speeds, said one direction being in the direction from said tub port to said chamber port along said semi-circular conduit, and central means associated with said trunnion for admitting liquid to said drum.

11. In a laundering machine. a tub, a drum rotatable therein having end walls, a substantially cylindrical wall joining said end walls, said cylindrical wall having grooves of gradually increasing depth extending from one end to the other and ports in one end wall, connecting with the enlarged end of said grooves, an annular chamber adjoining said ported end wall and connecting with said ports, and a semi-annular conduit substantially concentrically arranged in said chamber and having openings at its opposite ends, one opening leading into said tub and the other into said annular chamber, and means for rotating said drum in opposite directions for retaining wash water within said drum or draining said drum.

12. In a laundering machine, a tub, a drum rotatable therein having end walls, a substantially circular imperforate wall joining said end walls, said circular wall having at least one groove of gradually increasing depth extending from one end to the other, a peripheral port in the end wall adjacent the increased depth end of said groove, and a semi-circular channel means substantially coaxially arranged with respect to said circular wall and adjacent said last-mentioned wall, and having openings at its opposite ends, one opening leading into said tub and the other communicating with said port.

13. In a laundering machine, a tub, a drum rotatable therein having end walls, a substantially circular wall joining said end walls and having portions of the circular wall of gradually increasing radial diameter extending from one end to the other, peripheral ports in the end wall adjacent the increased radial diameter portions, a semi-circular conduit means substantially coaxially arranged with respect to said circular wall and adjacent said last-named end wall and having openings at its opposite ends, one opening leading into said tub and the other having communication with said peripheral ports.

14. In a cylinder type washing machine, a drum having a substantially imperforate cylindrical wall, and end members for holding a quantity of washing liquid in said drum, means for mounting said drum for rotation on an axis at least in part horizontally extending, means for rotating said drum at will in either direction, and substantially imperforate conduit means mounted for rotation with said drum and having at one end an opening connecting within said cylinder peripherally thereof, and extending in an arcuate direction substantially concentric with the axis of and around said drum a substantial length from said opening and terminating in an exhaust port directed outwardly from said drum at the periphery thereof, whereby washing liquid within said drum may be drained therefrom through said conduit by rotation in the arcuate direction of said conduit toward said opening, and retained within said drum by opposite rotation.

15. In a cylinder type washing machine, a drum having a substantially imperforate cylindrical wall and end members for holding a quantity of washing liquid in said drum, means for mounting said drum for rotation on a substantially horizontal axis, means for rotating said drum in either direction, and substantially closed conduit means mounted for rotation about the drum axis and having a peripheral opening within said drum in a region spaced from one end member in an arcuate direction around said drum a substantial arcuate length substantially concentric of the drum and terminating in an exhaust port on the periphery of said drum, whereby washing liquid within said drum may be drained therefrom through said conduit by rotation of the arcuate length toward said opening, and retained within said drum by opposite rotation, said substantially cylindrical wall having fluid diverting channels leading from said one end member to the region adjacent said opening, said channels being so shaped as to render liquid within such channels responsive to centrifugal force and cause the flow thereof to said opening.

16. In a laundering machine, a tub, a drum rotatable therein having end walls and a circular intermediate connecting wall, said circular wall having means for centrifugally moving liquid contained therein to an annular region thereof, an annular chamber associated with said drum in juxtaposition to said region and having ports connecting with said region, said chamber being adapted to receive liquid centrifuged through said ports, and a substantially semi-circular substantially concentric conduit rotatable with said drum and having ports at each end, one connected with said chamber and the other discharging into said tub.

17. In a laundering machine, a tub, a drum rotatable therein having end walls and a circular intermediate connecting wall, said circular wall having means for centrifugally moving liquid contained therein to an annular region thereof, an annular chamber associated with said drum in juxtaposition to said region and having ports connecting with said region, said chamber being adapted to receive liquid centrifuged through said ports, and an arcuate substantially concentric conduit rotatable with said drum having one end connected to said chamber by an opening, and the other discharging into said tub, and means for rotating said drum in either direction.

18. In a laundering machine, a tub, a drum

rotatable therein having end walls and a circular intermediate connecting wall, said circular wall having means for centrifugally moving liquid contained therein axially thereof to an annular region thereof, and a substantially unobstructed curved conduit carried by the drum having ports at each end, one communicating with said region and the other opening into said tub, said ports and said conduit along the entire length thereof being substantially equally distanced radially from the drum axis, and said ports being disposed more than 120° apart from one another around the drum.

19. In a laundering machine, a tub, a drum rotatable therein having end walls and a circular intermediate connecting wall, said circular wall having means for centrifugally moving liquid contained therein axially thereof to an annular region thereof, an arcuate unobstructed conduit having a length in excess of 120° carried by said drum and substantially coaxial therewith having one end connected to said region, and the other discharging into said tub, and means for rotating said drum in either direction.

20. In a laundering machine, a tub, a drum rotatable therein having end walls and a circular intermediate connecting wall, said circular wall having means for centrifugally moving liquid

contained therein axially thereof to an annular region thereof, and a substantially unobstructed curved conduit carried by the drum having ports at each end, one communicating with said region and the other opening into said tub, the latter port and said conduit along the entire length thereof being distanced radially from the drum axis by an amount at least as great as the radial distance of the port communicating with said region, and said ports being disposed more than 120° apart from one another around the drum.

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