AUTOMATIC WASH CYCLE

<table>
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<tr>
<th>SWITCH</th>
<th>OFF</th>
<th>WASH</th>
<th>DRAIN</th>
<th>RINSE</th>
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<tr>
<td>TIME (MIN-MAX)</td>
<td>18</td>
<td>6</td>
<td>8</td>
<td>10</td>
<td>TOTAL 30 MIN</td>
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INVENTOR.  DAVID TANN.

BY

ATTORNEYS
WASHING MACHINE

David Tann, Detroit, Mich., assignor to Avco Manufacturing Corporation, Cincinnati, Ohio, a corporation of Delaware

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58 Claims. (Cl. 68—19)

This invention relates to fabric cleaning devices, and particularly to a cleaning device which is operated at a constant speed automatically to produce a cleaning, rinsing, extracting and drying operation on fabrics.

This application is a continuation-in-part and a consolidation of subject matter of my co-pending applications Serial No. 155,682, filed April 13, 1950, and Serial No. 306,118 filed August 25, 1952, both now abandoned. Reference is also made to my co-pending applications, Serial No. 422,556, filed April 12, 1954, and Serial No. 463,172, filed October 19, 1954, which are divisional applications based on Serial No. 155,682 and Serial No. 306,118, respectively.

Difficulty has been experienced when utilizing automatic types of fabric cleaning machines which incorporate damp-drying in the cycle of operation since the best known principle of extraction was that produced centrifugally by increasing the speed of rotation of the rotor. When low extracting speeds were employed, the extracting operation produced only a partial removal of excess fluid so that more than a pound of fluid remained in each pound of fabrics. When higher extracting speeds were employed, bringing the extracting ratio below a pound of fluid per pound of fabrics, damage due to stretching and tearing resulted to the fabrics because of the increased forces applied thereto. Further, the increased speed employed for extraction required costly clutch and gear mechanisms, as well as controls, and also made it necessary to anchor the machine in some manner to the floor. This required the actual bolting of the machine to the floor or the provision of cups or other means which prevented the machine from traveling thereover.

40 When practicing the present invention, extraction is produced at the same speed utilized for the cleaning operation. A belt of absorbing material is disposed in engagement with the peripheral wall of the rotor in which the fabrics are tumbled as the belt and rotor are driven in synchronism. During the washing or cleaning operation, the belt may be driven to drive the rotor at a predetermined speed to produce the proper raising and tumbling of the fabrics through the cleaning fluid. Therefore, the fluid is drained from the tub in which the rotor operates and extraction is produced by the absorption of the water in the fabrics through the permeable peripheral wall of the rotor by the belt which takes up the fluid which passes through the wall.

60 A pair of pressure rollers may be employed which function as wringer rolls for squeezing the fluid from the belt as it is advanced therethrough. Suction or other means may also be employed for removing the fluid from the fabrics and belt or other absorbing element. The driving of the rollers produces the driving of the belt and the rotation of the rotor. The belt may be disposed about the peripheral wall of the rotor and the rollers employed in engagement with the wall and belt to extract the fluid therefrom, or the belt may encompass the greater portion of the peripheral wall and have a portion extending therefrom which passes through the wringer rolls or moved across fluid extracting means, or a short loop of belt may be utilized in engagement with only a portion of the peripheral wall.

A portion of the fabrics is constantly being raised along one side of the rotor or drum as the rotor is driven in rotation in one direction from which they tumble near the top of the rotor or drum downwardly across the rotor axis to the lower opposite side of the rotor. The falling of the fabrics upon the previous peripheral wall will cause the fluid thereof to be forced toward and through the wall onto the belt. When a short loop of belt is utilized, it is preferably disposed at the portion of the periphery onto which the fabrics are tumbled.

The pervious wall may be made of moisture-absorbing material, such as fabric, or it may be made of metal having apertures therethrough, or it may be made of perforated metal having fabric on the inner wall to prevent buttons and string-ends of the fabrics from projecting through the apertures. A solid wall may be employed having an inner fabric lining against which a roller is pressed as the rotor or drum is oscillated an amount less than 360° for squeezing the fluid directly from the inner fabric, the fluid thus extracted being conducted from the interior of the rotor.

It is also within the purview of the invention to have the wash and belt provided with suction cups and apertures so that the suction cup, if in the belt, can be flattened, or the belt can be forced into the suction recesses of the peripheral wall, by a roller applied against the belt at the point where the fabrics are tumbled onto the rotor for producing a suction on the fluid in the fabrics. It is apparent, therefore, that various types of structures may be employed for practicing the invention which embodies the extraction of fluid from fabrics within a rotor by absorbing the fluid from the fabrics and removing the fluid from the absorbing medium while operating the machine at a slow constant speed.

Automatic means are employed for operating the machine through the cycle, which may be produced by a mechanical timing means or by electric timing means, both of which are old in the art. Simplified mechanisms is utilized; for example, the initial fluid level is controlled manually, the depth of the rinse water is controlled by an overflow drain pipe provided at a predetermined height in the tub, and pulleys and belts are employed to produce the rotation of the rotor at a constant speed throughout the entire cycle of operation of the machine. A sump may be employed for retaining the suds when washing is operation is employed, or the cleansing fluid when a cleansing operation is to be utilized, and it is to be understood that the machine may be employed as a clothes washing machine or as a dry-cleaning machine, depending upon the fluid which is employed. Therefore, it is to be understood that when a washing operation is described for a machine, a similar cycle of operation may be utilized for producing a dry-cleaning operation upon the fabrics.

It is within the purview of the invention to utilize a drying system for the fabrics after the cleansing operation so that a complete cycle of cleansing, rinsing, wet-drying and complete drying may be performed by the machine. Preferably a blower is driven by the same motor which drives the rotor for producing a flow of air through the tub and container, over the fabrics in the fabric which is heated by a gas burner or by an electric heating element or other means before being directed into the machine. A lint trap may be provided in the outlet conduit of the drying system which receives a predetermined depth of the fluid drained from the tub onto which the return air from the tub is directed so that the lint thereof may be picked up by the fluid without being blown into a room or collected in the machine to form a fire hazard.

Accordingly, one object of the invention is to provide
a fabric cleansing machine which is driven at a constant speed through an entire cleansing and wet-drying cycle without requiring the machine to be anchored to the floor.

A further object of the invention is to provide a fabric cleansing machine which produces an extracting operation on the fabrics through the absorption of the fluid by an absorbing element from which the fluid is removed by vacuum, squeeze pressure or the like.

Another object of the invention is to provide a fabric cleansing machine with a rotor having a pervious peripheral wall against which the fabrics are tumbled to urge the fluid therein toward and through the wall against a belt in engagement therewith which absorbs the fluid and carries it to an extracting device which may be a pair of rollers, a suction shoe or the like.

A still further object of the invention is to provide a fabric cleansing machine with an absorbing belt which extracts fluid from the fabrics within a rotor as they are tumbled therein and after the extracting operation to produce circulation of hot dry air through the rotor and fabrics for producing a drying operation thereon after the cleansing operation, to thereby produce a complete cleansing and drying operation during a single cycle of operation of the machine.

Another object of the invention is to provide a driven container having a fabric peripheral wall which is heated both radiantly by a convection flow of air to dry the fabric out of contact with the clothes being laundered.

A further object of the invention is to provide a rotatable container with an enclosing fabric belt for the peripheral wall which passes over rollers externally of the container in an area in which the belt is heated for driving off moisture picked up from the clothes being laundered within the container.

A still further object of the invention is to provide a rotatable container and a belt having on an inner surface an absorbing fabric and on the outer face a layer of material impervious to moisture which contacts a sealing ring near the edges of the container about the peripheral wall so as to seal the bottom of the container so that it may hold water during the washing cycle of operation.

A further object of the invention is to provide a rotatable container with a peripheral wall of absorbing fibrous material in contact with a cylinder of larger diameter having an inner fabric absorbent wall both of which are driven in synchronism with the peripheral walls in engagement between which a heating unit is mounted and/or in driving rolls thereon, and, in general, to provide a machine for drying fabrics having an absorbent peripheral wall which is dried at a point remote from the area engaged by the clothes being laundered.

For a better understanding of the invention, reference is made to the following description taken in conjunction with the accompanying drawings, wherein:

Figure 1 is a front elevational view of a preferred embodiment of the invention;

Figure 2 is a plan view of the structure illustrated in Fig. 1;

Figure 3 is a greatly enlarged transverse sectional view of the structure illustrated in Fig. 1, taken substantially along the line 3—3 thereof;

Figure 4 is a broken sectional view of the structure illustrated in Fig. 3, taken substantially along the line 4—4 thereof;

Figure 5 is a broken sectional view of the structure illustrated in Fig. 4, taken substantially along the line 5—5 thereof;

Figure 6 is a broken enlarged sectional view of a modification showing an alternative mounting for the timer pulley;

Figure 7 is an enlarged sectional view of the structure illustrated in Fig. 3, taken substantially along the line 7—7 thereof;

Figure 8 is a broken elevational view of the structure illustrated in Fig. 5, taken from the line 8—8 thereof;

Figure 9 is an enlarged diagrammatic view of one of the control knobs;

Figure 10 is an enlarged diagrammatic view of the other control knob;

Figure 11 is an enlarged sectional view of the structure illustrated in Fig. 3, taken substantially along the line 11—11 thereof;

Figure 12 is a broken sectional view of the structure illustrated in Fig. 1, taken substantially along the line 12—12 thereof;

Figure 13 is an enlarged sectional view of the structure illustrated in Fig. 7, taken substantially along the line 13—13 thereof;

Figure 14 is a greatly enlarged broken view of that portion of the structure illustrated in Fig. 4, indicated by the broken line 14 therein;

Figure 15 is a sectional view similar to Fig. 14, illustrating a modification of the invention;

Figure 16 is a sectional view similar to Fig. 14, illustrating a further modification of the invention;

Figure 17 is a diagrammatic view of the water circuits of the structure illustrated in Fig. 1;

Figure 18 is a chart showing the positions of the switch and valves of the machine illustrated in Figs. 1 to 17, during an illustrative automatic washing cycle;

Figures 19, 20 and 21 are somewhat diagrammatic perspective views of modified forms of the invention;

Figure 22 is a somewhat diagrammatic elevational view of a further modified form of the invention;

Figures 23 and 24 are somewhat diagrammatic sectional views of other modified forms of the invention;

Figure 25 is a broken elevational view of the structure illustrated in Fig. 24, taken from the line 25—25 thereof;

Figure 26 is a sectional view of the structure illustrated in Fig. 24, taken substantially along the line 26—26 thereof;

Figure 27 is a somewhat diagrammatic perspective view of another modified form of the invention;

Figure 28 is a broken sectional view of the structure illustrated in Fig. 27, taken substantially along the line 28—28 thereof;

Figure 29 is a broken sectional view similar to Fig. 28, showing another modification of the invention;

Figure 30 is a sectional view of a modified form of the invention showing a combination automatic washing machine and clothes drier;

Figure 31 is a broken enlarged sectional view of the structure illustrated in Fig. 30, taken substantially along the line 31—31 thereof;

Figure 32 is a broken sectional view of the structure illustrated in Fig. 30, taken substantially along the line 32—32 thereof;

Figure 33 is a broken sectional view of the structure illustrated in Fig. 32, taken substantially along the line 33—33 thereof;

Figure 34 is a somewhat diagrammatic perspective view of a further modified form of the invention;

Figure 35 is a broken sectional view of the structure illustrated in Fig. 33, taken substantially along the line 35—35 thereof;

Figure 36 is a diagrammatic illustration of a part of the drive for and water circuits of the machine illustrated in Fig. 30;

Figure 37 is a diagrammatic view similar to a portion of Fig. 36, showing a further modification of the invention;

Figure 38 is a broken sectional view similar to Figs. 4 and 30, showing another modification of the invention;

Figure 39 is a broken enlarged sectional view of the structure illustrated in Fig. 38, taken substantially along the line 39—39 thereof;

Figure 40 is a broken sectional view of the structure illustrated in Fig. 39, taken substantially along the line 40—40 thereof;
Fig. 41 is a broken enlarged sectional view of the structure illustrated in Fig. 40, taken substantially along the line 41—41 thereof;

Fig. 42 is a broken sectional view showing a further modification of the invention;

Fig. 43 is an enlarged sectional view of the structure illustrated in Fig. 21, taken on the line 43—43 thereof;

Fig. 44 is a view in perspective of another laundering machine with parts broken away illustrating features of the present invention;

Fig. 45 is an enlarged broken sectional view of the structure illustrated in Fig. 46, taken along the line 47—47 thereof;

Fig. 46 is a view of the structure, similarly illustrated in Fig. 44, showing further form of invention;

Fig. 47 is an enlarged sectional view of the structure illustrated in Fig. 46, taken along the line 47—47 thereof;

Fig. 48 is a view of structure, similar to that illustrated in Fig. 44 showing a still further form that the invention may assume;

Fig. 49 is a broken sectional view of the fabric employed in belt illustrated in the device shown in Fig. 48;

Fig. 50 is a view of structure similar to that illustrated in Fig. 49, showing another form thereof;

Fig. 51 is a sectional view of structure, similarly illustrated in Fig. 44, showing a still further form of the invention;

Fig. 52 is an enlarged broken sectional view of the structure illustrated in Fig. 51, as viewed in the circle 52 thereof;

Fig. 53 is a sectional view of the machine similar to that illustrated in Fig. 44, showing another form thereof;

Fig. 54 is a broken sectional view of the structure illustrated in Fig. 53, taken along the line 54—54 thereof;

Fig. 55 is an enlarged broken sectional view of the structure illustrated in Fig. 54 taken on the line 55—55 thereof;

Fig. 56 is a view of structure similar to that illustrated in Fig. 53, showing a still further form of the invention; and

Fig. 57 is a broken sectional view of structure, similar to that illustrated in Fig. 44, showing a modified form thereof.

Fig. 58 is a front view partly in section of a machine to which has been applied a suction shoe type of liquid removing element, illustrated in Fig. 57.

Fig. 59 is a side view partly in section of the structure illustrated in Fig. 58.

Referring to the drawings, and more particularly to Figs. 1 through 17, inclusive, the preferred embodiment of the applicant's improved automatic washing machine there illustrated generally comprises a cabinet 40 supporting a tub 42 in which a drum 44 is rotatably supported, and which has a cylindrical outer wall portion 46 adapted to readily pass water therethrough, a band or belt 48 trained about the cylindrical wall 46 which is adapted to absorb water passing through the wall 46, a pair of wringer rolls 50 and 52 between which the band 48 is trained, a motor 54 drivingly connected to one of the rolls, suitable connections for supplying water to and removing it from the tub 42, and a suitable control mechanism 55, for controlling the supply of water to and draining of water from the tub 42 and the operation of the motor 54. The above mentioned control mechanism 55, which will be hereinafter described, is adapted upon initial actuation to automatically provide a cycle including a desired combination of washing, draining, rinsing the damp-drying operations. During these operations the drum 44 is driven by means of the belt 48 from the wringer rolls 50 and 52, the belt 48 performing the dual functions of driving the drum 44 and, during the draining and damp-drying operations, of absorbing water from the water permeable peripheral wall 46 of the drum 44 and carrying this water to the wringer rolls 50 and 52, where it is extracted from the belt 48 and permitted to drain.

Considering the above generally mentioned elements of the applicant's improved automatic washing machine in greater detail, the cabinet 40 includes a suitable supporting frame 56, which in the construction illustrated is formed of a plurality of interconnected angle irons, and which is enclosed by suitable front, side and rear panels 58, 60 and 62. The tub 42 is generally cylindrical in shape with its axis disposed horizontally and extending at right angles to the floor in appair of panels 58 and 62. At the front side of the cabinet 40, the cylindrical wall 46 of the tub 42 has a radially inwardly extending flange portion indicated at 64 defining a central opening 66 normally closed by a door 68 which is mounted in the opening 66 and provided with a suitable sealing gasket 70. The door 68 preferably has a glass panel 72 in which is mounted a small door 74 and chute 76 through which soap may be supplied to the tub 42. The tub 42 is closed at the rear end, by a plate 78 which is secured to an outwardly turned flange 80 integrally formed on the cylindrical wall of the tub 42, by screws 82. A suitable annular seal 84 is disposed between the plate 78 and the flange 80.

The drum 44 comprises a front wall plate 86, a rear wall plate 88 parallel thereto and the cylindrical wall 46 which is secured to the front and rear plates 86 and 88 and spaced a small distance inwardly from the peripherals of the plates 86 and 88 so that the outer peripheral portions of these plates provide shoulders 90 which serve as a guide to prevent the belt 48 from moving axially of the drum 44.

The drum 44 is rotatably supported in the tub 42 by a centrally disposed tubular shaft 92 which extends rearwardly from the rear wall 88 and is supported by suitable reinforcing ribs 94 welded or otherwise suitably secured to the outer surface of the rear wall plate 88. The shaft 92 is journaled in a shaft 96, supported on and projecting inwardly from the rear end plate 78 of the tub 42, which is provided with suitable reinforcing ribs 98.

In the construction illustrated, the shaft 96 is provided with a bearing sleeve 100. The front plate 86 of the drum 44 has an annular peripheral portion outwardly turned to provide a cylindrical flange 102 which defines a central opening aligned with the opening 66 at the front of the tub 42 and which also provides a bearing surface for supporting the drum 44 at the front end thereof. This support is provided by a pair of rollers 104 carried at opposite ends of a rocker arm 106 which is pivotally supported at its center on a screw 108 threaded into a nut 110 welded or otherwise secured to the radially inwardly projecting flange 64 at the inner side of the tub 42 and directly below the door opening 66. The rollers 104 are spaced at opposite sides of the center of the drum 44, as best illustrated in Figure 1.

Water is supplied to the tub 42 through a water supply line 112 which extends centrally through the rear wall 78 and axially through the tubular shaft 92 carried by the drum 44. At its inner end the supply line 112 is provided with a plurality of small apertures 114 through which incoming water is supplied into the interior of the drum 44. It will be appreciated that the water line 112 is stationary and that the shaft 92 turns with the drum 44. A suitable annular seal 116 is provided between the shaft 92 and the water supply line 112. Spaced slightly below the inwardly projecting shaft 96, the rear end 78 of the tub 42 carries an outwardly extended welded thereto and connected to a suitable hose to provide an overflow line 118. This line 118 prevents excessive filling of the tub 42. In this embodiment of the invention, the front and rear end plates 86 and 88 of the drum 44 are interconnected and held in fixed relation relative to one another by four quadrangually spaced baffles 120, which are formed of sheet metal strips which are longitudinally reversely folded to a generally V-shape,
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best illustrated in Fig. 4 and the marginal portions of which are outwardly flanged as indicated at 122. These flange portions 122 are disposed with their outer surfaces lying in a cylindrical surface spaced radially inwardly of the periphery of the end walls 86 and 88 and adapted to support the water permeable cylindrical wall 46. It will be appreciated that generically the cylindrical wall 46 may be formed of any suitable water permeable material including, by way of illustration, expanded metal, suitable fabrics of organic or inorganic material, sponge, sponge rubber, or any other material having suitable durability and water permeable characteristics. In the construction illustrated in Figs. 4, 5 and 14, the cylindrical wall 46 is formed of a suitable fabric and is supported intermediate the baffles 120 by a plurality of spaced rods 124 having reduced end portions 126 which project through apertures provided in the end plates 86 and 88. The rods 124 are flexible to permit them to be flexed so that the end portions 126 may be inserted into and removed from the co-operating apertures in the end plates 86 and 88. In the construction illustrated in Figs. 4, 5 and 14, the fabric wall 46 is stitched together as indicated at 128, at the outer side of the rods 124.

Figs. 15 and 16 illustrate modified constructions of the water permeable wall 46. In the construction illustrated in Fig. 15, two layers of fabric are employed, which pass respectively on the radially inner and outer sides of the rods 124 and which are stitched together as indicated at 130 intermediate the rods 124. In the modified construction illustrated in Fig. 16, a single continuous layer of fabric passes on the radially outer side of the rods 124, the inner sides of which are covered by strips of fabric 132 extending along the rods 124 and sewed to the fabric wall 46 at opposite sides of the rods 124, as indicated at 134.

The tub 42 has an opening 136 in the lower side thereof which underlies the drum 44 and is of a length slightly greater than the width of the belt 48. The opening 136 extends circumferentially of the tub 42, from its lowermost point at the center thereof, in the direction of rotation of the drum 44, as is best seen in Fig. 4. Through this opening 136, the tub 42 communicates with a V-shaped trough or sum 138 which is sealed to the tub 42 beyond the peripheries of the opening 136. The wringer rolls 50 and 52 are disposed within the sum 138 and are rotatably supported in castings 140 and 142 secured to the front and rear ends of the sum 138. In the construction illustrated, the upper roll 50 is the driven roll and is driven by the castings 140 and 142 for rotation about a fixed axis. The trunnion 144 at the left hand end of the roll 50, as viewed in Fig. 5, is journalled in a bearing 146 carried in the casting 140 and the trunnion 148 at the opposite or right hand end thereof, as viewed in Fig. 5, is supported in and drivingly engaged by a shaft 150 journalled in a bearing 152 carried in the casting 142. The shaft 150 extends outwardly of the casting 142 and carries a pulley wheel 154 which is driven from the motor 54 by a V-belt 156. The shaft 150 also carries a timer pulley 158 from which the above mentioned control mechanism 55 is driven, as hereinafter described.

Fig. 6 shows a modified construction in which the timer pulley 158' rotates with the drum 44 rather than the wringer roll 50. In the construction there shown, the shaft 96' carried by the rear wall 78 of the tub 42 extends outwardly rather than inwardly and the hollow shaft 92' has a reduced end portion projecting outwardly of the shaft 96' and to which the pulley wheel 158' is fixed. The shaft 92' has an intermediate portion journalled in the bearing 100' carried by the stationary shaft 96'. At its inner end the shaft 92' carries an annular seal 116' preventing water leakage through the shaft 92' around the water supply line 112. The shaft 96', at its inner end, carries a second seal 117 preventing the escape of water between the shafts 92' and 96'.

The lower roll 52 has its oppositely extending trunnions 160 and 162 journalled in bearings 164 and 166 slidably supported in the castings 140 and 142, respectively, for sliding motion toward and away from the axis of the roll 50. These bearing blocks 164 and 166 are urged toward the roll 50 by springs 168 and 170 housed in the castings 140 and 142, respectively, and one end of which is against adjustable seats 172 which may be moved vertically to adjust the loading of the springs 168 and 170 by means of screws 174 and 176 extending outwardly of the castings 140 and 142. Accordingly, it will be appreciated that adjustment of the screws 174 and 176 is effective to vary the pressure which the rolls 50 and 52 exert upon the belt 48 passing therethrough.

The belt 48 is continuous and may be of any suitable material adapted to absorb or entrain water from the wall 46 of the drum 44 and carry it to the sump 138 where it may be removed by the action of the rolls 50 and 52. By way of example, the belt 48 may be formed of any suitable fabric of either organic or inorganic material, or may include a suitable rubber or sponge, or any suitable material having the desired characteristics of durability and ability to carry absorbed or entrained water.

Also, within the sump 138 and idler roll 178 is mounted adjacent the edge of the opening 156 through which the belt 48 moves into the sump 138, and is supported for rotation about a fixed axis. The belt 48 is trained over the idler roller 178, from which it passes between the rolls 50 and 52. It reverses its course around the wringer roll 50 from which it is trained over a take-up roll 180, the opposite ends of which are rotatably supported in bearings 182 which are slidably mounted in channels 184 and urged by springs 186 in a direction to take up the slack in the belt 48, i.e., to the right as viewed in Fig. 4. Suitable means (not shown) may be provided for adjusting the loading of the springs 186, whereby the tension in the belt 48 may be readily adjusted.

A drain line 186 is connected to the bottom of the sump 138 and leads to a lint trap or strainer 190, the outlet side of which is connected by a line 192 to a drain valve 194 which is in turn connected through a line 195 to a pump 197. The strainer 190 is of the type in which the water flows into a central cartridge 196, from which it flows out through filter openings into an outer portion of the strainer connected to the outlet line 192. The lint and other foreign material is collected in the cartridge 196 which may be readily removed for cleaning out the lint. The overflow line 118 is connected to the drain line beyond the valve 194 and in the construction illustrated, discharges into the line 195, as best shown in Figs. 3 and 17.

The washing machine is provided with two control knobs 198 and 200 disposed at the right and left handsides on the front of the machine, as illustrated in Figs. 1 and 2. The control knob 198, illustrated in Fig. 10, is manually operable to control the supply of water to the tub for initially filling the tub, as hereinafter described. The control knob 200, illustrated in Figs. 9 and 12, is adapted upon operation thereof to start the motor 54 and initiate the desired cycle of operations and, as hereinafter described, may be turned to provide any desired washing period. As illustrated in Fig. 12, the control knob 200 is fixed on a shaft 202 which is journaled in a bearing 201 and 58 in the cabinet 40. The shaft 202 projects inwardly of the cabinet 40 and carries a sprocket wheel 206 over which is trained an endless chain 208 which is also trained over a sprocket wheel 210 fixed on a camshaft 212 forming a part of the control mechanism generally indicated at 55. The control mechanism 55 includes a base 214 disposed adjacent the bottom of the cabinet 40 and supported on the frame 56. The control mechanism 55 is disposed at the right hand side of the cabinet 40, as viewed from the front as is clearly illustrated in Figs. 3 and 4.
The control knob 198 is connected by means of a shaft, not shown, to a sprocket wheel 222 over which is trained a chain 224 which is driven over another sprocket wheel 226 fixed to a second cam shaft 228 journaled in bearings 230 and 232 carried by the base 214. The cam shaft 228 carries a pair of cams 234 and 236 which are adapted to engage rocker arms 238 and 240 respectively, which are pivotally mounted at their lower ends on the cam shaft 242 pivotally supported on the base 214. At their upper ends the rocker arms 238 and 240 engage pins actuating valves 244 and 246 which respectively control the flow of water in hot and cold water lines 248 and 250. The position of the pins controlling the valves 244 and 246 determines the mixture of water which flows from the lines 249 and 250 into the single water supply line 112. The shape of the cams 234 and 236 (which is not shown in the drawings) is such as to rotate the idler shaft 264 to the shaft 270 through a speed reducer mechanism best illustrated in Fig. 11. A gear 280, having a single tooth 282, is fixed to the idler shaft 264 and is disposed to engage a gear 284 mounted on a second idler shaft 286 so that once each revolution of the shaft 264, the tooth 282 engages the gear 284 which has a plurality of teeth uniformly spaced about its periphery, and effects a small angular rotation of the gear 284 and the shaft 286 upon which it is fixed. The idler shaft 286 also carries another gear 288 having a single tooth 290, which is adapted to engage a gear 292 fixed on the short shaft 270 and has a plurality of teeth uniformly spaced about its periphery. It will now be appreciated that as the shaft 286 is driven, as above described, once each revolution of the gear 288 the tooth 290 will engage the gear 292 and effect a small angular rotation of the short shaft 270 to which the gear 292 is fixed.

It will now be appreciated that when the motor 54 is started by rotation of the cam shaft 212, by turning the knob 200 in a clockwise direction, the shaft 270 will be driven in a clockwise direction by the motor through the idler shaft 218 and the idler mechanism 218 fixed to the frame 268 and journaled at its other end in a bearing 270 carried by the base 214 of the control mechanism 214. The idler shaft 212 is drivingly connected to a short shaft 220 which is disposed coaxially with the cam shaft 212 and journaled on the frame 214. As the cam shaft 212 is journaled in bearings 218 and 220 carried by the base 214. The control knob 198 is connected by means of a shaft, not shown, to a sprocket wheel 222 over which is trained a chain 224 which is driven over another sprocket wheel 226 fixed to a second cam shaft 228 journaled in bearings 230 and 232 carried by the base 214. The cam shaft 228 carries a pair of cams 234 and 236 which are adapted to engage rocker arms 238 and 240 respectively, which are pivotally mounted at their lower ends on the cam shaft 242 pivotally supported on the base 214. At their upper ends the rocker arms 238 and 240 engage pins actuating valves 244 and 246 which respectively control the flow of water in hot and cold water lines 248 and 250. The position of the pins controlling the valves 244 and 246 determines the mixture of water which flows from the lines 249 and 250 into the single water supply line 112. The shape of the cams 234 and 236 (which is not shown in the drawings) is such as to rotate the idler shaft 264 to the shaft 270 through a speed reducer mechanism best illustrated in Fig. 11. A gear 280, having a single tooth 282, is fixed to the idler shaft 264 and is disposed to engage a gear 284 mounted on a second idler shaft 286 so that once each revolution of the shaft 264, the tooth 282 engages the gear 284 which has a plurality of teeth uniformly spaced about its periphery, and effects a small angular rotation of the gear 284 and the shaft 286 upon which it is fixed. The idler shaft 286 also carries another gear 288 having a single tooth 290, which is adapted to engage a gear 292 fixed on the short shaft 270 and has a plurality of teeth uniformly spaced about its periphery. It will now be appreciated that as the shaft 286 is driven, as above described, once each revolution of the gear 288 the tooth 290 will engage the gear 292 and effect a small angular rotation of the short shaft 270 to which the gear 292 is fixed.

The speed reducer mechanism is such as to rotate the idler shaft 264 to the shaft 270 through a speed reducer mechanism best illustrated in Fig. 11. A gear 280, having a single tooth 282, is fixed to the idler shaft 264 and is disposed to engage a gear 284 mounted on a second idler shaft 286 so that once each revolution of the shaft 264, the tooth 282 engages the gear 284 which has a plurality of teeth uniformly spaced about its periphery, and effects a small angular rotation of the gear 284 and the shaft 286 upon which it is fixed. The idler shaft 286 also carries another gear 288 having a single tooth 290, which is adapted to engage a gear 292 fixed on the short shaft 270 and has a plurality of teeth uniformly spaced about its periphery. It will now be appreciated that as the shaft 286 is driven, as above described, once each revolution of the gear 288 the tooth 290 will engage the gear 292 and effect a small angular rotation of the short shaft 270 to which the gear 292 is fixed.

The chart shown in Fig. 18 illustrates the positions of the motor switch 254, the drain valve 194, the

hot water valve 244, and the cold water valve 246, when the control knob 200 is in the off position and during each of the above mentioned washing, draining, rinsing, and damp-drying periods it will now be appreciated that an operator desiring to wash clothes in the applicant's improved automatic washing machine needs only to place the clothes to be washed within the drum 44, to turn the control knob 198 to fill the tub 42 with water of desired temperature, return the knob 198 to the off position when the tub is filled to the proper level as indicated by the marker 251, add the proper amount of a suitable soap through the door 74 provided for that purpose, and rotate the control knob 200 in a counterclockwise direction until the arrow 308 (see Fig. 9) points at the number of minutes desired for the washing period. It may be noted here that if the control knob 198 is not returned to the off position, the water level will continue to rise above the proper elevation indicated by the marker 251 until it reaches the opening to the overflow line 118. Since the higher level of water is desired during rinsing than during washing, the overflow line 118 is connected to the tub at an elevation corresponding to the maximum level desired in rinsing. It will be appreciated that once the cycle of operations is initiated by the above mentioned turning of the knob 200, the cam shaft 212 which controls the cycle of operations will be driven by the motor through the shaft 270 and the complete cycle of operations will be performed. Upon the completion of the damp-drying period, the control knob 200 and the cam shaft 212 will be returned to the off position, in which position the motor switch 254 is opened, and the drain valve 194 and the hot and cold water valves 244 and 246 will be closed.

During the operation of the machine, the speed of rotation of the drum 44 is preferably such that the clothes within the drum 44 which rotates in a clockwise direction, as viewed in Fig. 4, will be carried upwardly by the baffles 120 to a position in the upper left hand quadrant of the tub as there viewed, from which the clothes will fall more or less diametrically across the drum 44 and slap against the water permeable cylindrical wall 46 of the drum 44 at the lower left hand quadrant thereof, as viewed in Fig. 4. During the washing interval this action provides an agitation resulting in a very efficient cleaning action. It will be noted that while the drum 44 rotates continuously during the operation of the machine throughout all of the washing, draining, rinsing and damp-drying intervals. During the rinsing interval, the above described movement of the clothes produced by the baffles 120 provides the requisite agitation for an efficient rinsing of the clothes. It will be noted from Fig. 18 that during the draining interval, the second or cold water rinsing interval, and the following damp-drying interval, the drain valve 194 is open. During these intervals the water in the clothes being washed passes into or through the water permeable cylindrical wall 46 of the drum 44 and is absorbed by the belt 48 which carries the water into the sump 138 where it is extracted from the belt 48 by the wringer rolls 50 and 52 and passes out the drain. The above mentioned action of the baffles 120, in causing the clothes to slap against the wall 46 at the lower right hand quadrant thereof, as viewed in Fig. 4, facilitates this removal of the water from the clothes and a very rapid and efficient damp-drying of the clothes is accomplished.

It will be appreciated from a complete understanding of the present invention that a wide variety of constructions may be employed for driving the clothes receiving drum 44 and removing water from the clothes within the drum without departing from the spirit of the present invention. Several such modified constructions are illustrated in Figs. 19 through 29, inclusive and Fig. 34.

Referring to Fig. 19, in the modification there illustrated, the drum 310 differs from the above described drum 44 in that the cylindrical wall 312 is formed of a metal screen rather than the absorbent fabric material. It will be appreciated that the slapping action effected by the baffles 120 will cause water from the clothes to be absorbed by the belt 48, from which it is removed by the wringer rolls 50 and 52. Fig. 19 illustrates that, rather than being disposed in a sump at the bottom of the tub, the wringer rolls 50 and 52 may be disposed at the upper right hand quadrant of the drum 310, as there illustrated. A trough 314 is provided to catch water removed by the rolls 50 and 52, and slopes downwardly toward its rear from which the water is suitably drained so that it does not run back onto the belt 48. It will be noted that in this construction, with the wringer rolls 50 and 52 disposed at the upper right hand side of the drum 310, the only portion of the cylindrical wall 312 not in contact with the belt 48 is the upper right hand portion which is not in contact with any clothes.

The modified form illustrated in Fig. 20 is similar to the construction illustrated in Fig. 19 and differs therefrom in that a take-up roll 316 is provided which is urged by a spring 318 in a direction to take up the slack in the belt 48 and in this construction the rolls 50 and 52 are disposed intermediate the take-up roll 316 and the drum 310. Water removed from the belt 48 by the rolls 50 and 52 falls onto a trough 320 which slopes toward the rear of the drum 310 and discharges into a drain line 322 leading into the lower part of the tub and preventing this water from falling onto the belt 48 or into the drum 310.

Referring to Fig. 21 and Fig. 43, a belt 324 is employed with the drum which may be of the same or similar material as the belt 48, but which is sufficient only to closely fit over the porous cylindrical wall 312. A suction roll 311 is disposed in the lower right hand quadrant of the drum 310 and a similar roll 311 or an idler wringer roll 52 may be employed at the lower left hand quadrant of the drum. The roll 311 embodies a cylindrical sleeve 313 having a plurality of closely disposed rows of apertures 315 extending through the wall thereof. The sleeve rotates on a fixed cylindrical support 317 mounted at each end on supporting brackets 319. A pulley 321 is secured to one end of the sleeve 313 driven by a belt from a motor illustrated in the figure. The motor of the invention may be located so as to be rotated from the intake to which is connected an aperture 325 in the cylindrical support 317 from which a slot 327 extends along the support parallel with the support axis. A suction is provided by a pump through the slot 327 and the rows of apertures 315 in the sleeve, as the rows of apertures pass therewith as the sleeve is driven. The suction removes a portion of the liquid contained in the belt 324 as the sleeve and belt roll in engagement with each other. The liquid drawn into the pump 323 is discharged therefrom to drain or into the tub (not shown) from the discharge conduit 329. As indicated above, a plurality of the suction rolls 311 may be employed in engagement with the belt spaced about the periphery of the drum, or an idler roller 52 may be utilized opposite the single suction roll 311 as illustrated in the figure.

Referring to Fig. 22, the drum 44 is rotatably supported with its water permeable cylindrical wall 46 in rolling engagement with a pair of rollers 326 and 328, each having an outer layer of water absorbent material 330. These rollers 326 and 328 are disposed to contact the wall 46 of the drum 44 in the lower right and left hand quadrants, respectively, as illustrated in Fig. 22, and are rotatably supported by rolls 332 and 334 which have a rolling engagement with the rollers 326 and 328 and cooperate therewith to extract water from the water absorbent covering 330 on these rollers. The rollers 332 and 334 are driven through pulleys 336 and 338 from the motor 54 through belts 340 and 342.

In the modification of the invention illustrated in Fig.
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23, the drum 44 is mounted for rotation in a tub 344 which is appreciably larger than the drum 44. The drum 44 is disposed in the upper portion of the tub 344, and is driven by a belt 346 an endless belt which is trained over a roller 348 mounted for rotation about a fixed axis in the lower left hand side of the drum 44, and a second roller 350 mounted adjacent the lower right hand periphery of the drum 44. These rollers 348 and 350 are disposed so that the belt 346 is held in contact with the drum 44. The drum 44 is provided with a water supply line 112 entering the drum 366 through the shaft 386. The drum 366 has a centrally disposed outwardly turned flange 388 defining an opening 390 in the front wall of the drum. A trough 392 is supported on the arm 384 adjacent the roller 380 and slopes forwardly and downwardly therefrom to discharge water out through the opening 390 in the front wall of the drum 366. This trough 392 collects water squeezed from the absorbent material 372 lining the inner cylindrical surface of the drum 366 by the action of the roller 380. The above mentioned oscillating movement of the drum 366 is transmitted through the motor 345 to the pulley belt 378 by means of a wheel 394 on the output shaft of the motor 54, a pulley wheel 396 rotatably mounted on a suitable support 398 and a link 400 pivotingly connected at one end to a crank pin 402 on the wheel 394 and pivotingly connected at its other end to a crank pin 404 on the pulley wheel 396.

Fig. 27 illustrates a modification of the invention in which the drum 405 is provided with a cylindrical wall 406 having a plurality of apertures 408, and in which a belt 410 is used which is formed of rubber or other suitable resilient material and has a plurality of vacuum cups or cavities 412 formed in the inner surface thereof. The belt 410 passes over a driving roller 414 disposed at the upper right hand side of the drum 405 and in spaced relation from the cylindrical wall 406 thereof. This driving roller 414 is driven from the motor 54 by a belt 416. A pair of idler rolls 418 and 420 are disposed at the lower right hand side of the drum 405. The belt 410 passes over a take-up roller 422 which is urged radially outwardly by springs 424 to provide the desired tension in the belt 410. As the belt passes over this take-up roller 422, the water carried in the suction cups 412 is squeezed therefrom and runs off the belt 410.

As illustrated in Fig. 29, rather than having the vacuum cups 412 provided in the inner surface of the belt 410, vacuum cups 426 may be permanently and integrally formed in the cylindrical wall 406 and the belt may have a smooth inner surface which is pressed into the cups 426 by the action of the rollers 418 and 420. In this form the water drawn into the space between the belt 410 and the wall 406 is carried downwardly to the point at which the belt 410 moves tangentially away from the drum 405 and toward the roller 422 and beyond which point it runs off the smooth inner surface of the belt 410.

As illustrated in Figs. 30, 31, 32, 33, 35 and 36 illustrate a modified embodiment of the present invention which comprises a combination clothes washer and clothes drier. In the construction there illustrated, the cabinet 430 includes a suitable frame 432 upon which is supported a generally cylindrical tub 434 generally similar to the tub 44. A drum or rotor 436 is rotatably supported within the tub 434, the support at the rear of the drum being provided by a bearing 438 mounted centrally of the rear wall of the drum and rotatable on a sleeve bearing 440 carried on a tubular element 442 supported in the rear wall of the tub 434. A collar 444 is fastened to the inner end of the tubular element 442 by a set screw 446 holds the drum 436 against axial movement. At the front of the drum 436 it is provided with an annular axially outwardly turned flange 448 which is engaged by three equiangularly spaced rollers 450 rotatably supported as indicated at 452 on the tub 434. The drum 436 has a cylindrical wall 454 which may be formed of any water permeable material and in the embodiment illustrated in these figures is formed of expanded metal. Within the drum 436 are four equiangularly spaced baffles 456 extending axially of the drum and projecting radially in
wardly from the cylindrical wall 454. These baffles 456 have end flanges 458 by which they are secured to the front and rear walls of the drum 456. The tub 434 has a pair of axially extending circumferentially spaced openings 460 and 462 disposed in the upper right hand quadrant thereof, as viewed in Fig. 30. In the upper right hand portion of the cabinet 340, as viewed in Fig. 30, a pair of wringer rollers 464 and 466 are rotatably supported. The rollers 464 and 466 have trunnions at their opposite ends which are rotatably supported in end plates 468, which are mounted for movement laterally of the cabinet 340 by means of a plurality of small rollers 470 on each end plate 468, which rollers 470 ride in channels 472, each of which has one end secured to the frame 432 and the other end supported on the tub 434 at the upper side thereof. The lower roller 466 has its trunnions journalized in bearings 474 fixed in the end plates 468 and one of its trunnions is drivingly connected to a shaft 475 coaxial therewith and carrying a pulley wheel 476. The other wringer roller 464 has its trunnions journalized in bearing blocks 478 slidably mounted in vertically extending slots 480 in the end plates 468. These bearing blocks 478 are urged toward the bearings 474 supporting the roll 464 by corresponding ends of arms 482 pivotally mounted on the end plates 468 as at 484, which are engaged at their outer ends by springs 486.

A continuous belt 488, formed of a suitable material adapted to absorb or entrain water is disposed about the drum 436 in engagement with the cylindrical wall 454 thereof and passes out through the opening 460 in the tub 434 and between the wringer rolls 464 and 466 from which it passes back into the tub 434 through the opening 462. As illustrated in Fig. 31, the end plates 468 carrying the rollers 464 and 466 are urged to the right as seen in Figs. 30 and 31 by springs 490 disposed within the channels 472 and having one end fitted over a spring guide 492 and seated against a block 494 secured in the channel 472 by a screw 496. The other end of each of the springs 490 fits over a threaded rod 498 carried by the end plate 468 and seats against adjustable lock nuts 509 threaded thereon. It will be appreciated that by adjusting the nuts 509, any desired tension may be provided in the belt 488.

A trough 502 is supported on the end plates 468 and slopes downwardly toward a suitable drain line 504 which carries away the water removed from the belt 488 by the wringer rolls 464 and 466. This drain line 504 connects to a drain fitting 506 mounted in the rear wall of the tub 434 at the low point thereof and to which is also connected a drain line 508 leading to the strainer 510 which may be similar to the above described strainer 190. The outlet of the strainer 510 is connected to a drain valve 512 by a line 514 and the drain valve is connected by a line 516 to the inlet of a pump 518, the outlet side of which is connected to a suitable drain line 520. The pump 518, which is mounted in the lower portion of the cabinet 430, is driven by a motor 522, the output shaft 524 of which also carries a small drive pulley 526 which is connected by a V-belt 528 to a large pulley wheel 530 fixed on an idler shaft 532. This shaft 532 is journalized in suitable bearings 534 and 536 carried in a supporting bracket 538 and also carries a small pulley wheel 540 fixed thereon which is connected by a V-belt 542 to the above described pulley wheel 476 for driving the lower wringer roll 464.

The output shaft 524 of the motor also carries a large pulley wheel 544 which is drivingly connected by a V-belt 546 to a small pulley wheel 548 fixed on the driven shaft 550 of a blower 552 suitably supported in the lower portion of the cabinet 430 and which is connected for the purpose and in the manner hereinafter described.

With 434 through a supply line 554, the upper end of which is threaded directly connected to the outer end of the tubular element 442 which also carries a nozzle 556 threadedly mounted in its inner end and provided with a plurality of small openings 558. To prevent excessive filling of the tub 434, an overflow connection 555 is provided which is suitably connected to the drain line 516 leading from the drain valve 512 to the pump 517. The desired mixtures of hot and cold water are delivered to the supply line 554 through an automatic cam controlled valve mechanism (not shown), similar to that described in connection with the embodiment of the invention illustrated in Figs. 1 to 18, inclusive.

The above mentioned blower 552 has its outlet or high pressure side connected to a condit 569 which is generally in the shape of an inverted U, with the transversely extending portion thereof well above the center of the tub 434 and with the end remote from the blower 552 connected to the rear wall of the tub 434 in the lower portion thereof, as illustrated in Figs. 30 and 33. As illustrated in Figs. 32 and 33, the horizontally extending portion of the condit 569 carries an electric heater generally indicated at 562 to which power is supplied through a suitable line 564 under the control of a relay indicated at 566, which is actuated by suitable cam means (not shown), which may be of the type illustrated and described in connection with the embodiment shown in Figs. 1 to 18, inclusive.

The inlet or low pressure side of the blower 552 is connected to one end of a conduit 568, the other end of which is connected to an opening in the rear wall of the tub 434 in the upper portion thereof, as illustrated in Figs. 30 and 33. As in the construction just described, the blower 552 is continuously driven by the motor 522, but is only effective to circulate air when the drain valve 512 is open because of the fact that when the drain valve is closed, the water standing in the tub fills the conduit 560 to a point such that the blower pressure is reduced so as to prevent or reduce the flow of water to the drain 562 only to lower the water level in the condit 560, but not sufficient to force the water from the conduit and blow air into the tub 434.

Heated air is delivered from the opening 560 to the interior of the tub 434, and air is drawn from the tub through the opening 568. The openings are located in the rear wall of the tub spaced from the openings 460 and 462, located in the peripheral wall of the tub. As a result, all the heated air delivered near the bottom of the tub is available for drying the fabrics with a substantial amount of the air free to exhaust through the opening 462. A substantial amount of fresh air is drawn into the circulating system through the opening 460 along with a desired amount of heated air. A sufficient mixture of fresh and preheated air is thereby maintained in the system to effectively dry the fabrics in the presence of the large volume which is continuously circulated.

Openings (not shown) are provided in the cabinet walls permitting the free passage of fresh and heated air therethrough.

A lint trap 570 is provided in the conduit 568, and includes a bath of water 572 and a baffle 574 extending downwardly toward the surface of the water 572. This baffle renders it necessary for the air drawn through the conduit 568 by the pump 552 to sharply reverse its path of movement adjacent the surface of the water 572, with the result that lint carried in the air, as well as the larger moisture particles carried in the air, are thrown into the water 572. The bath of water 572 is maintained within the lint trap 570, as illustrated in Fig. 36, by a needle valve indicated at 576 which permits a small flow of water from a line 578 connected to the drain line 516 along the needle valve 576, and into the lower portion of the lint trap 570 through a line 580. The outer end of the line 580 is closed by a clearance flange 582. The lint trap 570 is provided with an overflow 586 which is a one way check valve 586.

An alternative means for maintaining the desired liquid level in the lint trap 570 is illustrated in Fig. 37, in which the needle valve 576 is connected to the water supply line.
554 for the machine so that there is a continuous small flow of water through the needle valve 576 and into the lower portion of the lint trap 570 through the line 580. The lint trap 570 is of a size that is suitable for the machine so that there is a continuous small flow of water through the needle valve 576 and into the lower portion of the lint trap 570 through the line 578 into the drum 574.

It will be appreciated that in the control mechanism (not shown) for the combination washing machine and drier, the cams corresponding to the cams 298, 294, 296 and 252 in the control mechanism 55 of the washing machine illustrated in Figs. 1 to 18, inclusive, and described above, must include dwell portions corresponding to the period over which the drier operation is extended. In Fig. 7 a cam is represented at 256 for controlling a micro switch represented at 258, which is connected to the relay 566 through a line 568 (see Fig. 33) for controlling the operation of the heater 562.

In the embodiment just described, the drum is also driven at a speed to provide the tumbling action of the clothes referred to above in connection with the description of the construction illustrated in Figs. 19 to 50, inclusive. In this construction the only place where the belt slips is out of contact with the drum is at the upper right hand quadrant, as viewed in Fig. 30, where the clothes do not contact the drum wall 454.

Figures 30, 32 and 33 illustrate that a suitable work surface may be provided in the top of the cabinet. In the construction there illustrated, the top of the cabinet is covered with wood 587 and the wood is covered with a suitable covering such as linoleum 588. The edges of the wood and linoleum are covered by a suitable molding 589.

A further modification of the present invention is illustrated somewhat diagrammatically in Fig. 34, which demonstrates that in place of the wringer action employed in the previously described forms of the invention, water may be removed from the belt 590 which is trained about the drum 592 in contact with the water permeable cylindrical surface 594 thereof, by a vacuum shoe represented at 596. In the construction there illustrated, the shoe 596 has an outer surface over which the belt 590 is trained and in which are a number of apertures 598. Suction is applied to the shoe 596 by a blower 600 which may be driven by the same motor 602 which drives the drum 592. The shoe 596 is connected to the intake side of the blower 600 by a conduit 604, which includes a lower end portion 606 which extends below the intake of the blower and serves to collect water drawn into the shoe 596 and down the conduit 604. Water collecting in the lower end portion 606 is carried away through a drain line 608. The blower 600 blows into a tank 610 which collects any water passing through the blower and drains it away through a line 612. The tank 610 is open at the top to permit the escape of the air blown into the tank by the blower 600.

It is contemplated that a suds saver tank such for example, as that represented at 614 (see Fig. 35) may be employed, if desired, to permit re-use of the wash water. The tank may be covered with insulation 616 and may include an electric immersion heater, such as that represented at 618, to keep the wash water at a desired temperature until such time as it is re-used. Suitable connections may be provided for delivering the wash water to the suds saver tank 614 and returning it from the tank 610 to the washing machine.

Referring to Figs. 38 through 41, inclusive, show a modification of the invention similar to the embodiment illustrated somewhat diagrammatically in Fig. 23, and differs therefrom primarily in that the embodiment illustrated in Figs. 38 through 41, inclusive, includes means positively preventing slipping of the belt relative to the drum.
screws 696. It will now be appreciated that the entire assembly, including the rolls 640, 642 and 666, the arms 648 and 650 and the bracket 694 may be moved axially into place, the end of the trunnion 646 being moved into the receiving socket in the driving shaft 692. The bracket 694 may then be moved into position to 621 through the trunnion 646 and locked in position by the thumb screw 686. The arms 648 and 650 are urged toward the drum 624 by leaf springs 699 and 708, respectively, which engage the inner surface of the tub 622, as clearly illustrated in Figs. 38 and 40. These springs, through the arms 648 and 650, and the roll 666 carried thereby, hold the belt 670 against the drum 624 with the desired pressure.

A drain line 702 is connected to the bottom of the tub 622 and leads to a strainer 704 similar to the strainers 190 and 510 above described.

It will be noted that the construction is such that the belt 670 is in contact with the lower right hand quadrant of the drum which is the area against which the clothes tumble. The speed of rotation of the drum 624 is such as to give the above described tumbler action.

Fig. 42 illustrates a modification of the embodiment illustrated in Figs. 38 through 41, inclusive, which may be employed when a construction similar to that illustrated is modified to include a blower and serve as a combination washing machine and drier. Fig. 42 illustrates that when the machine is to be used as a drier, if desired, the take-up roll 666 may be formed of a central stationary portion 710 which houses a centrally disposed sealed electric heating element indicated at 712, and an outer sleeve portion 714 rotatable relative to the stationary portion 710. The sleeve portion 714 may be rotatably supported on the central portion in any suitable manner. In the construction illustrated, the central portion 710 may be formed of cast iron and the outer sleeve portion 714 may be formed of steel, thereby providing the requisite bearing characteristics between the inner and outer portions 710 and 714. Since, in the construction illustrated in Figs. 38 through 41, inclusive, the belt 670 moves in the direction indicated by the arrows therein, it will be appreciated that after passing between the wringer rolls 640 and 642, the belt 670 moves to and travels about the roll 666 which, if constructed in the manner illustrated in Fig. 42, will have an iron core effect driving steam from and further drying the belt 670 prior to its movement in contact with the cylindrical wall of the drum 624, thereby increasing the potential of the belt 670 for absorbing or entraining water from the water permeable wall of the drum 624.

In Fig. 44 a cylindrical container 811 is illustrated having an impervious front wall 812 and rear wall 813 joined by a plurality of rods 814 at the peripheral edge. A peripheral wall 815 of fluid absorbing material such as a non-woven, non-synthetic materials and the like may be secured to the rods by pleats 816 through which the rods extend, as illustrated more specifically in Fig. 45. Raising and tumbling vanes 816 are also secured to the front and rear walls 812 and 813 employed for assisting the rods to properly raise and tumble the fabrics within the container. The container is suspended on a shaft 817 driven by a pulley 818 from a speed reducing unit 819 by a motor 821. A heating plate 822 is disposed across the peripheral wall adjacent thereto and is herein illustrated as being located at the point of drop of the clothes within the container as they are tumbled. Heat is provided through conduits 823, either electrically, by steam, or other means, for heating the plate 822. The surface of the plate is disposed directly adjacent to the fabric wall 815 so that when the clothes being laundered are dropped upon it, the fabric will be carried into contact surface of the plate so that the moisture will be driven therefrom as by an ironing operation.

In Fig. 46 a similar container is illustrated having a front wall 812 and rear wall 813 joined by a perforated peripheral wall 820 adjacent to vanes 816 secured between the walls. A band of fabric material 824 is stretched around the peripheral wall 820 covering the openings 825 therethrough. The container is similarly driven by the motor 821 through the trunnion 646 and carried thereby, hold the belt 670 against the drum 624 with the desired pressure.

In Fig. 48 a further form of invention is illustrated wherein the container, having the front wall 812, the rear wall 813 and perforated peripheral wall 820, is encompassed by a belt 830 of the fabric material which encircles the container in rotation. A portion 831 and 832 are mounted adjacent to the edge of the walls 812 and 813 at the point at which the belt leaves the roller and where it returns thereto. The belt is driven between driving rolls 833 and 834 from a pully 835 which is connected to the roller 831 which is driven by a belt 836 from a speed reducing unit 819 and motor 821, not illustrated in the figure. An additional idler roller 837 is mounted above the roller 834 for the purpose of lengthening the portion of the belt 830 remote from the container so that the belt may be more readily dried. Heated air may be circulated over the portion of the belt 830 remote from the container, or heating elements 839 may be mounted in some or all of the rollers, and employed separately or additionally to the circulated air to heat and drive the moisture from the belt.

It is to be understood that the structures illustrated in Figs. 44, 46 and 48 may be employed solely for drying the clothes after a washing operation was first performed in a separate washing machine. The passage of the water from the clothes into the fabric wall disposed about the periphery of the container helps in drying the clothes while the heating element dries the fabric as air is circulated within the container in the conventional manner to dry the clothes while the heating element dries the fabric as air is circulated within the container in the conventional manner to dry the clothes which also assists in drying the fabric forming the peripheral wall.

The fabric employed as the belt 830 disposed about the peripheral wall of the container may consist of a flexible carrier 841, as illustrated in Fig. 49, which may be metal or plastic, or perforated metal or plastic material, or other flexible but rigid material to which a layer 842 of fabric cloth, matted fibers or the like may be secured. In Fig. 50 a similar belt is illustrated having the material 842 also applied to the outer side of the assembled layers.

In Figs. 51 and 52 a further form of invention is illustrated that wherein the container, such as those illustrated in Fig. 48, may have the belt 830 associated therewith in such manner as to retain water so that a washing action may be performed on the clothes agitated therein. In this arrangement the front face 812 and rear face 813 are joined by the raising and tumbling vanes 816 and by other portions 821 and 822. The surface of the peripheral wall, a troughlike annular groove 843 is provided for receiving and retaining a soft rubber ring 844. The belt 845 has an outer portion 846 of rubber or similar impervious material faced by a layer of fabric material 847 for receiving water from the clothes through the apertures 825 in the peripheral wall 820. The edges of
the belt engage the soft rubber ring 844 and form a seal therewith at least about the lower half of the container so that water may be retained therein, as illustrated in Figs. 51, 52 and 53, though as indicated by the numeral 849. A pan 851 having a drain outlet 852 may be provided beneath the container to pick up water which may drip from the belt as the container is driven thereby. The shaft 817 of the container is mounted in a bearing 853 of a suitable support in the conventional manner. By the use of the sealing rings 844 and the impervious belt 871, the container of the washing machine, can be converted to a washing machine for retaining the wash water without requiring a tub to be provided thereabouts. When the water carried by the belt is extracted therefrom by the driving rollers during a washing operation, it is returned to the container through the shaft 871, when hollow, or through the access opening in the front wall. After a washing operation, the water being extracted is directed from the driving rollers to drain, as hereinbefore described.

Referring to Figs. 52, 53, and 55, a further form of the invention is illustrated wherein a container 860 has a front and rear wall 812 and 813 and a perforated peripheral wall 861 which may be of screen material, expanded or punched metal or the like, having a fabric peripheral wall 862 applied to the exterior thereof. Vanes 816 are mounted adjacent to the peripheral wall between the front and rear wall 812 and 813. The container 860 is mounted on a shaft 817 as described above. The material of the container 860 is disposed about the peripheral wall 862 being larger in diameter, said band having a perforated exterior wall of metal, plastic or other rigid material 865 on which an inner surface of absorbent or water carrying material 865 is provided. The material 865 contacts the material 860 of the container 860 for some distance in the area 866 made possible by having the center 877 of the band 864 offset from the shaft 817. The band 864 and the peripheral edge 868 of the end walls 812 and 813 and peripheral wall 861 are scalloped at 869, as illustrated in Fig. 55, to form a gas-tight drive when driven by means of gears 871 and 872 as illustrated more specifically in Figs. 54 and 55. The scallops maintain the container and band in synchronized relationship when driven simultaneously by the gears 871 and 872.

The gears 871 are mounted on the ends of a roller 873 which are mounted on standards 874 from which stub shafts 875 extend to rotatably support the gears 872. A pulley 876 is mounted on the shaft 877 provided at one end of the roller 873 by which the gears 871 and 872 are driven from a belt 878 connected to a suitable speed reducer 819 which is driven by a motor 821 (not shown). A heating element 826 may be provided between the peripheral wall of the container 860 and the band 864 to assist in heating the air circulated within the motor and for directing radiant heat for drying the fabric material 862 and 865 provided therewith. In place of the heating element 826, or employed in conjunction therewith, is a heating element 881 which is disposed within the hollow roller 873 affixed to an insulating bracket 882 on one of the standards 874. Heat from the roller is directly applied to the band 864 to assist in driving moisture from the material 865 on the inner face thereof. In such relationship, the clothes within the container 860 are conveyed and carried to the fabric material 862 from which it passes to the fabric material 863, which is dried by the heater 862 or 834 or both in combination.

In Figs. 56 a further form of the invention is illustrated wherein the band 864 has scallops 869 thereof mated with the scallops 868 of the container at the point 866 so as to have the band and container driven in synchronization. The band 864 is driven from gears 871 and 872 mounted opposite the point 866 on a pair of rollers 883 and 884 which contacts the band 864 and applies pressure thereto for mechanically squeezing water from the fabric material 865 into a trough 885 from which it is conducted to the container during a washing cycle and to drain thereafter. A heating element 886 is mounted between the container and band for delivering radiant heat to the fabric material 862 and 865 for driving moisture therefrom and also for providing heat to circulate air which passes between the container and band through the clothes within the container. In either of the structures described in Figs. 53 to 56, an outer casing 887 may be provided about the other band to enclose the entire machine. Suitable mounting means, not herein illustrated, supports the casing 887 from the 46. It is to be understood that the gears 871 and 872 and rollers 883 and 884, illustrated in Fig. 56, are driven by pulley 876 on a shaft 877 from a speed reducing unit 819 and motor 821 as hereinbefore described.

In Fig. 57, a further form of the invention is illustrated, wherein a suction shoe 890 is substituted for the heating shoe 826 of Fig. 44 for drawing liquid from the peripheral wall 815. It is understood that the shoe 890 may be moved to a point substantially 90° from that illustrated so as to draw liquid from the wall before the wall is heated by the shoe 826. The shoe 890 has an arcuate face on the radius of the container provided with a plurality of apertures 891. The groove is sealed to a housing 893 having a suction conduit 894 connected thereto to which a pipe or hose 895 is secured. The conduit is connected to a source of vacuum so as to extract water from the fabric material. It is within the purview of the present invention to provide heated air under pressure to the conduit for heating and drying from the material. In this arrangement the shoe 890 is preferably located on the upper right-hand side of the container at a point where the fabric material is out of contact with the clothes.

In Figs. 57 and 59 the suction shoe 890 disclosed in Fig. 57 is shown actually assembled on a conventional clothes washer and clothes dryer of the type shown in Figs. 30, 31 and 32, wherein a clothes tumbling drum 436 is rotatably supported within a tub 434, but in this case a belt or band 815 surrounds the water permeable periphery 454 of the drum and rotates with the drum in the manner shown in Figs. 21, 44 and 46, previously described. The suction shoe of Fig. 47 (rather than the squeezer rollers as in Fig. 30) is here the means for removing the liquid from the surrounding belt or band 815. Thus the disclosure of Figs. 58 and 59 is an assembly of the suction shoe in a complete machine, as contemplated in Fig. 57 and as is contemplated by the variant structure shown in Figs. 21 and 43, which disclose also a variant type of suction unit contacting a band or belt surrounding the drum. The shoe 890 has an arcuate face generally corresponding to the radius of the drum 436 with its belt or band 815 and the shoe face is preferably provided with a plurality of apertures 892, the plate 894 being sealed to a housing 893 having a suction conduit 894 to which a hose 895 is secured, which is connected to a source of suction which is here shown as a pump 891 which is driven in rotation by a motor 902, which motor is also rotatably connected to rotate the drum 436, with its liquid-carrying band 815, past the suction shoe 890 through belt connections 896, 897 from the motor 902 as shown. The clothes are contained in and tumbling on rotation of the drum 436 as previously mentioned, and when the shoe 890 serves as the means to withdraw liquid from the belt 815 as it rotates past the apertures 892 in the arcuate face of the suction shoe 890. Provision for circulation of air for drying may be provided as in Figs. 30, 31 and 32 by conduits 560 and 566, as well as by blower 552 which is driven from the motor 902 by suitable belt connections 963.

The term absorb is employed throughout the following claims in its broad sense to include the taking up of water in any manner.

While several embodiments of the invention have been illustrated and described herein, it will be readily appreciated by those skilled in the art that numerous
modifications and changes may be made without departing from the spirit of the present invention.

I claim:

1. In a laundry machine for washing and drying fabrics, a rotatable container for washing fluid and fabrics, said container having an opening for admitting and discharging fabrics, said container having openings in the periphery thereof, means for imparting a tumbling action to the fabrics within the container, means for removing the free liquid from the container, and means for removing the major portion of the remaining liquid from said fabrics comprising a liquid carrying band in engagement with a substantial portion of said periphery and in contact with said fabrics through said openings, and means for removing liquid from said liquid carrying band.

2. A laundry machine as recited in claim 1, wherein said band extends around the container and is fixed to and rotates with the container and said means for removing liquid in a suction device supported adjacent the outside of the container thereby to remove liquid from said band as it rotates past said suction device.

3. A laundry machine as recited in claim 2, wherein means are provided for circulating heated air within the container for drying said fabrics and said band after a washing and liquid extracting operation.

4. In a laundry machine, a rotatable container for fabrics, a receptacle for liquid into which the bottom portion of said container extends, belt means on the exterior of said container for collecting liquid from the fabrics within the container as the container is rotated, means for rotating said container, and means for extracting liquid from said belt means.

5. A laundry machine as recited in claim 4, wherein said belt means on the exterior of said container consists of a band forming an absorptive moisture pervious peripheral wall of the container which is fixed to and rotated with the container for absorption of liquid within said container.

6. A laundry machine as recited in claim 5, wherein said means for extracting liquid is a suction device supported adjacent said band, in position to withdraw liquid from said band as said band is carried past said suction device on rotation of said container.

7. A laundry machine as recited in claim 6, including means supporting the suction device adjacent to the lower part of the container in an area onto which the fabrics within the container fall as the container is rotated.

8. A laundry machine as recited in claim 7, having means within the container for raising fabrics contained therein during the rotation of the container and permitting said fabrics to drop to the bottom portion of the container adjacent to an area at which said suction device is located.

9. A laundry machine as recited in claim 6, wherein means are provided for circulating heated air in said receptacle for drying said fabrics and said belt means after a washing and liquid extracting operation.

10. A laundry machine as recited in claim 5, wherein said means for extracting liquid comprises a suction shoe having a face with an apertured opening supported adjacent the outer surface of the belt means.

11. A laundry machine as recited in claim 5, wherein said means for extracting liquid comprises a suction shoe with an apertured face supported adjacent said band thereby to withdraw liquid by suction from said band as said liquid carrying band rotates past said suction shoe.

12. In a laundry machine having wash and dry cycles, a rotatable container for wash fluid and laundry, said container having an opening for admitting and discharging laundry, said container being provided with a perforate peripheral wall, discharge means for free liquid in said container, means to impart tumbling action to the laundry in said container, means to remove remaining fluid from said laundry comprising a carrying member in contact with a substantial portion of said perforate wall, means to squeeze liquid from said member, and means for moving said member successively into engagement with said wall and with said squeezing means.

13. In a washing machine, a liquid carrying band, a support for said band, means for driving said band longitudinally of the peripheral length thereof, means engaging said band in a manner to extract liquid therefrom when contained therein, and an opening in said support through which fabrics are passed to within the interior of the band to be in liquid transfer engagement therewith, said liquid band having a substantially constant speed, said belt having a surface of material in engagement with said peripheral wall which is capable of picking up liquid from within the receptacle through said pervious wall and carrying said liquid to said driving wringer rolls which remove a substantial amount therefrom.

14. In a washing machine, a liquid carrying band, a support for said band, means for driving said band longitudinally of the peripheral length thereof, means engaging said band in a manner to extract liquid therefrom when contained therein, an opening in said support through which fabrics are passed to within the interior of the band to be in liquid transfer engagement therewith, and means within said band to impart a tumbler action to said fabrics.

15. In a washing machine, a liquid carrying band, a tub within which said band is supported, means engaging said band and containing liquid therefrom, an opening in said tub through which fabrics may pass to within the interior of said band in liquid transfer relationship therewith, and means for directing the extracted liquid from said band into said tub during the washing of said fabrics and directing the liquid extracted from said band away from said tub after said washing cycle of operation.

16. In a laundry machine, a rotatable container for fabrics, a receptacle for liquid into which the bottom portion of said container extends, means on the exterior of said container for collecting liquid from the fabrics within the container as the container is rotated, means for rotating said container, and means spaced from said container and engaging said first means for removing the collected liquid therefrom.

17. In a laundering machine, a receptacle for tumbling fabrics contained therein, means for supporting said receptacle for rotation, said receptacle having a pervious peripheral wall, a belt about said peripheral wall in engagement with a substantial portion thereof, a pair of wringer rolls between which said belt is driven for driving said receptacle in rotation, means for driving said wringer rolls at substantially a constant speed, said belt having a surface of material in engagement with said peripheral wall which is capable of picking up liquid from within the receptacle through said pervious wall and carrying said liquid to said driving wringer rolls which remove a substantial amount therefrom, and means for returning the liquid removed by the rolls to said receptacle during the cleaning cycle of laundering.

18. In a laundering machine, a receptacle for tumbling fabrics contained therein, means for supporting said receptacle for rotation, said receptacle having a pervious peripheral wall, a belt about said peripheral wall in engagement with a substantial portion thereof, a pair of wringer rolls between which said belt is driven for driving said receptacle in rotation, means for driving said wringer rolls at substantially a constant speed, said belt having a surface of material in engagement with said peripheral wall which is capable of picking up liquid from within the receptacle through said pervious wall and carrying said liquid to said driving wringer rolls which remove a substantial amount therefrom, and means for returning the liquid removed by the rolls to said receptacle during the cleaning cycle of laundering.

19. In a laundering machine, a receptacle for tumbling fabrics in a liquid contained therein, means for supporting said receptacle for rotation, said receptacle having a pervious peripheral wall, a belt about said peripheral wall in engagement with a substantial portion thereof, a pair of wringer rolls between which said belt is driven for driving said receptacle in rotation, means for driving said wringer rolls at substantially a constant speed, said belt having a surface of material in engagement with said peripheral wall which is capable of picking up liquid from within the receptacle through said pervious wall and carrying said liquid to said driving wringer rolls which remove a substantial amount therefrom, and means for returning the liquid removed by the rolls to said receptacle during the cleaning cycle of laundering.
within the receptacle through said pervious wall and carrying said liquid to said driving wringer rolls which removes a substantial amount therefrom, and means for discharging the liquid removed by the rolls away from the receptacle during the drying cycle of laundering.

20. In a laundering machine, a receptacle for tumbling fabrics in a liquid contained therein, means for supporting said receptacle for rotation, said receptacle having a pervious peripheral wall, a belt about said peripheral wall in engagement with a substantial portion thereof, a pair of wringer rolls between which said belt is driven for driving said receptacle in rotation, means for driving said wringer rolls at substantially a constant speed, said belt having a surface of material in engagement with said peripheral wall which is capable of picking up liquid from within the receptacle through said pervious wall and carrying said liquid to said driving wringer rolls which removes a substantial amount therefrom, means for returning the liquid removed by the rolls to said receptacle during the cleaning cycle of laundering, and means for discharging the liquid removed by the rolls away from the receptacle during the drying cycle of laundering.

21. In a washing machine, a rotatable perforate container within which laundry is washed and dried, means to impart a tumbling action to laundry within said container, a liquid carrying band contacting a substantial portion of the exterior surface of said container, and means to squeeze liquid from said band and to drive said band, whereby said band dries said laundry and imparts rotary motion to said container.

22. In a washing machine, a rotatable container having openings for the passage of fluid about the periphery thereof, said container being adaptable to contain laundry to be washed and dried, means to impart a tumbling action to said laundry, means to drive said container at a constant uniform speed during washing and drying of said laundry, a liquid carrying band contacting a substantial portion of the exterior surface of said container and said openings therein, and means to squeeze liquid from said band and to drive said band, whereby the band dries the laundry and imparts rotary motion to said container.

23. In a washing machine, a rotatable container having openings about the periphery thereof, said container having an opening and a closure thereof for the insertion and removal of laundry, said container being adaptable to contain laundry to be washed and dried, means to impart a tumbling action to said laundry, means to drive said container at a constant uniform speed during washing and drying of said laundry, a liquid carrying band contacting a substantial portion of the exterior surface of said container and the openings therein, and means to squeeze absorbed liquid from said band and to drive said band, whereby the band dries the laundry and imparts rotary motion to said container.

24. A laundering machine for washing and drying fabrics comprising a rotatable container for said fabrics, means to rotate said container at a constant speed, means to tumble said fabrics in said container, said container having openings in the periphery thereof, a relatively dry liquid carrying band surrounding a substantial portion of said periphery, means to drive said band around said container, whereby said container is rotated, and means for removing liquid from said liquid carrying band.

25. In a laundry machine, a rotatable container for fabrics, a receptacle for liquid into which the bottom portion of said container extends, means to rotate said container in an upward position, means to remove liquid from the fabrics contained therein, means for removing liquid from the exterior surface of said container, a mechanism comprising vacuum cups provided on the inner surface of said belt for drawing liquid from said container.

26. In a laundry machine, a rotatable container for fabrics, a receptacle for liquid into which the bottom portion of said container extends, belt means on the exterior of said container for collecting liquid from the fabrics within the container as the container is rotated, means for rotating said container, and suction means in association with said belt means for removing liquid therefrom.

27. A laundry machine as recited in claim 26 wherein said belt means on the exterior of said container consists of a band around the periphery of the container and fixed to and rotated with the container.

28. A laundry machine as recited in claim 27 wherein means are provided for circulating heated air within the receptacle and the container for drying fabrics and belt means after a washing and liquid removing operation.

29. A laundry machine as recited in claim 27 wherein said means for removing liquid comprises a suction shoe with an apertured face supported adjacent said band whereby to withdraw liquid by suction from said band as said liquid carrying band rotates past said suction shoe.

30. A laundry machine as recited in claim 27 wherein said means for removing liquid comprises a suction shoe having a face with apertured opening supported adjacent to the outer surface of said band.

31. In a laundry machine, a rotatable container for fabrics, a receptacle for liquid into which the bottom portion of said container extends, belt means on the exterior of said container for collecting liquid from the fabrics within the container as the container is rotated, means for rotating said container and suction means in association with said belt means for removing liquid therefrom, said means in association with said belt to remove liquid therefrom including a perforated shoe having a vacuum means connected therewith to remove collected liquid from said belt.

32. A laundry machine as recited in claim 31, wherein said belt means on the exterior of said container consists of a band around the periphery of the container and fixed to and rotated with the container.

33. A laundry machine as recited in claim 32 wherein means are provided for circulating heated air within the receptacle and container for drying the contained fabrics and belt means after a washing and liquid removing operation.

34. In a laundry machine, a rotatable container for fabrics, a receptacle for liquid into which the bottom portion of said container extends, a belt on the exterior of said container for collecting liquid from the fabrics within the container as the container is rotated, means for rotating said container, and means for extracting liquid from said belt including means for heating said belt.

35. In a laundry machine, a rotatable container for fabrics having a permeable peripheral wall, a receptacle for liquid into which the bottom portion of said container extends, a belt on the exterior of said container for collecting liquid from the fabrics within the container as the container is rotated, means for rotating said container, and a heater in said roller for heating said belt.

36. In a laundry machine, a rotatable container for fabrics having a permeable peripheral wall, a receptacle for liquid into which the bottom portion of said container extends, a belt on the exterior of said container for collecting liquid from the fabrics within the container through said permeable peripheral wall as said container is rotated, means for rotating said container, a roller over which said belt is driven, and a heater in said roller for heating said belt.

37. In a washing machine having wash and dry cycles, a rotatable wash receptacle, fluid passageways about the periphery of said receptacle, said receptacle being adapted to contain laundry to be washed and dried, tumbling means
within said container, a liquid absorbent band contacting a substantial portion of the exterior surface of said container and said passageways, means to drive said band at a constant, uniform speed through said wash and dry cycles, whereby said receptacle is filled for said band and means to circulate heated air through said receptacle, whereby said laundry is dried.

38. In a laundry machine, a rotatable container to contain said laundry, means to impart tumbling motion to said laundry, said container having a perforate peripheral wall, means to remove liquid from said fabrics comprising a liquid carrying belt in engagement with a substantial portion of said wall, roller means for driving said belt around said container, means to drive said roller means, said belt and said container at a substantially constant speed, said roller means being adapted to remove moisture from said belt, means for returning liquid removed by said roller means to said container during the washing cycle of said machine, means for discharging the liquid removed by said roller means away from said container during the drying cycle of said machine, air drying means comprising a blower for circulating air through said container, a heating element in the path of flow of air, said blower and said heating element being operable during the drying cycle of said machine for air drying the fabrics and the belt.

39. In a washing machine, a liquid carrying band, a tub within which said band is supported, means engaging said band and extracting containing an opening in said tub through which fabrics may pass to within the interior of said band in liquid transfer relationship therewith, means for directing the extracted liquid from said band into said tub during the washing of said fabrics and directing the liquid extracted from said band away from said tub after washing said liquid extraction, and means for circulating heated air within said tub for drying said fabrics and said band after a washing and liquid extracting operation.

40. In a laundry machine having wash and dry cycles, means for washing said laundry comprising a rotatable container for liquid and fabrics, means to tumble said fabrics in said container, means to rotate said container at a constant speed through said wash and dry cycles, said container having a peripheral wall provided with liquid passageways therethrough, means for draining free liquid from said container, means for removing the fabrics within the container including a liquid carrying band contacting a substantial portion of said peripheral wall and the laundry through said passageways, means for expressing the liquid carried by said band, and air drying means comprising a blower for circulating air through said container and a heating element in the path of the flow of air, whereby said fabrics and said band are dried while rotating said container at said constant speed.

41. In a laundering machine, a support, a fabric receiving cylinder mounted for rotation on said support with its axis substantially horizontal, said cylinder comprising a pair of spaced end walls and a peripheral wall made of liquid impervious material, said peripheral wall having a plurality of apertures therein, a layer of relatively permeable material enclosing said peripheral wall on one side thereof, said material being capable of picking up liquid from said fabrics by contact therewith, baffle means adjacent said peripheral wall and extending inwardly therefrom for tumbling said fabrics within said cylinder upon rotation thereof, heating means, and means for directing heat from said heating means onto said permeable material for driving moisture therefrom.

44. In a laundering machine, a support, a fabric receiving cylinder mounted for rotation on said support with its axis substantially horizontal, said cylinder comprising a pair of spaced end walls and a peripheral wall made of liquid impervious material, said peripheral wall having a plurality of apertures therein, a layer of permeable material over the outer surface of said peripheral wall, baffle means adjacent said peripheral wall and extending inwardly therefrom for tumbling said fabrics within said cylinder upon rotation thereof, said permeable material being capable of picking up liquid from said fabrics by contact therewith through said apertures, and drying means for said permeable material embodying a heating element located exteriorly of said cylinder and adjacent said permeable material.

45. A laundry machine as recited in claim 16, wherein said removing means is supported on the outside of the containing cylinder of the center thereof.

46. A laundry machine as recited in claim 16, wherein said collected liquid is directed to drain when removed from said first means.

47. A laundry machine as recited in claim 16, wherein said container has a peripheral wall made of expanded metal providing large openings through which said exterior means extends at the point of contact therewith.

48. A laundry machine as recited in claim 16, wherein said container has a peripheral wall made of expanded metal providing large openings through which said exterior means may extend about the point of contact therewith.

49. A laundry machine as recited in claim 16, wherein said container has a peripheral wall made of metal, and liquid carrying material on the inner face of said metal wall.

50. A laundry machine as recited in claim 16, wherein said container has a peripheral wall made of fabric material at least a portion of which is engaged by said exterior means.

51. A laundry machine as recited in claim 16, wherein said removing means is a roller.

53. A laundry machine as recited in claim 16, wherein said removing means is a suction device.

54. A laundry machine as recited in claim 53, including means supporting the suction device adjacent to the lower part of the container in an area onto which the fabrics within the container fall as the container is rotated.

55. A laundry machine as recited in claim 54, having means within the container for raising fabrics contained therein during the rotation of the container permitting said fabrics to drop to the bottom portion of the container adjacent to an area at which said removing means is located.

56. A laundry machine as recited in claim 16, wherein said container has a peripheral wall made of fabric material and said exterior means being a belt in contact with
the fabric wall to which liquid from the interior of the container passes as the container rotates.

57. In a laundry machine, a rotatable container for fabrics, a receptacle for liquid into which the bottom portion of said container extends, said container having an absorptive moisture-pervious fabric peripheral wall for the absorption of liquid within said container, means for rotating said container, and suction means positioned adjacent said moisture-pervious peripheral wall for extracting liquid from said wall.

58. A laundry machine as recited in claim 57, wherein the suction means for extracting liquid comprises a suction shoe supported adjacent said wall to withdraw liquid from said wall as the same is carried past said suction shoe on rotation of the container.

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