March 21, 1961 E. J. FREY 2,975,626

WASHING MACHINE HAVING A CENTRIFUGAL EXTRACTOR AND DRYER

Filed Nov. 19, 1956 9 Sheets-Sheet 1

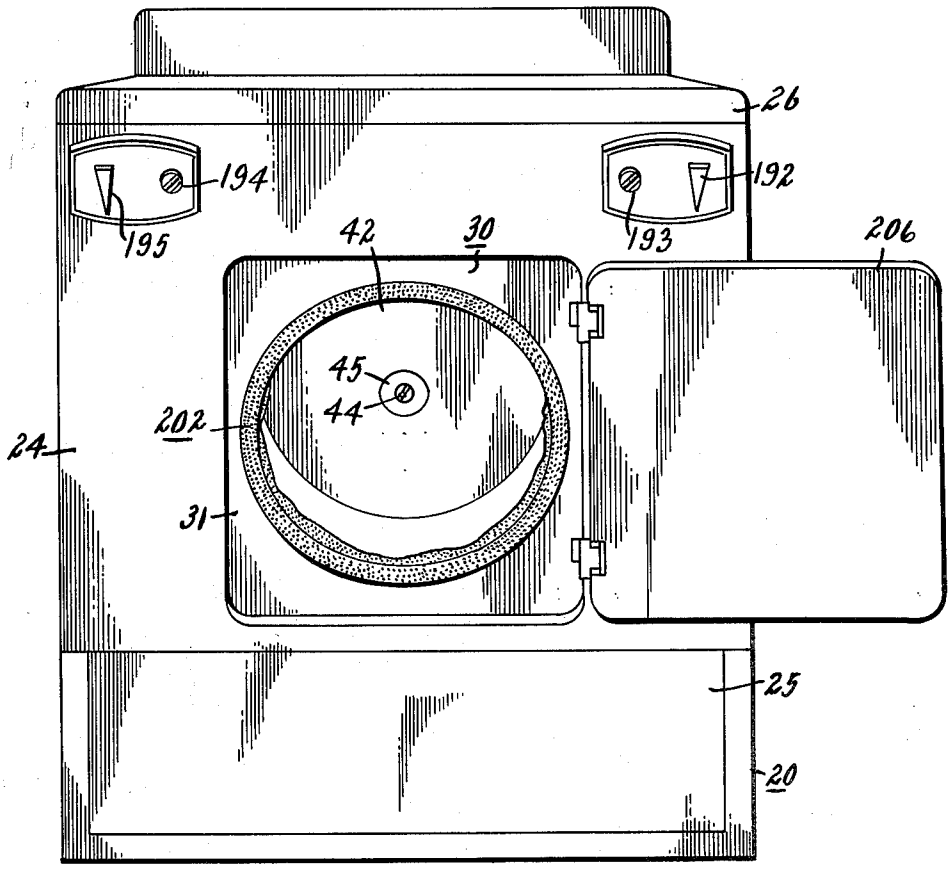


Fig. 1

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WASHING MACHINE HAVING A CENTRIFUGAL EXTRACTOR AND DRYER

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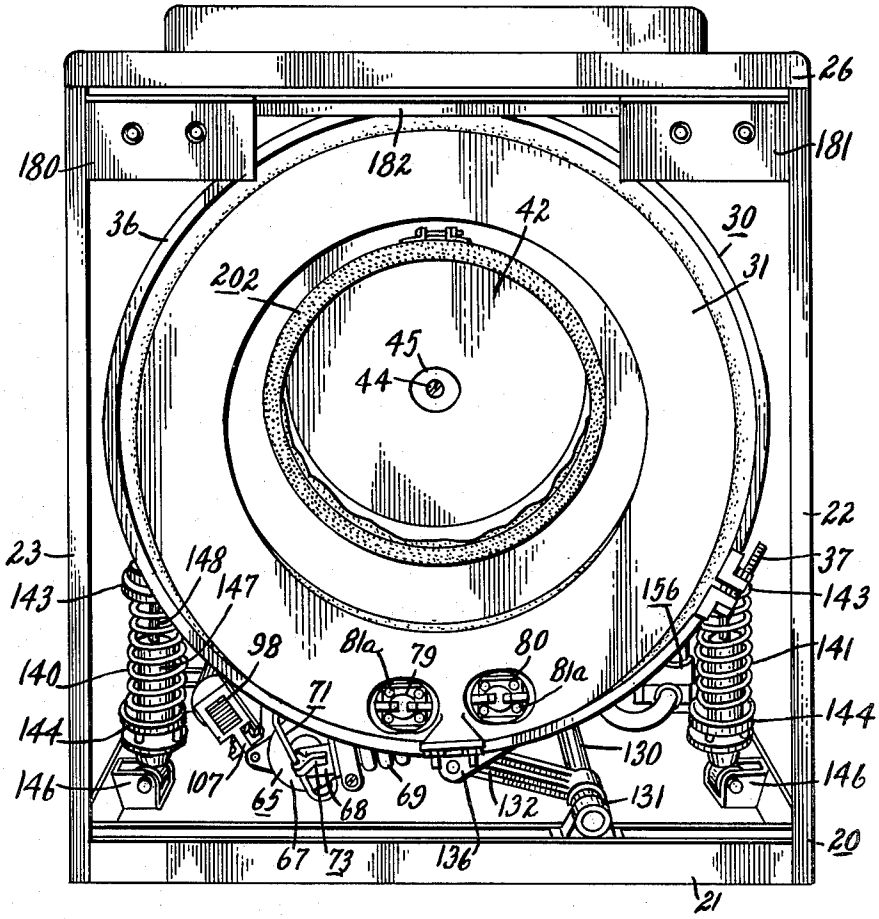


Fig. 2

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WASHING MACHINE HAVING A CENTRIFUGAL EXTRACTOR AND DRYER

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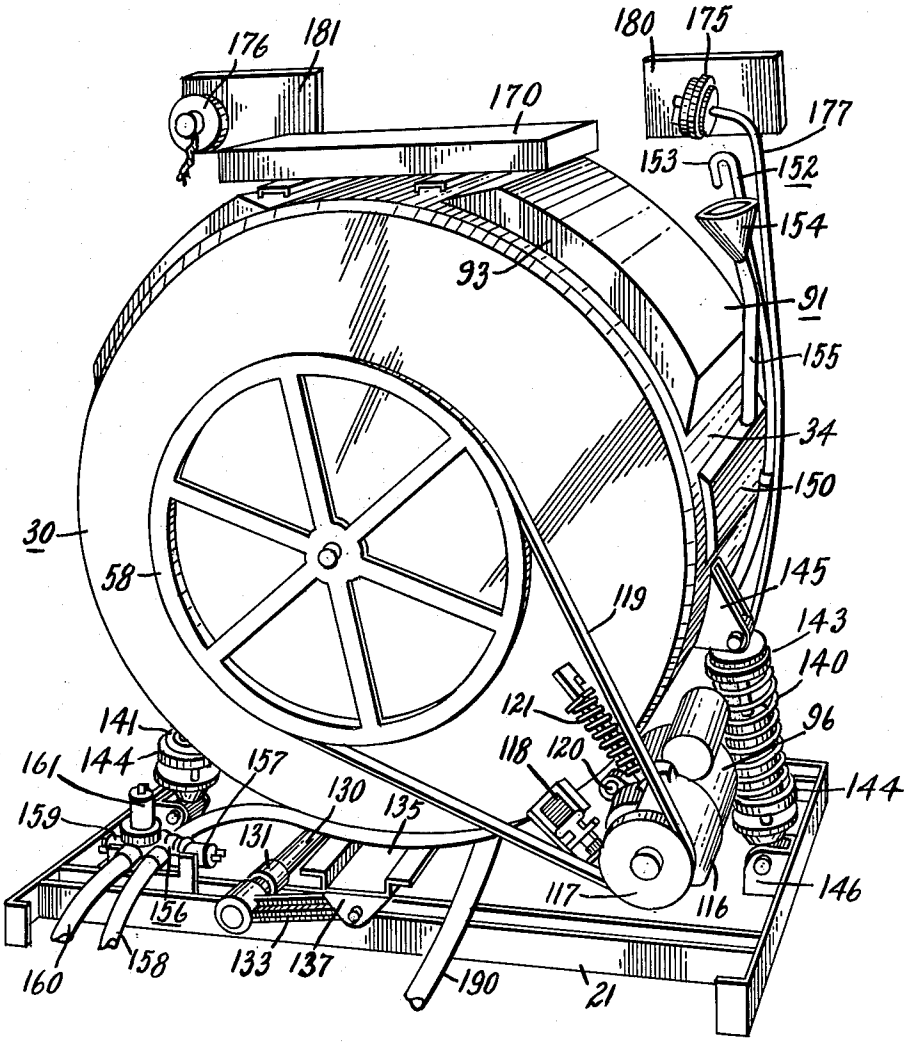


Fig. 3

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WASHING MACHINE HAVING A CENTRIFUGAL EXTRACTOR AND DRYER

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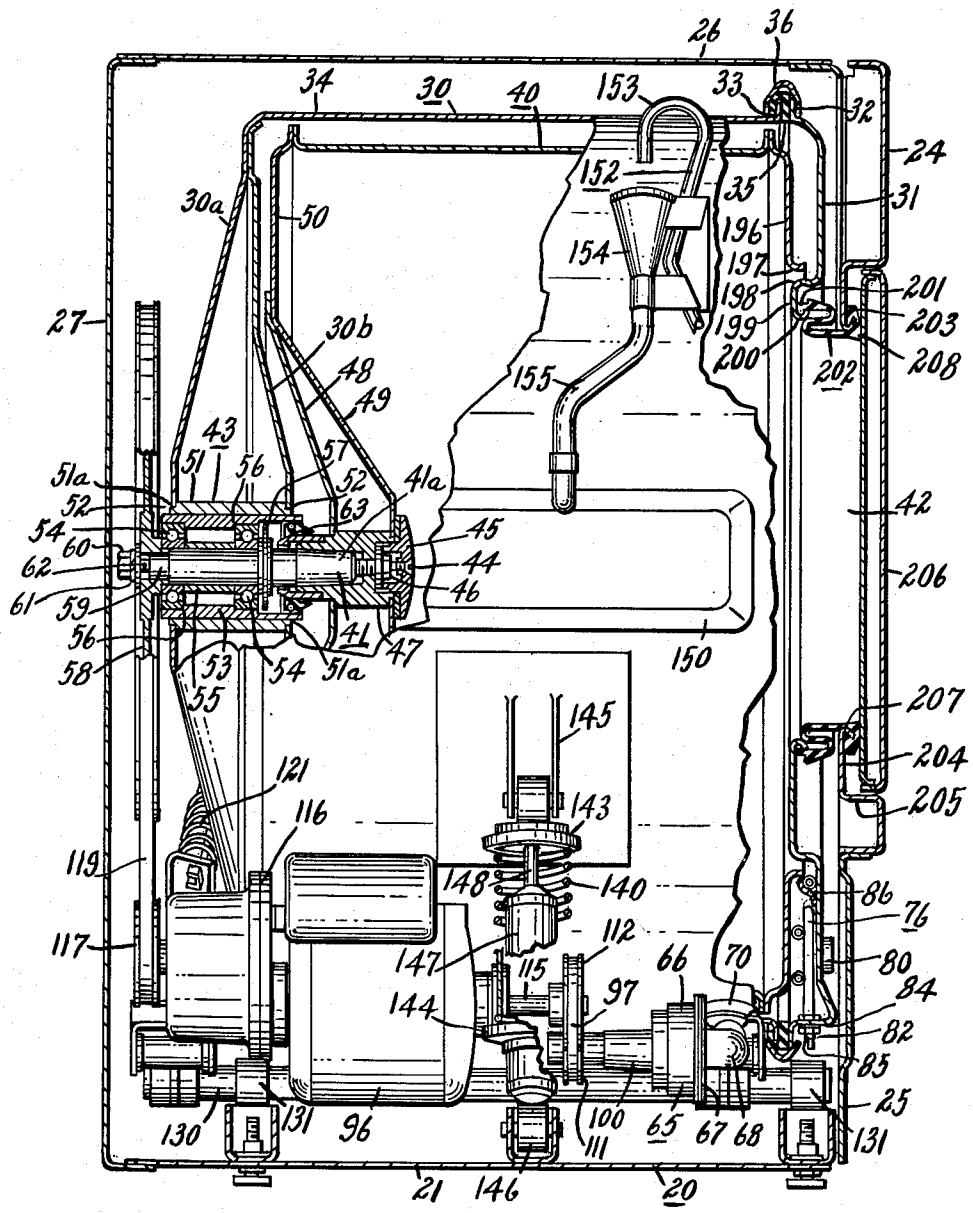


Fig. 4

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WASHING MACHINE HAVING A CENTRIFUGAL EXTRACTOR AND DRYER

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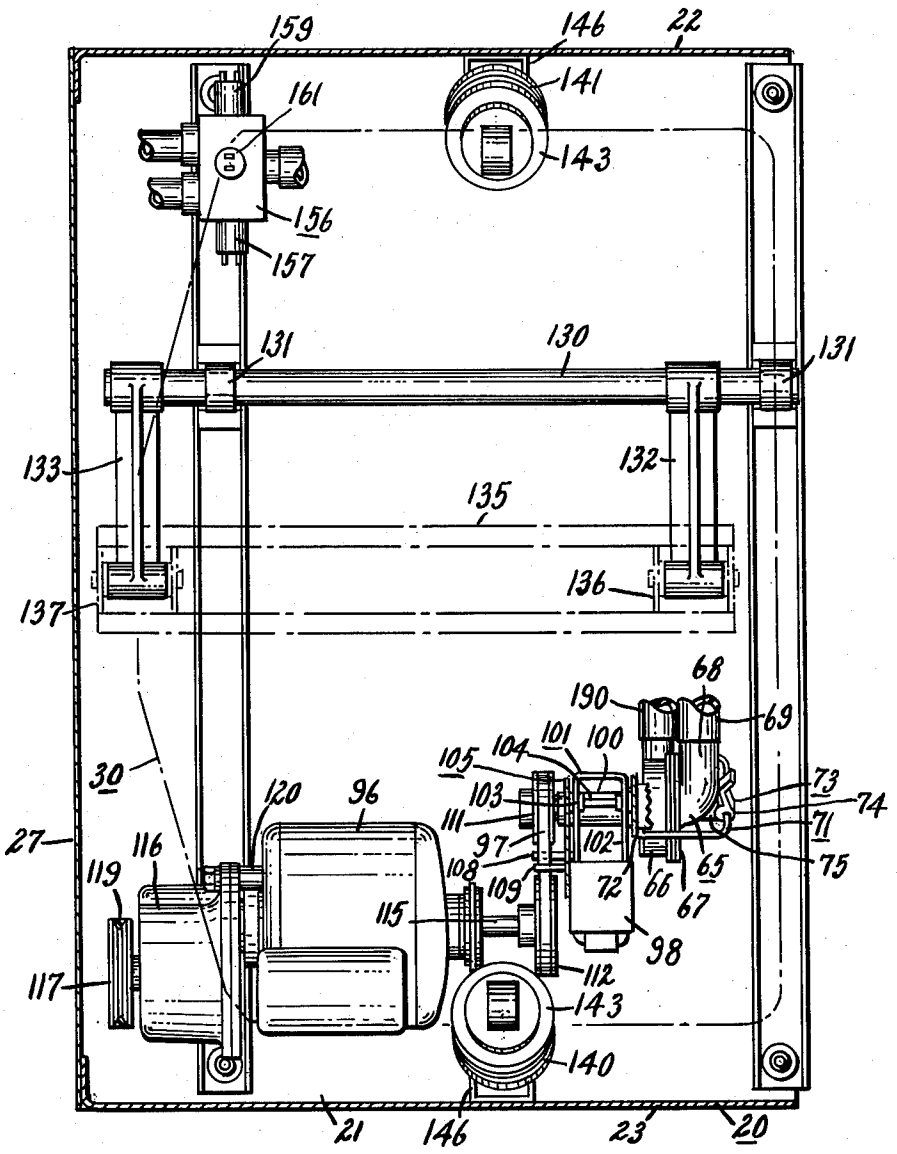


Fig. 5

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WASHING MACHINE HAVING A CENTRIFUGAL EXTRACTOR AND DRYER

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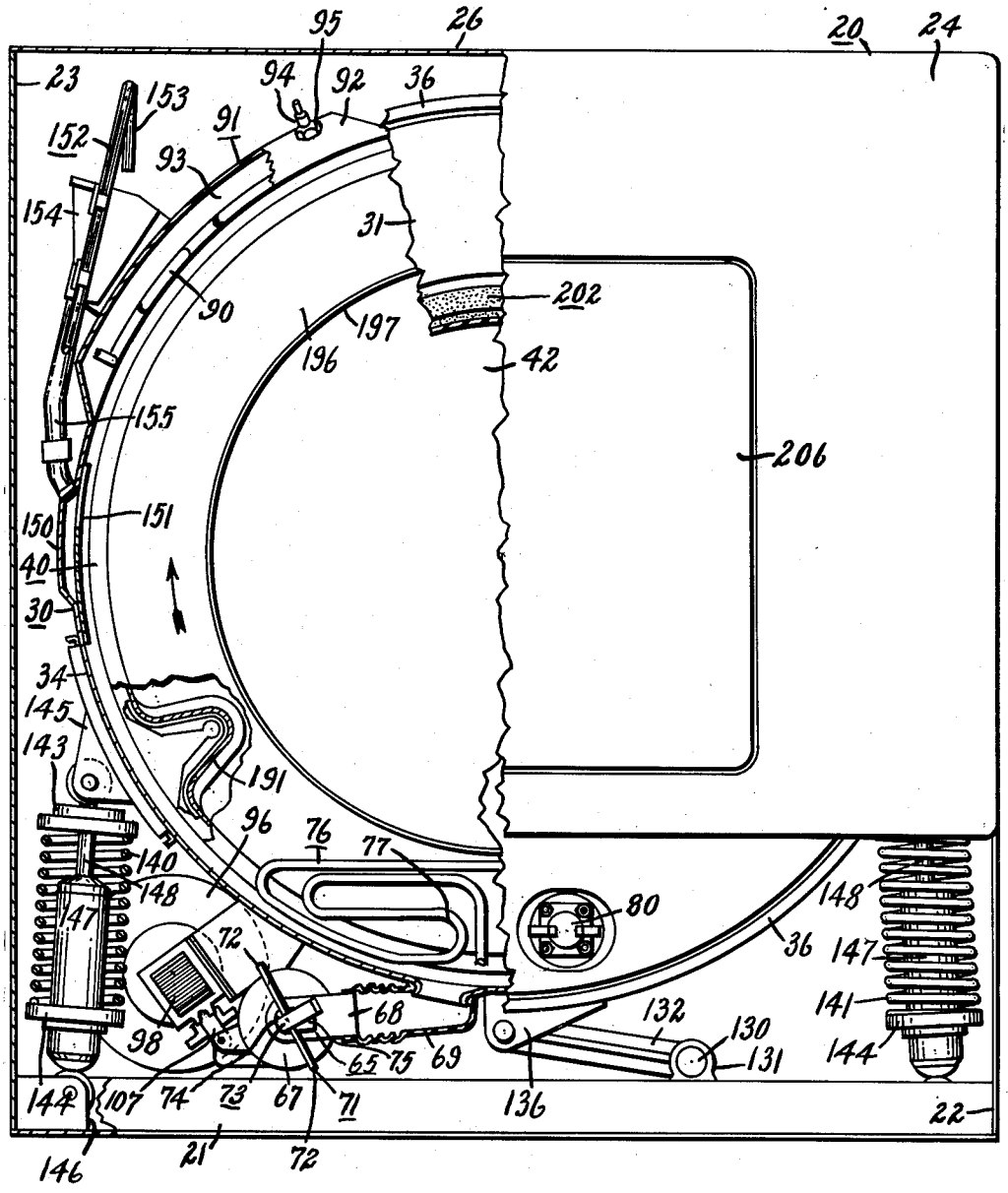


Fig. 6

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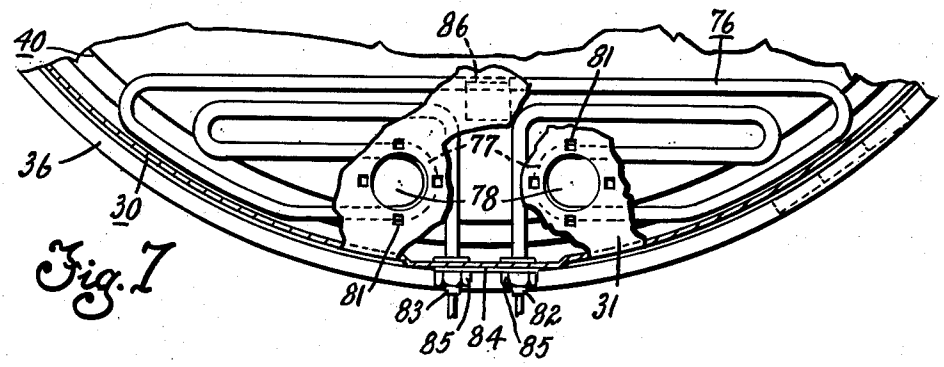


Fig. 7

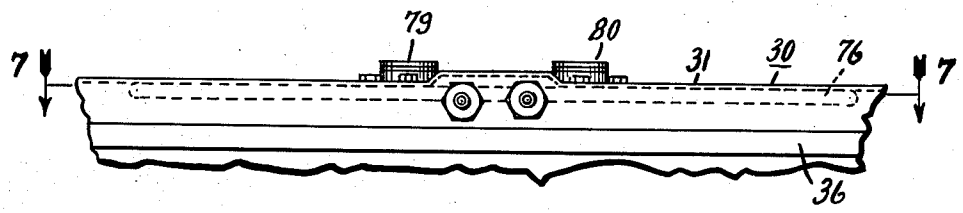


Fig. 8

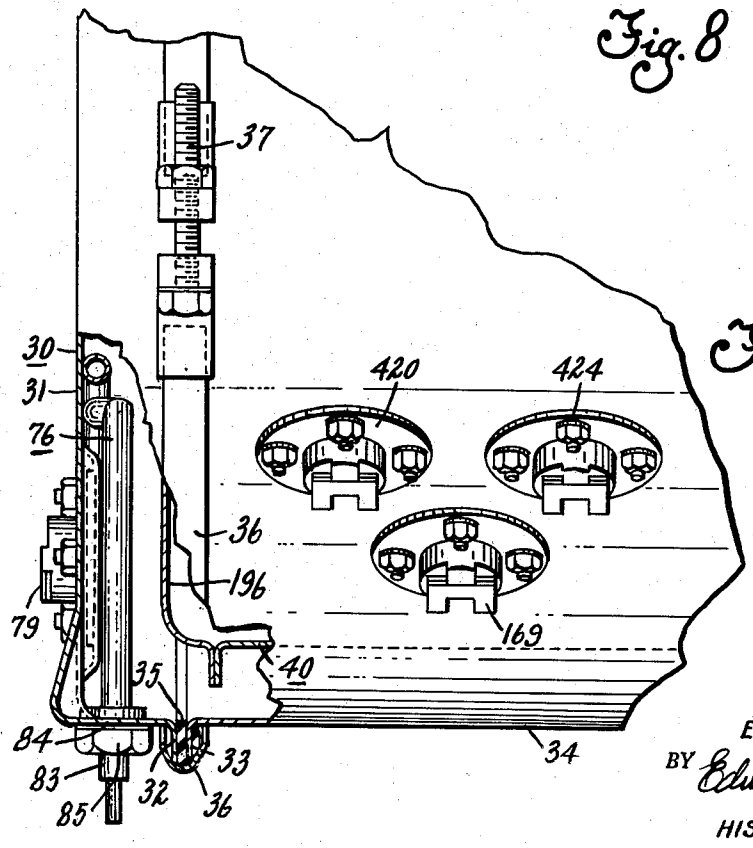


Fig. 9

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WASHING MACHINE HAVING A CENTRIFUGAL EXTRACTOR AND DRYER

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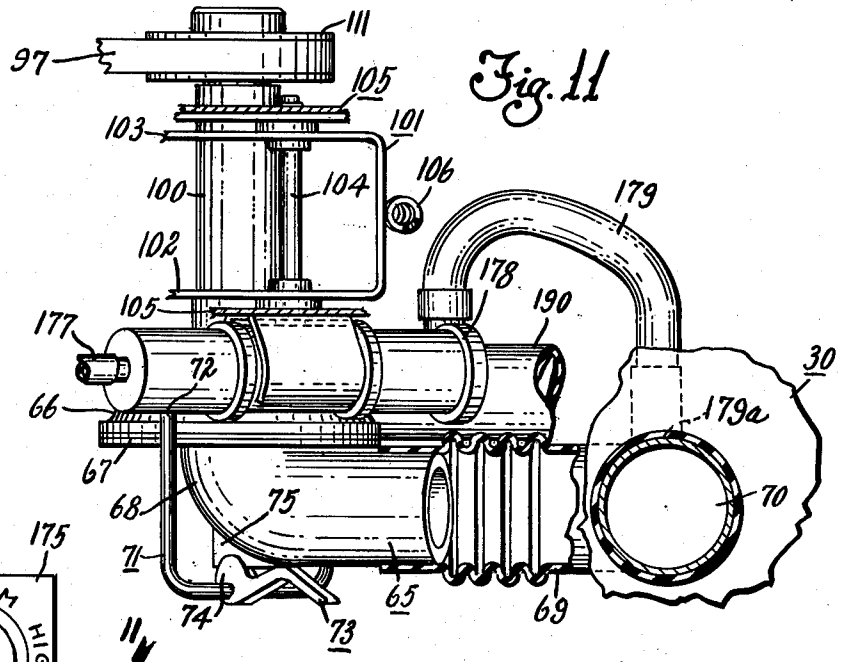


Fig. 11

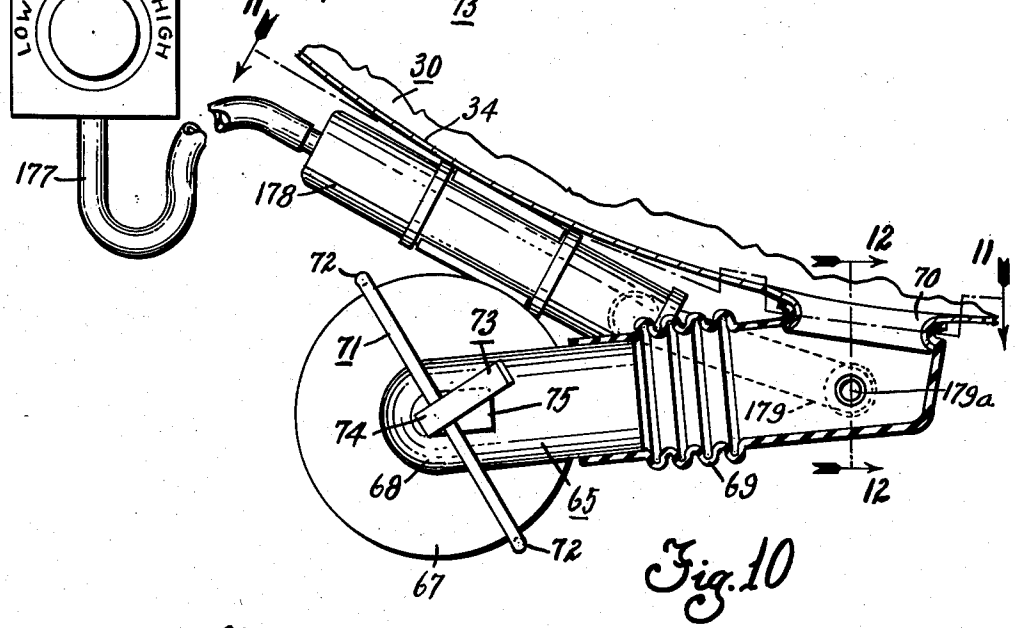


Fig. 10

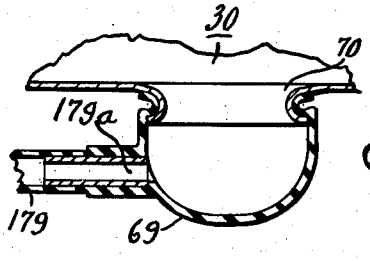


Fig. 12

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WASHING MACHINE HAVING A CENTRIFUGAL EXTRACTOR AND DRYER

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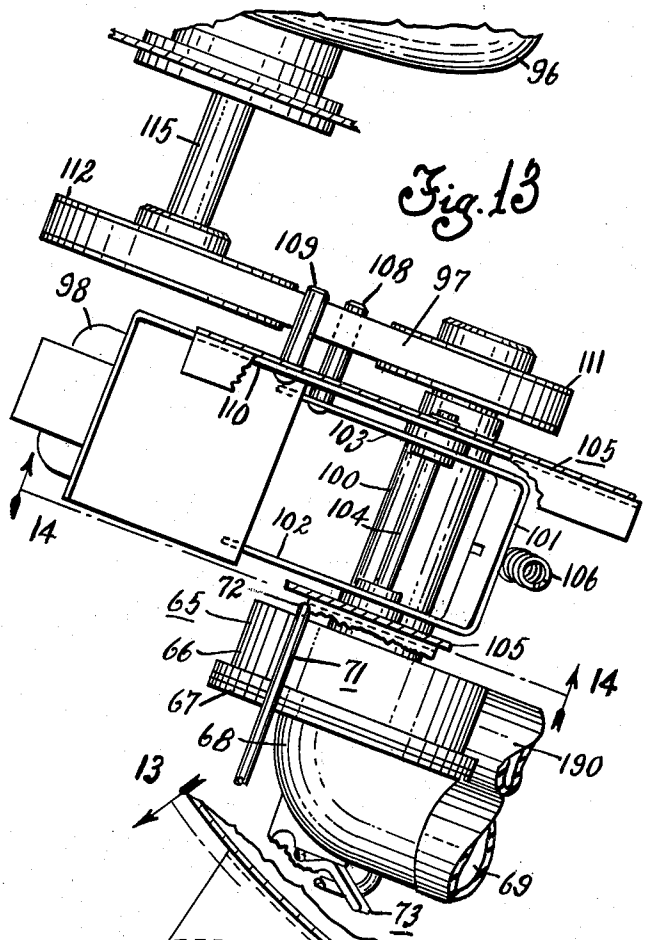


Fig. 13

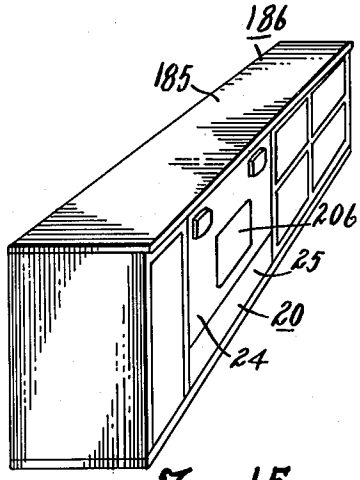


Fig. 15

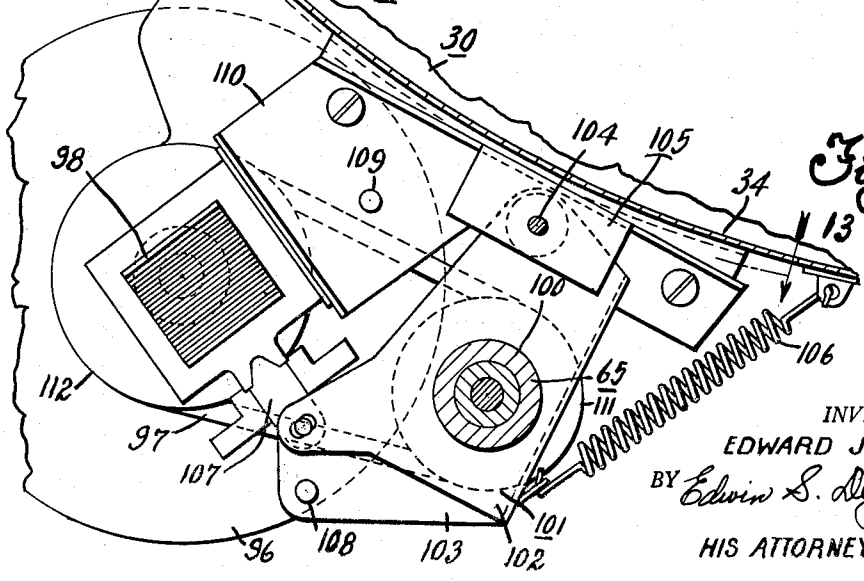


Fig. 14

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United States Patent Office 2,975,626 Patented Mar. 21, 1961

2,975,626

WASHING MACHINE HAVING A CENTRIFUGAL EXTRACTOR AND DRYER

Edward J. Frey, Dayton, Ohio, assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Filed Nov. 19, 1956, Ser. No. 623,052

4 Claims. (Cl. 68—19)

This invention relates to domestic appliances, and more particularly to a washer-dryer.

An object of this invention is to provide a washer-dryer in which a large number of parts, which ordinarily require service, are available from the front of the machine, this being particularly advantageous when the machine is made part of a kitchen cabinet arrangement where the side and the rear of the machine are not available or removable for service without disturbing the kitchen cabinet, or without pulling the entire machine forward from the cabinet.

Another object of this invention is to provide a washer-dryer having a cabinet with one or more removable front panels which leave openings through which service may be rendered to any one of a number of major parts requiring service, such as the water heaters, the dryer heaters, the water heater thermostats, the dryer heater thermostats, the construction being such that the drain pump may be readily cleaned out without removal of the entire pump through such open front.

Another object of this invention is to provide a washer-dryer having a generally cylindrical tub at the side of which condenser water is introduced for the purpose of condensing the moisture driven out of the clothes during the drying operation, and through which opening the wash water and the rinse water are also introduced for the washing operation.

Further objects will become apparent as the description proceeds with reference to the drawings in which:

Figure 1 is a front elevation of the washer-dryer with the front panel or panels in position.

Figure 2 is a front elevation of the washer-dryer with the front panels removed.

Figure 3 is a rear view of the washer-dryer with the cabinet parts of the washer-dryer removed.

Figure 4 is a vertical view, partly in elevation and partly in cross-section, of certain parts of the washer-dryer, taken parallel to the axis of rotation of the drum.

Figure 5 is a horizontal view of certain portions of the washer-dryer which are adjacent the bottom or base portion.

Figure 6 is a vertical view, partly in elevation and partly in cross-section, of the washer-dryer taken transversely to the axis of rotation of the drum.

Figure 7 is a vertical view transverse to the axis of the machine showing mainly the water heater construction, taken along the line 7—7 of Figure 8.

Figure 8 is a view looking up from the bottom of Figure 7.

Figure 9 is a vertical view, partly in cross-section and partly in elevation, looking from the right side of Figures 7 and 8, showing mainly the dryer-heater thermostat construction, the water heater construction, and the means for attaching and removing the front of the tub.

Figure 10 is a vertical view showing certain portions of the drain pump connection and water level switch connection.

Figure 11 is a top view taken along line 11—11 of Figure 10.

Figure 12 is a cross-section taken along the line 12—12 of Figure 10.

Figure 13 is a top view taken along line 13—13 of Figure 14 showing the tub tightening connection for the drain pump.

Figure 14 is a side view of Figure 13 taken along line 14—14 of Figure 13.

Figure 15 shows the washing machine mounted within a kitchen cabinet.

A washer-dryer, according to this invention, comprises, in general, a cabinet 20 having a base 21, side walls 22 and 23, a front wall made of removable panels 24 and 25, a top 26, and a rear panel 27. The front panels 24 and 25 are removable substantially without disturbing the other panels of the cabinet, so that an opening is uncovered at the front of the cabinet for access to the various parts, as indicated in Figure 2. These panels are secured together by flange and bolt construction now well known.

A generally cylindrical drum or tub 30 is provided with a removable front wall 31, which wall is removable through the access opening which is uncovered by the removal of panels 24 and 25, as shown in Figure 2.

The front panel or face 31 of the tub 30 is made removable by providing flanges 32 and 33 (Figure 4) in the front panel 31 and a cylindrical side panel 34 of the tub 30. These flanges 32 and 33 are sealed together by a gasket 35. They are drawn up tightly and securely together by the wedge-shaped ring 36 which is provided with a tightening nut and bolt construction 37 (Figure 2) which permits the ring 36 to be drawn up tightly to produce a water-tight joint between the flanges 32 and 33.

Removal of the front panels or covers 24, 25 and 31 permits the rotatable drum 40 to be easily removed for service. Referring particularly to Figure 4, the drum 40 is removably mounted on the drive shaft 41 in such a manner that the mounting elements at 41 may be assembled and unassembled through the opening 42 at the front of the machine. This is accomplished by mounting the shaft 41 on bearing construction 43 mounted within the oppositely directed conical walls 30*a* and 30*b* which constitute the rear wall of the drum casing 30. The serviceman may unscrew the screw 44 and thus release the cupped cover 45. He then may unscrew the hexagonal-headed screw 46 out of the end of the threaded end of shaft 41 after which the inwardly tapered hub 47 may be pulled from the tapered end 41*a* of the shaft 41. The hub 47 is secured to the cones 48 and 49 which merge outwardly into the rear wall 50 of the drum 40.

The bearing construction 43 includes an outer sleeve 51 having reduced end portions 51*a* fitting tightly within the aligned openings 52 in the conical walls 30*a* and 30*b*. These reduced portions 51*a* are bonded to the two openings 52 by any suitable welding process and the drum casing 30 with this sleeve 51 in it may then be treated to any enameling or baking process without destroying the bearing construction which is later inserted in the sleeve 51.

An inner bearing sleeve 53 is tightly press-fitted within the outer sleeve 51. It contains the two ball bearing races 54 spaced apart by another sleeve 55 and by the shoulders 56. The righthand bearing 54 is locked against rightward movement on the shaft 41 by the ring 57 which is axially locked on the shaft 41 in any well-known manner. The lefthand bearing ring or assembly 54 is locked against leftward movement on the shaft 41 by the pulley wheel 58 which is secured on the reduced end 59 of the shaft 41 with a keyed construction, not indicated, and is then secured by the nut 60 and washer 61 which are assembled around the threaded portion 62 of the shaft

41. A suitable water excluding seal ring 63 is provided at the righthand end of the bearing construction.

A drain pump 65 has a main body 66 (Figure 4) in which the rotor is located, which is not illustrated, and has a front plate 67 to which the pipe 68 is connected and which constitute the inlet to the pump 65. The pipe 68 is connected to a flexible pipe 69 (Figure 6), the other end of which is secured to the outlet 70 of the drum 30.

Means are provided for quickly removing the front plate 67 of the pump in order that the pump may be quickly cleaned without any major dismantling process. To this end the wire bale or U-shaped member 71 (Figure 5) has its ends 72 hooked around the rear part of the main body 66 of the pump 65. A cam lever 73 is rotatable on the wire 71 and the cam surface 74 rides within the curved surface on the lug 75. By turning the lever 73, the ends 72 are relieved of their tension and may be removed outwardly from the main body 66 of the pump 65 whereupon the front plate 67 of the pump may be removed from the body 66 and any obstructing matter in the rotor of the pump may be removed through the front of the cabinet.

In order to clean out the pump, it is only necessary to remove the front panel 25 at the front bottom of the washer-dryer, shown in Figure 1, and then the front 67 of the pump may be removed by turning the lever 73 and releasing the ends 72 of the wire 71. The flexibility of the pipe 69 allows the front plate 67 to be removed forwardly for the cleaning operation. The pump can then be reassembled by reverse operations and the panel 25 can then be restored. The pump 65 discharges into the drain hose 190 which may be connected to a laundry tub or to a standpipe in the floor drain, as desired.

A sheathed water heater 76 (Figures 7–9) is placed inside of the drum casing 30 and immediately behind the front wall 31 of the drum casing. It is given a flat serpentine construction adjacent the front wall 31 and has turns 77 around the openings 78 which receive the water heater thermostats 79 and 80 (Figure 2) which are secured to the front wall 31 by bolts 81*a* (Figure 2) passing through holes 81 (Figure 7). Thermostats 79 and 80 correspond to thermostats 418 and 419 described in the application of Edward J. Frey and Thomas E. Davidson, S.N. 548,644, filed November 23, 1955, now Patent No. 2,928,267. One of the thermostats, such as 79, is adapted to terminate the heating action of the heater 76 by starting the timer when the desired water temperature is attained within the drum casing 30. The other of the thermostats, such as 80, is a safety thermostat adapted to turn off the current entirely as long as the temperature of that thermostat is above a normal working temperature. The ends 82 and 83 of the heater 76 pass through the flat bottom 84 of the front wall 31 of the drum 30. The ends 82 and 83 of the heater 76 are held by the nut constructions 85, now well known. The heater 76 may be removed from the machine by removing the front panels 24 and 25, and the front panel 31, which carries the heater with it. The heater may be reinstated, or a new one installed, by a reverse procedure, as will be apparent. If desired, a bracket 86 may be provided in the front wall 31 to hold the upper rung of the heater 76 snugly against the front. The heater 76 may be easily removed from or installed in the machine.

One or more dryer heaters 90 (Figure 6) are mounted within the drum casing 30 so they may be removed from the machine without pulling the machine away from any kitchen cabinets or the like. To this end, an arcuate bulge 91 (Figures 3 and 6) is formed in an upper corner of the drum casing 30 and has end walls 92 and 93 which teminate the bulge 91 short of the ends of the drum 30. The plurality of ends 94 of the heater or heaters 90 pass through the front wall 92 of the bulge 91. They are secured thereto by the nut construction 95, which is now well known, and the heater or heaters can be removed or secured therein by proper manipulation of the nut construction 95, as is well known. Hence, the heaters 90 may be removed by first removing the front panels 24 and 25, then removing the front wall 31 and the rotatable drum 40 as previously described, after which the heaters 90 can be removed or installed through the front openings 42, since the nut constructions 95 are accessible from the front of the machine. The ends 94 of the heater can be pulled into the drum 40 before the heaters are withdrawn through the opening 42, or vice versa.

The drain pump 65 (Figures 4, 5, 13 and 14) is belt driven from the motor 96 in such a manner that the belt 97 may be tightened or loosened by the proper energization or deenergization of the solenoid 98. To this end, the pump shaft bearing 100 is carried by a U-shaped bracket 101 having a forward wing 102 and a rear wing 103. The bracket 101 is fulcrumed on the pin 104 carried by a bracket 105 which is secured to the bottom of the drum casing 30 (see particularly Figures 13 and 14). The bracket 101 is biased counterclockwise by the tension spring 106, which tends to tighten the belt 97. The bracket 101 is given a clockwise motion by the pull of armature 107 of solenoid 98. If desired, pins 108 and 109 are mounted respectively on the rear wing 103 and on the wing 110 of the bracket construction 105. These pins 108 and 109 prevent the belt from turning when the belt tension is slackened by energization of the solenoid 98. The pins 108 and 109 prevent the belt from spreading outwardly in the form of a circle which might otherwise pull the ends of the belt against the pulleys, and cause the pump to operate. The well known multiple rubber vane construction of the pump rotor, not shown, is such that it prevents the flow of liquids through the pump whenever the pump is stationary. Accordingly, when the belt is slackened by energization of the solenoid 98 and the upward movement of the armature 107, the tension of the belt 97 is slackened by movement of pulley 111, of the pump 65 toward the pulley 112 of the motor 96. The pin 108 moves toward the pin 109 and these pins then exert a braking action on the outside of the belt when it is slackened and thus prevent any turning of the rotor of the pump 65. On the other hand, if a pump is used which does not prevent the flow of liquid through it while stationary, the discharge hose from the pump may be hooked over the stationary tub or over a stand pipe placed in the floor drain with an inlet higher than the water level in the tub. Since the pump in either case prevents any liquid from passing through the pump when stationary, such stopping of the pump allows the drum casing 30 to be filled with liquid since no liquid can flow out through the outlet 70 and pipes 69 and 68 while the pump is stationary. On the other hand, when the solenoid 98 is deenergized, the tension spring 106 moves the pulley 111 away from the motor pulley 112 and tensions the belt 97 to drive the pump and thus empty any water which may be in the drum casing 30.

The motor 96 is double-ended (Figures 4 and 5), so its shaft 115 extends out both ends. The pulley 112 is mounted on one end of the shaft 115 while any well known two-speed transmission is connected to the other end of the shaft 115. The two-speed transmission 116 drives the pulley 117 at slow speed when the solenoid 118 (Figure 3) is deenergized and drives the pulley 117 at high speed when solenoid 118 is energized, or vice versa, as desired. The pulley 117 drives the drum pulley 58 through the medium of belt 119 either at high speed or low speed, in accordance with the speed of the pulley 117, as previously described. The motor 96 and the transmission 116 are hingedly mounted on the fulcrum 120 (Figure 3) which is bracketed to the drum 30 by any suitable construction. A compression spring 121 maintains a tension on the belt 119.

The drum 30 is resiliently mounted to permit it to vibrate gently when the clothes in the drum 40 are out of balance. However, the construction is such that it prevents excessive vibration and also prevents forward

and backward vibration of the drum 30, so the machine may be mounted inside a kitchen cabinet of ordinary height without vibrating against such cabinet. To this end, a relatively stiff stabilizing torsion bar 130 (shown best in Figure 5) is rotationally mounted on bearings 131 mounted on the base 21. (The bar 130 will be hereafter referred to merely as a torsion bar, for brevity.) The arms 132 and 133 are fixedly secured to the torsion bar 130 at one end, and are hingedly secured to the drum 30 at their other ends. This may be accomplished by securing a channel member 135 (Figure 3) to the bottom of the drum casing 30, which channel member 135 has a forward bracket 136 (Figure 6) and a rear bracket 137 (Figure 3) to which the swinging ends of the arms 132 and 133 are secured. Two substantially vertical spiral springs 140 and 141 are held between the end cups 143 and 144 which are secured respectively to the brackets 145 on the side of the drum 30 and the brackets 146 on the base 21. The cups 143 and 144 are part of the automobile type of shock absorber 147 and 148 (Figure 6) which have a piston effect with respect to each other, as is well understood. The torsion bar 130 supports the drum 30 so it is free to move in a vertical direction up or down. The springs 140 and 141 likewise support the drum 30 for vertical vibration, but the automobile type of shock absorber 147 and 148 dampens any excessive vibrations that might be produced by abnormal out-of-balance clothes arrangement while passing through the critical speed, when there are synchronized periods of vibrations. The torsion bar 130 prevents any substantial forward or backward movement of the tub 30, because of the relative stiffness of the bar.

A heavy counterbalancing weight 170 is mounted on top of the drum casing 30 (Figure 3). The weight 170 may take the form of a heavy metal bar. The purpose of the counter-balance 170 is merely to add weight to the drum 30, and thus to increase the ratio of weight as compared to the weight of the clothes in the drum 30. This reduces the vibration which the clothes may impart on the drum casing 30 when the clothes are out of balance.

Hot water, cold water, or a mixture of hot water and cold water, may be introduced into the drum 30, by overflow from the trough 150 over the lips 151 (Figures 3 and 6). The water is introduced into the trough 150 from a feed pipe 152 which has a hook outlet 153 directly over the funnel 154, which funnel 154 is connected by the pipe 155, with the trough 150. The feed 152 receives water from a valve body 156 which includes a hot water solenoid valve 157 providing full flow of hot water from the hot water supply conduit 158. A cold water soleniod valve 159 provides a full flow of water from the cold water supply conduit 160. (The valve 159 may provide for full flow of mixed hot and cold water, instead.) Another cold water solenoid valve 161 is connected to the cold water supply conduit 160, but provides a limited flow of water from the cold water conduit 160 into the trough 150 by means of a flow controlling valve or orifice, now well known, for the purpose of condensing the water vapor from the clothes during drying operation.

A water level responsive switch 175 (Figures 3 and 10), responsive to the water level in the drum casing 30, permits the full flow of water from either of the solenoid valves 157 or 159 to enter the drum casing 30 to the trough 150 as long as the water level is below the selected height. The switch 175 turns off either or both of these valves 157 or 159 when the water level reaches the correct height. The switch 175 is in series with a timer 176, which controls the machine to produce the various washing, rinsing, centrifuging, and the vapor extracting operations which are more fully described in the said copending application of Edward J. Frey and Thomas E. Davidson, to which reference is made for further disclosure of the timer control and of its effect on the various elements of the machine. The level switch 175 is connected by the tube 177, Figures 3 and 10, with an air trapping capsule 178, the other end of which is connected to a pipe 179 having an inlet at 179*a* in the flexible pipe 69 which is connected to the drum casing outlet 70. The water level in the drum casing 30 varies the air pressure in the capsule 178 and pipe 179 to effect the bellows in the switch 175 to energize and deenergize the solenoid valve 157 and 159, as more fully described in the said application of Frey and Davidson, supra.

The manual controls described in the said Frey and Davidson application, are mounted on the plates 180 and 181 which are detachably secured to a bar 182 which joins the top edges of the side plates 22 and 23 of the cabinet.

The plates 180 and 181 may be detached and moved aside whenever it is desired to service any accessible parts behind them, such as the nut constructions 95 of the drying heater.

The perforated rotatable drum 40 has a front plate 196 which has a cylindrical flange 197 telescoping outside of the flange 198 of the front plate 31 of the drum casing 30. The flange 198 extends downwardly at 199 and is curled at 200 to receive the bead 201 of the flexible bellows 202. The other end of the bellows 202 has a bead 203 which fits over the flange 204 forming a square offset at 205 to receive the square door 206 and having a circular opening 207 to receive the bead 203 of the bellows 202. The bead 203 may include a conical lip 208 adapted to bear against the door 206 and to return any water which may be splashed on the inner side of the door 206 back into the drum casing 30.

The machine parts which are mounted on the base 21, and as shown in Figure 3, are adapted to be assembled with a cabinet adapted to stand by itself, as indicated in Figures 1 and 2, with its individual top 26. However, the machine of Figure 3, together with the side panels 22 and 23 and the front panels 24 and 25 may be mounted under the top 185, of a kitchen cabinet 186, as shown in Figure 15. The machine of Figure 3 need not be removed from the kitchen cabinet for servicing many operations, since many of the parts are accessible from the front merely by removing the front panels 24 and 25 and the front cover 31 and the drum 40 as required in accordance with the previous description.

It is to be seen that the accessibility of the parts of the machine according to this invention constitutes an improvement over previous constructions.

In the operation of the machine, clothes to be washed and/or dried are inserted into the rotatable drum 40, which rotates in a clockwise direction, as viewed from the front, and is perforated and is provided with baffles 191. One or more of the knobs 192, 193, 194 and 195 (Figure 1) are manipulated to set the controls as desired in accordance with the description given in the said copending application of Frey and Davidson, and then the clothes are washed with detergent, centrifuged, rinsed with clear water, and again centrifuged, with or without the operation of the water heater, and thereafter they are dried, the moisture remaining in the clothes being driven out of them by the action of the drying heater or heaters 90, in combination with the vapor condensing action of the low volume water flow from the trough 150 under the control of the low volume valve 161. When the clothes are dried, they are removed as will be apparent. It is to be noted that all of the water, whether it be detergent wash water, rinse water, or vapor condensing water, are all introduced through the same trough 150 and through the same supply pipe 152, which is connected to the valve construction 156.

The said application of Frey and Davidson is referred to as a suitable controlling system for this machine. The knob in my instant application, designated by 192, is a timer knob and corresponds to knob 55 of the Frey and Davidson application. Knob 193 of my application is a water temperature selector knob and corresponds to

the knob 147 of the Frey and Davidson application. Knob 194 of my application is a water level selecting knob and corresponds to knob 95 of the Frey and Davidson application. Knob 195 of my application is a dryer heat selecting knob and corresponds to knob 185 of the Frey and Davidson application. The Frey and Davidson application refers to a drain valve 465 which is open when energized. In this application, there is no drain valve and in lieu thereof the pump 65 is either operated or stopped. The operation of solenoid 98 in this application is opposite in result from the solenoid 465 in the Frey and Davidson application. That is, when the solenoid 98 of this application is energized, no water is discharged through the drain whereas when the solenoid 465 of the Frey and Davidson application is energized, water is discharged through the drain, since that valve is open. The control of Frey and Davidson solenoid 465 is to be considered the same as solenoid 98 of this application, except that cam 27 is to be changed to energize solenoid 98 of this application when it is desired to prevent draining operation and to deenergize the solenoid 98 of this application when it is desired to drain water from the tub. Dryer thermostats 169, 420 and 424 correspond to similarly numbered thermostats in said Frey and Davidson application, and operate in the same manner. Thermostat 169 is a safety thermostat, 420 is the high temperature thermostat, and 424 is the low temperature thermostat. The other elements of this application will be readily recognized to be substantially identical in operation with corresponding elements in the Frey and Davidson application. Reference is also made to my copending application S.N. 547,475, filed November 17, 1955, for Domestic Appliance. Certain features disclosed in the instant application are disclosed in my said previous application S.N. 547,475, and the benefit of the filing date of that application is claimed for such features. The two-speed transmission 116 herein referred to may be of the construction disclosed in said application S.N. 547,475, if desired.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. In combination, a cabinet having a base, side walls mounted on the base, a top, a removable front wall removable without disturbing the side walls to provide a large front access opening to the interior of the cabinet, a generally cylindrical outer drum within said cabinet, said outer drum having a removable front wall providing a front access opening for said outer drum, said large front access opening of said cabinet being large enough and the front wall of said outer drum being small enough for removal through said front access opening of said cabinet, a rotatable inner drum within said outer drum, a sheathed tubular electric heater extending between the inner and outer drums and having a terminal portion extending through the peripheral wall of the outer drum adjacent its access opening and removable front wall, and external fastening means on the outside of said outer drum adjacent said terminal portion accessible when the front wall of said cabinet is removed for fastening said heater to the peripheral wall of said outer drum.

2. In combination, a cabinet having a base, side walls mounted on the base, a top, a removable front wall removable without disturbing the side walls to provide a large front access opening to the interior of the cabinet, a generally cylindrical outer drum within said cabinet, said outer drum having a removable front wall providing a front access opening for said outer drum, said large front access opening of said cabinet being large enough and the front wall of said outer drum being small enough for removal through said front access opening of said cabinet, a rotatable inner drum within said outer drum, a sheathed tubular electric heater extending between the inner and outer drums and having a terminal portion extending through the peripheral wall of the outer drum adjacent its access opening and removable front wall, and external fastening means on the outside of said outer drum adjacent said terminal portion accessible when the front wall of said cabinet is removed for fastening said heater to the peripheral wall of said outer drum, and a removable thermostat removably mounted on the external surface of said outer drum casing for controlling said electric heater.

3. A combined washer dryer including a drum casing having a water feed trough to feed water along an inside wall of said casing, a rotatable perforated drum rotatable at agitating and centrifuging speeds within said casing, water control valve means having hot and cold water inlets for connection to hot and cold water supply sources and an outlet arranged for feeding said trough, said valve means including means providing full flow of all hot water or colder water for washing and means providing a limited flow of all cold water for drying, said casing being provided with a drain, a pump connected to said drain having means for pumping liquid from said drain when it is operating and preventing the flow of liquid out of the casing when it is stationary, and means responsive to a selected liquid pressure upon said pump for stopping the full flow of water through said valve means, a cabinet enclosing said casing and said valve means and pump and said liquid pressure responsive means, said cabinet and said casing having removable front walls for access from the front to said valve means and pump and said liquid pressure responsive means and for removal of said perforated drum.

4. In combination, a cabinet having a base, side walls mounted on the base, a top, a removable front wall removable without disturbing the side walls to provide a large front access opening to the interior of the cabinet, a generally cylindrical outer drum within said cabinet, a rotatable inner drum within said outer drum, a sheathed tubular electric heater extending between the inner and outer drums and having a terminal portion extending through the peripheral wall of the outer drum adjacent said front access opening and removable front wall, and external fastening means on the outside of said outer drum adjacent said terminal portions accessible when the front wall of said cabinet is removed for fastening said heater to the peripheral wall of said outer drum.

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