Nov. 6, 1956 R. D. SHAPTER 2,769,246

CLOTHES DRIER

Filed May 6, 1953 4 Sheets-Sheet 1

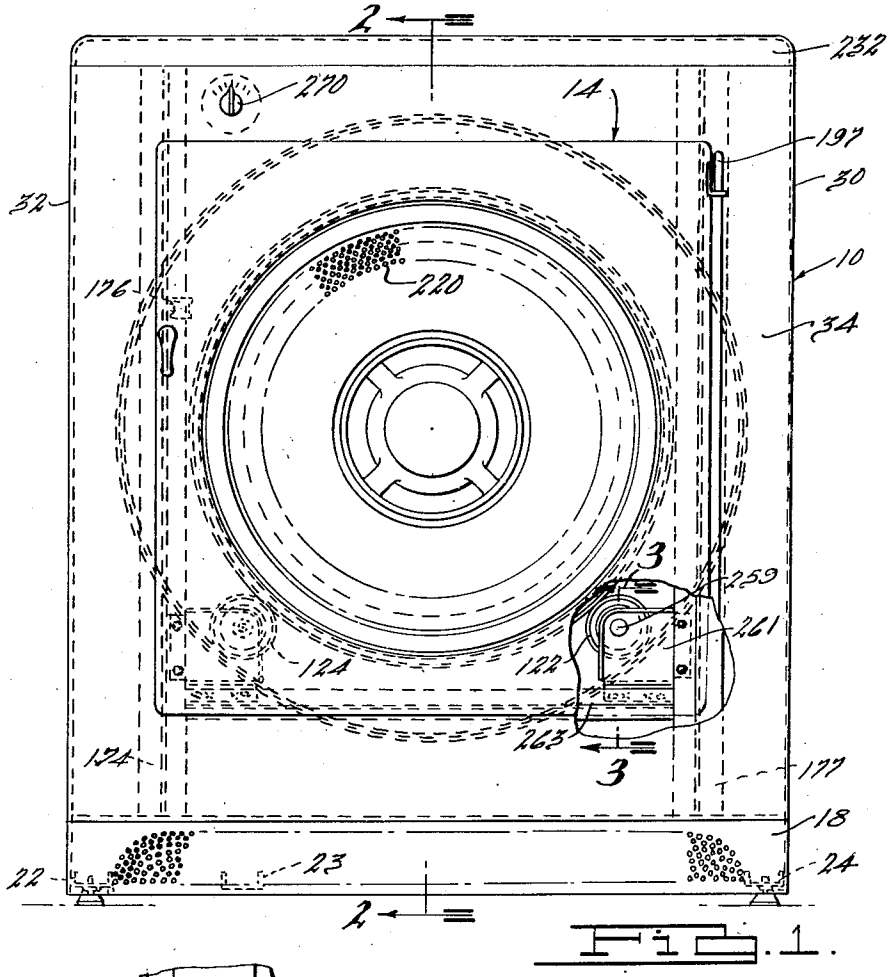


Fig. 1.

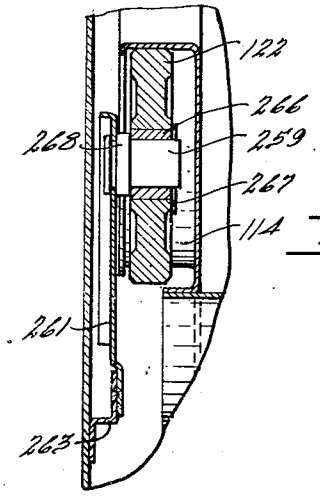


Fig. 3.

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CLOTHES DRIER

Filed May 6, 1953 4 Sheets-Sheet 2

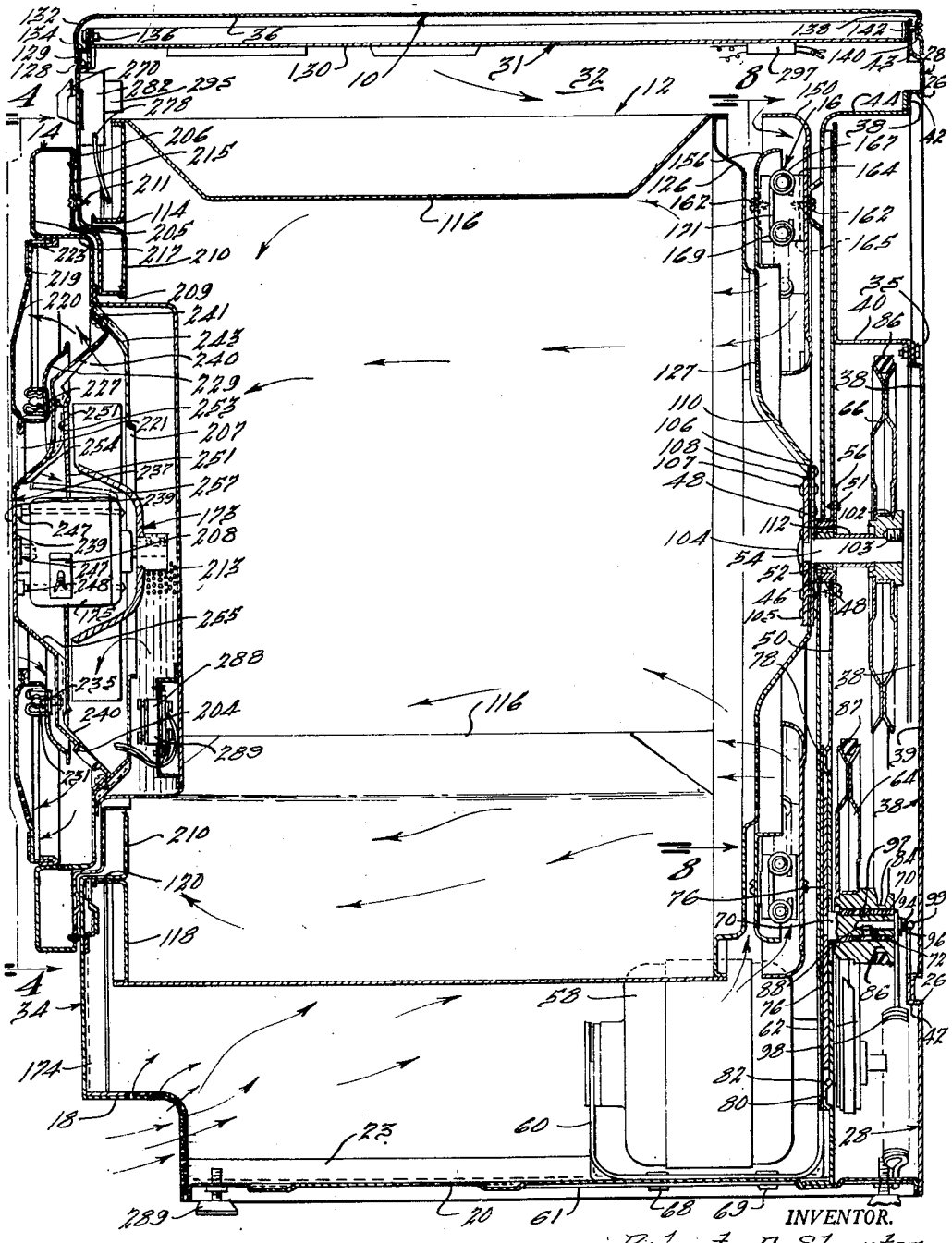


FIG. 2.

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CLOTHES DRIER

Filed May 6, 1953 4 Sheets-Sheet 3

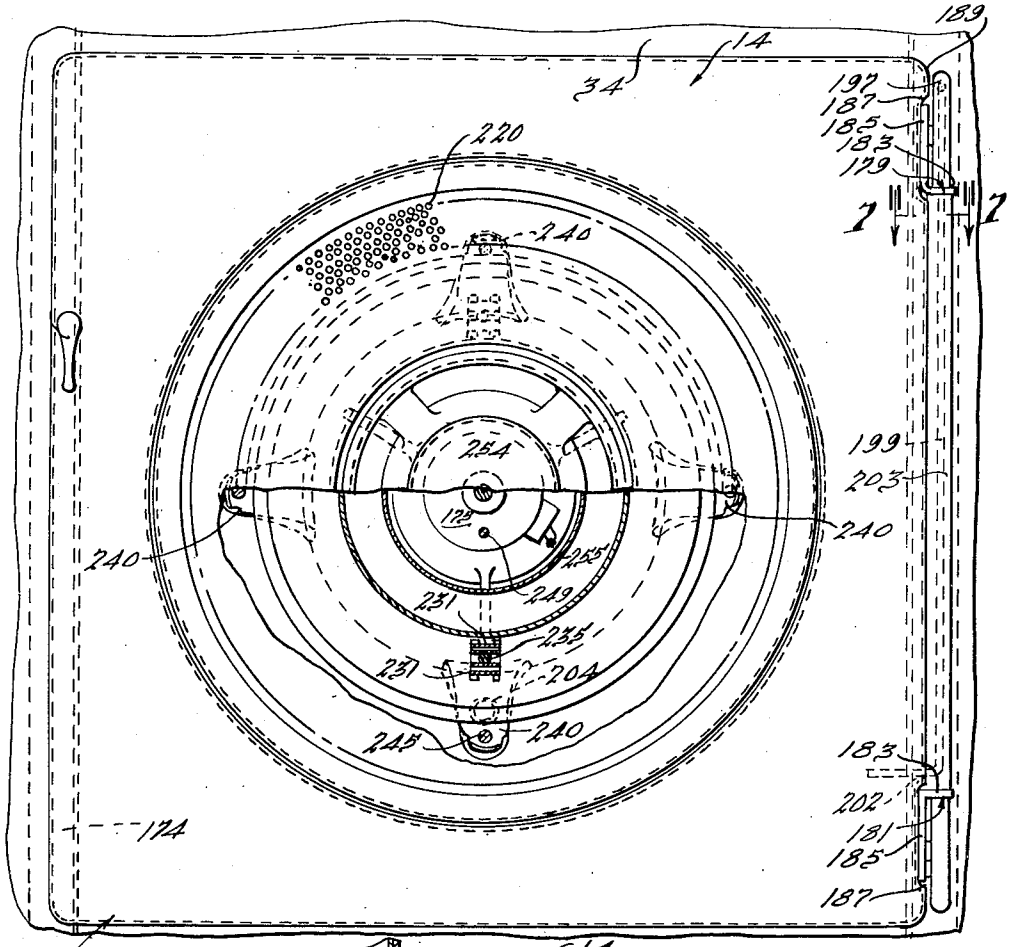


Fig. 4.

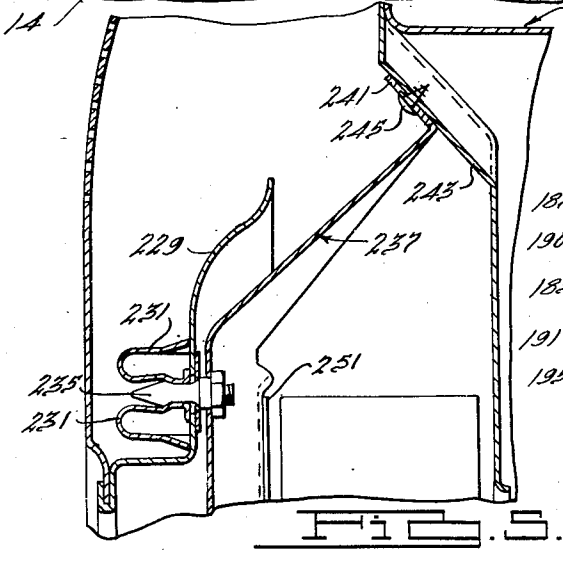


Fig. 5.

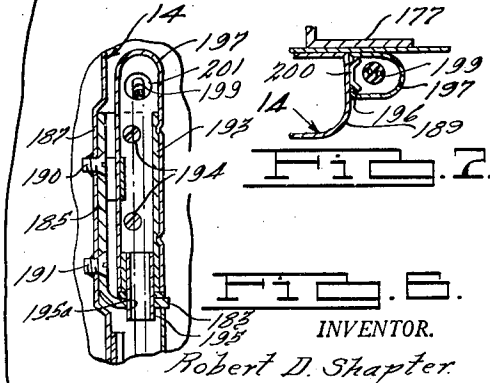


Fig. 2.

Fig. 3.

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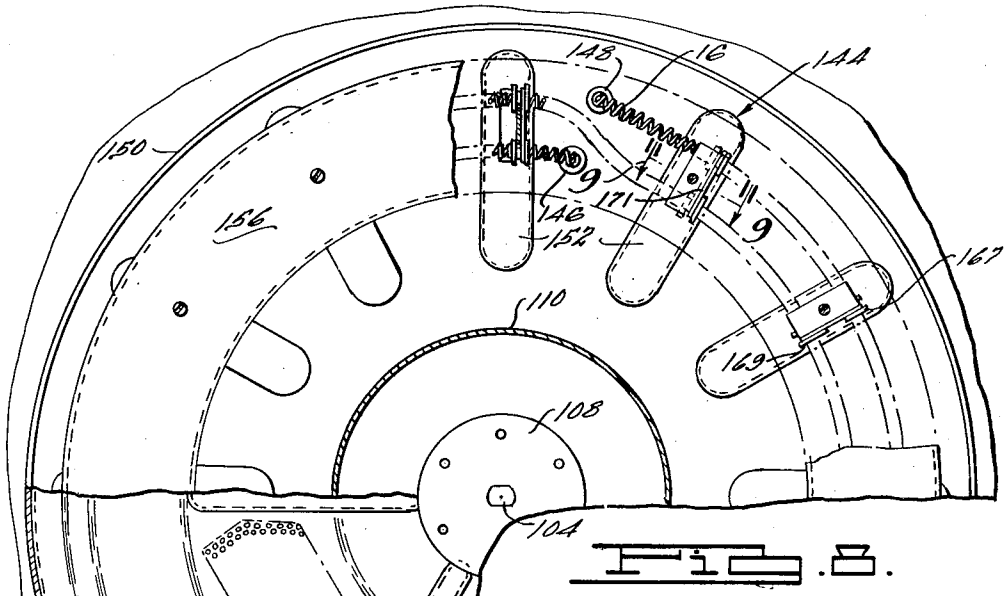


Fig. 8.

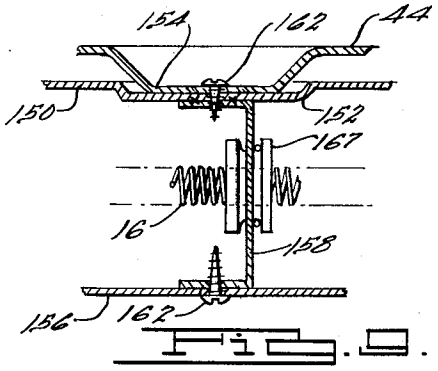


Fig. 9.

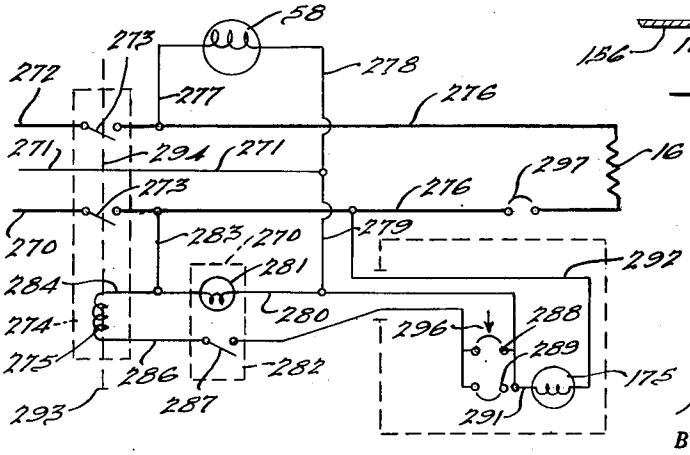


Fig. 10.

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CLOTHES DRIER

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Application May 6, 1953, Serial No. 353,323

8 Claims. (Cl. 34—82)

The present invention relates to improved apparatus for drying clothes and the like, and more particularly to a clothes drier of the rotatable basket type having improved means for heating and translating air about the clothes to be dried.

It is one of the objects of this invention to provide an improved apparatus for drying wet fabrics which features a novel arrangement of a source of heat.

A further object of the invention is to provide in a clothes drier an improved door construction carrying means for translating, delinting and exhausting the drying air.

Another object of the invention is to provide improved means for controlling the operation of the drier, and, in general, it is an object to provide an improved apparatus for drying wet fabrics which is durable, simple and efficient in operation, and relatively inexpensive to manufacture.

Other objects and advantageous features of the invention will become apparent as the full description thereof is developed when taken in conjunction with the accompanying drawings, in which:

Figure 1 is a front elevational view of a drying device constructed in accordance with the present invention, with a part broken away;

Fig. 2 is an enlarged sectional view of the structure illustrated in Fig. 1, taken along the line 2—2 thereof;

Fig. 3 is an enlarged, broken sectional view of the structure illustrated in Fig. 1, taken along the line 3—3 thereof;

Fig. 4 is an enlarged broken view of the door of the drying device illustrated in Fig. 1;

Fig. 5 is an enlarged broken view of a portion of the structure illustrated in Fig. 2;

Fig. 6 is an enlarged, sectional view of the door hinge construction, taken downwardly through the hinge portion thereof;

Fig. 7 is an enlarged sectional view of the door construction taken along the line 7—7 of Fig. 4;

Fig. 8 is an enlarged, broken sectional view of the structure illustrated in Fig. 2, taken along the line 8—8 thereof;

Fig. 9 is an enlarged sectional view of the structure illustrated in Fig. 8, taken along the line 9—9 thereof, and

Fig. 10 is a wiring diagram of a typical electrical control circuit for the drying device embodying the present invention.

Referring more specifically to the drawings, there is illustrated in Figs. 1 and 2, a drier having a casing generally indicated by the numeral 10, and a rotatable container or basket 12 adapted for receiving wet fabrics and arranged for rotation within the casing. The casing 10 is provided with a door 14 at the front and an annular heating element 16 positioned at the rear of the container 12 on the casing wall. The door 14 has mounted therein means for translating air through the apparatus and, as indicated by the arrows in Fig. 2, the air enters casing

10 through casing toe panel 18, flows around and through the heating element 16 and then into and through the rotatable container 12 and outwardly through suitable vents positioned in the door 14. It will be noted that the air flows around the peripheral wall of the container 12 and is drawn inwardly about the heating element 16 and into the container 12 at a point disposed inwardly from the peripheral edge of the container. Suitable control means are provided for initiating the operation of the rotatable basket and energizing the heating element and the air translating means. The control means includes safety control mechanisms for terminating the operation of the basket, heating element and translating means simultaneously or selectively, as will hereinafter be more fully discussed.

The casing 10 embodies a floor panel 20 disposed on the bottom of a plurality of rearwardly extending supporting and reinforcing channel members, 22, 23, 24, to which a rear panel 28, two side panels 30, 32, a front panel 34 and an inner top panel 31 are secured. An outer top panel 36 is removably secured to the top of the front and side panels enclosing the insulated inner panel 31. The front and side panels may comprise a single sheet of metal wrapped around the floor panel 20 at the front and sides thereof and spot-welded thereto and to the top panels 31. The rear panel 28 is fixed to the rear edge of the bottom panel and is provided with a large central circular opening 26. The edge of the opening 26 is reinforced by an angular flange 42 and the enclosing panel 38 is cut away at 35 to provide an opening to the similarly shaped flanged panel 40 which forms a recessed compartment in the rear panel for the plug-in cable, tools and the like.

The flange 42 about the central aperture in the rear panel 28 has a dish-shaped heater supporting panel 44 attached thereto to be spaced from and parallel to the rear panel 28 but removable therefrom. The panel 44 is inwardly displaced to provide space in which a power driving mechanism for the container 12 may be located. The heater supporting panel 44 is centrally apertured at 46 to accommodate a bearing housing 48, which is also supported by a channel-shaped flanged bracing element 50 which is secured to panel 44 and the base panel 20 by screws or other suitable means. A shaft 54 on the rotatable basket 12 is secured in a bearing 52 supported by the housing 48 where it is secured by a retaining plate 56 suitably attached to the bracing element 50, as by screws 51.

The driving means for the rotatable basket 12 comprises a motor 58 mounted in a cradle support 60 which is adjustably carried by a plate 61 mounted beneath the floor panel 20. The cradle support 60 is secured for adjustment in slots in the floor panel 20 and plate 61 by suitable screws 68, 69. The drive means includes a pulley 62, an idler pulley 64 and a driven pulley 66. The idler pulley 64 has bearings 72 journaled on a stub shaft 70 upon which the bearing rotates. The shaft 70 is integrally attached to a plate 76 which is horizontally and vertically adjustable in a slot 82 provided between the channel plate 77 and the bracing element 50. The bracing element 50 is deflected at 78 and 80 to form ribs which confine the plate 76 in the slot 82 which is formed thereby for horizontal and vertical movement.

A drive belt 86 encircles the driven pulley 66 and the belt groove 84 in the outer portion of the idler pulley 64. The stub shaft 70 has a central aperture 88 forming an oil reservoir and a groove 94 near the end which receives a hooked end 96 of a tensioning spring 98. A ball valve 99 permits a lubricant to be introduced into the reservoir 88 from which it passes through apertures 97 to the bearing 72. The opposite end of the spring 98 is secured to the floor panel 20. It will be understood that the tension

of spring 98 acts upon the idler pulley 64 to maintain the belts 86 and 87 tensioned through the sliding of the plate 76 in the slot 82. The replacement of belts is facilitated by the shifting of the plate 76 in the slot 82 in a reverse direction. The driven pulley 66 is operatively connected to the shaft 54 of the rotatable basket 12 and is secured thereon by a setscrew 103 threaded into an aperture, one-half of which is in a hub 102 of the pulley, the other half of which is in the shaft. The inner end 104 of the shaft 54 has opposite parallel sides which engage a mating aperture in a drum retainer plate 105 and is secured thereon by the flanged-over end of the shaft. A similar plate 106 is disposed over the inner side of the belled portion 110 and is secured thereto and to the plate 105 by screws 107. The driven pulley 66 is spaced from the bearing 52 by a spacer sleeve 112.

The rotatable container 12 is provided with an access opening 114 in its forward end and the peripheral wall has a plurality of inwardly projecting bosses 116 of generally triangular cross-section disposed thereabout to form vanes for controlling the tumbling of the clothes. Satisfactory tumbling of the clothes has been found to result from the use of three equally spaced vanes 116, although a larger number may be utilized. As may be seen in Figure 2, the forward panel 118 of the basket 12 has a central opening, the edge of which is formed into an outwardly projecting flange 120 which serves as a track for a pair of idler wheels 122 and 124 which support the forward end of the container. A rearward plate 126 of the container 12, which is provided with the outwardly projecting belled, axially disposed portion 110, has a perforated annular portion 127 outwardly thereof through which air may be translated into contact with the wet fabrics within the container. It will be appreciated that the vanes 116 serve to strengthen the container or basket 12, in addition to their function of controlling the tumbling of the fabrics.

The top edge 42 of the rear panel 28 and the upper portion 128 of the front panel 34 are recessed inwardly to form ledges 43 and 129 for receiving the top panel 36. The top panel 36 has its forward edge 132 bent downwardly to extend into the recess portion 128 at the top of forward panel 34 and the edge 132 of the panel 36 has one or more Z-shaped elements 134 secured thereto supporting a stud 136 which extends into an aperture in the flange provided above the ledge 129. The rearward edge 138 of top panel 36 is recessed, as at 140, to enable the securing thereof to the flange above the ledge 43 of rear panel 28, as by screws 142 extending through apertures in the recessed portion.

Heat is supplied to the casing 10 by the heating element 16 which is carried by a plurality of suitable supporting assemblies, generally indicated by the numeral 144. The heating element 16 is preferably in the form of a coiled resistance wire and, as may be seen in Figs. 2, 8, 9, may be annularly wound continuously around and threaded through the supporting elements 144 to form a two-turn series wound element, the ends of which are joined to the insulated connectors 146 and 148. The supporting elements 144 are encompassed by a forwardly facing annular reflecting plate 150 secured to a plurality of inwardly projecting bosses 154 on the rear panel 44. A rearwardly facing radiation interrupting plate 156 is spaced from the reflection plate 150 by channel members 158 and secured in integral relationship therewith as by screws 162. The forwardly facing reflector plate 150 is of greater diameter than the rearwardly facing plate 156, the plates being separated by the channel members 158 to provide an air passageway therebetween. The opposite edges of the webs of the channel members 158 are notched at 164 and 165 to receive a pair of insulating spools 167 and 169 which are retained within the notches by the encircling retaining wires 171. The plate 156 serves to protect the rearward surface 126 of basket 12 from concentrated radiant heat, while the reflector plate 150 protects the rear

panel 44 in a similar manner. In this arrangement air passes between the plates 150 and 156 and over the outside surfaces of the plates through the entire peripheral edge thereof and is drawn into the container through the perforated annular portion 127. Thus a portion of the air is directly heated by the heating element as it passes between the plates 150 and 156 while other portions thereof are heated by the plates. With such an arrangement a maximum amount of heat is supplied to the air while the air cools the heating element 16 and the plates 150 and 156.

Air is translated through the casing 10 by a fan or blower 173 which is driven by an electrical motor 175 mounted in the door 14. In order to support the added weight of the air translating means in the door, reinforcing and supporting means, such as Z-bars 174 and 177, are secured to the front panel. The bars extend vertically upwardly from the toe panel 18 to the top of the front panel 34 and are suitably attached thereto at each side of the door opening. The Z bar 174, in addition to reinforcing the casing 10, provides the support for a conventional door handle latch mechanism 176. The Z bar 177 serves as a reinforcing support for the hinges of the door.

As may best be seen in Figs. 4, 6 and 7, the door 14 is hinged to the casing 10 and Z bar 177 by a pair of vertically disposed hinges 179 and 181. The hinges 179 and 181 have a supporting outturned flange 183 and an integral vertically disposed portion 185 disposed in the recesses 187 in the edge portion 189 of door 14. The portions 185 of the hinges are secured in the recesses 187 by suitable securing means, such as screws 190 and 191. A pair of housings 193, which are generally D-shaped, is fixedly attached to the forward panel 34 and the upright Z bar 177 by screws 194 passing through enlarged openings in the forward side thereof. As seen in Fig. 6, the lower portion of the D-shaped housing 193 receives and supports an extending pintle 195 which projects through the outturned flanges 183 of the hinges to support the door 14 for swinging motion. The D-shaped members 193 are encircled by an outer vertically disposed casing 197 having rearward ears 196 adapted to hook behind the outwardly projecting portions of retaining strips 200. A central aperture 195*a* is provided in the upper pintle 195 to enable electrical conductors 199 to extend therethrough. The conductors 199 enter the sheath 197 through an aperture 201 in the casing 10 and extend downwardly to a position slightly above the lower hinge 181, where they enter the door 14 through an aperture 202 and thence extend upwardly through the aperture 204 in the leg of the motor support to the motor 175 to which they are connected in a junction box 208. A tube 203 is preferably provided between the portions 183 of the hinges to enclose the conductors 199 which extend therethrough and through an opening in the wall thereof where the wires pass into the door.

The door 14 is formed of an outer panel or plate 205 having a centrally disposed aperture 207 therein adapted to accommodate air translating means 173. In abutment with the inner extremity 206 of outer plate 205 is a ring stamping 215 which is secured by screws 211 to the forward panel 34 to have the flange 209 extend into the opening in the central dished portion 210 of the panel 34. Attached to the recessed portion 217 of outer plate 205 is a dished-shaped cover 213 for enclosing the aperture 207, having the lower half of the wall thereof perforated to allow the entry of air into the door 14. The lower half only of the wall is perforated, since it was found that a more desirable path of air circulation is provided than when cover 213 was otherwise perforated. Position in abutting relationship with the inner surface of recessed portion 217 of the outer plate 205 is an annular detachable lint filtering member 219. The peripheral edge of the filtering member 219 has an inturned flange on which a sealing member 223 is secured. The outer portion of the filtering member 219 is perforated at 220

and a large aperture 221 is provided centrally of the member. At the central aperture 221, a dished reflector 229, having a central flange, is secured, the deflector functioning as an aspirator, as hereinafter explained. Clips 231, supported on the deflector 229, are releasably secured to the outwardly projecting studs 235 carried by the motor supporting member 237. It will be apparent that the clips 231 are readily separable from the studs 235 and form a simple and positive attachment means by which the annular filter member 219 may be readily disengaged and cleaned, when desired.

The motor supporting member 237 has a central dished portion 239 from which four supporting legs 240 extend. The ends of the legs are flanged at 241 and secured to the inwardly dished portion 243 of the plate 205 by suitable means, such as screws 245. The dished portion 239 of the member 237 is provided with four equally spaced threaded nuts 247 to which the bolts 248 of the motor 175 are secured to support the motor on the member. The motor 175 is encircled and additionally braced and supported at approximately its midpoint by an inner plate 251 secured to the four legs of the motor supporting member 237 by welding or other means. The wall of the dish-shaped member 237 is provided with suitable apertures 255 which permit air to pass over and cool the motor 175. Oil may be supplied to the motor 175 through the oil tube 257 which is accessible through an aperture 254 in alignment therewith in the motor supporting member 237.

The motor 175 has a three-bladed fan 173 attached to the shaft thereof to promote a centrifugal outward travel of air, as indicated by the arrows. This outward air traveling across the deflector 229 causes the air to be drawn inwardly through the central opening defined by the peripheral edge 221 and mix with the air drawn in through the opening 207. Air flow within the casing 10 has been diagrammatically indicated in Fig. 2, and it may be seen that air enters near the floor level through toe panel 18, and once within the casing 10, is drawn up around rotatable container 12 through the heating element 144 and into container 12 through annular aperture 127. The heated air comes into contact with the wet fabrics tumbling within the container and absorbs moisture therefrom before passing through the opening 207 into the door 14 and out through the apertures 220 of the filter member 219. Should the filter member be neglected and the apertures become clogged, the air would still be drawn through the container as it would then be directed between the reflector 229 and plate 237 to atmosphere through the large central opening defined by the peripheral edge 221 of the filter member.

The forward end of the rotatable container 12 is supported for rotation on rollers 122 and 124 which are spaced apart at either side of the container axis. As may be best seen in Fig. 3, the rollers 122, 124 are journaled for rotation on a stationary shaft 259 which is rigidly attached to an upwardly extending plate 261. The lower end of plates 261 is welded to a horizontally disposed Z bar 263 which is in turn releasably secured to the forward panel 34 and to the upwardly extending Z bars 174, 177.

In Fig. 10, a wiring diagram is illustrated showing the circuits for controlling the operation of the drying machine. A 230-volt circuit is illustrated embodying three conductors 270, 271 and 272. The conductors 270 and 272 are interrupted by contacts 273 of a relay 274, having a coil 275 which, when energized, holds the contacts 273 in closed position. The conductors 270 and 272 are extended at 276 to the heating element 16, thereby delivering current at 230 volts thereto, which produces 4600 watts to the heating element. The circuit 272 is connected by a conductor 277 to the driving motor 58 for the rotatable container 12. A conductor 278 from the motor 58 is joined to the central conductor 271 to provide current at 115 volts to the motor. A conductor 279 is connected to a conductor 280 which in turn is connected to a timing motor 281 of the time control mechanism 282. The conductor 280 is connected by a conductor 283 to the line 270 delivering current at 115 volts to the motor 281. The conductor 283 is connected by a conductor 284 to the holding coil 275 of the relay 274, the conductor 286 extending therefrom in series with a switch 287 provided in the timing mechanism and with a pair of thermostatic switches 288 and 289 which are in parallel relation. The circuit 291 from the parallel thermostatic switches passes through the fan motor 175 from which a conductor 292 extends to the line 270, providing circuits of 115 volts to the solenoid coil 275 and to the fan motor 175 in the presence of the circuit 279. A push button 293 is connected to the end of the solenoid actuated rod 294 which operates the switches 273 in the main lines 270 and 272.

After the clothes have been placed into the container 12 and the door moved to latched position, the manual movement of the push button inwardly closes the contacts 273 of the circuits 270 and 272 within the switch box 295 at the rear of the time control mechanism 282 and thereby energizes the motor 58, the heating element 16, the timing motor 281, the fan 175 and solenoid coil 275, which retains the switches 273 in closed position. With this connection, the container 12 is rotated, the motor 175 drives the fan to cause the circulation of the air through the container past the heater 16, which raises the temperature of the air. This operation will continue until the circuit to the solenoid coil 275 is opened, either by the time contacts 287 or either one of the thermostatic switches 288 or 289. Normally, the thermostatic switch 289 is of the closed type and employed to control the interruption of the circuit when the normal load of clothes is being dried. This thermostat functions when the temperature in the container reaches approximately 150° F. which is sufficiently high to assure that clothes have been dried. When a small load of clothes, however, is being dried, it was found that such load would not be satisfactorily dried at 150° F. so that a manual reset, normally open thermostat 288 is provided in parallel with the thermostat 289. This thermostat opens a circuit when the temperature within the container reaches 170° F. and since it is in parallel with the thermostat 289, will control the opening of the circuit to the coil 275 after the thermostat 289 opens. When the operator is drying a small load of clothes, the thermostat 288 is manually set, as by a push button 296. Should the operator desire the clothes to be removed in a damp state for ironing, the timing mechanism 282 is set for a predetermined period of time so that the switch 287 opens before either of the thermostats 288 or 289 open. Even though the operator is depending upon the opening of the circuit by the thermostats 288, 289, the timing mechanism 282 functions as a safety device when the thermostatic switches fail to operate. When this occurs the switch 287 of the timing mechanism 282 will open after a predetermined time of operation of the machine. In any of these instances, the solenoid coil 275 is de-energized and the switches 273 are moved to open position, thereby interrupting the current to the motors and the heating elements.

A safety thermostatic switch 297 is preferably provided in one of the lines 276 ahead of the heating element 16, which is normally closed and which will open when the temperature surrounding the thermostat reaches a temperature of substantially 300° F. This thermostat is only employed as a safety element in case, for some reason, the temperature within the container 12 reaches an abnormally high amount. It is doubtful, however, whether this could occur in view of the thermostatic switches 288 and 289 in the control circuit and the fact that even with the filter screen 219 clogged with lint, the air would still pass through the container out through the central opening 221 and thereby prevent the air

in the interior of the cabinet from rising to a high temperature.

What is claimed is:

1. A clothes drier including, in combination, a casing having an air inlet, a container having front and rear walls and an imperforate peripheral wall mounted for rotation in said casing, said rear wall having apertures annularly disposed therethough, means for rotating said container, the front wall of the container and the adjacent portion of the casing having aligned access openings, a door supported on said casing closing said openings and having a passage therethrough, blower means on said door for drawing air from the interior of said casing through the apertures in the rear wall and a removable filter element on said door in the passage of air therethrough.

2. A clothes drier including, in combination, a casing, a container having front, rear and peripheral walls mounted for rotation in said casing, said rear wall having apertures annularly disposed therethrough, means for rotating said container, the front wall of the container and the adjacent portion of the casing having aligned access openings, a door supported on said casing closing said openings and having a passage therethrough, blower means on said door for drawing air from the interior of said casing, a removable filter element on said door in the passage of air therethrough, and an annular heating element in said casing disposed rearwardly of and adjacent to the rear wall of said container and the apertures disposed annularly therethrough.

3. A clothes drier including, in combination, a casing, a container having front, rear and peripheral walls mounted for rotation in said casing, said rear wall having apertures annularly disposed therethrough, means for rotating said container, the front wall of the container and the adjacent portion of the casing having aligned access openings, a door supported on said casing closing said openings and having a passage therethrough, blower means on said door for drawing air from the interior of said casing, a removable filter element on said door in the passage of air therethrough, an annular heating element in said casing disposed rearwardly of and adjacent to the rear wall of said container and the apertures disposed annularly therethrough, and a toe panel at the front bottom portion of the casing having apertures through which air is drawn into the casing.

4. A clothes drier including, in combination, a casing having a front panel provided with an opening, a door supported by said casing having an opening therethrough aligned with the opening in the panel, air translating means supported by said door, a filter removably supported on said door, said filter having a central opening, and a baffle extending from said central opening to the air path from said air translating means for causing air to be drawn in the central opening of the filter.

5. A clothes drier including, in combination, a casing having an air inlet, a container having a front panel, an apertured rear panel, and an imperforate peripheral wall, said container arranged for rotation in said casing, means for rotating said container, blower means mounted on said door for drawing air from said casing through the apertures in the rear wall, annular heating means disposed rearwardly of and adjacent to the rear panel of said container, and oppositely presenting dished washer-like elements supporting said heating means therebetween.

6. A clothes drier including, in combination, a casing, a rotatable container within said casing, means for rotating said container, means for heating air within said casing, said casing and container having aligned access openings, a door pivoted on said casing for closing said openings and having an opening aligned therewith, said door having a panel having spaced legs secured over the opening in the door, air translating means supported on said panel, detachable air filtering means disposed over the door opening, and releasable supporting means on said door for retaining said filtering means thereon.

7. A clothes drier including, in combination, a casing, a rotatable container within said casing, means for rotating said container, means for heating air within said casing, said casing and container having aligned access openings, a door pivoted on said casing for closing said openings and having an opening aligned therewith, said door having a panel having spaced legs secured over the opening in the door, air translating means supported on said panel, detachable air filtering means disposed over the door opening, and releasable supporting means on said door for retaining said filtering means thereon, said filter having a central aperture a deflector plate extending from said aperture to the air stream from said translating means for causing air to be drawn in through said aperture, the air being discharged through said aperture when the filter becomes clogged.

8. A clothes drier including, in combination, a casing, a rotatable container within said casing, means for rotating said container, means for heating air within said casing, said casing and container having aligned access openings, a door pivoted on said casing for closing said openings and having an opening aligned therewith, said door having a panel having spaced legs secured over the opening in the door, air translating means supported on said panel, detachable air filtering means disposed over the door opening, releasable supporting means on said door for retaining said filtering means thereon, and a dished element closing the opening in the door and extending into the openings of said casing and container, the lower portion of said dished element containing apertures for the passage of air therethrough.

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