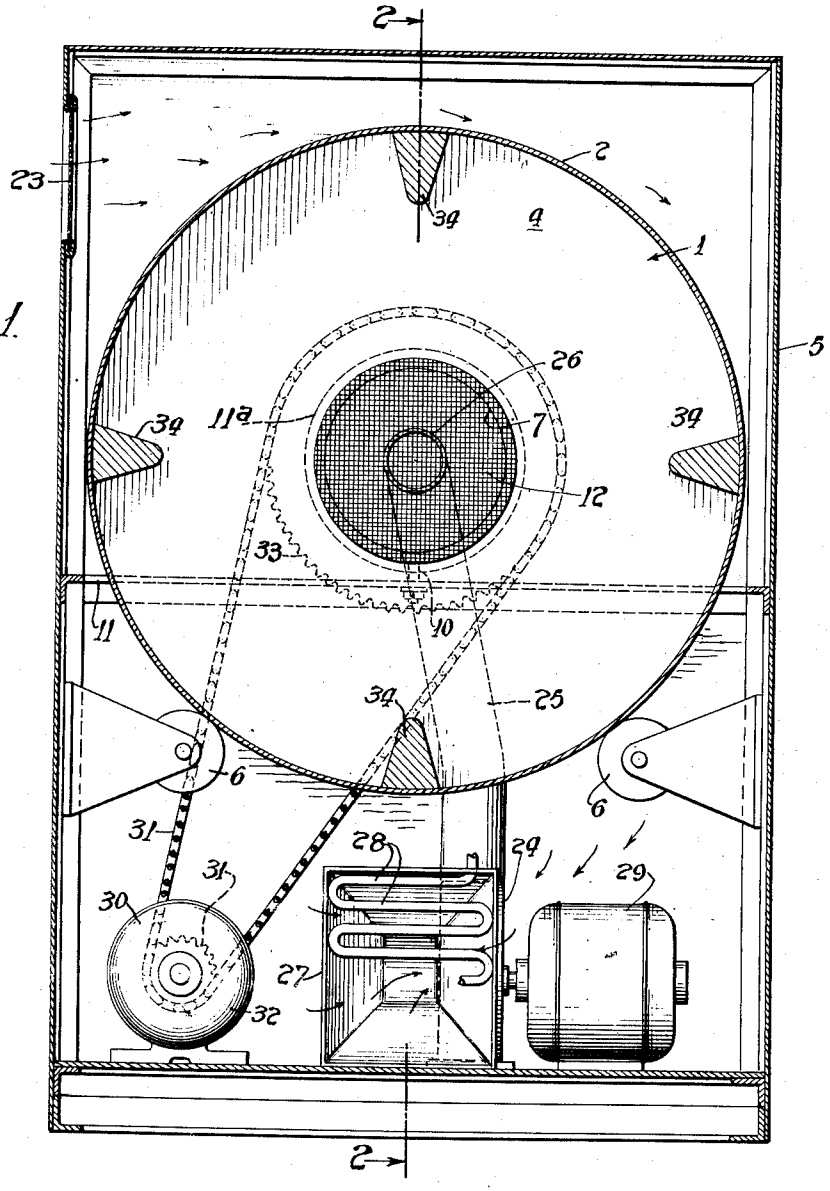
Nov. 11, 1941. B. LINDBERG 2,262,186

LAUNDRY DRYING MACHINE

Filed March 8, 1940 2 Sheets-Sheet 1

Fig. 1.



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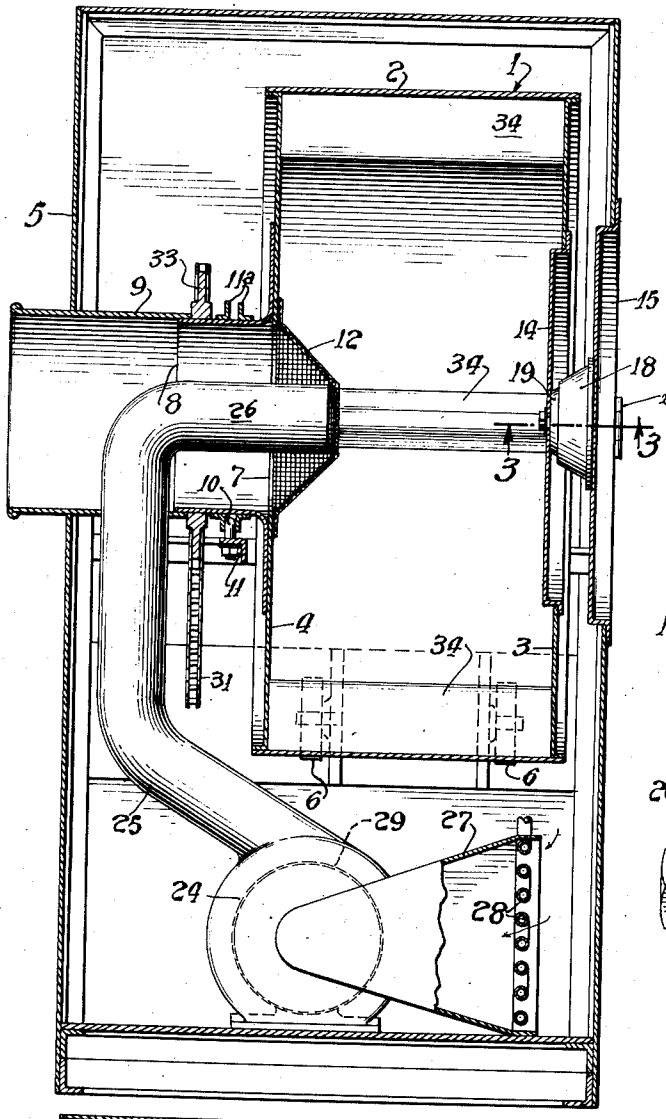


Fig. 2.

Fig. 4.

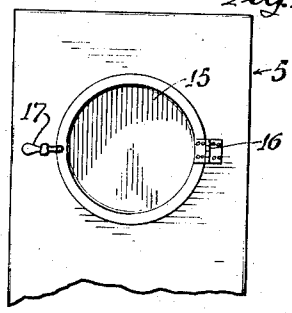
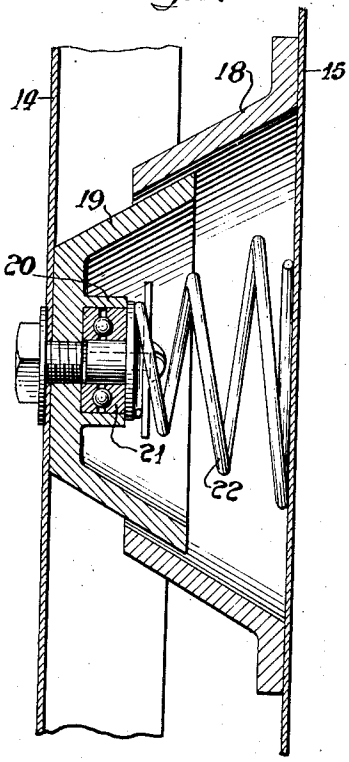


Fig. 3.



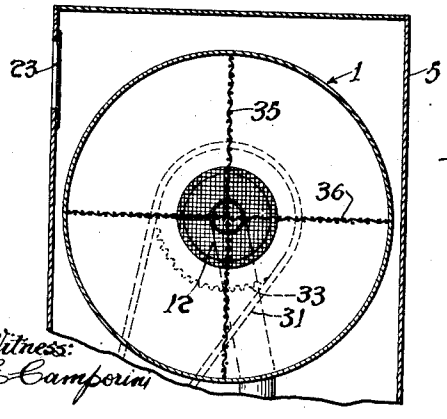


Fig. 5.

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Patented Nov. 11, 1941

2,262,186

UNITED STATES PATENT OFFICE

2,262,186

LAUNDRY DRYING MACHINE

Bernhard Lindberg, Chicago, Ill.

Application March 8, 1940, Serial No. 322,925

9 Claims. (Cl. 34—133)

The object of the present invention is to produce a simple, novel and efficient machine or apparatus for drying laundry after it has been washed.

Drying machines have heretofore been constructed with rotatable drums having perforated walls, each drum being enclosed in a casing, and means being provided for drawing heated air through the casings and more or less through the drums. Such air as passes through a drum picks up moisture from the laundry, but it also picks up lint much of which remains in the casing and in time stops up the passages between the drum and the walls of the casing. Therefore, in the old type of machine, hand holes must be provided through which the massed lint may be removed from time to time. Also, since the heated air is confined solely by the casing, the latter becomes hot, thereby causing a waste of heat through convection and radiation from the casing. The fact that the casing is hot is also objectionable from the standpoint of the convenience and comfort or even safety of the operators who, unless they always exercise great care, are apt to receive burns through contact with the casing.

Viewed in one of its aspects, the present invention may be said to have for its object to produce a simple and novel drier of the rotatable drum type which eliminates the objectionable characteristics of the older style just mentioned.

In carrying out my invention, instead of perforating the walls of the drum in which the laundry is tumbled, I make them solid and provide the drum with a definite inlet and definite outlet for the drying air. Also, instead of attempting to draw heated air through the drum, I force it into the drum and permit it to escape only through the outlet provided therefor. Consequently, only the outlet need be screened, and, because all of the moisture-laden air must flow through this screen, a great enough force is exerted upon any lint carried along with the stream of air to carry it through the screen; whereby clogging by the lint is prevented. The air which is forced into the drum may first be drawn from the outside into the casing and past the drum, thereby keeping the walls of the casing cool and giving to the incoming air a preliminary heating through contact with the drum. The more or less warm air is then heated to the desired temperature and forced directly into the drum and, therefore, its heat units cannot be wasted in the raising of the temperature of the walls of the casing or in the heating of the motor and other mechanism located within the casing for rotating the drum and forcing the air into the drum.

In order that even the door in the casing through which the laundry is inserted and removed may be cooled by the air that is afterwards used in drying the laundry, the end of the drum adjacent to that door must be spaced apart from the door in the casing and must therefore be provided with its own door. A further object of the present invention is to produce a simple and novel compound closure for both a door opening in the casing and a door opening in the drum, whereby both the casing and the drum may be opened and closed by an action on the part of an operator that is no different from the act of opening and closing any single door.

The various features of novelty whereby my invention is characterized will hereinafter be pointed out with particularity in the claims; but, for a full understanding of my invention and of its objects and advantages, reference may be had to the following detailed description taken in connection with the accompanying drawings, wherein:

Figure 1 is a vertical section through a drying apparatus embodying the present invention, the plane of the section being at right angles to the axis of the drum; Fig. 2 is a section taken on line 2—2 of Fig. 1, showing the door closed; Fig. 3 is a section on a much larger scale, on line 3—3 of Fig. 2, showing a part of the compound door; Fig. 4 is a front view of the drier on a greatly reduced scale; Fig. 5 is a view similar to Fig. 2, but on a smaller scale and including only the drum and the upper part of the casing, showing a modification.

Referring to the drawings, 1 represents a drum of any desired length and diameter, comprising a cylindrical shell 2 composed of a sheet metal or light plate material, together with the end walls 3 and 4. The drum is rotatably supported, with its axis horizontal, in a suitable casing 5. In the arrangement shown, the drum rests on two pairs of rollers 6 which may conveniently be composed of hard rubber. The rear wall of the drum contains a rather large central opening 7 with which registers a sleeve-like hub 8 projecting rearwardly from this wall. The hub fits rotatably into the inner end of a stationary, open-ended sleeve 9 extending through and fixed in the rear wall of the casing. The opening 7, together with the hub and the sleeve 9, form the outlet from the interior of the drum to the

atmosphere surrounding the casing. The drum may be held against movement from front to rear, namely, in the axial direction, in any suitable manner as, for example, by means of a stationary pin 10 carried by a bar 11 extending from one side of the casing to the other behind the drum, the pin being entered into a channel between two annular flanges 11 surrounding and fastened to the hub on the drum. The outlet from the rear end of the drum is covered by a strainer which may conveniently be a wire screen 12 formed into a frusto-conical dish; the large diameter of the dish being about equal to that of the opening 7, and the end of larger diameter being fastened to the rear wall of the drum.

In the front end wall of the drum is a large door opening adapted to be closed by a pan-shaped door or cover 14; both the door opening and the door or cover being round. The front wall of the casing is provided with a circular door opening registering with but larger in diameter than the opening in the drum. The door opening in the casing is closed by means of a door 15 which may be similar to the door 14; the door 15 being hinged to the front wall of the casing at one side of the door opening, as indicated at 16, and being adapted to be secured in its closed position by a suitable latch 17 arranged diametrically opposite the hinge. In accordance with the present invention, the two doors are connected together in such a manner that they may be opened and closed together by a single movement; the door for the drum closing in advance of the other door, however, and being held closed by a yieldable pressure just before and also after the outer door reaches its seat. Also, the two doors are connected together so that the inner door may revolve with the drum while the outer door remains stationary. The principle of the mounting for the inner door on the outer door is illustrated in Fig. 3. It will be seen that the outer door has on the rear side, at the center, a frusto-conical sleeve 18, whereas the inner door has fixed on the outer side thereof a frusto-conical projection 19 whose larger diameter is smaller than the smaller internal diameter of the sleeve 18; the angles of the conical surfaces being alike so that when the member 19 is inserted, small end first, through the large end of the sleeve, it may be moved ahead until the greater portion thereof projects beyond the small end of the sleeve, but no farther. The member 19 is made dish-shaped and is provided in the center of the dish with a socket 20 containing an anti-friction thrust bearing 21. One element of this thrust bearing is attached to an end of a coil spring 22 whose other end engages with the inner face of the outer door; the spring being of such length that it is under compression even when the part 19 has been projected out through the small end of the sleeve 18 as far as it will go. The parts are so proportioned that after the inner door has been closed, the outer door cannot gain its seat until the spring has been compressed and the member 19 has receded more or less into the interior of the sleeve 18, as shown in Fig. 3. Consequently, as long as the outer door is closed, the spring is exerting a constant pressure against the inner door. Furthermore, the telescoped portions of the sleeve and the member 19 do not touch each other and the member 19 may rotate with the drum without being retarded by any frictional coaction between the sleeve 18 and the member 19; the only negligible resistance to rotation of the inner door being that offered by the anti-friction thrust bearing. As soon as the outer door is swung open, however, the spring forces the inner door rearwardly until the frusto-conical member 19 fits snugly against the surrounding rear end of the sleeve 18; thus temporarily locking the inner door in a fixed position on the outer door to cause the two doors to act as a single rigid structure at all times except when the inner door contacts the drum.

In the bottom of the casing, below the drum, is a blower 24, the discharge side of which is connected to a conduit 25 that extends upwardly and through the lower side of the stationary sleeve 9. At the axis of this sleeve the conduit is bent laterally so as to extend forwardly in the casing through the center of the tubular hub 8 on the drum. The forward end of the horizontal section of the conduit is open and terminates near the vertical central portion of the strainer or screen 12. The inlet side of the blower is connected to a funnel-like intake 27 containing a suitable heating element 28. In the rear wall of the casing, near the top, is a window which is preferably covered by a wire screen 23 or other strainer through which air may pass.

The blower and the drum may be driven in any suitable manner. In the arrangement shown, there are two motors 29 and 30, one for the blower and the other to rotate the drum; a sprocket chain 31 extending over a sprocket wheel 32 on the shaft of the motor 30 and over a sprocket wheel 33 surrounding and fixed to the hub 8 on the drum.

Assuming that the compound door has been closed and that the motors are running, the drum will be rotated and air will be driven by the blower into the center of the drum from the rear. The only way that air can escape from the drum is through the screen or strainer 12 and through the tubular members 8 and 9 to the exterior of the casing. The heater being in operation, air for the blower is taken in through the window at the top of the casing and flows down around the drum and into the intake for the blower. Since the drum itself becomes warm in a short time, this incoming air, flowing over the surfaces thereof, absorbs heat and therefrom reaches the heater in the blower intake in a warm condition. The incoming air forms a protective lining for the casing, preventing it from becoming heated; this being accomplished by the cooling action of the outer strata of the air flowing past the interior surfaces of the casing walls and through the absorption by the air of heat energy that might otherwise pass from the walls of the drum to the walls of the casing. As a result, the casing walls never become hot, and therefore no heat energy is wasted in this way, and neither are the attendants subjected to the annoyance and perhaps danger through touching a hot casing.

In order to make the apparatus effective, it is necessary that the contents of the drum be lifted and then dropped again as the drum rotates or, in other words, be tumbled. This may conveniently be accomplished by providing deep, longitudinal ribs 34 distributed along the inner surface of the cylindrical wall of the casing. With this arrangement, as the drum revolves, one rib after another serves as a lifting step for laundry engaged therewith, causing the same to be raised above the level of the axis of the drum and then to drop down. This so-called tumbling action effects a removal of the wrinkles in the wet fabrics and, also, opens or spreads the individual

pieces so that they will present large surfaces to the blasts of hot air entering the drum.

I have found that in order to secure the best results, the discharge or nozzle end of the blower conduit should extend a substantial distance into the drum. Possibly the effect of this is to permit the strainer 12 to act as a baffle upon which pieces of laundry may drop and thus be first subjected to the action of the moisture-bearing air that is trying to escape from the drum, and then be allowed to pass directly across the stream of fresh, heated air entering the drum.

In the event that a laundry handles many small lots which should be kept separated from each other, and none of which could be efficiently treated individually in a large drum, the drum may be divided into compartments by longitudinal partitions. Thus, in Fig. 5, I have shown two wire mesh partitions 35 and 36 each extending diametrically across the interior of the drum from one end to the other, and the two partitions being arranged at right angles to each other so as to divide the interior of the drum into four compartments, all of which are accessible through the single door opening in the front end of the drum.

The moisture-laden air that travels rearwardly through the stationary outlet sleeve 9 may be carried to any desired point before being discharged into the surrounding atmosphere. Usually, it will be sufficient to fasten the mouth of a bag (not shown) over the outer end of the member 9, thereby collecting the lint and preventing it from filling the air in the room in which the apparatus may be located.

While I have illustrated and described with particularity only the single preferred form of my invention, with a slight modification, I do not desire to be limited to the exact structural details thus illustrated and described; but intend to cover all forms and arrangements which come within the definitions of my invention constituting the appended claims.

I claim:

1. In a laundry drying machine, a casing, a drum rotatably mounted in the latter and having a large outlet leading to the exterior of the casing, said drum having a door opening through which laundry is inserted and removed, a door for said door opening, the drum being constructed to shut off direct communication between the interior of the drum and the surrounding space within the casing, a heater in the bottom of the casing, and means to cause air to flow into the top of the casing, between the exterior of the drum and the surrounding casing, then past the heater and then into the drum.

2. In a laundry machine, a casing, a drum mounted in the latter for rotation about a horizontal axis and having at one end a large central outlet leading to the exterior of the casing, said drum having a door opening through which laundry is inserted and removed, a door for said door opening, the drum being constructed to shut off direct communication between the interior of the drum and the surrounding space within the casing, the casing having an air inlet at the top, a blower in the bottom of the casing, a heater associated with the inlet to the blower, and a discharge conduit leading from the blower through said outlet and into the interior of the drum.

3. In a laundry machine, a casing, a drum mounted in the latter for rotation about a horizontal axis and having at one end a large central outlet leading to the exterior of the casing, said drum having a door opening through which laundry is inserted and removed, a door for said door opening, the drum being constructed to shut off direct communication between the interior of the drum and the surrounding space within the casing, the casing having an air inlet at the top, a blower in the bottom of the casing, a heater associated with the inlet to the blower, a discharge conduit leading from the blower through said outlet and into the interior of the drum, and a perforated cover over the inner end of said outlet.

4. In a laundry machine, a casing, a drum mounted in the latter for rotation about a horizontal axis and having at one end a large central outlet leading to the exterior of the casing, said drum having a door opening through which laundry is inserted and removed, a door for said door opening, the drum being constructed to shut off direct communication between the interior of the drum and the surrounding space within the casing, the casing having an air inlet at the top, a blower in the bottom of the casing, a heater associated with the inlet to the blower, a discharge conduit leading from the blower through said outlet and into the interior of the drum, and a dish-shaped wire screen within and fixed to the drum over said outlet and the adjacent end of said conduit.

5. In a laundry machine, a casing, a drum mounted in the latter for rotation about a horizontal axis and having in one end a large central outlet leading to the exterior of the casing, said drum having a door opening through which laundry is inserted and removed, a door for said door opening, the drum being constructed to shut off direct communication between the interior of the drum and the surrounding space within the casing, means in the drum to lift the contents of the latter and to permit them to drop as the drum revolves, the casing having an air inlet at the top, a blower in the bottom of the casing, a heater associated with the inlet to the blower, a discharge conduit leading from the blower through said outlet and into the interior of the drum, and a perforated cover over the inner end of said outlet.

6. In a laundry machine, a casing, a drum mounted in the latter for rotation about a horizontal axis and having in one end a large central outlet leading to the exterior of the casing, a door in the drum, the walls of the drum being imperforate except for the outlet and the door opening, the casing having an air inlet at the top, a blower in the bottom of the casing, a heater associated with the inlet to the blower, a discharge conduit extending from the blower through said outlet and a considerable distance into the interior of the drum, and a dish-shaped strainer within and fixed to the drum over said outlet and the adjacent end of said conduit.

7. In a laundry drying machine, a casing, a drum mounted in the latter for rotation about a horizontal axis and having in one end a large open outlet leading to the exterior of the casing and in its other end a door opening, the walls of the drum being imperforate except for the outlet and the door opening, a door for said door opening, a heater in the bottom of the casing, and means to cause air to flow into the top of the casing, between the exterior of the drum and the surrounding casing, past the heater and into the drum.

8. In a laundry machine, a casing, a drum

mounted in the latter for rotation about a horizontal axis and having in one end a door and in the other end a large central outlet leading to the exterior of the casing, the walls of the drum being imperforate except for the outlet and the door opening, a longitudinal perforated partition extending across the interior of the drum, the casing having an air inlet at the top, a blower in the bottom of the casing, a heater associated with the inlet to the blower, and a discharge conduit leading from the blower through said outlet and into the interior of the drum.

9. In a laundry drying machine, a casing, a horizontal drum rotatably mounted in the casing with one end spaced a short distance from a wall of the casing, said end of the drum and said wall of the casing having registering door openings, a door for the opening in said wall, a door for the drum, a frusto-conical sleeve fastened on the inner side of the door for the casing with its smaller end farthest from that door, a frusto-conical boss fastened on the door for the drum positioned partially in and partially out of said sleeve, and a spring within the sleeve loosely engaged with and exerting a pressure against the boss to force the doors apart, the parts being so proportioned that the boss lies far enough back in the sleeve, when the doors are closed, to be out of contact with the sleeve.

BERNHARD LINDBERG.