Sept. 26, 1961 F. PLÜMER 3,001,297

LAUNDRY DRYING APPARATUS

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Fig. 3

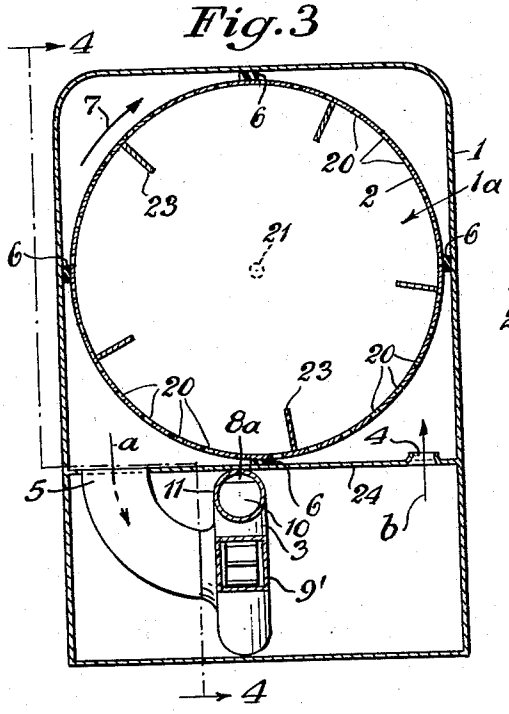


Fig. 1

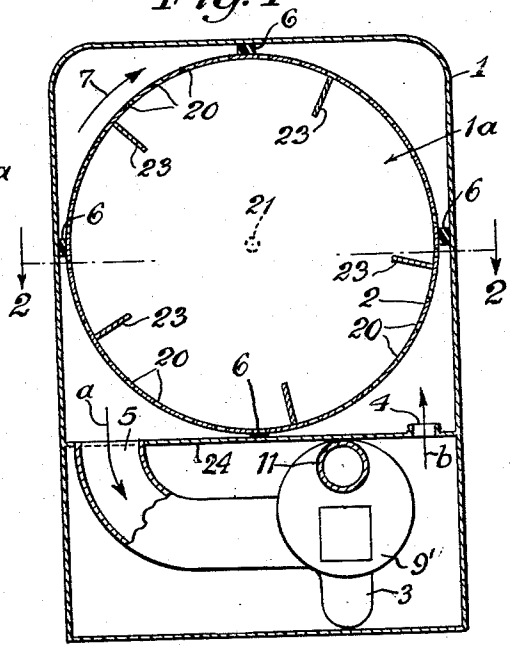


Fig. 4

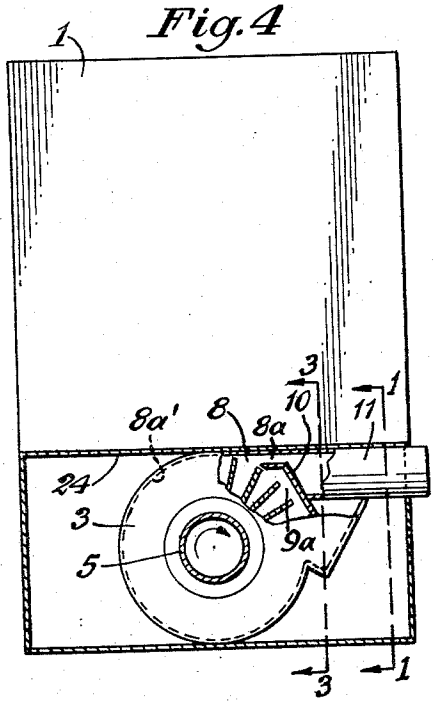
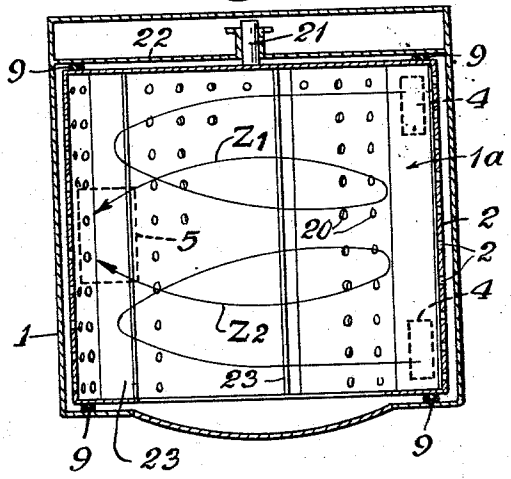


Fig. 2



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LAUNDRY DRYING APPARATUS

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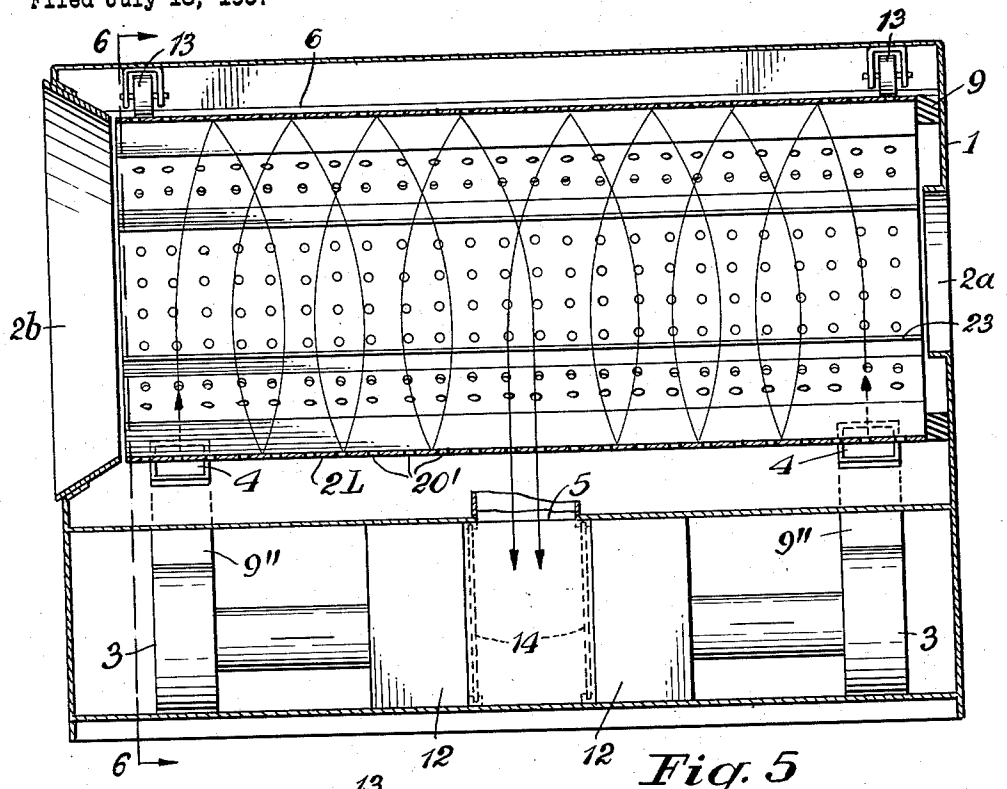

Fig. 5

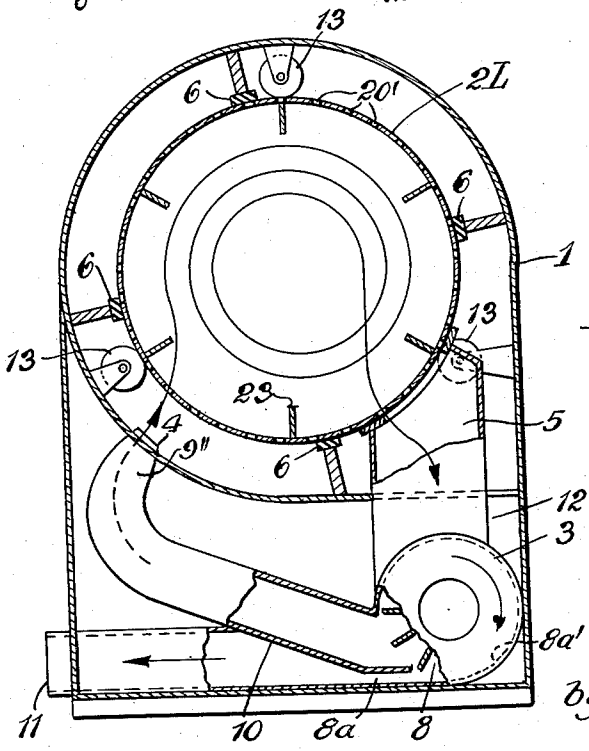

Fig. 6

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3,001,297
LAUNDRY DRYING APPARATUS

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6 Claims. (Cl. 34—133)

This invention relates to laundry drying devices and more particularly to drying devices in which hot air is circulated through a rotating drum containing laundry to be dried, and is a continuation-in-part of my application Serial No. 576,453 filed on April 5, 1956, now abandoned.

It is an object of this invention to provide a new and improved rotating drum laundry drying machine of increased efficiency. In prior drying devices of the rotating drum type a stream of air was heated and forced through the drum between inlet and outlet ports. The efficiency of such drying apparatus depends upon the length of the dry air path through the drum, the longer the path the better the efficiency. Consequently, it is highly desirable to increase the length of the dry air path through the drum.

In the present invention the dry air path is lengthened by providing two dry air streams, each of which traverses one half of the length of the drum. This is done by introducing dry air into the two opposite ends of the drum and by sucking the saturated air out of the drum at a point midway between its ends. The effect of this action is to produce two spiral air currents traveling from the opposite ends of the drum toward the center thereof where they unite and are sucked out of the drum.

A further object of the invention resides in the provision of a continuous laundry drying device of the rotating drum type. In accordance with this object, the invention provides a rotating drum open at its opposite ends, and positioned inclined if desired, so that wet laundry may be placed in one end of the drum and removed dry from the other end. By virtue of the fact that the dry hot air is introduced into the drum at its opposite ends and removed at the center of the drum, substantially none of the hot air escapes from the open ends of the drum. The arrangement is such that all of the hot air is retained within the drum and none passes from the ends of the drum to annoy the operator and reduce the efficiency of the machine. As a matter of fact, cool air flows into the drum with a pleasant cooling action on the end faces of the drum. By this inventive arrangement for continuous drying, the laundry is not only dried, but is also loosened and separated into single pieces so that the laundry at the discharge end of the drum will fall out or can be easily removed without the necessity of subsequent beating.

The above and other objects and features of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings which form a part of this specification and in which:

FIG. 1 is a cross sectional view taken on line 1—1 of FIGURE 4 of one embodiment of the invention,

FIG. 2 is a cross sectional view taken along line 2—2 of FIG. 1;

FIG. 3 is another cross sectional view taken on line 3—3 of FIGURE 4 of the invention similar to that of FIG. 1, but including a cross sectional view of the blower of the dryer.

FIG. 4 is a cross sectional view taken along the line 4—4 of FIG. 3;

FIG. 5 is a cross sectional view of another embodiment of the invention intended for continuous drying operations; and

FIGURE 6 is a vertical cross-sectional view taken on line 6—6 of FIGURE 5 looking in the direction of the

arrows and showing the embodiment of the invention illustrative in FIGURE 5.

Referring to FIGS. 1–4 it will be noted that a drum 2 having perforations or openings 20 therein is supported for continuous rotation in the direction of arrow 7 on an axle 21. The axle 21 is carried by a backing plate 22 which, in turn, is securely fastened to a stationary housing 1 for the drum. The drum 2 may be provided with interior ribs or grippers 23 which serve to move the laundry along a path which is as long as possible through the drying air current. Air, heated by any suitable means, not shown, is blown into the drum housing 1 through two inlet slots or ports and by means of a blower 3. From ports 4 the hot air passes through perforations 20 into the interior of the drum where it travels toward the median portion of the drum in two helical streams Z_1 and Z_2. Another opening 6 in plate 24 serves as an exhaust port for the hot air moving in the streams Z_1 and Z_2. As shown in FIG. 2, the port 5 is located at the midportion of the dryer on the side of the housing opposite from ports 4 so that the three openings are disposed in the shape of a triangle. It will thus be seen that warm, dry air enters the drum from one side of a vertical plane extending through the axis of the drum while it is discharged through the outlet 5 arranged on the other side of said plane. As will be understood, the arrangement is such that hot dry air entering ports 4 will travel in helical paths Z_1 and Z_2 to the center of the drum from whence it will pass out through port 5 to blower 3. The air is then radially directed toward each of the two end portions of the drum where it again enters the drum through the openings 4.

To prevent the dry air from passing directly to outlet port 5 without passing through the drum 2, four sealing ribs 6 are provided around the outer periphery of the drum, spaced apart by 90 degrees. In addition, sealing means 9 are provided between the front side of drum 2 and the corresponding wall of housing 1. With this arrangement, four chambers are provided between the drum 2 and housing 1. The lower two chambers are used to accommodate entry and exit of the drying air, while the upper chambers are employed to reduce the current speed of the air and to equalize the same whereby the efficiency of the apparatus is improved.

In FIGS. 3 and 4 the design of the blower 3 is disclosed. Air enters the blower in the direction of arrow *a* and leaves in the direction of arrow *b* from whence it flows into the interior 1*a* of the drum 2. The pressure channel 8 of the blower 3 is divided into two channels 8*a* and 9*a* by the guiding plate 10 which is bent at an angle to accommodate the extraction of water particles from the air stream passing therethrough. Air is directed to the inlet ports 4 from the blower 3 through an open-ended channel 9'. Water particles in the air within the blower are thrown by centrifugal force outwardly against the wall 8*a*'. From wall 8*a*' they are forced through partial channel 8*a* and channel 11 to the atmosphere. By adjustment of guiding plate 10 by suitable means, not shown, the cross sectional areas of the partial channels 8*a* and 9*a* can be varied to accommodate different operating conditions.

In FIGS. 5 and 6 the embodiment of the invention shown comprises a longitudinal drum 2L carried within a housing 1 and provided with perforations 20' in its outer wall. An opening 2*a* at one end of the drum and opening 2*b* at the other end provide an entrance and exit, respectively, for the laundry. The drum is carried for rotation on rollers 13 which are supported by housing 1 for free rotary movement. Sealing members 6 and 9 divide the interior of housing 1 into four chambers similar to those shown and described with reference to FIGS. 1–4. Hot air entering the drum 2L at the

two inlet ports 4 passes in helical streams to the outlet channel 5, arranged at the median portion of the drum. From channel 5, the moist air passes through screens 14 and the heaters 12 into the blower 3. The blower, in turn, conveys the hot dry air through channels 9'' to the inlet ports 4 located at the ends of the drum 2L. A baffle plate 10 divides the pressure channel 8 of the blower 3 into a moist air outlet channel 11 and the dry air circulating channel 9'' in a manner similar to the arrangement shown in FIGS. 3 and 4.

The arrangement is such that wet or damp pieces of laundry placed in the drum 2L through opening 2*a* will be tumbled as the drum rotates and forced to the left until they reach opening 2*b* from which they are discharged in a dry condition from the drum. Since the hot dry air enters the drum from its opposite ends, very little, if any, will escape out of the openings 2*a* and 2*b* to reduce the efficiency of the apparatus and annoy the operator who is placing clothes in the opening 2*a*.

Although the invention has been described in connection with certain specific embodiments, it will be readily apparent to those skilled in the art that various changes in form and arrangement of parts can be made to suit requirements without departing from the spirit and scope of the invention.

What I claim is:

1. In a drying apparatus comprising a stationary housing having opposing openings, a horizontal partition wall in the lower portion thereof providing a heating chamber and a drying chamber thereabove, an open ended drum rotatably mounted above the horizontal partition wall in said housing provided with a plurality of perforations distributed throughout the periphery thereof, spaced longitudinal sealing strips between the housing and drum forming a series of chambers, openings formed in said partition wall at each end thereof, means for heating and circulating air through said drum, duct means below said partition wall for directing air toward each end of said drum and to the openings in said partition wall, said air heating and circulating means being disposed to one side of a vertical plane extending through the axis of said rotating drum and communicating with one of said chambers, said partition wall being provided with an outlet opening located on the other side of said vertical plane at a point substantially mid-way between the end of said drum communicating with another of said chambers and fan means for circulating air through said air inlets and out of said air outlet.

2. The combination claimed in claim 1 in which said sealing strips are formed by radially and inwardly extending ribs on the inner surface of said housing projecting into said drying chamber and slidably engaging the peripheral surface of said rotary drum, said ribs being arranged in circumferentially spaced longitudinal relation to permit warm air to pass into the drying chamber at opposite ends thereof and travel through a spiral path to the central portion of the housing and drying chamber where it is returned through the outlet opening in said partition wall to said other chamber.

3. In a drying apparatus comprising a stationary housing having opposing openings, an open ended rotatable drum mounted in said housing having perforations distributed throughout the periphery thereof, a series of circumferentially spaced axially extending ribs depending from the housing between the inner walls of said housing and the outer periphery of said drum to define a plurality of chambers extending along the axial length of the drum around the circumference thereof, means for heating and circulating air located near the opposite ends of said drum in one of said chambers and offset to one side of a vertical plane extending through the axis of the drum to direct the air in a direction generally parallel to the vertical plane through the drum axis, said last-named means including fan means for circulating dry, hot air into opposite ends of said drum, and duct means in the lower portion of said casing and offet on the opposite side of said vertical plane extending through the drum axis and arranged in another of said chambers at a point substantially midway between the opposite ends of said drum, said duct means being in communication with the inlet of said fan means for directed air radially toward each of the two end portions of the drum.

4. In a clothes drying apparatus comprising a housing having opposing openings, an open ended rotatable drum having end portions and a plurality of perforations distributed throughout the periphery thereof, said opposing openings communicating with the open ends of said drum, means forming a plurality of circumferentially spaced chambers between the outer periphery of the drum and the inner wall of said housing, said chambers being formed by equidistantly spaced circumferentially arranged longitudinal ribs depending from said housing and extending along the axial length of said drum, means for heating and circulating air including fan means located on one side of a vertical plane extending through the drum axis, duct means communicating with the fan means and directing the air radially toward each of the two end portions of the drum to one of said chambers, and an exhaust port in the lower portion of said housing offset on the other side of a vertical plane extending through the drum axis from the side on which said fan means is located and in communication with another of said chambers at a point substantially mid-way between the opposite ends of the drum and in communication with the intake of said fan means.

5. A combination as set forth in claim 4 wherein the open ends of the drum permit the feeding of clothes to be dried and the discharge thereof after drying.

6. In a clothes drying apparatus, comprising a stationary housing having opposing openings, an open ended rotatable drum mounted within said housing having perforations distributed throughout the periphery thereof, the openings in said housing communicating with the open ends of the drum, a series of axially extending sealing ribs depending from said housing and arranged in circumferentially spaced apart relation and interposed between the inner walls of said housing and the peripheral surface of said drum to define a plurality of chambers extending along the axial length of the drum, heating means arranged one near the opposite ends of said drum in one of said chambers and in the lower portion of said housing offset to one side of a vertical plane extending through the drum axis for directing the air in a direction generally parallel to the direction of the vertical plane through the drum axis, means for circulating hot air from said heating means including fan means, duct means communicating with said fan means and directing the air radially toward each of the two end portions of the drum so that said air will travel through a spiral circulatory pathway in the drum toward the intermediate portion thereof, and an exhaust channel in the lower portion of said housing for said air having communication with one of said chambers at a point substantially mid-way between the opposite ends of said drum and arranged on the other side of the vertical plane extending through the drum axis and offset therefrom, and means including a duct for conducting the air passing through said exhaust channel to the intake of said fan means.

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