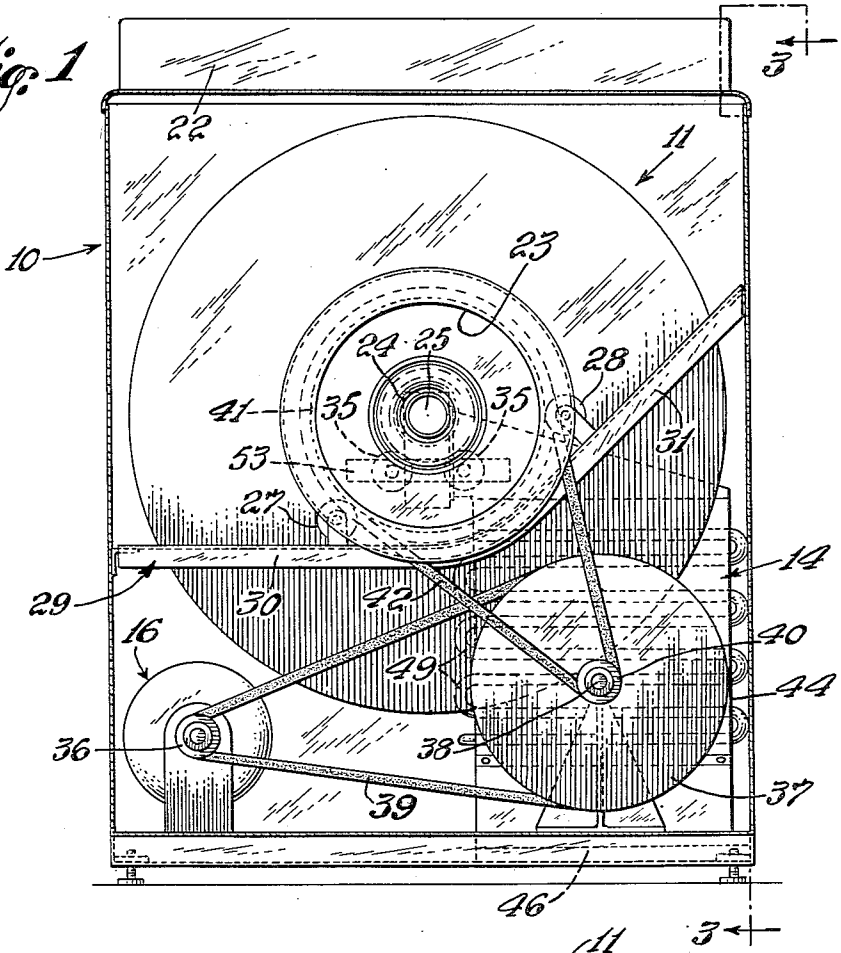
Oct. 15, 1957 J. P. GLASBY, JR 2,809,442

LAUNDRY DRYING MACHINE

Filed June 25, 1954 3 Sheets-Sheet 1

Fig. 1



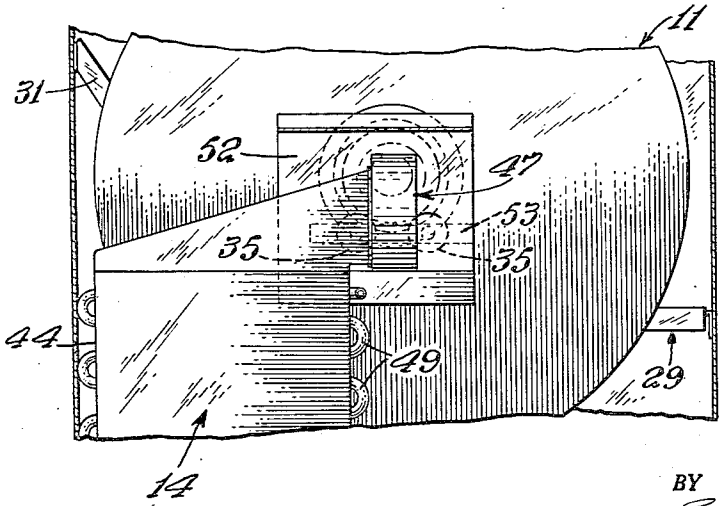


Fig. 2

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Filed June 25, 1954 3 Sheets-Sheet 2

Fig. 3

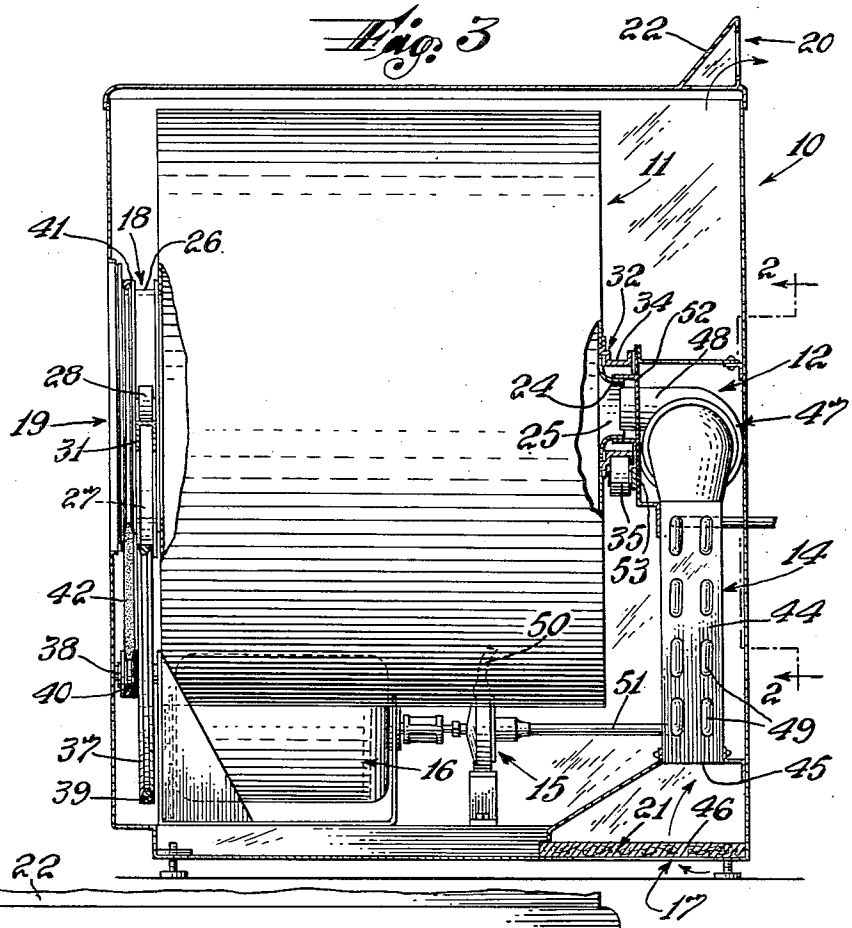
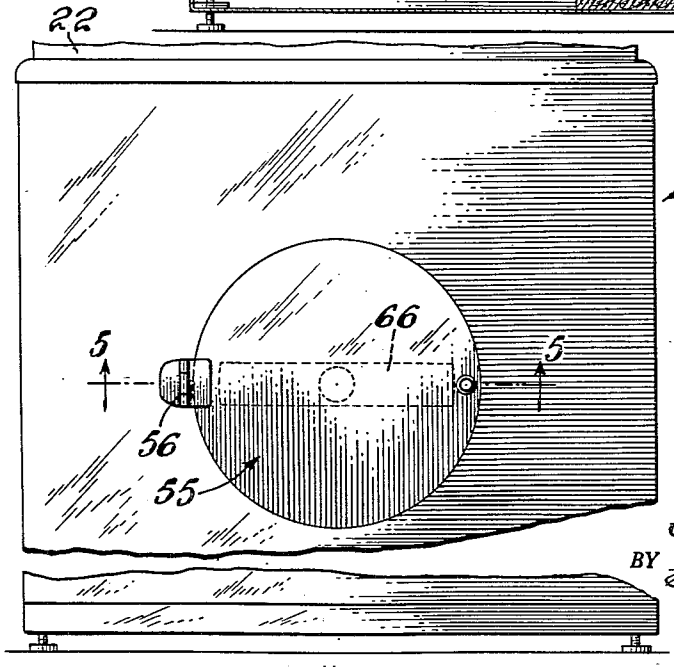


Fig. 4



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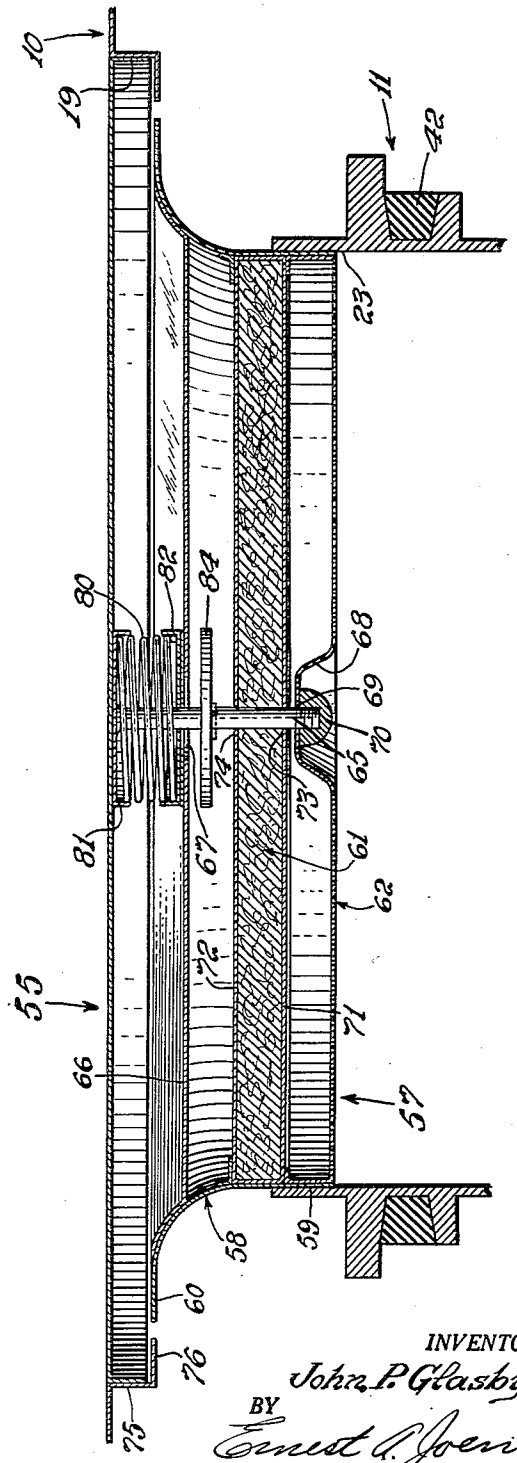
Filed June 25, 1954 3 Sheets-Sheet 3

Fig. 5



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LAUNDRY DRYING MACHINE

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10 Claims. (Cl. 34—82)

The present invention relates to drying machines of the rotary drum type, and, more particularly, to a machine for drying laundry after it has been washed.

The primary object of the present invention is to provide such a machine which is simple and economical in construction and is practical and efficient in operation.

Another object is to provide such a machine which will not scorch the laundry after it has been dried and is permitted to remain in the machine, whereby the machine need not be frequently attended or supervised and automatic control means are not required.

Another object is to provide such a machine wherein an improved drum mounting arrangement is utilized.

Another object is to provide such a machine wherein the drying air is introduced into the drum in a novel manner.

Another object is to provide such a machine wherein the drying air is circulated in a manner to utilize practically the entire heat content thereof.

Another object is to provide such a machine wherein the drying air is filtered before being introduced into the drum.

Another object is to provide such a machine where lint is removed from the air leaving the drum.

A further object is to provide a novel arrangement for supporting the lint removing means.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

A preferred embodiment of the invention has been chosen for purposes of illustration and description, and is shown in the accompanying drawings, forming a part of the specification, wherein:

Fig. 1 is a front elevational view of a drying machine in accordance with the invention with the front wall of the casing broken away.

Fig. 2 is a fragmentary rear elevational view illustrating the manner in which the back of the drum is supported.

Fig. 3 is a sectional view taken substantially along the line 3—3 on Fig. 1.

Fig. 4 is a fragmentary front elevational view of the drying machine.

Fig. 5 is an enlarged sectional view taken substantially along the line 5—5 on Fig. 4, illustrating the casing front wall closure and the filter closure for the outlet of the drum.

Referring to the drawings, there is shown a clothes drying machine generally comprising a casing **10**, a drum **11** rotatably mounted in the casing, means **12** for circulating air into the drum, a heat exchanger **14** for heating the air, a pump **15** for circulating hot water through the heat exchanger and a motor **16** for driving the drum and the pump.

The casing **10** is generally cubical in shape, and is

airtight except for an air inlet **17** at the bottom adjacent the back for admitting air to the heat exchanger, a front wall opening **19** adapted to be sealed while the machine is in use, as described hereinafter, and an air discharge outlet slot **20** at the top adjacent the rear thereof. Suitable air filter means **21** extend across the air inlet **17**, and a deflector or hood **22** extends across the slot **20** for directing the discharge air rearwardly of the casing (Figs. 1 and 3).

The drum **11** is generally cylindrical and is imperforate except for a central front wall opening **23** adjacent the casing opening **19** for depositing laundry therein and a central rearwardly extending tubular portion **24** at the back wall formed with an opening **25** through which heated air is directed into the drum.

In order to rotatably support the drum, the front wall thereof is provided with a collar **18** having a central circular recess or groove **26** surrounding the opening **23** for receiving a pair of rollers **27** and **28** mounted on a structural member **29** extending across the casing at the front of the interior thereof. This member has a horizontal section **30** on which the roller **27** is mounted and has a section **31** inclined at an angle of about 45° with respect to the horizontal on which the roller **28** is mounted, and the rollers are circumferentially spaced about 135° apart with respect to the axis of rotation of the drum for the purpose described hereinafter. At the rear wall of the drum, a pulley or collar **32**, formed with a central circular recess or groove **34**, surrounds the tubular portion **24** and is secured to the back of the drum, and a pair of rollers **35** are mounted on the upper end of the heat exchanger for rotatably supporting the drum (Fig. 3).

The motor **16** preferably drives the pump directly from one end of its shaft (Fig. 3); and effects rotation of the drum through a speed reduction arrangement (Figs. 2 and 3) comprising a small pulley **36** on the other end of the motor shaft, a large pulley **37** supported on a shaft **38**, a belt **39** connecting the pulleys **36** and **37**, a small pulley **40** on the shaft **38**, a cylindrical surface **41** on the front collar **18** adjacent the recess **26** (Figs. 3 and 5), and a belt **42** connecting the pulley **40** and the surface **41**. As shown herein, the shaft **38** supporting the pulley **40** which acts as a drive wheel for the drum is substantially intermediate the rollers **27** and **28** with respect to the axis of rotation of the drum.

The heat exchanger **14** comprises a vertical stack **44** within the casing **10** having an air inlet opening **45** at the bottom adjacent the casing opening **17**, an air filter **46** intermediate the openings **17** and **45**, a motor driven blower **47** having an inlet in air flow communication with the upper end of the stack and having an outlet in the form of a sleeve **48** extending at least partially into the tubular portion **24** of the drum to direct air through the opening **25**, and a heat exchange coil **49** in the stack between the upper and lower ends thereof.

The coil **49** is constructed and arranged to conduct hot water therethrough which heats the air entering the stack. The hot water is supplied by a conventional hot water heater (not shown) having its outlet connected to the pump inlet **50**. The pump outlet **51** is connected to the coil inlet and the coil outlet is connected to the inlet of the heater to recirculate the water.

The upper end of the heat exchanger preferably is structurally connected to the casing, such structure including an upright plate or frame **52** through which the blower sleeve **48** extends and on which the pulleys **35** are rotatably mounted, for example by a rigid strap **53** (Fig. 2).

As shown more particularly in Figs. 4 and 5, the front wall casing opening **19** is provided with a door or closure

55 hinged to the casing at 56, and the front wall drum opening 23 is provided with a closure 57.

The closure 57 (Fig. 5) comprises a shell 58 having an inner cylindrical section 59 and a flared outer section 60, a filter element 61 removably disposed in the shell for removing lint from the air discharged from the drum, and a perforated disc or plate 62 between the filter element and the inner end of the shell adapted to be disposed within the drum opening. The closure 57 is supported by the door 55 to facilitate applying and removing the same to and from the drum opening 23, simply by opening and closing the casing closure 55, and is rotatably mounted to enable the same to rotate with the drum when it is applied thereto.

Suitable means for so mounting and supporting the closure 57 are illustrated herein which comprise a stud 65 secured to the inner wall of the casing door 55, a strap 66 secured within the flared section 60 of the shell having an aperture 67 through which the stud 65 extends, a central recess 68 on the inner wall of the disc 62 formed with an aperture 69 through which the stud 65 extends, and a smooth faced nut 70 or other suitable readily removable means secured to the inner end of the stud and disposed in the recess to minimize abrasize contact thereof with the laundry in the drum. As shown, the filter element includes two end plates 71 and 72 formed with apertures 73 and 74 through which the stud 65 extends, whereby the closure is rotatably supported at a plurality of points along the stud.

The closure 57 is constructed and arranged so that the outer end of the flared section 60 is spaced from the inner wall of the door 55, and a ring 75 secured within the front wall casing opening 19 has a flange 76 extending annularly about the free edge of the section 60 and spaced therefrom, whereby the drum closure in effect is provided with an annular opening for directing air about the outer periphery of the drum. This air still contains some heat and serves to maintain the drum in a warm atmosphere to prevent heat losses which otherwise would occur if the drum were surrounded by cooler air at room temperatures.

Another feature of the casing and drum closures is that the drum closure is urged into the drum front wall opening by a spring arrangement which comprises a helical cylindrical spring 80 surrounding the stud 65, and caps 81 and 82 for receiving the ends of the spring having a central aperture for receiving the stud and respectively bearing against the inner wall of the casing closure 55 and the outer surface of the strap 66 under the influence of the spring. A stop, such as a disc 84, is provided on the stud 65 between the filter element end plate 72 and the strap 66, whereby, when the closures 55 and 57 are withdrawn from their respective openings, the spring urges the inner surface of the strap against the disc 84. This arrangement maintains the closure 57 in central registry with the drum opening 23 and facilitates insertion of this closure when the door or closure 55 is being closed. Also, the closure 57 is maintained in position on the stud to prevent wobbling thereof while opening the door or closure 55.

In operation, the closures 55 and 57 are withdrawn to unclose the openings 19 and 23 and a batch of wet laundry is placed into the drum through these openings, the laundry having been passed through a wringer or centrifuged to remove most all of the water therefrom except that which remains absorbed by the material. The closures are then applied, and the drum motor and the blower motor are started thereby causing hot water to be circulated through the heat exchanger and warm air to be circulated through the rotating drum. The warm air removes the moisture from the laundry and this moisture is carried away by the spent air exhausted from the casing through the slot 20.

In so drying the laundry, scorching thereof is prevented even if the dryer is unattended for a considerable length of time after the laundry has been dried. Also, it has been found that the laundry can easily be dried to a damp state to facilitate ironing thereof without frequent attendance of the dryer by the operator because the laundry is dried slowly and not bone-dry.

Another feature of the machine illustrated and described herein is that the lint of the material being dried is confined within the drum by the filter element 61, whereby lint contamination of the casing is prevented and the danger of lint fires or explosions is eliminated. The lint filtered from the air leaving the drum is collected between the disc 62 and the filter end plate 71, and can readily be removed, simply by unfastening the nut 70 or the like from the stud 65 to release the disc 62. Such lint tends to mat against the plate 71 and improves the efficiency of the filter element without unduly restricting the flow of air therethrough.

In order to illustrate the operation of the dryer in actual use, a number of tests were conducted by placing ten pounds of wet laundry in the drum, rotating the drum about fifty revolutions per minute, circulating about four gallons of water per minute and circulating about one hundred cubic feet of heated air per minute in each instance. The water temperature ranged from 120° to 180° F. and the resulting temperature of the heated air was about ten degrees lower than the water temperature in each instance. It was found that about two pounds of water were removed from the laundry in about fifty-five minutes at the higher water temperature and in about one hour at the lower water temperature.

From the foregoing description, it will be seen that the present invention provides a simple, practical, safe and reliable laundry drying machine which is particularly adapted for household use. The machine is economical in construction and operation, and requires a minimum of maintenance and repair because it is adapted to withstand such rough usage to which it may normally be subjected.

As various changes may be made in the form, construction and arrangement of the parts herein, without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in any limiting sense.

I claim:

1. In a laundry drying machine, the combination of a casing; a drum in said casing having a front wall provided with an opening for depositing laundry into said drum and having a back wall provided with a central opening; means for rotatably supporting the back of said drum including an annular recessed pulley secured to said drum adjacent said back wall opening and a pair of rollers fitting into the recess of said pulley and means for mounting said rollers to support said pulley; means for rotatably supporting the front of said drum including an annular recess on said drum and a pair of rollers fitting into said recess and means for mounting said last mentioned rollers approximately 135° apart with respect to the axis of rotation of said drum; and means for rotating said drum including a cylindrical surface on said drum, a drive wheel substantially intermediate said last mentioned rollers with respect to the axis of rotation of said drum, and belt means operatively connecting said drive wheel and said cylindrical surface.

2. A laundry drying machine according to claim 1, wherein said last mentioned rollers are mounted on a unitary structural member secured between the sides of said casing at the front thereof, said member having a horizontal section for supporting one of said last mentioned rollers and having a second section inclined at an angle of about 45° with respect to said first section for supporting the other of said last mentioned rollers.

3. In a laundry drying machine, the combination of a casing having a front wall opening, a door for sealing said opening, a rotatable drum in said casing having a

front wall provided with an opening facing said opening of said casing and having a back wall provided with a central opening, said drum being imperforate and its said front and back openings constituting the sole means for respectively admitting and discharging air, means for heating air and introducing the heated air directly into said back wall opening including means for filtering the air, a closure for said drum front wall opening carrying means for filtering air discharged from said drum, and means carried by said door for rotatably supporting said closure.

4. In a laundry drying machine according to claim 3, wherein spring means are mounted on said closure supporting means for urging said closure into said drum front wall opening.

5. In a laundry drying machine according to claim 3, wherein said drum closure has an opening for directing filtered air into said casing exteriorly of said drum, and said casing has an outlet at the back for discharging the filtered air leaving said drum.

6. In a laundry drying machine according to claim 5, wherein said drum closure opening is an annular slit for directing the air radially outwardly towards the periphery of said drum to cause the filtered air to flow about the periphery of said drum.

7. In a laundry drying machine according to claim 6, wherein said discharge outlet is an elongate slot having a length about equal to the diameter of the drum and located at the top wall of said casing.

8. In apparatus of the class described, the combination of a casing having a front wall opening, a door

hinged on said casing for closing said opening, a rotatable drum in said casing having a front wall provided with an opening facing said casing opening, a stud secured to the inner wall of said door adapted to extend into said drum opening, a closure assembly for said drum opening including filter means mounted slideably and rotatably on said stud, and removably securable means on the free end of said stud for retaining said closure assembly on said stud.

9. In apparatus according to claim 8, wherein a spring carried by said door urges said closure assembly into said drum opening and a stop on said stud for limiting the extent of sliding movement of said closure assembly on said stud.

10. In apparatus according to claim 8, wherein an annular flange is provided at the inner side of said casing opening, and said closure assembly includes an annular flange section concentrically disposed within said flange and adjacently spaced therefrom to provide an annular slit for directing air passing through said closure assembly towards said drum and causing the air to flow substantially uniformly about said drum.

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