Aug. 22, 1961 R. D. SHAPTER 2,996,809

CLOTHES DRYER

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Fig. 1

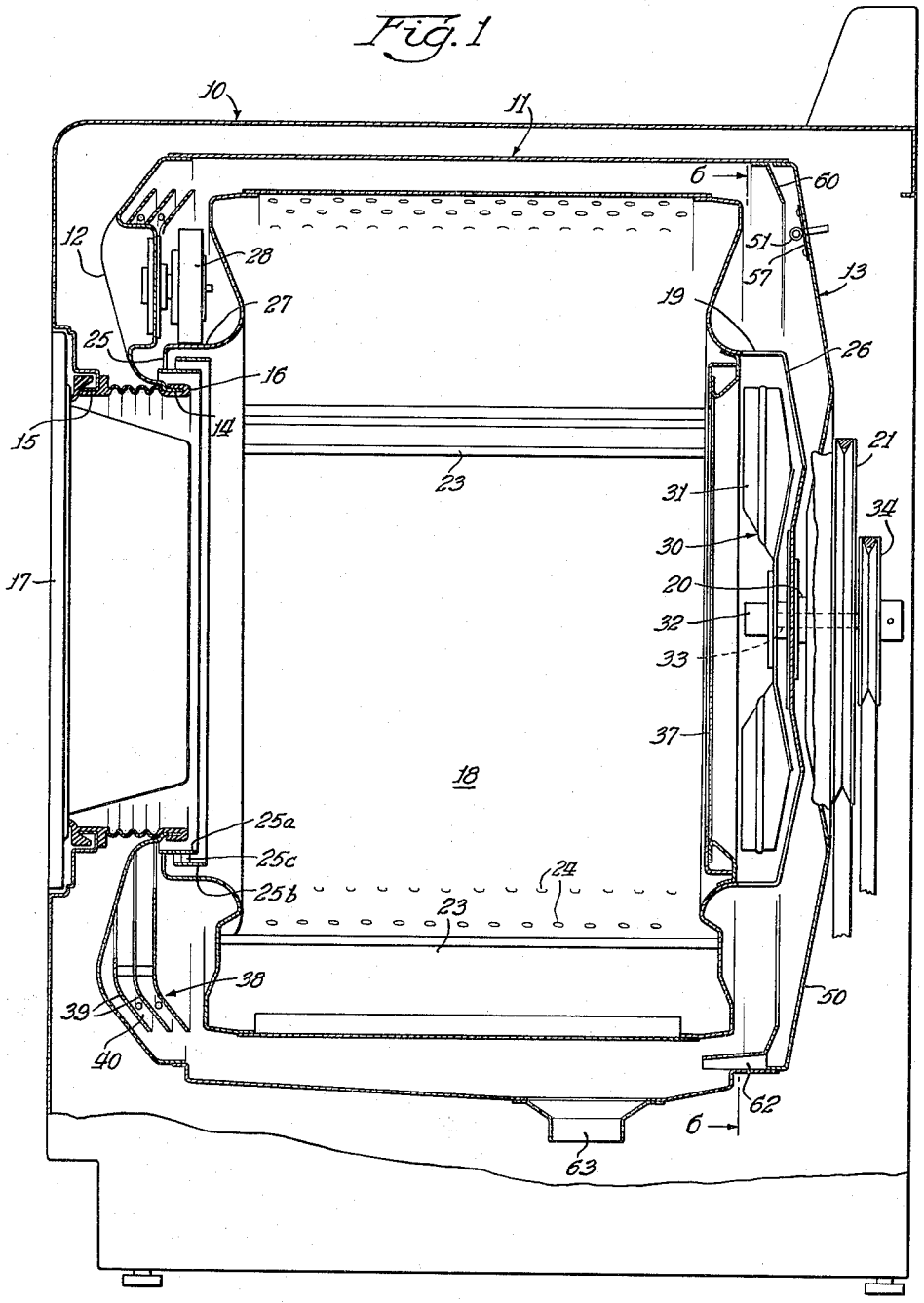

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Fig. 2

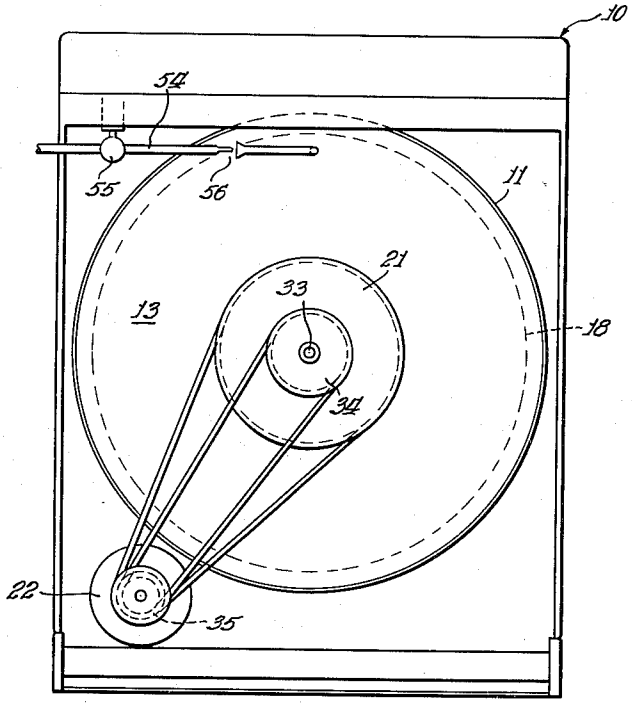

Fig. 6

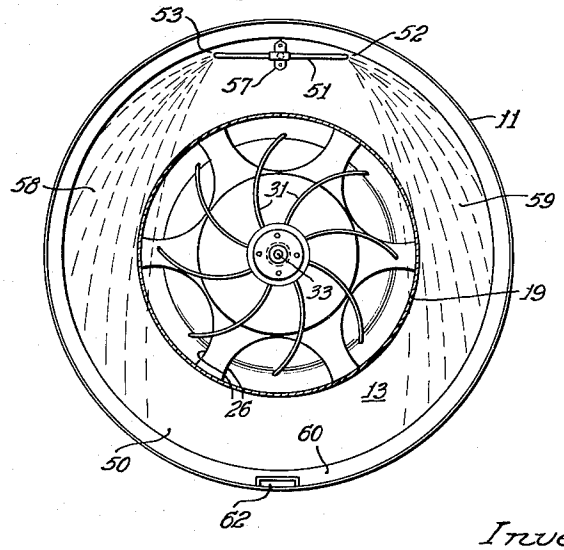

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Fig. 3

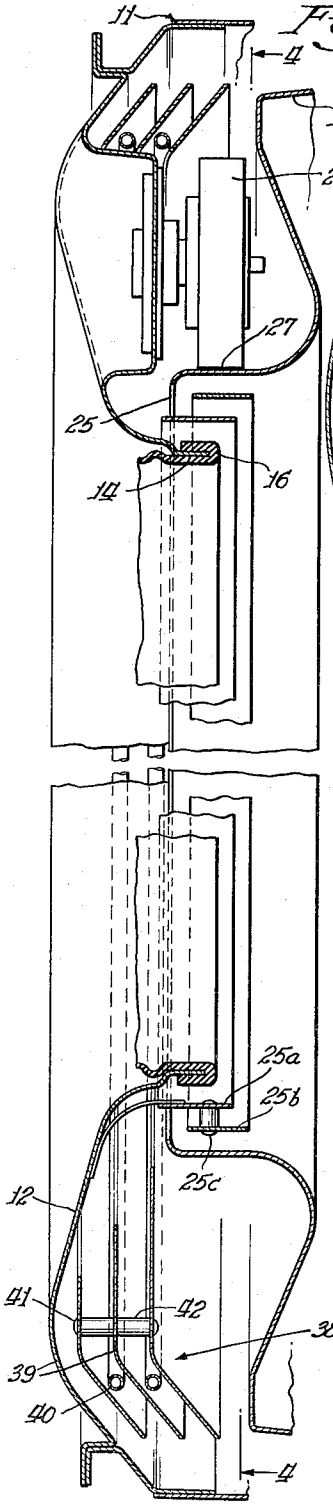


Fig. 4

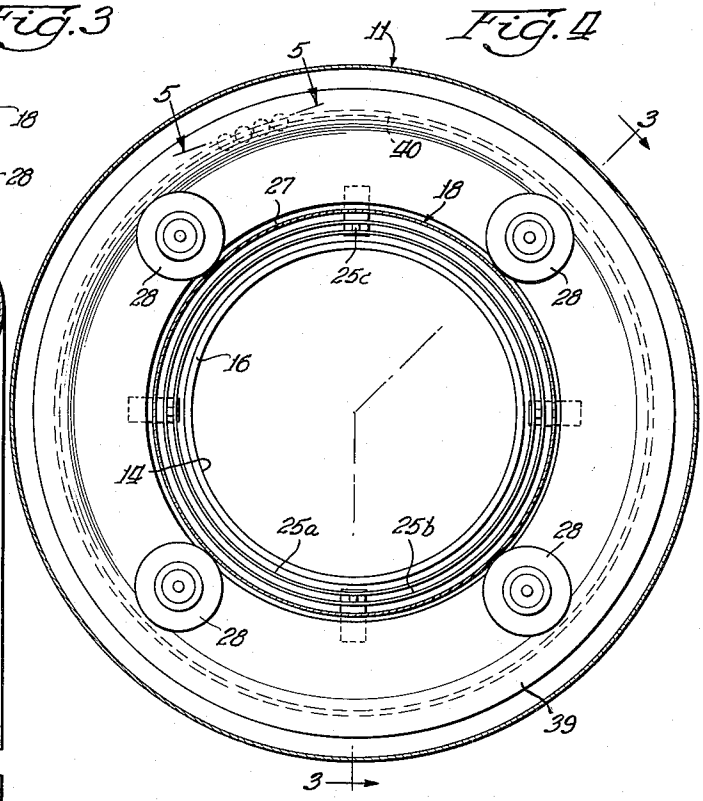
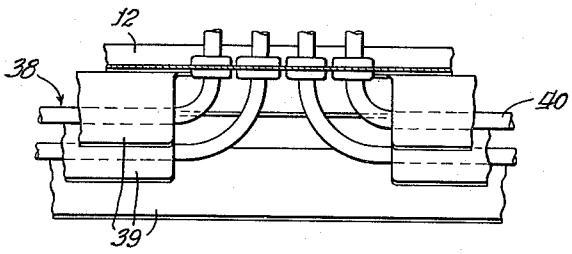


Fig. 5



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2,996,809
CLOTHES DRYER

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This invention relates to an improved apparatus for drying clothes and the like and particularly to domestic clothes dryers employing a closed, condensate-type drying system.

Due to the problem of objectionable lint and heated moist air that is discharged from conventional domestic dryers employing heated forced air drying and also due to the inefficiency of open drying systems, it has been proposed to use a closed system for the drying of clothes in the home. Such a dryer usually employs a closed, recirculating air system wherein the moist, heated air is caused to pass through or over a spray or film of cool water whereby the cool water causes condensation of the water vapor in the moist air and dries the air. The thus dryed air is again heated and recirculated through the clothes until all of the moisture has been removed therefrom.

It is an object of the present invention to provide an improved closed, condenser-type dryer of simple and compact construction.

It is another object of the invention to provide a condensate dryer having a shorter time for the drying operation than known condensate dryers.

The objects of the invention are accomplished by the particular construction disclosed which provides large duct areas within the dryer for the movement of large volumes of air circulated by a large fan.

The invention consists of the novel constructions, arrangements, and devices to be hereinafter described and claimed for carrying out the above stated objects and such other objects as will be apparent from the following description of a preferred embodiment of the invention, illustrated with reference to the accompanying drawings, wherein:

FIG. 1 is a sectional elevation of the clothes dryer of the present invention;

FIG. 2 is a rear elevation;

FIG. 3 is an enlarged sectional view of the heating element employed in the present dryer;

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

FIG. 5 is a cross sectional view taken on line 5—5 of FIG. 4; and

FIG. 6 is a view looking into the rear of the casing 11, and taken on the line 6—6 of FIG. 1.

Referring to the drawings, the numeral 10 designates a cabinet in which the present dryer apparatus is disposed. The dryer apparatus comprises an imperforate casing 11 having a front wall 12 and a rear wall 13, the casing 11 being fixedly secured to the cabinet 10 by any suitable means (not shown). An access opening 14 is provided in the front wall of the casing 11 and a corresponding opening 15 is provided in the cabinet 10. A gasket 16 connects the two openings and a door 17 is provided to close the opening 15.

A basket 18 is provided within the casing 11 for the reception of damp clothes to be dryed and is rotatably supported by means of spiders 19 on a sleeve shaft 20 attached to the rear wall 13 of the casing 11. A pulley 21 is fixedly secured to the shaft 20 and the pulley 21 is adapted to be rotated through a belt by an electric motor 22 (FIG. 2) at a relatively slow speed, for example 50 r.p.m., to rotate the basket 18 and tumble the clothes

therein during the drying operation. A plurality of baffles 23 are provided on the inner periphery of the basket 18 for lifting the clothes as the basket is rotated.

As seen in FIG. 1 the basket 18 has a plurality of openings 24 therein but it is to be understood that an imperforate basket can be used and the same advantages would be obtained by the present invention. The basket 18 is provided with a front opening 25 spaced from the opening 14 of the front wall of the casing 11. An annular ring 25*a* is suitably attached to the front wall 12 of the casing 11 and a second annular ring 25*b* of larger diameter is attached to the ring 25*a* and spaced therefrom by a plurality of pins or rivets 25*c*. The rear wall of the basket 18 is provided with a plurality of openings 26 formed by the spider 19. The front of the basket 18 has a flange 27 defining the opening 25 and the front wall 12 of the casing 11 has a plurality of bearing rollers 28 secured thereto so that the front of the basket is supported by the rollers 28 as seen in FIG. 4. If the sleeve shaft 20 is supported with sufficient rigidity to the rear wall 13 of the casing 11, the rollers 28 may be dispensed with. Air circulating means in the form of a suction type fan 30 is provided in the rear wall of the basket 18. Fan 30 has a plurality of curved blades 31 fixedly secured to a hub 32, which hub is driven by a shaft 33 and pulley 34. The pulley 34, is connected to a pulley 35 on the electric motor 22. The fan 30 is of a very large diameter (for example, 16 inches) and is rotated at a relatively low speed (such as 1100 r.p.m.) to provide a high rate of air flow through the dryer (approximately 450 c.f.m.).

To prevent the clothes within the basket from engaging or interfering with the operation of the fan 30, a screen 37 is fixedly secured to the rear of the basket. The screen 37 may be made of any foraminous material but preferably comprises a perforated disc as shown.

A heater assembly 38 is fixedly secured to the front wall 12 of the casing 11 and comprises a plurality of spaced baffle members 39 having Calrod type heating coils 40 therebetween. The baffles 39 are secured together by a plurality of pins 41 and spaced by spools 42. The Calrod type heating coils 40 give off primarily radiant heat rays which are absorbed by the baffles 39. The air from the fan 30 flows across both sides of each of the baffles 39 as seen in FIG. 1 wiping the heat therefrom. The heater assembly 38 thus acts as a radiant to convection heat exchanger.

The rear wall 13 has an inclined wall portion 50 which serves as the condenser surface of the dryer. The wall portion 50 is so disposed with respect to the outlet of the fan 30 so that a portion of the air discharged by the fan impinges against the wall portion 50. A film of cool water is supplied to the wall portion 50 by a double ended nozzle 51 having outlets 52 and 53. Water is supplied to the nozzle 51 through a pipe 54 which is connected to the water main. A solenoid operated valve 55 is provided in the water pipe 54 and a vacuum breaker 56 is also provided in the water pipe. The nozzle 51 is attached by a bracket 57 to the interior of the wall portion 50 of the rear wall 13. It will be noted from FIG. 6 that the nozzle 51 is disposed near the top of the rear wall 13 and that the outlets 52 and 53 are so disposed as to direct two separate films of water 58 and 59 over the wall portion 50. A peripheral baffle 60 is secured to the casing 11 adjacent the rear wall 13 and functions as a retainer for the water discharged by the nozzle 51 to confine the water to the rear wall of the casing. A passage 62 is provided in the bottom of the baffle 60 so that the water may pass into an outlet 63 from whence it is discharged to drain.

Operation

Damp clothes as they come from a domestic washer are placed in the basket **18** and the door **17** is closed. A suitable control mechanism (not shown) is then actuated to start operation of the dryer. The control energizes the electric motor **22** and the motor drives the pulleys **21** and **34** to rotate the basket **18** at about 50 r.p.m. and the fan at about 1100 r.p.m., respectively. The control also energizes the solenoid valve **55** to admit cool water from the pipe **54** to the nozzle **51** and at the same time, the heater **38** is energized. It is to be understood that appropriate thermostats are provided in the dryer to prevent excessive heat within the dryer. The large diameter fan **30** being rotated at 1100 r.p.m. provides a very high air flow through the basket **18** and past the condenser water films **58** and **59** whereby only a small amount of the air comes into contact with the water film as it leaves the fan **30**. Moreover, the air movement is so great that practically no sensible heat is removed from the air as it flows past the water films **58** and **59**, only a small amount of moisture being removed from the air. While only a small portion of the air discharged by the fan comes into contact with the water film, the air flow is so great (450 c.f.m.) that all of the air in the dryer will come into contact with the water films in a period of seconds whereby the water films are effective to remove moisture and lint from the air.

The air discharged by the fan **30** flows through the space between the basket **18** and the casing **11**, through the heater assembly **38** wiping the heat from the coils **40** and baffles **39** and is returned to the basket **18** through the opening **25** to again contact the damp clothes to pick up moisture therefrom. When the clothes are dried to the desired dryness, suitable conventional means such as a timer or thermostat (not shown) de-energizes the electric motor **22**, the solenoid valve **55**, and the heater assembly **38** to shut down the dryer.

By circulating the air within the dryer at a very high rate, the present dryer is capable of drying a load of damp clothes in considerably less time than any known domestic dryer. For example, an eight pound consumer load of clothes which has been centrifuged after rinsing at 200 r.p.m. can be completely dried in the present dryer in about 66 minutes.

While I have described my invention in connection with one specific embodiment thereof, it is to be understood that this is by way of illustration and not by way of limitation and the scope of my invention is defined solely by the appended claims which should be construed as broadly as the prior art will permit.

I claim:

1. In a clothes dryer including an imperforate cylindrical casing having a front wall provided with means defining an access opening, a rear wall, a door for closing said access opening, means defining a cylindrical basket for receiving clothes to be dried, said basket being provided with front and rear walls, means rotatably supporting said basket on said rear wall of said casing with the rear wall of said basket spaced from said casing to define a condensing space therebetween, said basket having means defining a front opening the periphery of which is spaced radially outwardly of said casing opening to provide for the circulation of air therebetween and into said basket, heating means positioned within said cylindrical casing in the path of air being circulated between said openings, said arrangement being particularly characterized by the provision of means defining air discharge openings in the rear wall of said basket for discharging air from said basket directly into said condensing space, air pumping means located coaxially of said basket and adjacent said rear openings, said pumping means having independent driving means from said basket driving means, means for conducting a spray of cooling water into the upper portion of said condensing portion of said space and directly in the path of said air discharge from said air openings in said basket effective to accomplish substantial and intimate gas contact and condensing if steam resulting from moist air being circulated over said heating means.

2. The structural arrangement as defined in claim 1 further particularly characterized by the said openings in the rear wall of said basket being a plurality in number and disposed about the access of rotation of said drum, said air pump being in the form of a fan having radially extending blades the outlet portions of which located closely adjacent to said openings for discharging the air from the basket and through said openings into direct intimate contact with said cooling liquid.

3. The subject matter as defined in claim 1 further particularly characterized by the means for discharging the cooling and condensing liquid being in the form of a T-shaped inlet, said T-shaped inlet having a plurality of discharge openings for distributing the cooling liquid at the upper portion of said condensing space and over the substantial part of said space to thus assure the requisite effective and intimate gas liquid contact for accomplishing condensation.

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