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CLOTHES DRIER

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Edwin S. Lybreg
Their Attorney

May 8, 1962

R. H. WHYTE ET AL
CLOTHES DRIER

3,032,887

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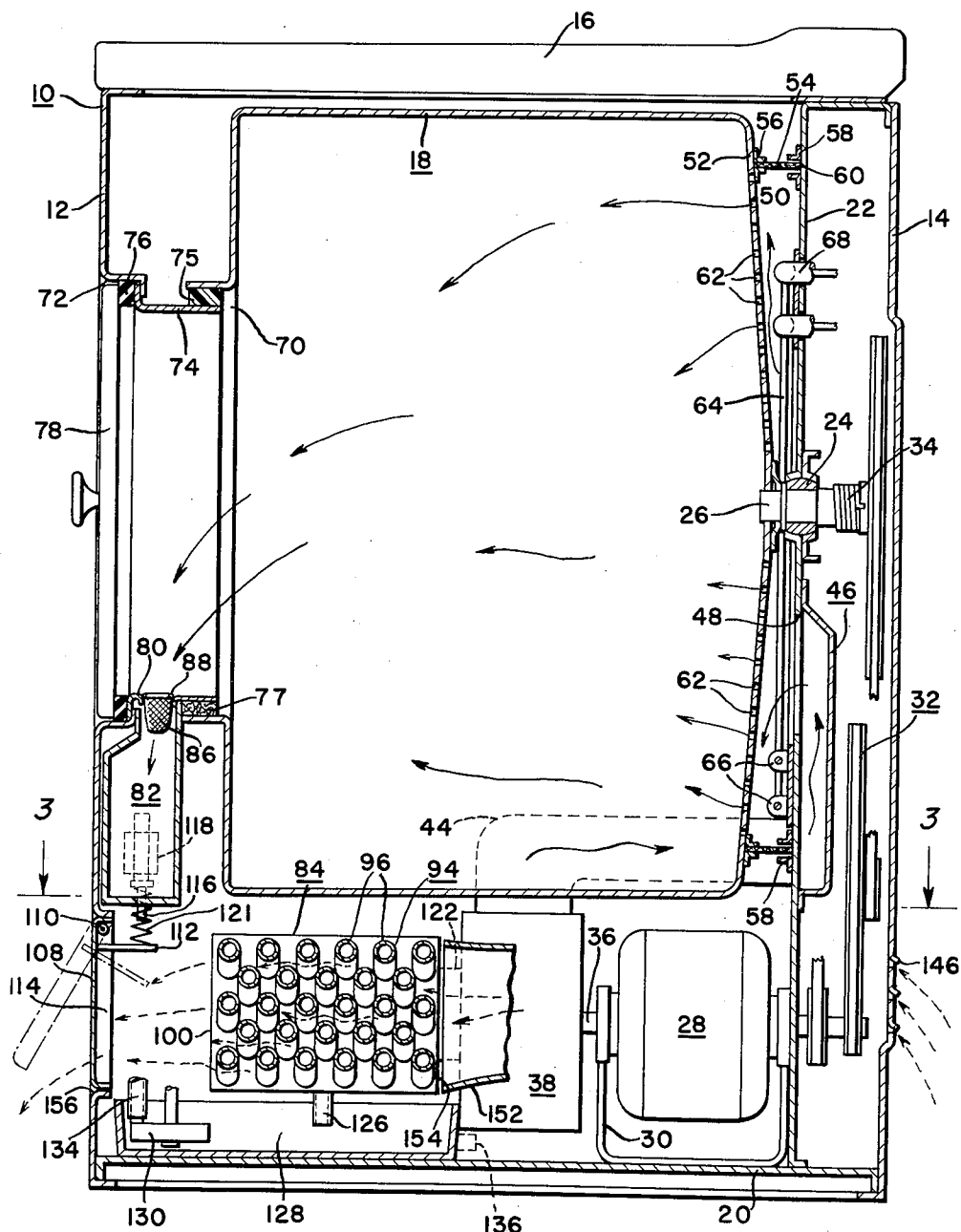


Fig. 2

INVENTORS

Ronal H. Whyte

BY *Byron L. Brucken*

Edwin S. Olson
Their Attorney

Their Attorney

May 8, 1962

R. H. WHYTE ET AL

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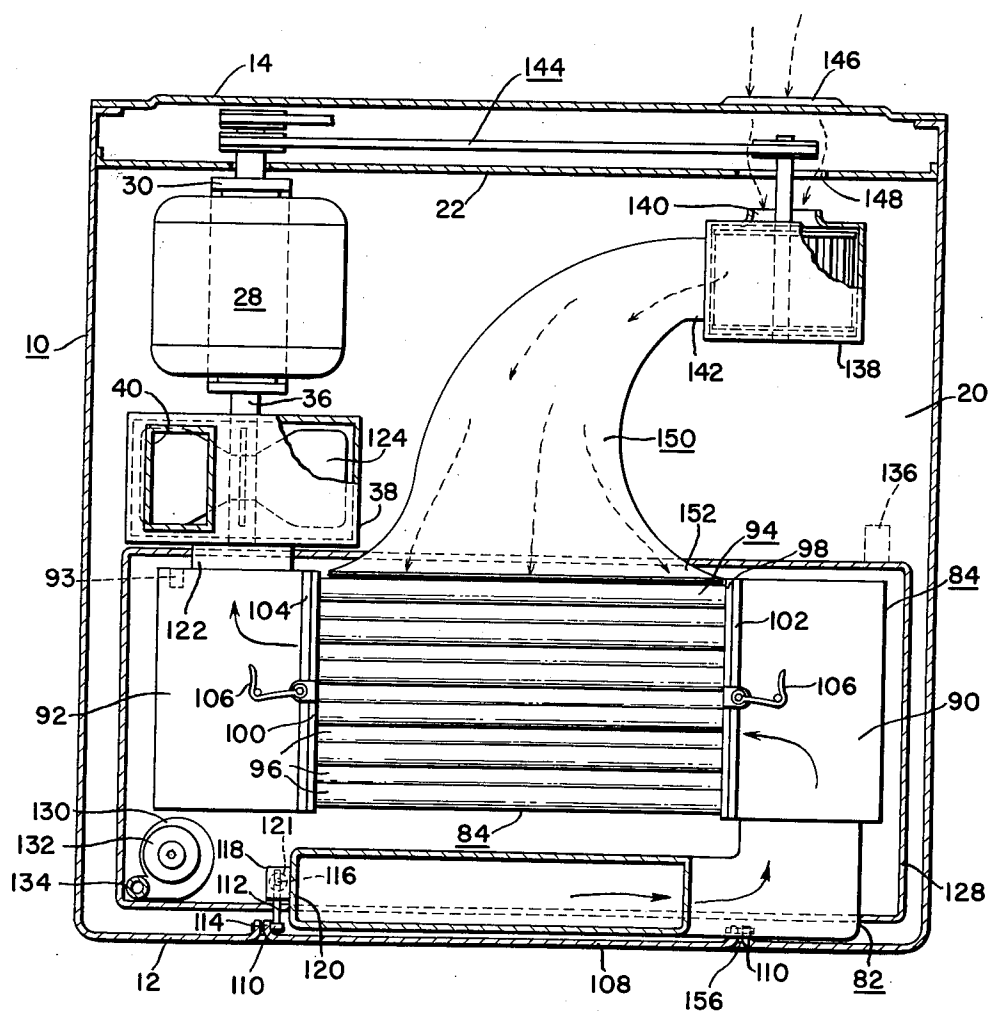


Fig. 3

INVENTORS
Ronal H. Whyte
BY Byron L. Brucken
Edwin S. Dybnig
Their Attorney

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CLOTHES DRIER

Ronal H. Whyte and Byron L. Brucken, Dayton, Ohio,
assignors to General Motors Corporation, Detroit,
Mich., a corporation of Delaware

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This invention relates to a domestic appliance and more particularly to an improved method and apparatus for drying clothes.

One of the problems in removing moisture from damp clothing in an apparatus adapted for installation within a residence is the disposition of the moisture removed. The most direct method, of course, is to vent the moisture-laden dryer air through an outside wall of the residence, whereby the moisture is prevented from saturating the air within the residence. In much property it is not advisable to disturb the building walls and in other homes, it is either inconvenient or undesirable to do so. For these reasons, a dryer is sought which will remove the moisture from the clothing to be dried by passing air thereover and then subsequently remove the moisture from the moisture entrained air. A particular dryer in which apparatus is provided for removing a substantial amount of the moisture so entrained is set forth in the patent to McCormick, 2,742,708, issued April 24, 1956. In the patented structure a condenser is utilized to remove the moisture from the drying air stream. However, to remove the desired amount of moisture required an excessively large condenser which required a larger dryer cabinet than is desirable under smaller space limitations.

Accordingly, it is an object of this invention to provide an air condenser dryer which can be incorporated in a smaller dryer cabinet.

It is a further object of this invention to provide a closed recirculating dryer air system and an air cooling and moisture condensing system in counterflow relationship.

It is a more particular object to provide a clothes dryer having a tumbling drum and an air cooled condenser in series flow relationship, wherein the condenser is adapted for installation within a conventional 27" dryer cabinet.

A more specific object is the provision, in a clothes dryer, of a drying air blower for recirculating air into moisture-absorbing relationship to said clothes and a cooling air blower for circulating cooling air into moisture-removing relationship to said drying, air and a pump for carrying off the moisture so removed.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

FIGURE 1 is a generally schematic representation in perspective, with parts broken away, of a clothes dryer incorporating this invention;

FIGURE 2 is a side sectional view of the clothes dryer; and

FIGURE 3 is a sectional view taken substantially along line 3—3 of FIGURE 2.

In accordance with this invention and with reference particularly to FIG. 2, a clothes dryer 10 having a front wall 12, a rear wall 14 and a top 16 is adapted to enclose a tumbling drum 18. Extending vertically from a dryer base 20 to the top wall 16 and parallel to the rear wall 14 is a bulkhead or partition 22 which carries a spherical bearing 24 for rotatably supporting the shaft 26 of the tumbling drum 18. A motor or prime mover 28 is disposed beneath the tumbling drum on a bracket 30 located on the dryer base 20. The motor 28 and shaft

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36 rotate the tumbling drum 18 by means of a pulley system 32 which is adapted to turn the drum shaft 26 in one direction only through a spring clutch 34. Mounted on the opposite end of the motor shaft 36 is a recirculating air blower 38 having an outlet 40 and an inlet 42. Leading from the blower outlet 40 and directed toward the bulkhead 22 is a conduit or duct 44 which terminates in a rear recirculating air duct 46. The air duct 46 is formed to the rear of the dryer bulkhead 22 and adapted to overlie an opening 48 in the bulkhead which leads to an annular chamber 50 between a rear wall 52 of the tumbling drum 18 and the bulkhead 22. The chamber 50 is closed along its outer periphery by an annular seal 54 which is carried in brackets 56 by the wall 52 of the rotatably mounted tumbling drum 18. In juxtaposed relationship to the brackets 56 is an annular channel 58 secured by any convenient means, as by welding, to the bulkhead 22. With the seal 54 rotatably carried by the rear wall 52 of the tumbling drum 18, the free or rearwardly extending end 60 of the seal 54 resides in sliding engagement with the channel 58. This arrangement has the advantage of providing for an air seal which is continuously rotating to prevent the development of hot spots at any particular point on the seal. The U-shaped channel, furthermore, improves the air sealing characteristics of this slidable seal construction.

Within the area of the annular chamber 50 the rear wall 52 of the tumbling drum is perforated as at 62 to permit air flowing from the rear circulating air duct 46 to enter the tumbling drum 18. Disposed also within the annular chamber 50 is a heating element 64 which is adapted to heat the air passing through the chamber 50 prior to entering the tumbling drum 18. To provide for better heat distribution within the tumbling drum, the heating element 64 is of arcuate design substantially circumscribing the entire annular chamber 50. This arrangement also facilitates an even distribution of the heated air within the tumbling drum 18 and provides a measure of radiant heat for drying the clothes. Heating element 64 may be carried on brackets 66 affixed to the bulkhead 22 and may receive power through terminal portions 68 projecting rearwardly through the bulkhead 22. Of course, conventional high limit controls may be disposed in the chamber 50 to prevent excessive temperatures in this area. Oppositely disposed from the support shaft 26 of drum 18 is a flanged opening or neck portion 70. The flanged opening 70 is aligned concentrically with an opening or port 72 in the front wall 12 of the dryer 10. Joining the drum opening 70 and the cabinet opening 22 in air sealing, relatively rotatable relationship is a collar 74, affixed to the cabinet opening 72, which projects within the flanged drum opening 70 for support thereof. Spacer blocks 75 of nylon or other similar material are interposed between the concentric flanges 70, 74 as a sliding bearing surface. Interspersed between the spacer blocks 75 are pieces of felt or sealing material 77 which complete the air sealing connection between the collar 74 and opening flange 70. The collar 74 is carried in affixed relationship to the cabinet wall 12 in a resilient annular bushing or seal 76 and an access or loading door 78 is hingedly mounted to the front wall 12 to close in air-tight relationship against the annular seal 76. Thus, it is seen that the collar 74 is secured to the front wall of the dryer cabinet 12 and extends inwardly to provide support for the drum 18 at its flanged opening 70.

Peripherally arranged along the bottom flange of the collar 74 is an outlet 80 which leads to a front recirculating air duct 82 disposed therebelow and subsequently to the tubular condenser or heat exchanger, shown generally at 84. To provide for the elimination of lint in the air being recirculated from the tumbling drum 18 to the front duct 82, an arcuately shaped lint bag or strainer 86 is sup-

ported in the outlet port 80 of the collar 74. The lint bag 86 is suspended from a rectangular support frame 88 which is formed arcuately in a manner to complement the shape of opening 80 and slightly larger than the opening 80 to prevent its being drawn into the front duct 82 below. With this construction, the lint bag 86 may be removed by opening the access door 78 and manually lifting the lint collector from its position in collar 74. After removing the lint from the surface of the bag fabric, the bag may easily be replaced to assure an adequate filtering of the lint from the dryer air stream.

The construction of the tubular condenser 84 will best be understood with reference to FIG. 3 wherein the condenser is comprised of an inlet header portion 90 and an outlet header portion 92 in fixed relationship to the dryer cabinet base 20. A bank of tubes 94 is removably interposed between the headers 90, 92 and consists in particular of 36 tubes 96, $\frac{1}{16}$ " in diameter and 18" in length held at their termini in spaced apart relation by an inlet support plate 98 and an outlet support plate 100. The tubes 96 are arranged parallel and spaced apart to provide for flow of air between the tubes. An approximately 2° taper downwardly from the inlet header 90 toward the outlet header 92 has been found effective in providing for the gravity flow of condensate formed within the conduits or tubes 96 during recirculation of the moisture-laden dryer air, to be described more fully hereinafter. Although the aforementioned specific dimensions have been found preferable in providing the maximum operational efficiency, it should be understood that these dimensions may be modified without departing from the scope of this invention to provide for adequate condensate removal from the air passing through the conduits 96.

As aforesaid, the bank of tubes 94 is removably mounted between the headers 90 and 92. To effect this construction, header seals 102 and 104 are installed on the inlet header 90 and outlet header 92, respectively, in a manner to lie in sandwiched relationship with the inlet support plate 98 and the outlet support plate 100 of the tube bank 94. A pair of over-center latches 106 are mounted on the headers 90, 92 and adapted to secure the tube bank 94 in air flow sealing relationship to the headers. In this regard, the release of over-center latches 106 provides sufficient play between the headers 90, 92 to permit easy slidable removal of the tube bank 94 from its interposed position between the headers. For complete removal of the tube bank 94 from the dryer 10 a combination vent and access door or panel 108 is formed in a bottom portion of the front wall 12 and pivotally mounted at 110 to the cabinet wall 12. A cantilevered vent arm 112 projects in fixed relationship from a side flange 114 of the door 108 in a manner to place the arm in operational alignment with an armature shaft 116 of a push-type solenoid 118. The solenoid 118 is affixed to side wall 120 of the recirculating front duct 82 and adapted upon energization to partially open the vent or access door 108 for a reason to be described more fully in connection with the operation of the dryer. To guard against a situation where the access door 108 is jammed when the solenoid is energized, the solenoid shaft 116 carries at its outer terminus a spring 121 which contacts the cantilever arm 112 in a manner to yieldingly bias the door 108 open. If the door is jammed, the stroke of the armature shaft 116 will be taken up in the collapse of the spring 121. Since there is no direct connection between the arm 112 and the spring 121, the door 108 may be lifted or pivoted manually into a vertical or out-of-the-way position whereby the condenser tubes 94 may be removed completely from the dryer 10. Once removed, the tubes 94 may be held beneath any supply of water to remove the dirt or lint which may have collected either on the outside or the inside of the condenser tubes 96.

Completing the recirculating or closed air system is a conduit 122 leading from the condenser outlet header 92 to the inlet of recirculating blower 38. The blower

38 is preferably of the paddle-wheel variety to minimize the lint build-up on the impeller 124 during extended operation of the dryer. Thus, the recirculating air system follows an air flow series relationship from the blower 38 through conduit 44, rear duct 46, annular chamber 50 and apertures 62 to the interior of the tumbling drum 18. The air leaves the tumbling drum 18 through an opening 80 in access opening collar 74 and proceeds through a front duct 82 to an inlet header 90 of the condenser 84. From this point the air flows through the inside or interior portion of the conduits 96 into the outlet header 92 and then by way of conduit 122 returns to the recirculating air blower 38.

The condensate removed from the recirculating air within the tubes 96 flows by gravity into the outlet header 92 where a drain connection 126 is disposed to remove the condensate from the closed circulating air system without permitting excessive air leakage. For this purpose, a condensate drain 126 approximately $\frac{1}{8}$ " in diameter has been found adequate. To catch the flow of condensate issuing from the conduit 126 a collecting pan or sump 128 is removably supported on the dryer base 20 beneath the condenser 84. There are several methods by which condensate may be removed from this pan. For one method, the pan 128 may be physically removed from the dryer 10 through access door 108 and the water dumped at some convenient remote location. Where a completely automatic system is desired, a small pump 130 powered by a fractional horsepower motor 132 or by a belt and pulley arrangement from motor 28 is disposed within the sump 128 and adapted to pump condensate from the sump by way of conduit 134 to any drain outside the dryer 10. For installations having a conveniently located floor drain a sump outlet stub 136, shown in phantom, may be used to direct condensate from the sump or collecting tank 128 to the drain by means of any suitable conduit (not shown).

The cooling air or counterflow condensing system will now be explained with reference to FIG. 3 in particular. A cooling air blower 138 having an inlet 140 and an outlet 142 is located in the bottom portion of dryer 10 and adapted to be driven by the motor 28 through a pulley system, shown generally at 144. Louvers or ports 146 are formed in the rear wall 14 of the dryer 10 adjacent the cooling blower inlet 140. An opening 148 in the bulkhead 22 serves to pass air entering the dryer 10 through the louvers 146 to the blower 138. A cooling air duct 150 directs air from the blower outlet 142 over the bank of condenser tubes 94. In this regard, the duct 150 is flared at its outlet end 152 to substantially cover the depth and width of the tube bank 94 at its innermost side 154. Although no direct connection exists between the outlet end 152 of the cooling air duct 150 and the tube bank 94, the two lie in juxtaposition whereby substantially all of the cooling air impelled through the duct 150 is projected over the outside surface of the tubes 96. With the tubes 96 in spaced-apart relationship, the cooling air travels between the tubes to effectively cool the entire exterior surface thereof in a manner to condense the moisture from the recirculating air travelling in counterflow relation through the interior of the tubes 96. Egress for the cooling air from the dryer 10 is provided through the opening or port 156 in the front wall 12 when the door 108 is solenoid actuated to a partially open position.

The novel functioning of this invention is believed best understood in connection with an operational cycle of the clothes dryer set forth next following. To initiate a drying cycle, a load of damp clothes is placed within the tumbling drum 18 through the access door 78 and the timing control (not shown) set for any desired time period. The dryer operation will thus be initiated to commence a drying cycle and the recirculating air system will become effective with the energization of recirculating blower 38. However, although both blower 38 and cooling air

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blower 138 are operating, the cooling air system does not become effective or operative until vent door 108 is opened partially in response to the action of solenoid 118. The advantage of this feature is gained from a knowledge that the clothing placed within the tumbling drum does not begin to dry until the temperatures within the tumbling drum are sufficiently high to cause the recirculating air to absorb moisture from the clothes. It is therefore obvious that the sooner the temperatures within the drum 18 are raised, the more quickly will the drying operation be commenced. To permit the cooling air system initiated by blower 128 to cool the recirculating air within the condenser 84 during this warm-up period, would be to reduce the efficiency of the dryer. For this reason the solenoid 118 is made thermostatically actuatable in response to the temperature within the tumbling drum. After a sufficient period has elapsed to permit the recirculating air to warm sufficiently to initiate the drying operation, approximately 120° F., solenoid 118 is actuated in response to the drum thermostat to force the arm 112 downwardly whereby the vent door 108 is opened at approximately a 30° angle to the front wall 12 of the dryer. The cooling air thus is permitted to flow across the condenser tubes 96 and exhaust through the opening 156 in the dryer cabinet. As moisture is absorbed from the clothing by the recirculated air, it is carried through the lint screen 86, the front recirculating air duct 82 and into the inlet header 90. The moisture-laden air then breaks into 36 different flow paths of substantially equal amounts and proceeds through the tubes 96 to the outlet header 92. With the cooling air flowing across the exterior of the tubes 96, the dew point within the tubes is quickly reached and condensate falls from the moisture-laden air as this recirculating air passes through the tubes. The recirculating air returns to the recirculating blower 38 and is again impelled through conduits 44 and 46 to the annular heating chamber 50 where its drying temperatures are maintained by the heater 64. From the annular chamber 50 the air enters the tumbling drum 18 through the port 62 where moisture is again absorbed into the comparatively dehumidified air. This process continues for the time period selected on the control. The condensate removed in the condenser 84 flows by gravity due to the 2° taper of the tubes 96 into the outlet header 92. The condensate leaves the recirculating system by means of the conduit 126 and falls into the collecting sump 128 for removal from the dryer 10 by any of the suggested methods described hereinbefore.

With a closed recirculating air system, it is not necessary to have substantial air flow through the tumbling drum. A recirculating blower capacity of approximately 50 c.f.m. has been found satisfactory. Since a reduced air flow is suitable, the blower 38 may be of the paddle-wheel type, which is substantially lint free—an obvious advantage in a dryer air flow system. On the other hand, the cooling air blower 138 should have a capacity capable of producing approximately 250 c.f.m. cooling air flow across the bank of condenser tubes 94 whenever the vent door 108 is open. Furthermore, the condenser tubes 96 should be formed of a heat conducting material such as copper or aluminum, to improve the heat transfer from the recirculating air to the cooling air.

Occasionally, it will be necessary to remove the bits of dirt collecting on the outside of the tubes 96 and the bits of lint accumulating inside the tubes. For this reason, the door 108 may be pivoted vertically upwardly to expose the condenser 84. The over-center latches 106 may be disengaged from the support plates 98 and 100 of the tube bank 94 and the tube bank slidably removed from the dryer. Water run on the outside of the tubes 96 and through their interiors provides adequate cleaning. The reverse of the removal operation will reinstall the tube bank 94 in air flow sealing relationship to the headers 92, 90.

In the foregoing arrangement a clothes drying system

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has been provided wherein the steam or vapor emitted during the drying process is prevented from entering the surrounding atmosphere. Furthermore, the recirculating system provides for a recirculation of the heat rather than an exhaust of the moisture-laden air prior to a complete utilization of the B.t.u. content of the drying air. These advantages have been obtained in a system wherein air is utilized to condense the moisture within the dryer without the need of condensing water plumbing. This dryer not only improves on the efficiency of the one-pass condenser system set forth in the patent recited hereinbefore but improves on the speed with which the drying operation may be completed.

Since the drying air is being recirculated during the drying process, the input of heater 64 must be carefully controlled to avoid overheating in the dryer cabinet. In the prior art dryer temperatures fluctuate so widely at any point within the air flow path that close air temperature control is made extremely difficult and undesirable heater cycling results. In this invention, however, the novel air cooled condenser 84 creates an area of stable temperature values within the outlet header 92. The constant flow of air from the cooling air blower 138 modulates or minimizes the extreme temperature fluctuations of the air entering the header 92. For this reason, the operation of heater 64 may now be closely and reliably controlled by a thermostatic or recirculating air sensitive control 93 of any suitable type installed within the outlet header 92 and responsive to air conditions such as temperature therein. In this regard a thermostatic control 93 will open or close a circuit to the heater 64 in accordance with the temperature of the recirculating air flowing through the header 92.

While the embodiment of the present invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. In combination, a dryer for damp fabrics comprising a casing having a bulkhead and enclosing a recirculating air system and a cooling air system, an access door in said casing, a tumbling drum within said casing for receiving said fabrics and rotatably supported on said bulkhead, said drum having a perforate wall and a flanged opening axially aligned with said access door, an inlet collar affixed to said casing adjacent said door and extending toward said drum into rotatably slidable support relationship with said flanged opening, said collar having an arcuate recirculating air passage, a lint filter in said arcuate passage, a condenser having a plurality of recirculating air conduits in parallel, non-horizontal, spaced apart relationship and removably interposed between a pair of headers, the lowermost of said headers having a condensate drain and a recirculating air sensitive control, a front recirculating air duct connecting said drum, said arcuate air passage and said condenser in series recirculating air flow relationship, a recirculating air blower connected to the interior of said conduits, an annular chamber between said perforate wall and said bulkhead, said bulkhead having an annular channel, said chamber having its outer peripheral wall formed by a recirculating air seal carried by said wall and extending into slidable recirculating air sealing relationship with said annular channel, a heater in said chamber responsive to said recirculating air sensitive control, a rear recirculating air duct connecting said recirculating air blower and said chamber in series recirculating air flow relationship, a cooling air blower connected to the exterior of said conduits, a cooling air inlet in said casing, a cooling air outlet in said casing, said outlet having a pivotally mounted panel automatically operable to a partially open position after a predetermined on-period for said heater and manually operable to a fully opened position for removing said condenser.

2. In combination, a dryer for damp fabrics comprising a cabinet having a partition and enclosing a recirculating

air system and a cooling air system, an access door in said cabinet, a tumbling drum within said cabinet for receiving said fabrics and rotatably supported on said partition, said drum having a perforate wall and an opening aligned with said access door, a condenser having a plurality of recirculating air pipes in substantially parallel, non-horizontal, spaced apart relationship and removably interposed between a pair of headers, one of said headers having a condensate drain, a first recirculating air duct connecting said drum and said condenser in series recirculating air flow relationship, a recirculating air blower connected to the interior of said pipes, a chamber between said perforate wall and said partition, said partition having a channel, said chamber having its outer wall formed by a recirculating air seal carried by said wall and extending into slidable recirculating air sealing relationship with said channel, a heater in said chamber, a second recirculating air duct connecting said recirculating air blower and said chamber in series recirculating air flow relationship, a cooling air blower connected to the exterior of said pipes, a cooling air inlet in said cabinet, a cooling air outlet in said cabinet, said outlet having a solenoid actuated door automatically operable to a partially open position after a predetermined on-period for said heater and manually operable to a fully opened position for access to said condenser.

3. In combination, a dryer for damp fabrics comprising a cabinet having a partition and enclosing a recirculating air system and a cooling air system, an access door in said cabinet, a tumbling drum within said cabinet for receiving said fabrics and rotatably supported on said partition, said drum having a perforate wall and an opening aligned with said access door, a condenser having a plurality of recirculating air pipes in substantially parallel, non-horizontal, spaced apart relationship and removably interposed between a pair of headers, one of said headers having a condensate drain, a first recirculating air duct connecting said drum and said condenser in series recirculating air flow relationship, a recirculating air blower connected to one side of said pipes, a chamber between said perforate wall and said partition, said partition having a channel, said chamber having its outer wall formed by a recirculating air seal carried by said wall and extending into slidable recirculating air sealing relationship with said channel, a second recirculating air duct connecting said recirculating air blower and said chamber in series recirculating air flow relationship, a cooling air blower connected to another side of said pipes, a cooling air inlet in said cabinet, a cooling air outlet in said cabinet, said outlet having a door automatically operable to a partially open position to speed the drying of said fabrics and manually operable to a fully opened position for access to said condenser.

4. In combination, a dryer for damp fabrics comprising a casing having a bulkhead and enclosing a recirculating air system and a cooling air system, an access door in said casing, a tumbling drum within said casing for receiving said fabrics and rotatably supported on said bulkhead, said drum having a perforate wall and a flanged opening axially aligned with said access door, an inlet collar affixed to said casing adjacent said door and extending toward said drum into rotatably slidable support relationship with said flanged opening, said collar having an arcuate recirculating air passage, a lint filter in said arcuate passage, a condenser having a plurality of recirculating air conduits in parallel, non-horizontal, spaced apart relationship and removably interposed between a pair of headers, the lowermost of said headers having a condensate drain, a sump beneath said drain for collecting condensate, means for pumping said condensate from said dryer, a front recirculating air duct connecting said drum, said arcuate air passage and said condenser in series recirculating air flow relationship, a recirculating air blower connected to the interior of said conduits, an annular chamber between said perforate

wall and said bulkhead, said bulkhead having an annular channel, said chamber having its outer peripheral wall formed by a recirculating air seal carried by said wall and extending into slidable recirculating air sealing relationship with said annular channel, a heater in said chamber, a rear recirculating air duct connecting said recirculating air blower and said chamber in series recirculating air flow relationship, a cooling air blower connected to the exterior of said conduits, a cooling air inlet in said casing, a cooling air outlet in said casing, said outlet having a pivotally mounted panel automatically operable to a partially open position after a predetermined on-period for said heater and manually operable to a fully opened position for removing said condenser.

5. In combination, a dryer for damp fabrics comprising a cabinet having a partition and enclosing a recirculating air system and a cooling air system, an access door in said cabinet, a tumbling drum within said cabinet for receiving said fabrics and rotatably supported on said partition, said drum having a perforate wall and an opening aligned with said access door, a condenser having a plurality of recirculating air pipes in substantially parallel, non-horizontal, spaced apart relationship and removably interposed between a pair of headers, one of said headers having a condensate drain, a removable pan in said cabinet for receiving condensate from said drain, a first recirculating air duct connecting said drum and said condenser in series recirculating air flow relationship, a recirculating air blower connected to the interior of said pipes, a chamber between said perforate wall and said partition, said partition having a channel, said chamber having its outer wall formed by a recirculating air seal carried by said wall and extending into slidable recirculating air sealing relationship with said channel, a heater in said chamber, a second recirculating air duct connecting said recirculating air blower and said chamber in series recirculating air flow relationship, a cooling air blower connected to the exterior of said pipes, a cooling air inlet port in said cabinet, a cooling air outlet port in said cabinet, one of said ports having a door manually operable to a fully opened position for access to said condenser.

6. In combination, a dryer for damp fabrics comprising a cabinet having a partition and enclosing a recirculating air system and a cooling air system, an access door in said cabinet, a tumbling drum within said cabinet for receiving said fabrics and rotatably supported on said partition, said drum having a perforate wall and an opening aligned with said access door, a condenser having a plurality of recirculating air pipes in substantially parallel, non-horizontal, spaced apart relationship and removably interposed between a pair of headers, one of said headers having a condensate drain, a first recirculating air duct connecting said drum and said condenser in series recirculating air flow relationship, a recirculating air blower connected to one side of said pipes, a chamber between said perforate wall and said partition, said chamber having its outer wall formed by a recirculating air seal carried by said wall and extending into slidable recirculating air sealing relationship with said partition, a second recirculating air duct connecting said recirculating air blower and said chamber in series recirculating air flow relationship, a cooling air blower connected to another side of said pipes, a cooling air inlet port in said cabinet, a cooling air outlet port in said cabinet, one of said ports having a door manually operable to a fully opened position for access to said condenser.

7. In combination, a dryer for damp fabrics comprising a casing having a bulkhead and enclosing a recirculating air system and a cooling air system, an access door in said casing, a tumbling drum within said casing for receiving said fabrics and rotatably supported on said bulkhead, said drum having a perforate wall and a flanged opening axially aligned with said access door, an inlet collar affixed to said casing adjacent said door and ex-

tending toward said drum into rotatably slidable support relationship with said flanged opening, said collar having an arcuate recirculating air passage, a lint filter in said arcuate passage, a condenser having a plurality of recirculating air conduits in parallel, non-horizontal, spaced apart relationship and removably interposed between a pair of headers, the lowermost of said headers having a condensate drain, a sump beneath said drain for collecting condensate including means for removing said condensate from said dryer, a front recirculating air duct connecting said drum, said arcuate air passage and said condenser in series recirculating air flow relationship, a recirculating air blower connected to the interior of said conduits, an annular chamber between said perforate wall and said bulkhead, said bulkhead having an annular channel, said chamber having its outer peripheral wall formed by a recirculating air seal carried by said wall and extending into slidable recirculating air sealing relationship with said annular channel, a heater in said chamber, a rear recirculating air duct connecting said recirculating air blower and said chamber in series recirculating air flow relationship, a cooling air blower connected to the exterior of said conduits, a cooling air inlet port in said casing, a cooling air outlet port in said casing, one of said ports having a pivotally mounted panel manually operable to a fully opened position for removing said condenser.

8. A dryer for moist fabrics comprising means forming

a chamber for said fabrics and having an inlet and an outlet, means for heating said chamber to remove moisture from said fabrics, an air cooled condenser tube, a first blower, first duct means connecting said chamber outlet, the inside of said condenser tube, said first blower, said heating means and said chamber inlet in closed circuit series air flow relationship, said first blower recirculating air through said chamber into moisture absorbing relationship with said fabrics and through the inside of said condenser tube, a second blower, second duct means connecting the second blower to the outside of said condenser tube, said second blower circulating atmospheric air across the outside of said condenser tube whereby said moisture is removed from said recirculating air, means for selectively restricting said circulating atmospheric air flow across the outside of said condenser tube, and means thermally responsive to said recirculating air for controlling said restricting means.

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