May 13, 1958 P. E. GELDHOF 2,834,121

COMBINED CLOTHES WASHER AND DRIER

Filed Oct. 19, 1953 3 Sheets-Sheet 1

Fig. 1

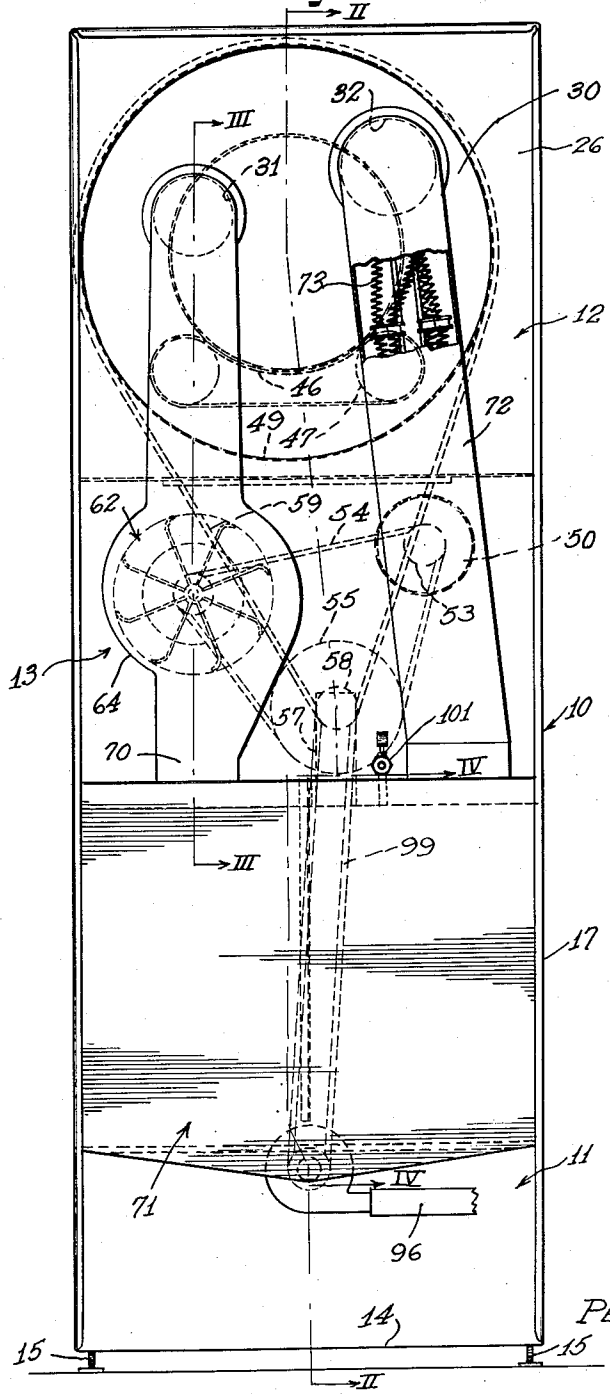
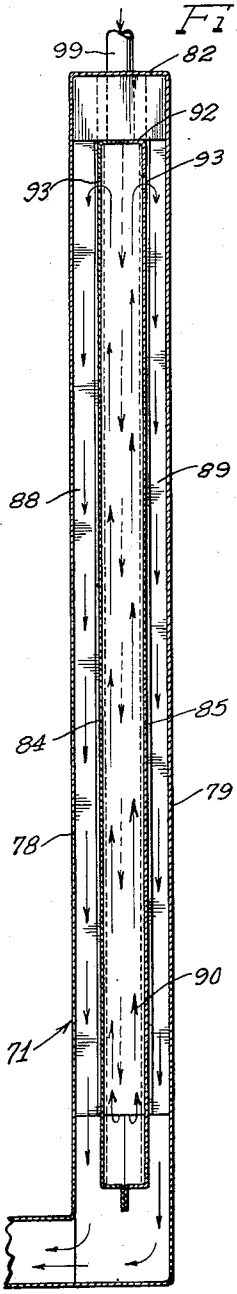



Fig. 4




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Fig. 2

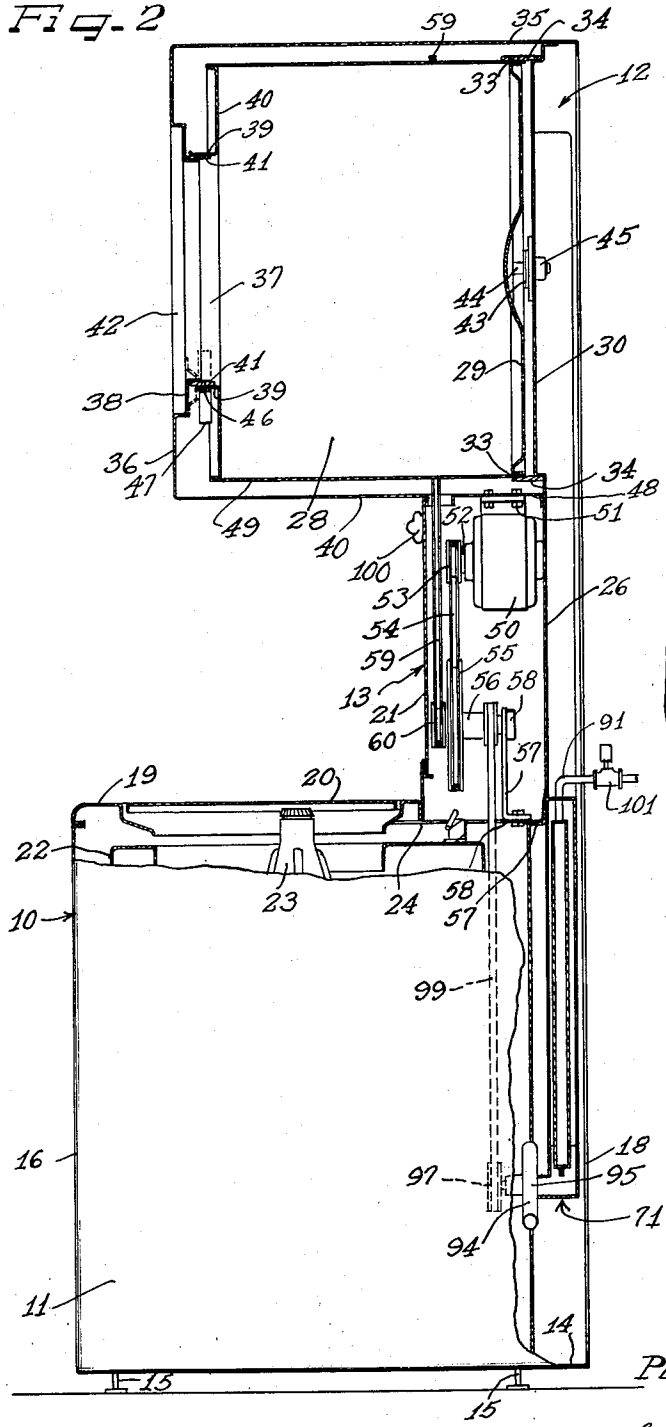
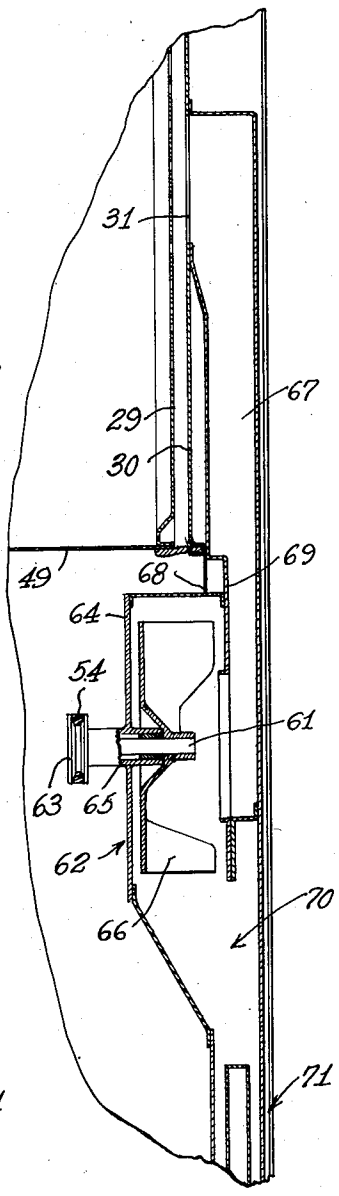



Fig. 3




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COMBINED CLOTHES WASHER AND DRIER

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Fig. 5

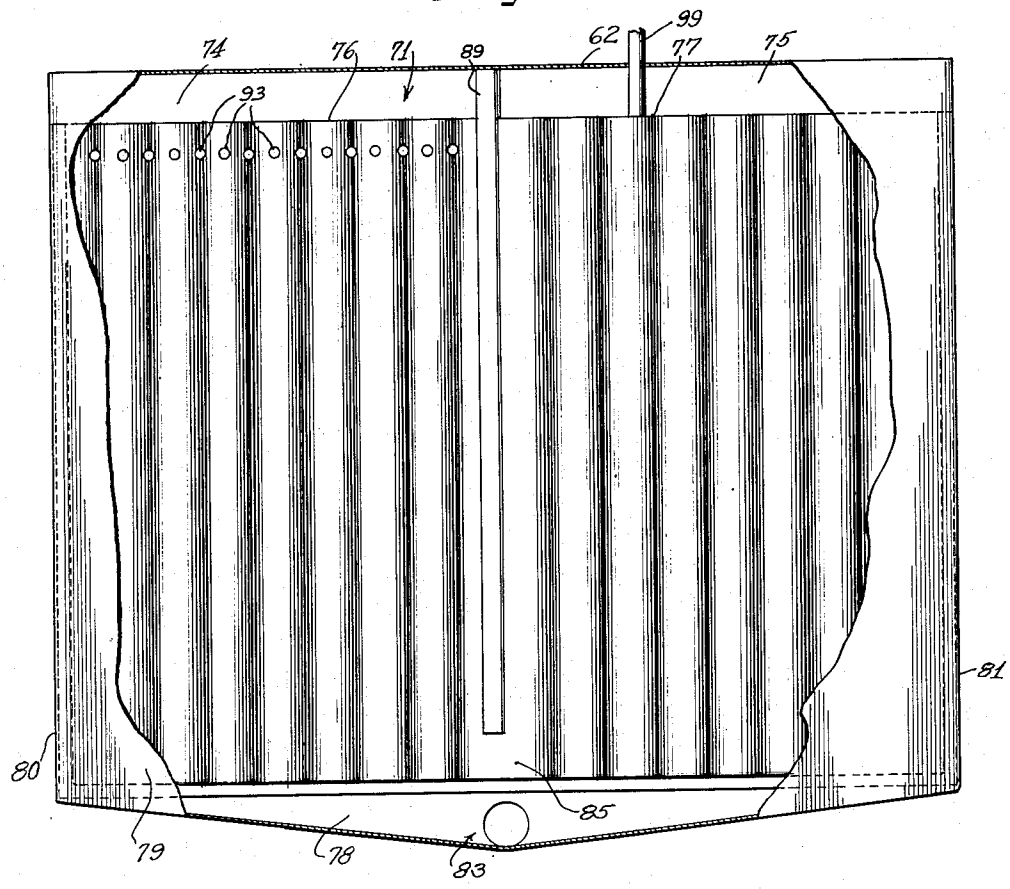
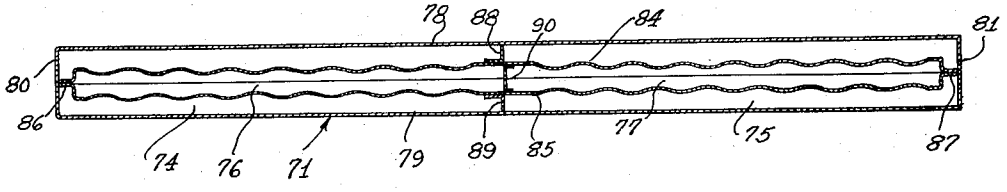



Fig. 6




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United States Patent Office 2,834,121 Patented May 13, 1958



2,834,121

# COMBINED CLOTHES WASHER AND DRIER

Peter Eduard Geldhof, Benton Harbor, Mich., assignor, by mesne assignments, to Whirlpool Corporation, a corporation of Delaware

Application October 19, 1953, Serial No. 386,924

5 Claims. (Cl. 34—75)

The present invention relates to a combined washing and drying machine for clothes and the like, and more particularly, the present invention relates to a combined clothes washing and drying machine having a recirculating air system for the drier and a condenser to substantially clean and dehumidify air in the circulating system for the drier.

Combined clothes drying and washing machines and clothes drying machines in general employing hot air or heated air are usually provided with a filter or the like in the exhaust stream to catch lint picked up from the clothes in the drier, and the still warm or hot air leaving the filter is then exhausted either to the outside atmosphere or into the room containing the drier unit. When driers of this form are employed in apartments or the like venting to the outside is frequently difficult or otherwise impractical therefore necessitating exhausting of the hot moist air from the drier into the room in which the drier is located. Such a procedure, however, causes the atmosphere in the room to become uncomfortably warm and humid causing the working conditions for the operator of the drier, who in most instances is a housewire or housekeeper, to be most undesirable.

By the present invention, however, these problems are substantially obviated by the provision of a substantially closed circulating system for the drier. Since it is important that the drier be provided with substantially clean and dry hot air, the present invention also provides means to remove the lint from the air at the drier exhaust and means to substantially dehumidify or remove moisture in the exhaust air from the drier.

Thus, by the present invention, there is provided a clothes drier with a substantially closed recirculating air system and a condenser operable to remove lint and the like and moisture from the air in the circulating system.

It is, therefore, an important object of the present invention to provide a new and improved air cleaning and dehumidifying mechanism for a hot air drier for clothes or the like.

Another important object of the present invention is to provide a new and improved condenser operable in combination with a clothes drier or the like to wash and clean air exhausted from the drier and to substantially remove the moisture in the air picked up in the drier.

Still another object of the present invention is to provide a new and improved combined washer and drier with a closed circulating system for the drier and a condenser to remove lint and moisture from air exhausted from the drier prior to reheating the air and resupplying it to the drier.

Yet another object of the present invention is to provide a new and improved combined washing and drying mechanism having a lower washing compartment and a vertically disposed upper drying compartment with a drive and fan compartment therebetween and further with a condenser disposed adjacent to the rear wall of the washing compartment and arranged and connected to remove lint and moisture from air exhausted from the drier prior reheating the air and resupplying it to the drier.



Another object of the present invention is to provide a condenser operable in combination with a clothes drier or the like to remove lint and moisture from air exhausted from the drier and including a pair of air chambers each having a liquid coolant chamber therein, a passage between each of the air chambers whereby air admitted into one of the chambers will pass therethrough and through the passage into the other of the chambers, a passage between the liquid coolant chambers whereby liquid coolant admitted into one of the chambers will circulate therethrough and through the passage into the other of the liquid chambers, and a passage between the second coolant chamber and the first air chamber for the passage of liquid coolant from the second liquid chamber into the first air chamber, whereby air admitted into the first air chamber is washed and substantially cleaned and dehumidified and passed into the second air chamber where it is further dehumidified by the first liquid coolant chamber walls as cooled by the flow of liquid coolant through the chamber.

Yet another object of the present invention is to provide an air recirculatory system for a combined washing and drying machine for clothes or the like and a liquid cooled condenser forming a part thereof, wherein the drive for the drier and the fans in the air circulating system and the liquid discharge pump from the condenser are driven through a new and improved driving system.

Still other objects, features and advantages of the present invention will become readily apparent from the following detailed description of the principles of the present invention and a preferred embodiment thereof, from the claims, and from the accompanying drawings in which there is illustrated a preferred embodiment of the present invention, which fully and completely disclose each and every detail shown thereon, in which like reference numerals refer to like parts, and in which:

Figure 1 is a back side elevational view of a combined clothes washing and drying machine embodying the principles of the present invention and having the back cover removed to more clearly illustrate certain features of the machine;

Figure 2 is a side elevational view of the machine of Figure 1 and is illustrated partially in section taken substantially along the line II—II of Figure 1 and having a portion of the outer cabinet wall of the washing compartment broken away to better illustrate certain portions and features of the machine;

Figure 3 is a fragmental sectional view of the drier exhaust fan and ducts or conduits associated therewith taken substantially along the line III—III of Figure 1;

Figure 4 is a sectional view of a condenser embodying the principles of the present invention as operable in combination in the combined machine of Figure 1 as taken substantially along the line IV—IV of Figure 1 and indicating the directions and paths of liquid coolant flow therein;

Figure 5 is an enlarged elevational view of the condenser with a substantial portion of the outer panel of the air chambers removed to more clearly illustrate the interior features of the condenser; and

Figure 6 is a top plan view of the condenser with the top cover removed to illustrate the plan features of the condenser.

In the preferred embodiment of the present invention illustrated in the drawings, the combined washer and drier has a housing or cabinet **10** of unitary construction and formed with a lower washing compartment **11** and an upper drying compartment **12** vertically spaced a distance sufficient to afford access to the lower compartment **11** through the top thereof. A drive and fan compartment **13** is positioned between the two washing and drying

compartments 11 and 12 and disposed substantially adjacent to the rear wall of the combined washing and drying machine further to afford access to the lower compartment through the top thereof.

The lower compartment 11 is shown as having a base plate 14 supported off the floor on feet 15, 15, which may be adjustable to level the machine with respect to the floor. The lower compartment also has a front wall 16 and parallel side walls 17, 17 connected together by a back wall 18. A top 19 for the lower compartment 11 is shown as having a cover 20 hinged thereto adjacent to the front wall 21 of the intermediate inwardly spaced drive and fan compartment 13, opening toward said compartment into the space between the compartments 11 and 12 for access to a clothes container 22. The clothes container may be of well known form of washing and extracting clothes container suitably journalled within the compartment 11 for rotation with respect thereto about a vertical axis, when extracting water from the clothes in said container.

The clothes container 22 is further shown as having an oscillatable agitator 23 supported therein and driven in any convenient manner such as in the manner clearly shown and described in U. S. Letters Patent No. 2,521,159, which issued jointly to me and Luther Ringer on September 5, 1950 and forming no part of the present invention and therefore not herein shown or described in detail.

The top 19 of the washing compartment 11 is shown in Figure 2 as having a downwardly recessed rear end portion 24 upon which is mounted the front panel wall 21 of the intermediate drive and fan compartment 13 for supporting the drier compartment 12. The front panel wall 21 of the intermediate compartment 13 is flanged at its lower end as at 25 and there secured to the recessed portion 24 of the upper wall 19 for the washer 11. Further support is provided to the drier compartment 12 by the back wall or panel 18 which preferably extends for the full height of the combined machine and is secured to the side walls 17, 17 which may be formed in sections for each of the compartments and joined together or which may be formed of a unitary construction for each, as shown, and secured to the back panel 18 on the two vertical sides thereof.

A still further supporting structure for the drier compartment 12 may be provided in the region of the intermediate compartment 13, as desired, depending upon structural characteristics and calculations, etc., for the combined machine.

A rear plate or partition 26 extends upwardly within the several compartments, is secured to the upper panel 19 of the washing compartment 11 at an inturned flange 27 on the partition 26, and at its upper end forms a support for the rear end portion of a drier drum 28 and also forms an air circulating bulkhead, confronting a rear perforated wall 29 of the drier drum 28. The vertical partition 26 has a circular recessed portion 30 confronting the rear wall 29 of the drier drum 28 and forming a bulkhead therefor. The recessed portion or bulkhead 30 is shown as having an air exhaust opening 31 therein for exhausting spent air from the drier through the rear perforate wall 29 thereof. The bulkhead also has a laterally spaced air circulating inlet opening 32 leading therethrough and confronting the perforate wall 29 of the drier drum 28 for admitting heated air into the drier drum 28 through the rear perforate wall 29.

A seal 33 is shown as being secured thereto and encircling the rear end portion of the drier drum 28 and as extending over a shouldered portion 34 of the partition 26, forming the outer margin of the circular recess 30. The seal 33 slidably engages the shouldered portion and seals the perforate wall 29 of the drier drum 28 through the bulkhead, to assure the passage of air into and out of the drier drum 28 through the intake and outlet openings 32 and 31. The partition 26 is also secured, at its upper end, to the top or upper cover 35 of the drier compartment 12 to firmly position and strengthen the same.

A front wall 36 of the drier compartment 12 has a clothes receiving opening 37 therein, which is defined by an inwardly extending stepped flange 38. The stepped flange 38 is shown as being coaxial with the axis of rotation of the drum 28 and the inner portion thereof is shown as extending within an outwardly extending annular flange 39 extending from a front wall 40 of the drier drum 28 and lapping the inwardly stepped portion of the stepped flange 38. A sealing member 41 is shown as being mounted on the outer periphery of the inwardly stepped portion of the stepped flange 38 and as being secured thereto. The seal 41 has slidable sealing engagement with the inner periphery of the flange 39 to seal the clothes receiving opening of the drier drum 28 to the clothes receiving opening 37 in the front wall 36. A door 42 may be hinged to the front wall 36 of the drier compartment 12 to close the opening 37, and may be sealed to the clothes receiving opening by suitable sealing means (not shown) as in U. S. Patent No. 2,619,737, which issued to myself and Harold E. Morrison on December 2, 1952, and which does not form any part of the present invention so is not herein shown or further described.

The perforate wall 29 is provided with a central hub 43 having a shaft 44 mounted therein and extending rearwardly therefrom through the bulk head 30. A bearing member 45, which may be a self-aligning bearing of a well known construction, is shown as suitably secured to the bulk head 30 and as forming a bearing support for the shaft 44 supporting the drum 28 for rotation about a horizontal axis and accommodating limited axial movement of the drum 28 and shaft 44 during rotation thereof.

Since the self-aligning bearing 45 and the shaft 44 are relatively short compared with the overhanging length of the drier drum 33 and thus enable the horizontal depth of the drying compartment 12 to be reduced considerably from the depth of other driers, the forward end portion of the drier drum 28 is rotatably supported on a traveling endless belt 46 having supporting engagement with the under surface of the flange 39 and trained over spaced idler pulleys 47 as described in my copending application for patent entitled "Combination Washing and Drying Machine," Serial No. 357,797, filed May 27, 1953, and forming no part of the present invention and therefore not further described nor further illustrated herein.

During the clothes drying operation, the drier drum 28, which is rotatably supported, as described, is rotatably driven by a motor 50 which is secured to a base plate 48 for the drier compartment 12 by any convenient means such as bolts or the like 51. The motor 50 has a shaft 52 to which there is secured a pulley or the like 53 for rotation therewith and for driving a belt 54 which couples the motor 50 to an idler pulley or the like 55 fixed for corotation on a shaft 56 journaled on a supporting bracket 57 which is secured to the rear region of the recessed portion 24 of the top cover 19 for the washing compartment 11. The bracket 57 is a substantially L-shaped member having a rearwardly turned flange 58 secured to the top 19 for the washing compartment 11 for supporting and journalling the shaft 56 in a bearing 58' for rotation about a substantially horizontal axis. A second belt 59 fitted to another pulley 60 secured to the shaft 56 for rotation therewith, perpherally engages the cylindrical drum walls 49 of the drier drum 28, externally thereof, and drives the drum 28 as it is driven through coupling with the motor 50. The pulleys 55 and 60 are proportioned for a significant speed reduction in drier drum drive by providing the pulley 55 with a larger diameter than the motor drive pulley 53 and the drum drive pulley 60. By permitting this speed reduction commercially available motor units may be employed thereby facilitating the use of standardized equipment as much as possible.

The belt 54 also drives a fan rotor shaft 61 of an air circulating fan 62 by engaging a pulley 63 secured to the shaft 61 for rotation therewith. Thus, the main drive belt 54 which is driven by the motor drive pulley 53 engages both the main idler pulley 55 and the exhaust fan pulley 63.

The exhaust fan shaft 61 is journaled in a fan housing 64 through any convenient bearings or the like 65 for rotating an air impeller or the like 66 operably arranged to draw air from the drier drum 28 through the perforate wall 29 and through the air circulating exhaust opening 31 in the bulk head 30. Air from the exhaust opening 31 is directed towards the center of the centrifugal impeller 66 by a conduit or duct work 67 secured to the bulk head 30 and about the exhaust aperture 31 therein.

The exhaust duct 67 is secured to the bulk head 30 about the exhaust opening 31 therein and leads to a generally circular aperture facing the center of the centrifugal impeller 66. The housing 64 for the exhaust impeller is also secured to the bulk head as at 68 and further secured to the exhaust duct 67 as at 69. The blower housing 64 is formed substantially as a volute so that the impeller which draws air from the exhaust duct 67 into its axial area may pressurably expel the air at its periphery. The exhaust region of the housing 64, indicated generally at 70, directs the air from the impeller to a condenser 71 in accordance with the principles of the present invention.

The condenser 71, hereinbelow described in detail, washes the drier exhaust air to remove lint and the like therefrom which was picked up in the drying chamber and also dehumidifies or removes a substantial portion of the moisture in the drier air which was picked up during the drying operation in the drier drum.

Air leaving the condenser 71 is directed through a drier inlet duct or the like 72 which directs the air over a heater unit, such as, for example, an electrical heater or a gas heater or the like, generally indicated at 73, for reheating the air to a substantially increased temperature, and then directs the air to the inlet aperture 32 in the bulk head 30 for passage thereof through the perforate wall 29 of the drier drum 28.

The condenser 71, which forms an important part of the present invention, may be best understood with references to Figures 4, 5 and 6. The condenser 71 is preferably positioned within the washing compartment 11 and immediately adjacent to the rear wall 18 of the combined structure for securement to the lower portion of the partition 26. The condenser itself is comprised of a pair of air chambers 74 and 75 within which there is disposed a pair of liquid coolant chambers 76 and 77 respectively. The air chamber 74 and 75 have a unitary construction formed by a pair of outer front and back walls 78 and 79 joined at their ends by a pair of side walls 80 and 81 and a top wall 82 (Figures 2 and 5) and a bottom wall 83, thus giving the exterior a generally box-like configuration having a relatively narrow thickness dimension and relatively large height and width dimensions. The walls for the air chambers may be formed of any convenient material such as sheet metal which may be galvanized or the like as desired.

The liquid coolant chambers 76 and 77 have the same general configuration as the air coolant chambers but have a lesser thickness dimension and are formed of corrugated sheet material in the side walls 84 and 85 thereof, joined together at flange strip areas 86 and 87 which also provide means for securing the same to the side walls 80 and 81 of the air chambers. Partitioning members such as angle members 88 and 89, secured to the corrugated faces 84 and 85 of the water chambers substantially along the vertical centerline thereof, centrally position the water chambers within the air chambers and may be secured to the side walls 78 and 79 of the air chambers to laterally divide the condenser structure into a pair of air chambers. These angle members 88 and 89 preferably have a length substantially the same as the height of the water chamber walls 84 and 85 but are displaced from mating with the top and bottom edges of the water chambers so that the upper ends of the angle members are adjacent to and, if desired, secured to the top plate 82 of the condenser housing and of the air chambers.

An additional partition member such as a channel member or the like 90 is disposed along the vertical center line of the water chamber housing and is positioned substantially identically with the angle members 88 and 89 to separate the liquid coolant chambers 76 and 77 in accordance with the principles of the present invention. As a further feature of the condenser illustrated in the drawings the water chamber housing is supported above the bottom of the air chambers by inclining the lower or bottom surface 83 from each of the sides 80 and 81 downwardly to the centerline along which the divider members are secured so that the cross-sectional configuration of the bottom member 83 forms an obtuse angle the vertex of which lies along the vertical centerline of the condenser and the legs of which are substantially equal in length and terminate at the sides 80 and 81 of the condenser.

The top cover 82 for the air chambers is provided with a pair of apertures therein respectively accepting exhaust air from the outlet 70 of the fan or exhaust blower 62 and for delivering air to the drier inlet duct or conduit and heater conduit 72. Both of these conduits are secured to the condenser and substantially close or surround the above described apertures in the top plate 82. The fan exhaust duct 70 delivers air to the first air chamber 74 and the air circulates therethrough and through the passage between the air chambers as defined by the space below the partition or separator members 88 and 89 into the second air chamber 75 for redelivery of the air to the duct 72 and back to the drier drum.

While the air is passing through the described air chamber channelling a liquid coolant such as cold water or the like is supplied to the first liquid coolant chamber 77 by a water inlet pipe or the like 91 connected to any convenient source of cold water or the like and connected directly into the first coolant chamber 77 through the top wall or upper cover 92 for the water coolant chambers. The water entering the first water coolant or water chamber 77 circulates therethrough and through the passage between the two coolant chambers 76 and 77 as provided by the space below the partition channel member 90 and into the second coolant chamber 76. As the coolant chambers 76 and 77 fill with water the water level rises to a level just below the cover 92 where the corrugated side walls of the second coolant chamber are provided with a plurality of coolant orifices or apertures 93.

As the cold water exits from the second coolant chamber 76 through the aperture 93 into the front and rear portions of the first air chamber 74 a heavy spray or the like is produced and the cold water washes the exhaust air from the drier compartment 12. This washing process substantially removes the lint and dust and the like from the air and substantially cleans the same.

In addition to cleaning the air and removing the lint and dust therefrom the cold water spraying through the first air chamber 74 and the cold side walls of the second coolant chamber 76, as cooled by the passage of the coolant therethrough, are effective to cool the exwater content and vapor content therefrom. The exhaust air from the dried compartment 12 having picked up a substantial quantity of moisture from the clothes or the like beilng dried in the drier drum 28, has a relatively high humidity and water vapor content. Cooling this air is effective to condense a substantial portion of the water vapor therefrom even though the air is cooled by cold water spraying therethrough in addition

.o cooling by the cold side walls of the second water chamber 76.

The air circulating through the passage between the air channels or chambers 74 and 75 passes into the second air chamber 75 where it is further cooled and a further dehumidifying process takes place. Here, the side walls of the first coolant chamber 77 are cooled by the inlet water thereto from the water pipe 91 and are sufficiently cold to effect a substantial dehumidification of the air passing thereover as the air passes through the second air chamber 75 to the inlet duct 72.

As stated hereinabove, the air leaving the second air chamber, which is now substantially dry air and relatively cool, is heated by the heater elements 93 or the like to a relatively high temperature for passage into the drier drum 28 through the aperture 32 in the bulk head 30 and through the perforate wall 29. This air as heated by the heater element 93 and the inlet duct 72 has a substantially low water vapor content and a relatively high temperature, which is an efficient set of conditions for drying clothes or the like in the drier drum 28.

The paths of liquid coolant flow through the chambers and past the heat conductive walls thereof are indicated by the arrowheaded lines in Figure 4. These lines indicate that liquid coolant flows from the inlet 91 into the first coolant chamber 77 at the top thereof. From the first coolant chamber, flow is past the partition 90 and into the second coolant chamber 76 which fills until the coolant flows through the apertures 93 into the first air chamber 74.

The water or other liquid coolant from the first air chamber 74 is removed from the condenser 71 by a pump or the like 94 having an inlet 95 at the apex of the base plate 83 and an outlet 96 which discharges to any convenient drain. The pump 94 is driven by a belt and pulley mechanism including a pulley 97 on the pump shaft and another pulley 98 on the idler pulley shaft 56 and a belt 99 interconnecting the same. By these means the pump 94 is driven by the single motor 50 which operates through the several pulleys on the idler pulley shaft 56 to drive the single fan 62 for the closed air circulating system, the drier drum 28 within the drying compartment 12 and the liquid coolant discharge pump 94.

The operation of the washer in the compartment 11 and the drier in the compartment 12 and the condenser 71 immediately rearward of the washer may be controlled in any convenient manner such as by dial control members 100 positioned on the front wall 21 of the intermediate drive and fan compartment 13 and connected to the several portions of the combined mechanism, respectively. For convenience of illustration a shut-off valve 101 has been included in the liquid coolant pipe line 91 as a means of control of liquid coolant flow therethrough. This valve 101 may be included in the system as a supplementary control for water flow through the condenser in addition to any of the control dials 100 which may be connected thereto for control of the coolant flow.

From the foregoing it will be readily observed that numerous variations and modifications may be effected without departing from the true spirit and scope of the novel concepts and principles of the present invention.

I, therefore, intend by the claims to cover all such modifications and variations that fall within the true spirit and scope of the novel concepts and principles of my invention.

I claim as my invention:

1. In a combined washer and drier for clothes or the like wherein the drier is disposed above the washer and spaced therefrom to provide for opening and closing of a door disposed at the upper face of the washer and wherein a bulkhead substantially seals and supports a perforate end wall of a rotatable drier drum, the improvement which comprises, a condenser positioned adjacent to a rear surface of said washer, means to exhaust air from said drier and deliver the same to said condenser, means to exhaust air from said condenser and heat the air and redeliver the air to the drier, said condenser having a pair of outer chambers, and a pair of inner chambers positioned within said outer chambers, all of said chambers being substantially closed, a passage between said pair of outer chambers, a passage between said inner chambers, and a coolant passage between one of said inner chambers and one of said outer chambers, and means to deliver liquid coolant to the other of said inner chambers of said condenser whereby coolant will flow through both of said inner chambers and said one of said outer chambers to wash and dehumidify the air delivered to the condenser, said exhaust air first passing through said one outer chamber having said coolant passage to contact the coolant and then through the other outer chamber in order that the lint will be removed first from the air.

2. In a combined washer and drier for clothes or the like wherein the drier is vertically dispaced and substantially aligned with the washer and wherein the drier has a rotatable drum with a perforate wall which is substantially sealed and supported by a bulkhead having apertures therein for providing air to the drier drum and exhausting air from the drier drum, the improvement which comprises a condenser forming part of the combined mechanism, a pair of outer air chambers in said condenser, a pair of inner coolant chambers within said air chambers respectively, all of said chambers being substantially closed, a passage between said pair of outer air chambers, a passage between said pair of inner coolant chambers, and a passage between one of said inner coolant chambers and the outer air chamber within which said one inner coolant chamber is positioned, means to deliver liquid coolant to said liquid coolant chambers for passage therethrough and through one of said outer air chambers, means to exhaust air from said drier and to deliver the same to said one of said outer air chambers, means to exhaust air from the other of said outer air chambers to redeliver the same to said drier, whereby air circulates from said drier to said condenser and successively through the outer air chambers thereof back to said drier, and whereby said air is washed and dehumidified during passage through said condenser.

3. In a combined washer and drier having a washer compartment, a drier compartment disposed above said washer compartment and spaced therefrom and an intermediate compartment with means in said intermediate compartment to exhaust air from said drier compartment and means in said intermediate compartment to heat air and deliver the same to said drier compartment drive means in said intermediate compartment to actuate the air exhaust means, a condenser assembly including a pair of air chambers and a pair of coolant chambers exposed to air flowing through the air chambers, means to deliver coolant to said coolant chambers means to deliver coolant to one of said air chambers for removing lint from the air, means to remove coolant from said one air chamber, and means interconnecting the drive means in said intermediate chamber with the means to remove coolant from said air chamber, said condenser being connected to the air exhaust means and air heater and delivery means whereby exhaust air will flow through the air chambers in contact with the coolant and with the coolant chambers and will be washed and substantially dehumidified and delivered to said air heater.

4. A hot air clothes drier or the like comprising in combination in a closed and recirculating air system, means to exhaust air from said drier, conduit means for receiving the air and directing it back to the drier, a condenser in said conduit means including first and second air chambers through which the air is sequentially forced in traversing said conduit, a second fluid chamber positioned within said first air chamber with the walls thereof spaced from the walls of the air cham-

ber, a first fluid chamber positioned within the second air chamber with the walls thereof spaced from the walls of the air chamber, fluid communication means between said fluid chambers, fluid openings at the top of the second fluid chamber whereby the fluid is discharged into the first air chamber to flow down the walls of the air chamber and fluid chamber, and means to deliver a fluid coolant to the first fluid chamber whereby the cooler fluid is first introduced into the second air chamber and subsequently introduced into the first air chamber with the warmest fluid coolant passing into the first air chamber, the next warmest fluid being in the second fluid chamber and the coolest fluid being in the first fluid chamber, the air in the first air chamber receiving the dual cooling action of the free fluid coolant in the air chamber and the cool walls of the fluid chamber, and the air flowing through the first air chamber in the direction in which the fluid coolant flows downwardly through the air chamber.

5. In a hot air clothes drier or the like, a closed and recirculating air system comprising an air conduit for leading air out of the drier and returning it thereto, means to exhaust air from the drier and move it through said conduit, a condenser in said conduit formed of a generally rectangular vertical horizontally elongated enclosure forming a first and a second air chamber, said chambers separated by a vertically extending baffle through said enclosure extending to the top of the enclosure and spaced from the bottom to provide for the passage of air from the first to the second chamber, first and second liquid coolant chambers positioned respectively within said second and first air chambers, said coolant chambers having walls with vertical corrugations therein to direct the flow of air through the air chambers in a vertical direction, the walls of said liquid chambers being spaced from the air chambers to provide for the passage of air therebetween, means for delivering a supply of coolant fluid to the first liquid chamber, communication means between the first and second liquid chamber for the flow of fluid coolant to the second chamber, means for the escape of liquid coolant at the top of the second liquid chamber whereby the liquid flows down the walls of the second liquid chamber and the first air chamber, and means for removal of the fluid at the base of said enclosure, the air entering the top of the first air chamber from said enclosure, the air entering the top of the first air chamber from said conduit and being discharged from the top of the second air chamber to said conduit.

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