

Feb. 1, 1949.

E. R. KOPPEL

2,460,422

CLOTHES DRIER

Filed July 28, 1945

4 Sheets-Sheet 1

Fig. 2

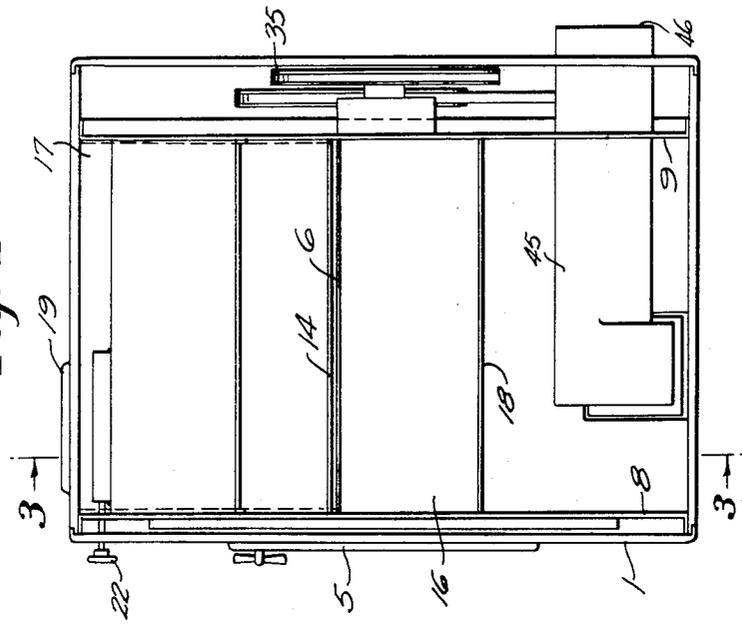
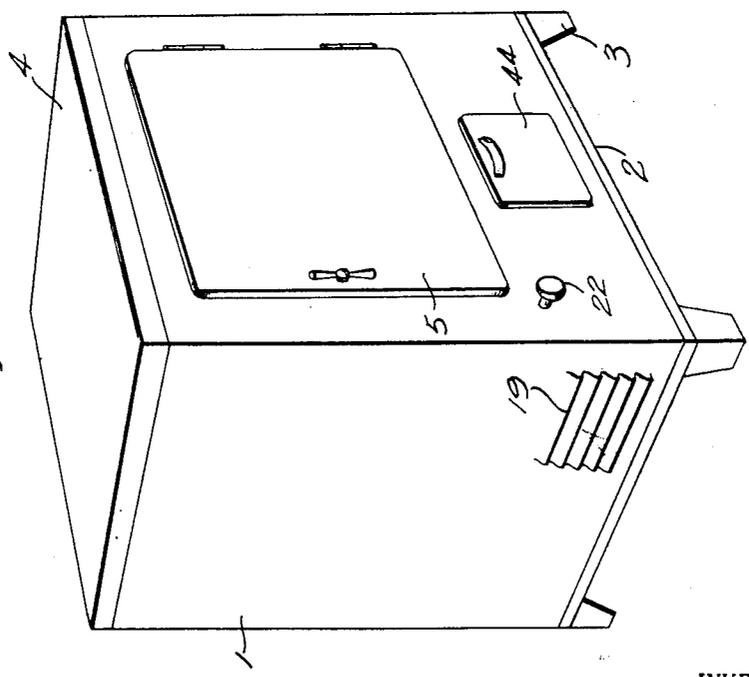


Fig. 1



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Fig. 4

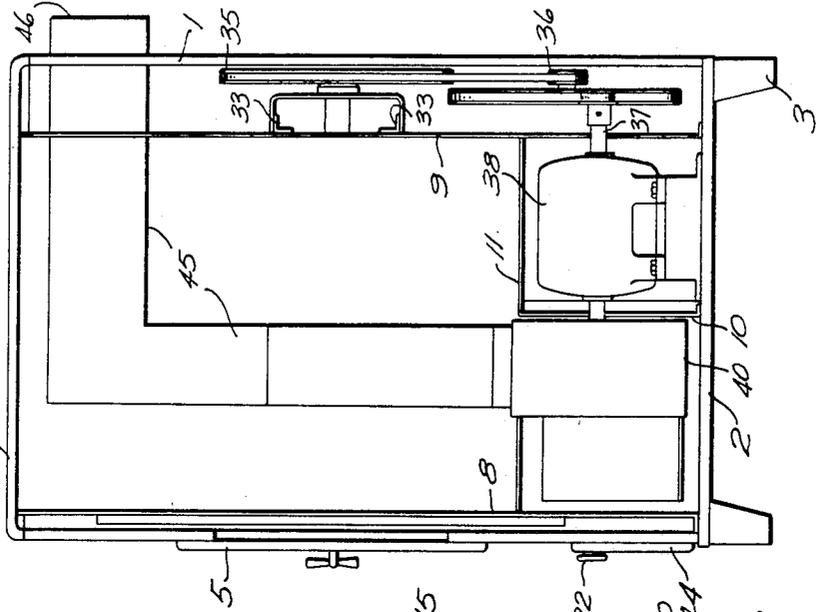
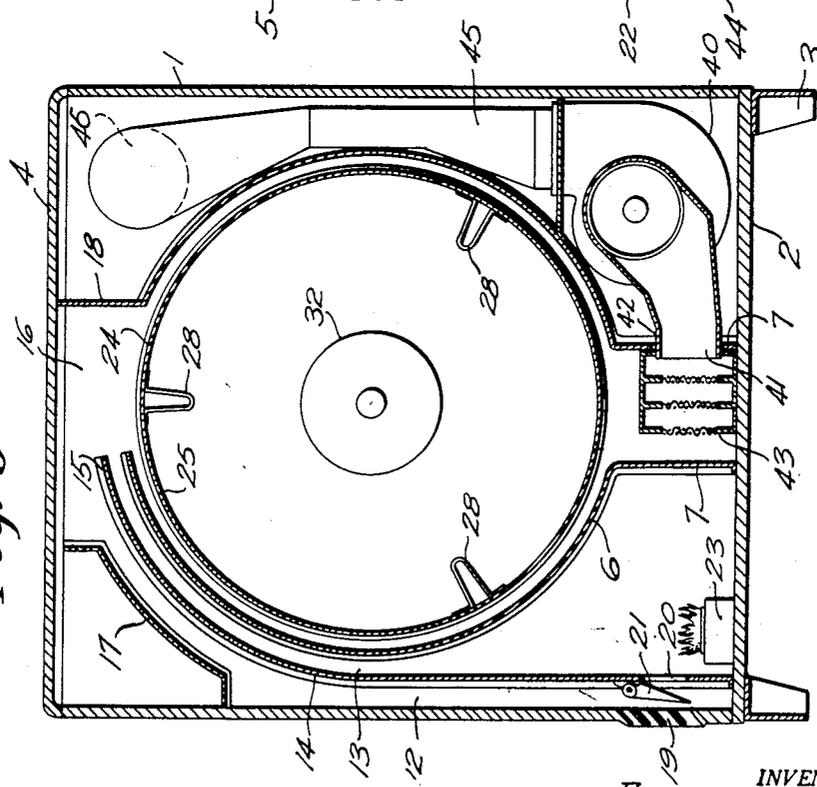


Fig. 3



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4 Sheets-Sheet 3

Fig. 6

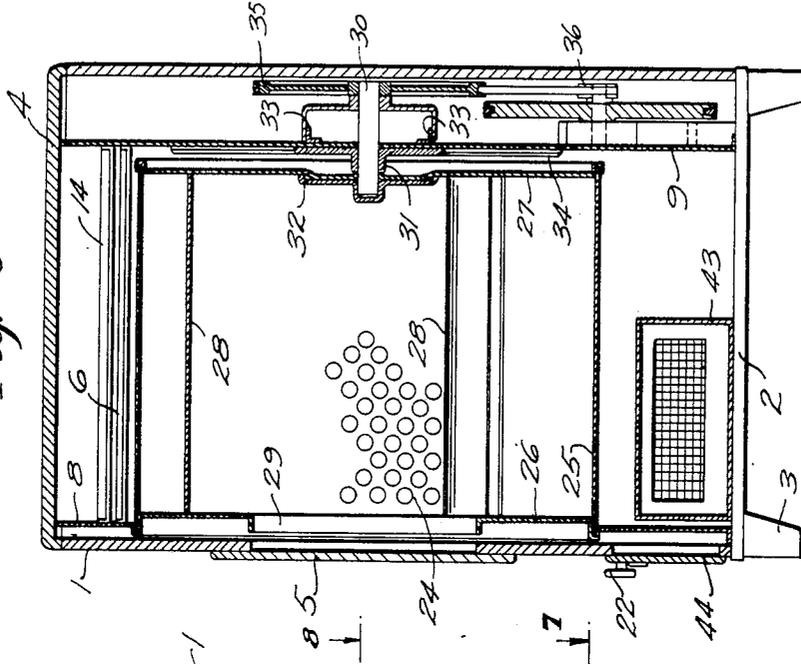
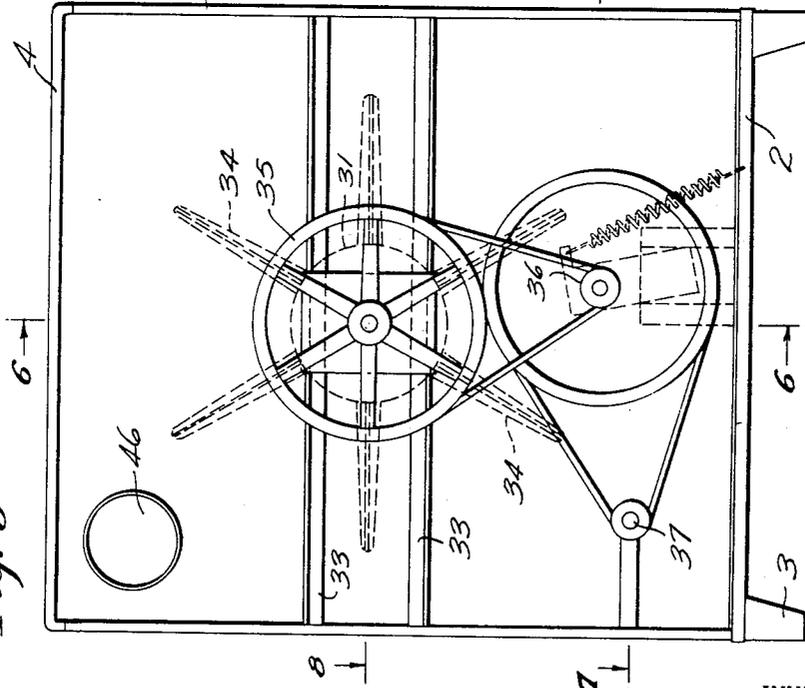


Fig. 5



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Fig. 8

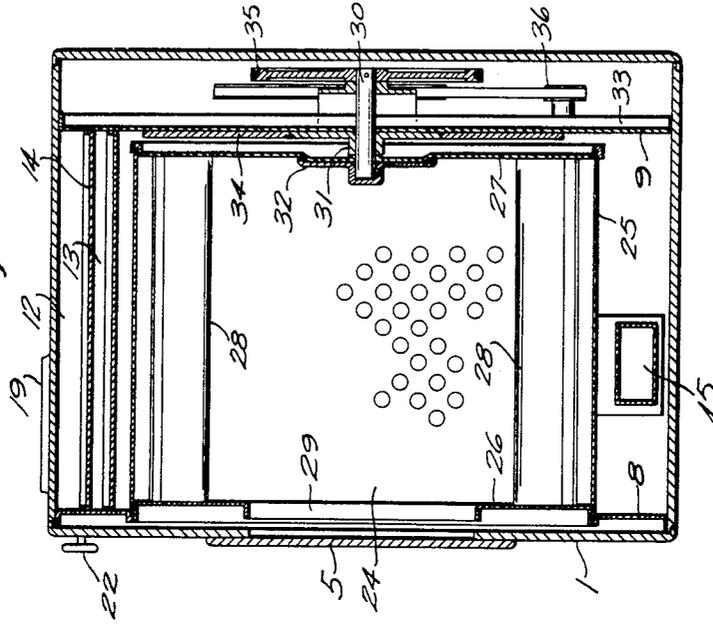
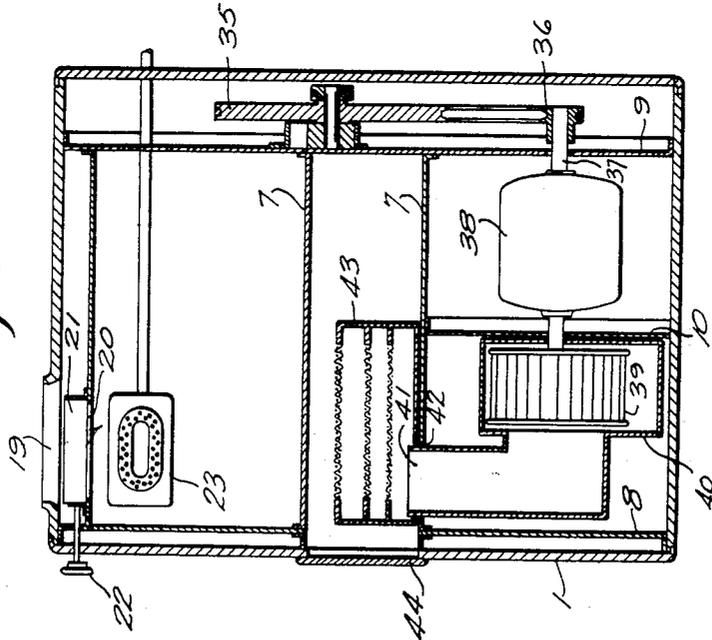


Fig. 7



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UNITED STATES PATENT OFFICE

2,460,422

CLOTHES DRIER

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Application July 28, 1945, Serial No. 607,578

11 Claims. (Cl. 34—133)

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This invention relates to a clothes drier and has particular reference to a drier that will find domestic use in homes and apartment buildings.

One object of the invention is to provide a generally light weight and compact clothes drier unit that may be readily employed in domestic use or the like.

Another object is to provide a clothes drier unit in which the drying air comprising a mixture of fresh air and heated air is drawn through the drum of the drier with maximum air movement and utilization of the greatest moisture carrying capacity of the air.

Another object is to provide a clothes drier in which cabinet surface temperatures are lower with the consequent elimination of a substantial amount of insulation.

Another object is to provide a clothes drier that is well balanced with respect to location of the parts and can be readily assembled.

A further object is to provide a clothes drier in which the drying air after being drawn through the clothes holding drum, is exhausted together under forced draft to the outside air.

A further object is to provide a clothes drier in which the inflowing fresh air is employed to insulate the side of the drier cabinet adjacent the heater unit.

Another object is to provide a clothes drier in which inflowing drying air and heated air or gases are mixed as they enter the rotating clothes holding drum.

The structure of the invention in general comprises a generally square cabinet enclosing a rotatable perforated cylindrical clothes containing drum through which fresh air and heated air are simultaneously pulled by a suction fan driven by a motor that also drives the drum through reduced gearing. The flow of the fresh air and the heated air created by a heater unit, to the drum under the suction of the fan occurs in separate ducts formed by a diverter plate with the air uniting to provide the drying air at the line adjacent the top of the drum where they enter the same. The diverter plate is spaced from the outer cabinet and the inflowing room air in the outer duct formed by the plate insulates that side of the drier adjacent the heater unit.

An embodiment of the invention is illustrated in the accompanying drawings, in which:

Fig. 1 is a perspective view of the drier;

Fig. 2 is a top plan view with the top cover plate removed;

Fig. 3 is a vertical transverse section of the drier taken on line 3—3 of Fig. 2;

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Fig. 4 is a right hand elevation with the side plate removed;

Fig. 5 is a rear elevation with the rear cover plate removed;

Fig. 6 is a longitudinal vertical central section taken on line 6—6 of Fig. 5 with the rear cover plate in position;

Fig. 7 is a horizontal section taken on line 7—7 of Fig. 5; and

Fig. 8 is a horizontal central section taken on line 8—8 of Fig. 5.

The clothes drier of the invention illustrated in the drawings comprises a generally square casing 1 formed of front, rear and side panels and supported on a base 2 having four short legs 3 at the respective corners of the base. The casing is closed at the top by a removable cover 4 and access to the interior of the drier is provided by a relatively small door 5 suitably secured to the front panel of casing 1.

A drum housing 6 is located inside the casing 1. Housing 6 is generally cylindrical in shape with the ends thereof disposed adjacent the front and rear panels of the casing 1. The drum housing is formed from two sheet metal members each of semicylindrical shape with the downwardly extending sheet metal edge flanges 7 spaced apart horizontally a substantial distance to leave the housing open at the bottom.

The front end of the housing 6 is secured to the front housing plate 8 while the rear end is secured to rear housing plate 9. The front and rear housing plates are in turn secured to base 2 with the latter extending outwardly beyond the housing in all directions to accommodate casing 1 and the other parts of the drier to be described hereinafter. The lower flanges 7 of the housing extend downwardly to base 2. The plates 8 and 9 support the housing within casing 1. Rear plate 9 closes the rear of housing 6 and of casing 1 while front plate 8 closes the front of casing 1 and has a circular opening registering with the cylindrical portion of housing 6 and adapted to receive the drier drum.

The space on the right side of the housing 6 above the base 2, as shown in Fig. 4 is substantially equally divided into two parts transversely by the vertical plate 10 which extends horizontally outwardly to the side panel of the casing 1 from housing 6 substantially parallel to housing plates 8 and 9. Plate 10 extends upwardly from base 2 and is provided with a cover plate 11 suitably secured thereto.

The space on the left of the housing 6 between base 2 and the top cover 4 is substantially equally

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divided into an outer compartment or duct 12 and an inner compartment or duct 13 by the upwardly extending diverter plate 14.

The diverter plate 14 extends from the front to the rear housing plates 8 and 9 and is suitably secured to base 2. The plate 14 extends upwardly to a line removed from cover 4 and housing 6 and the upper end portion 15 is curved inwardly corresponding to the curvature of housing 6 to a line adjacent the laterally extending opening 16 provided in the top of the housing. The ducts 12 and 13 are of substantially equal dimensions since the plate 14 is preferably equi-distant from the housing 6 and from the side panel of casing 1. The housing 17 for the automatic controls, not shown, to operate the drier is located in the upper left corner of the casing 1. This housing 17 also maintains outer duct 12 substantially equal in dimensions throughout.

A separator or baffle plate 18 extends between front and rear housing plates 8 and 9 from top cover 4 to housing 6 at the right side of the opening 16 in the housing 6 to direct the flow of drying air from ducts 12 and 13 down through the housing opening 16 at the top of the drum housing.

Fresh air enters louvered opening 19 in the lower left panel of the casing 1 and flows upwardly through outer duct 12 and into housing 6 through vertical opening 16. Fresh air may also flow into inner duct 13 through opening 20 in the lower inner portion of diverter plate 14. Flow of air through opening 20 may be regulated by damper 21 which is manually operated from the outside by handle 22.

The fresh air flowing to duct 13 through opening 20 is heated by a heater unit 23 which is shown as a gas burner suitably mounted on base 2 at the bottom of inner duct 13 near the front lower left hand corner of the drier. An electric heating unit may also be employed, to heat the air passing through opening 20 or any other suitable type of heating installation may be used. The heated air flows upwardly in inner duct 13, and unites with the stream of fresh air flowing in outer duct 12 at the line of entry into housing 6 through vertical opening 16 to provide the drying air for the clothes drier unit. The temperature of the heated air flowing in inner duct 13 may be regulated by opening or closing damper 21 by handle 22 to control the passage of air through opening 20 into the inner duct.

The fresh unheated air flowing in outer duct 12 eliminates the necessity of insulation on the heater side of the drier since the air keeps the outside casing cool and raises the efficiency of the drier by mixing of the cool fresh air with the heated air as it enters the drum housing 6 through opening 16.

A generally cylindrical rotary clothes carrying drum 24 is disposed within drum housing 6 with a radial clearance being provided between the drum 24 and housing 6.

The body portion 25 of the drum 24 is perforated to permit passage therethrough of the drying air and the front and rear circular end plates 26 and 27, respectively, are suitably secured to each end of the body portion 25. Inward longitudinal rib-like projections 28 are secured to the body portion 25 of the drum to agitate the clothes within the drum during rotation.

The front end plate 26 substantially closes the cylindrical portion of the front end of housing 6, and a circular opening 29 is provided in the middle of the end plate 26 aligned with door

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5 in the front panel of casing 1 to provide for the introduction and removal of clothes into and out of drum 24.

The rear of drum 24 is completely closed by rear end plate 27 which is parallel to and adjacent the rear housing plate 9.

A generally short shaft 30 extends through the center of rear end plate 27 and rotates within bearing 31 which is mounted in rear housing plate 9 of housing 6 to support the drum in the housing. The inner end of the shaft 30 is welded or otherwise secured to a cap plate 32 which is in turn secured to drum plate 27 to rotate the drum when shaft 30 is rotated.

Bearing 31 is preferably of the oilless type and may be reinforced by a pair of horizontal strips 33 welded to the back side of rear housing plate 9 and extending horizontally across the same parallel to each other. Rear plate 9 may additionally be reinforced on its front side by strips 34 welded thereto and extending radially from bearing 31.

A sheave 35 is secured to the rear end of shaft 30 projecting rearwardly from rear housing plate 9. The sheave 35 is removable from the shaft to free the latter for removal of the drum 24 through the front of the unit should this be necessary.

The sheave 35 is belt-connected to an intermediate sheave 36 which is in turn belt-connected to the drive shaft 37 of the motor 38. The sheave 36 is preferably supported in a floating manner by any suitable arrangement adapted to automatically take up slack in the belt connections of sheave 36 to sheave 35 and to shaft 37.

The motor 38 is mounted on base 2 in the rear compartment formed by transverse plate 10 and cover plate 11 in the lower right-hand rear corner of the drier. The shaft 37 is a double shaft extension.

The rear end of shaft 37 extends rearwardly through plate 9 and drives drum 24 by the belt drive described. The several sheaves are of a size to give a substantial speed reduction so that the rotation of drum 24 is slow.

The forward end of shaft 37 extends through plate 10 and is directly connected to the rotor of fan 39 of the rotary blower 40.

The blower 40 is mounted on base 2 in the compartment formed by transverse plate 10 and cover plate 11 in the lower right-hand front corner of the drier.

The blower 40 is of the squirrel cage suction type and fan 39 thereof is of a construction that prevents it from clogging with lint. The intake conduit 41 of blower 40 extends horizontally inward and is connected to drum housing 6 at a rectangular opening 42 provided in the right hand flange 7 of the housing. A lint filter 43 of any suitable type may be provided between flanges 7 on base 2 at the entrance to conduit 41 and below drum 24 to catch lint carried by the drying air sucked into the blower from the drum housing 6. A small door or removal panel 44 may be provided in the front panel of casing 1 to facilitate removal and cleaning of the filter 43 from time to time.

The fan 39 of blower 40 sucks the drying air through the intake conduit 41 and discharges the same through an exit conduit 45. Exit conduit 45 extends upwardly through cover plate 11 from blower 40 between casing 1 and drum housing 6 to a flue opening 46 in the rear wall of the casing at the upper end thereof. The flue opening may

be suitably connected to a vent or chimney not shown, leading to the outside of the building in which the drier of the invention is located. Suitable insulation may be provided adjacent conduit 45 to prevent excessive heat reaching the panels of casing 1.

When fan 39 is in operation a suction is created in the inlet 41 to blower 40 which pulls the drying air downwardly through drum 24, from ducts 12 and 13, as the drum rotates. The motor 38 serves to rotate both the drum 24 and fan 39 and is regulated by the controls, not shown, disposed within housing 17.

In the operation of the drier described and illustrated, a suitable amount of the wet clothes to be dried are deposited in drum 24 through door 5 and opening 29 in the front plate 26 of the drum. The door is then closed and the controls are manipulated to start motor 38 and heater unit 23. Motor shaft 37 drives fan 39 at a high speed and rotates drum 24 at a slow speed.

The fan 39 pulls fresh air into outer duct 12 through opening 19 in the side panel of casing 1 and also draws the air heated by the heater unit 23 up through the inner combustion duct 13. The fresh air and heated air unite at the line of entry through opening 16 in housing 6 to provide the drying air which flows through the drum 24 as the latter rotates to dry the clothes therein.

The fan 39 sucks the drying air through the drum 24 and filter 43 into intake conduit 41 of the blower 40. The drying air is then discharged by the fan through exit conduit 45 and out through a suitable vent or chimney to the outside air. The controls operate automatically by a thermostat or hygrometer to turn off the heater unit 23 after the clothes in the drum are brought to the degree of dryness desired, and then to stop motor 38 as soon as the clothes have been suitably cooled by circulation of room air therethrough.

Damper 21 may be manipulated by handle 22 to control the flow of air into inner duct 13 through opening 20 in diverter plate 14 and regulate the temperature of the air heated by the heater unit 23. From time to time lint filter 43 may be removed through door or panel 44 for periodic cleanout of the same.

The invention provides a compact clothes drier for domestic use. The invention also utilizes the outside air for insulation purposes and provides a novel structure for mixing fresh air and heated air prior to entry into the clothes carrying drum to utilize the maximum moisture carrying capacity of the air.

Various embodiments of the invention may be employed within the scope of the accompanying claims.

I claim:

1. A clothes drier comprising, an outer casing, a generally cylindrical housing secured within said casing, a perforated clothes carrying drum mounted for rotation within said housing and accessible through the front of said casing for loading and unloading of clothes, a diverter plate disposed laterally within one side of the casing substantially equi-distant between the casing and said housing to provide an outer duct between the plate and casing for the passage of fresh air and an inner duct between the plate and housing for the passage of heated air, said plate being curved inwardly at the upper portion to the shape of the housing and extending to a line above said hous-

ing, a vertical opening in said housing beneath the upper end of said plate, a baffle plate secured between the housing and top of the casing on the side of said opening opposite said ducts to direct the fresh air and heated air simultaneously through said housing opening and into said drum, means to supply fresh air to the outer passage and heated air to the inner passage, means to drive said drum, and means to flow said fresh air and heated air through said ducts and drum and out through the casing wall.

2. A clothes drier of the class described comprising a generally rectangular casing, a generally cylindrical housing disposed in substantially the center of said casing, a perforated clothes drum rotatably mounted in said housing, a door in one panel of the casing to load and unload said drum axially thereof, a diverter plate on one side of the casing generally equi-distant from said housing and casing and providing an inner and outer passage to an opening through the top of said housing into said drum, a heater unit in the lower portion of the casing beneath said inner passage and an opening in the side panel of the casing to permit air to flow into said outer passage, a control housing for controls in the upper portion of the casing on the same side as said heater, a baffle plate between said housing and upper panel of the casing to direct the fresh air and heated air into said drum through the housing opening, a suction blower unit near the bottom of the casing adjacent the front panel thereof, a drive motor in the lower portion of the casing back of said blower and adjacent the rear panel to drive said drum and the fan of said blower, and an exit conduit leading from said blower to an outside vent to carry off the discharged drying air.

3. A clothes drier comprising an outer casing, a drum housing in said casing, a perforated clothes carrying drum mounted for rotation within the housing, a plate member disposed within one side of said casing between the same and said housing in a manner to provide at least two separate passages for conduction of drying media to said drum, one passage being adjacent the outer casing and the other being adjacent the drum housing, means to supply fresh air to the outer passage and heated air to the inner passage, said housing having an opening communicating with the ends of said passages and a second opening opposite the first for discharging air from the drum and through the casing, and means to simultaneously rotate said drum and pass air through said passages and openings through said drum.

4. A clothes drier comprising an outer casing, a drum housing secured in said casing, a perforated clothes carrying drum mounted for rotation within said housing, a plate member disposed within one side of said casing between the same and said housing in a manner to provide at least two passages to said drum for the carrying of fresh air in the outer passage and the carrying of heated air in the inner passage, said casing having an opening to provide fresh air for the outer passage, a heater unit in the inner passage to supply heated air thereto, a damper member to supply air from said outer passage to the inner passage and to regulate the temperature of the air flowing therein, said housing having an opening communicating with the ends of said passages and an opposite opening communicating with the outside of said casing, and means to rotate said drum and to flow air through said

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passages simultaneously to a line of mixture upon entry into said drum and thence through the drum and out through the wall of the casing.

5. A clothes drier comprising an outer casing, a drum housing secured in said casing, a perforated clothes carrying drum mounted for rotation within said housing, a plate member disposed within one side of said casing between the same and said housing in a manner to provide at least two passages to said drum for the carrying of fresh air in the outer passage and the carrying of heated air in the inner passage, said casing having an opening to provide fresh air for the outer passage, a heater unit in the inner passage to heat the air flowing therein, a damper member to supply air from said outer passage to the inner passage and to regulate the temperature of the heated air flowing therein, a rotary suction fan located on the other side of said casing adjacent said drum housing, said housing having an opening communicating with the ends of said passages and an opposite opening communicating with said suction fan, an outlet passageway through the wall of said casing for said suction fan, and a motor adjacent said fan to rotate said drum and to drive said fan to pull the fresh air and heated air through said passages to a line of mixture and thence through said drum and discharge the same out through the wall of the casing.

6. A clothes drier comprising an outer casing, a generally cylindrical housing secured within said casing, a perforated clothes carrying drum mounted for rotation within said housing and accessible through the front of said casing for loading and unloading of clothes, a common passage in the upper part of said casing communicating with said drum through said housing, a diverter plate disposed within one side of said casing in a manner to provide an outer passage between the same and the casing and an inner passage between the same and the drum housing, air inlet vents for said passages, the outer passage being a fresh air duct and the inner passage being a duct to carry heated air with said heated air and fresh air combining into drying air in said common passage and into said drum, said housing having an opening opposite said common passage communicating with the outside of the wall of said casing, and means to rotate said drum and to flow fresh air and heated air through said duct passages simultaneously to a line of mixture into drying air in said common passage for flow through said drum and thence out through the wall of the casing.

7. A clothes drier comprising an outer casing, a generally cylindrical housing secured within said casing, a perforated clothes carrying drum mounted for rotation within said housing and accessible through the front of said casing for loading and unloading of clothes, a diverter plate disposed within one side of said casing in a manner to provide an outer passage between the same and the drum housing, the outer passage being a fresh air duct and the inner passage being a duct to carry heated air with said fresh air and heated air combining into drying air in a common passage through said housing and into said drum, air inlet vents at one end of and for said passages, a baffle plate disposed between the upper portion of said housing and the top of the casing at an opening through said housing at the mouth of said duct passages to direct the flow of said drying air into said drum, an outlet duct passage at another opening of said housing com-

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municating with the outside wall of said casing, and means to rotate said drum and to flow the fresh air and heated air through said duct passages simultaneously to a line of mixture into drying air in said common passage for flow through said drum and thence discharge the same out through the wall of the casing.

8. A clothes drier comprising an outer casing, a generally cylindrical housing secured within said casing, a perforated clothes carrying drum mounted for rotation within said housing and accessible through the front of said casing for loading and unloading of clothes, a diverter plate disposed laterally within one side of the casing substantially equidistant from the casing and said housing to provide an outer duct between the plate and casing for the passage of fresh air and an inner duct between the plate and housing for the passage of heated air, said plate curving inwardly at the upper portion to the shape of the housing and extending to a line above said housing, a vertical opening in said housing beneath the upper end of said plate, a baffle plate secured between the housing and top of the casing on the side of said opening opposite said ducts to direct heated air and fresh air simultaneously through said housing opening and into said drum, means to supply fresh air to the outer passage and heated air to the inner passage, a rotary suction fan having its intake connected to the lower end of said housing at the opposite side of the casing from said ducts, an outlet duct passage from said fan passing through a wall of said casing, and a motor to drive said drum and fan to pull fresh air and heated air through said ducts and drum and discharge the same through a wall of said casing.

9. In a clothes drier of the class described comprising essentially an outer casing having an inlet opening on one side for passage of fresh air therethrough, a clothes carrying drum rotatively mounted within said casing, a generally cylindrical housing within said casing and about said drum having an opening therein to said drum, a drive motor rotating said drum through a reduction drive, a suction fan directly driven by said motor to pull fresh air and heated air through said drum to dry the clothes tumbling therein upon rotation of the drum, a diverter plate dividing the space between the housing and casing on one side of the casing to provide an inner passage and an outer passage and having an inlet therein to said inner passage, means to heat the air in said inner passage, and an opening in the upper portion of said drum housing communicating with said passages, said fan drawing fresh air through the inlet opening in said casing into said outer passage and through the inlet in said plate to said inner passage for heating the latter air by said means and effect a mixing of the fresh air and heated air into drying air at a line of entry into said drum through the opening in said housing with the colder air in the outer passage between the casing and plate insulating the outer casing from the heat carried by the heated air flowing in the inner passage.

10. In a clothes drier of the class described comprising essentially an outer casing, a clothes carrying perforated drum rotated therein, a generally cylindrical drum housing enclosing said drum and open at the top to the drum, a drive motor for rotating said drum through a reduction drive, a suction fan located inside the casing adjacent said drum and directly driven by said motor, means extending from the inlet of the fan

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and through said cylindrical housing to connect the suction of the fan to the space surrounding the drum to pull fresh air and heated air through said drum to dry the clothes tumbling therein upon rotation of the drum, a heater located between the drum housing and side wall of the casing in the lower portion of said casing, an inner duct extending upwardly from said heater and discharging air heated by said heater to said drum through the opening in the top of the drum housing, an outer duct separate from said inner duct for carrying fresh air to said drum along the wall of the casing and a common duct on the side of the casing opposite said first named ducts and connected to the outlet side of said suction fan for the discharge of the drying air after passage through said drum and fan.

11. A clothes drier comprising an outer casing, a housing secured within said casing and having a generally cylindrical body portion and lower longitudinal flanges spaced apart and extending downwardly to the base of said casing, a perforated clothes carrying drum mounted for rotation within said housing with the rear end closing said housing and the front end open to receive and discharge clothes, a door in said casing for closing said drum during rotation of the same, a rotary suction blower disposed in the lower portion of said casing beneath said drum, a motor to drive the blower and said drum through an extension shaft, an outer duct within and adja-

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cent the outer casing and a second inner duct within and more remote of said casing leading from openings in the lower side of said casing to an opening in the top of said housing with the outer duct carrying fresh air and the inner duct carrying heated air, an exit conduit leading from said blower to another opening in said casing to discharge the drying air pulled through said ducts and drum by the fan of the blower, and a lint filter located at the entrance to said blower beneath the drum to catch lint drawn from the clothes in the drum by the suction of the blower.

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