Sept. 6, 1966 D. F. FAIRGRIEVE 3,270,436

CLOTHES DRIER

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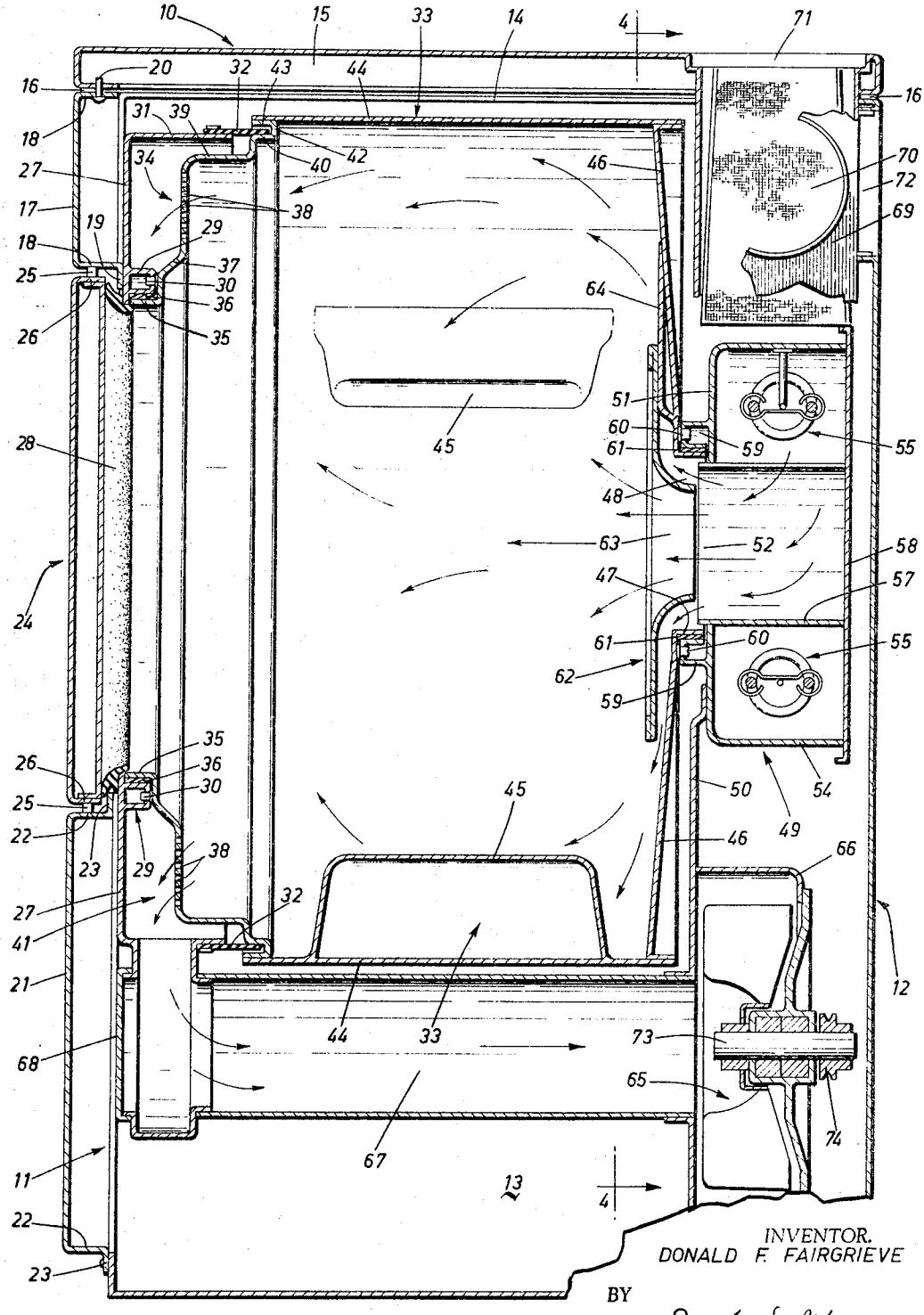


FIG. 1

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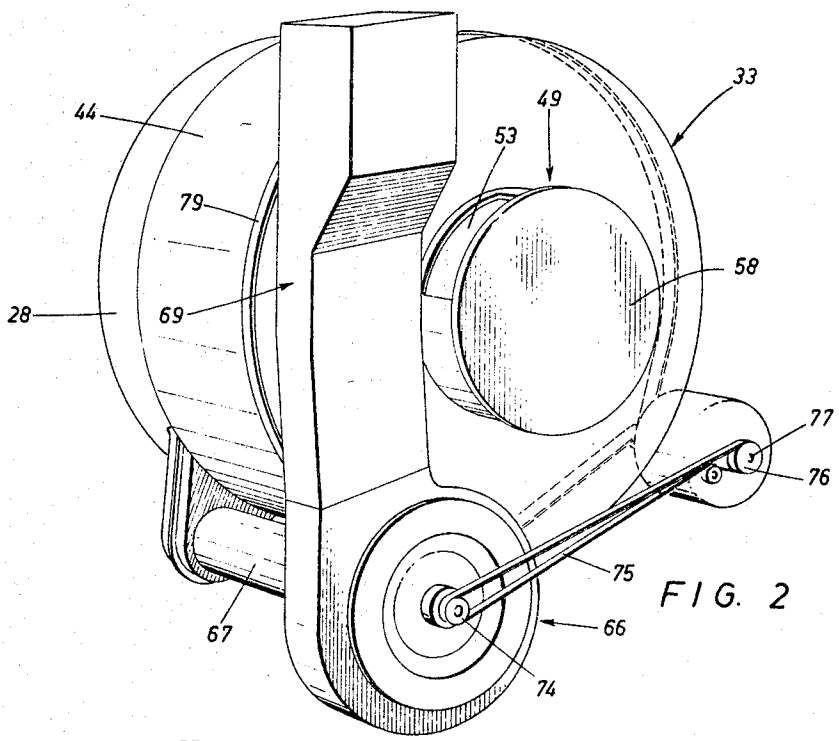


FIG. 2

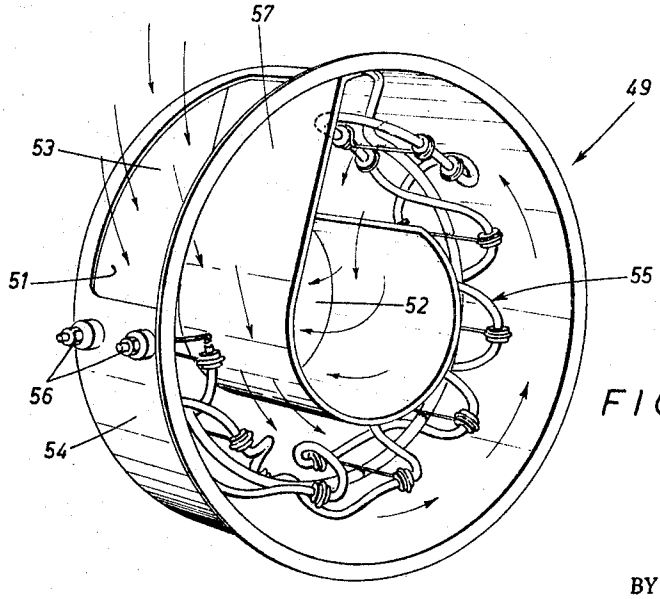


FIG. 3

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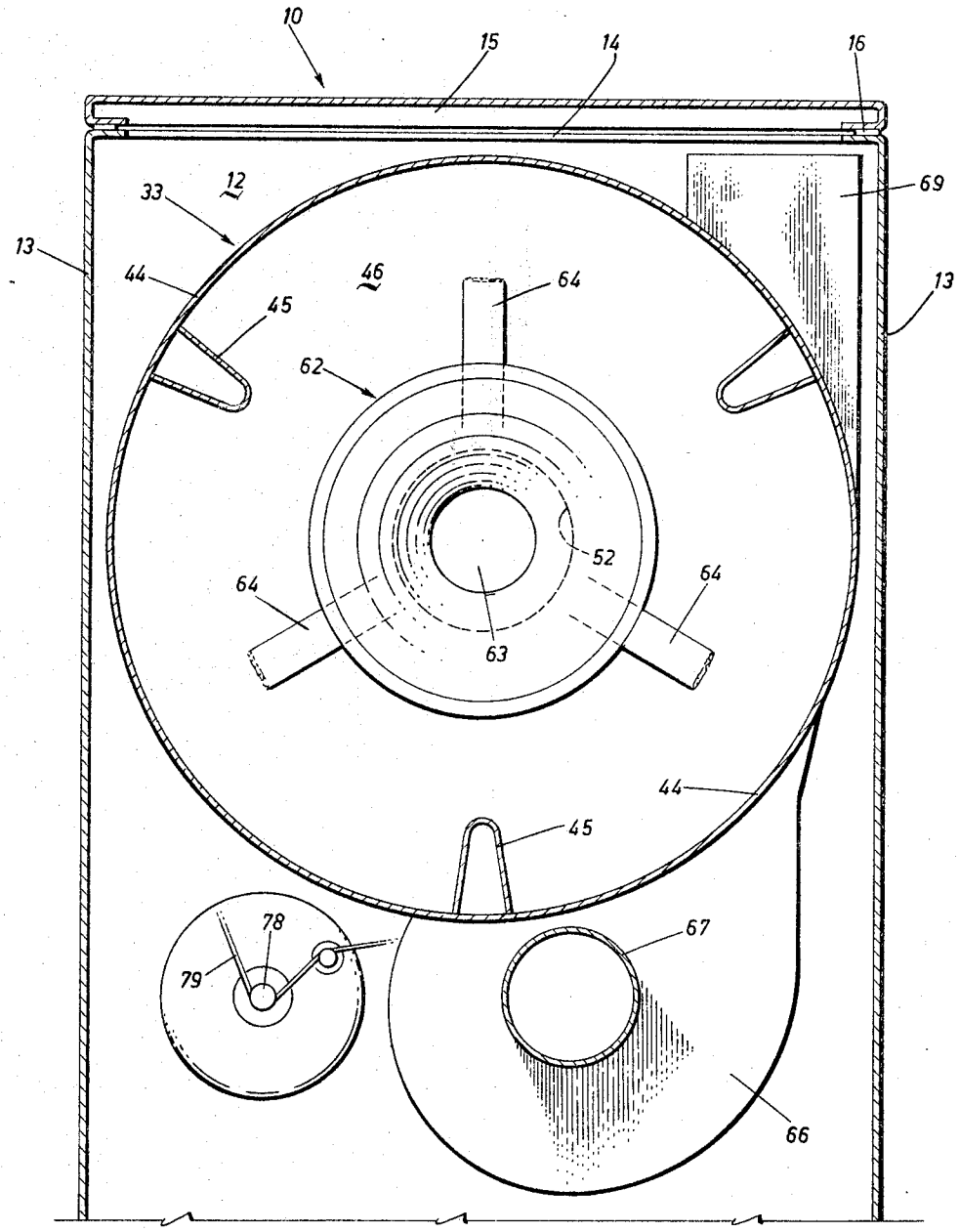


FIG. 4

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CLOTHES DRIER

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2 Claims. (Cl. 34—131)

This invention relates to improvements in a clothes drier of the type in which drying is accomplished by tumbling clothes in a horizontally rotating drum in the presence of a controlled flow of heated air.

More particularly, the invention is directed to a drier having a drum provided with spaced peripheral baffles secured to the inner surface, the wall of the drum being perforated adjacent to its forward end. The ends of the drum are provided with central openings, the forward opening giving access to the drum for insertion and removal of the clothes and the rear opening communicating with a heating unit; means are provided to trap the lint which is removed from the clothes during the drying operation.

To be efficient in operation a drier of this type requires uniform distribution of the air in the drum but a high throughput or flow rate of air is also desirable because with the same distribution the speed of drying will increase with the throughput, the other factor determining the drying speed, namely air temperature, being limited by the need to avoid damage to the clothes.

A high flow rate is also advantageous because it provides a sweeping action which prevents the accumulation around the insulators attached to the heating elements of particles of lint drawn in from the atmosphere; such accumulation frequently arises with slow rates of air flow and may develop to the extent of creating a fire hazard.

However, while high flow rates are desirable, the problem of ensuring uniform distribution of the air is increased because of the tendency of the air to channel in the drum. Again the advantages of increased air flow are only attained if the air temperature is maintained at the highest permissible level but for this condition to be achieved the faster flowing air must pass over the heating elements for a longer time; the obvious way of ensuring this condition is to increase the length of the elements but this affects the size of the heating unit and thus the compactness of the drier.

The invention is directed to a clothes drier having an open-ended rotatable drum operating with a high throughput of air with an arrangement for heating the air which is in a compact form.

Another object of the invention is to provide an arrangement for ensuring that the high velocity air flow is distributed uniformly in the drum to provide thorough drying of the clothes.

The operative advantages of the invention will be more fully understood from the following specification taken in conjunction with the drawings, in which:

FIGURE 1 is a cross-sectional view of a clothes drier embodying one form of the invention;

FIGURE 2 is a view in perspective of the arrangement of the drum, the heating enclosure and the exhaust duct at the base of which a fan is located;

FIGURE 3 is a view in perspective of the heating enclosure showing the disposition of the element and the convolute channel;

FIGURE 4 is a section of the drier taken along the lines 4—4 in FIGURE 1.

Referring more particularly to the drawings, the reference **10** is employed to generally designate a cabinet embodying the invention. This cabinet **10** is a conventional structure of sheet metal and comprises a front wall **11**, a rear wall **12** and a pair of side walls **13**. A

top wall **14** closes the upper end of the cabinet **10** and a plate **15** is superimposed on the top wall **14** but separated therefrom by rubber spacers **16** to provide an air space for the purpose of keeping the plate **15** cool when the drier is in use.

The front wall **11** is cut away to provide a centrally disposed circular opening giving access to the interior of the cabinet **10**. The upper part of the front wall **11** is covered by a plate **17** having inwardly directed flanges **18**; the plate **17** is secured to the front wall **11** by means of a downwardly directed flange **19**, and also to the cover plate **15** by means of pins **20** secured to the upper flange **18**. The plate **17** extends the whole width of the front wall **11** and its lower inwardly directed flange **18** is positioned somewhat above the uppermost level of the opening in the front wall **11**.

Another plate **21**, having inwardly directed flanges **22** is secured to the lower part of the front wall **11** by means of vertical flanges **23**. The plate **21** extends the whole width of the front wall **11**, its uppermost flange **22** terminating in a plane somewhat below the lowermost point of the opening in the front wall **11**; the lowermost flange **22** is positioned somewhat above the floor level of the cabinet **10** to provide the usual toe space in conjunction with the front wall **11**.

A rectangular door **24** is carried by suitable hinges **25** and it consists of a vertical panel defined by marginal inturned flanges **26** which project into the rectangular recessed area framed by the upper plate **17** and the lower plate **21**.

Secured to the front wall **11** of its inner side is a ring-shaped member **27** having a centrally disposed opening similar in dimension to that provided in the front wall **11**. The ring-shaped member **27** and the front wall **11** are separated in conventional manner at their edges to provide a cavity, not shown, to hold an edge of a circular gasket **28**, the body of which provides a seal over the inner face of the door **24**. A circular U-shaped bracket **29** is secured to the inner ring-member **27** adjacent to the opening; the bracket **29** is provided with spaced apertures, each holding a bearing pin **30** composed of polytetrafluroethylene. The ring-shaped member **27** terminates in an inwardly directed marginal flange or rib **31** to which is attached a circular felt gasket **32**. A drier drum generally denoted by the numeral **33** has a front face **34** which bears against the spaced bearing pins **30**. The front face **34** of the drum **33** terminates in an outwardly directed flange **35** which frames an opening coaxial with the opening in the front wall **11**; the outer face of the flange **35** bears against a large diameter circular plate bearing **36** also of polytetrafluroethylene which is supported by the face of the bracket **29** adjacent to the opening.

The front face **34** extends outwards of the longitudinal axis of the drum **33** in a rearwardly directed shoulder **37** to connect with another drum face **38** which has a series of perforations; the drum **33** then turns inwardly from the face **38** to a short peripheral wall **39** followed by a stepped inwardly directed horizontally disposed flange **40**, the outer face of which bears against the felt **32**. The shoulder **37**, the perforated face **38** and the short peripheral wall **39** provide a circular cavity **41** in conjunction with the inner ring member **27** and its marginal ring **31**; it will be appreciated that the circular cavity **41** provides an exit for the circulating air. The flange **40** then extends to a short flange **42** after which it turns outwardly to another short horizontal flange **43**, thus providing a channel for locating the felt **32**.

The flange **43** is secured to the main peripheral wall **44** of the drum **33**; suitable tumbling vanes **45** secured to the peripheral wall **44** are mounted in the drum **33**. The main peripheral wall **44** ends in a back wall **46** which

slopes rearwardly towards the axis of the drum **33** to terminate in a marginal ring or flange **47** which defines a centrally disposed opening **48**.

An electrical air heating enclosure **49** is positioned between the back wall **46** of the drum **33** and the rear wall **12** of the cabinet **10**; the cylindrical enclosure **49** is supported by members **50** secured to the side walls **13** of the cabinet **10**. One end wall **51** of the cylindrical enclosure **49** has an opening **52** axially disposed with respect to the opening **48** framed by the flange **47**. The cylindrical enclosure **49** is also provided with another opening **53** positioned in its peripheral wall **54**; the opening **53** permits access of the air into the enclosure **49** after which it will exit through the opening **52** and then into the drum **33** through the opening **48**.

As shown more particularly in FIGURE 3, an electrical heating element **55** is contained in the cylindrical enclosure **49** and provided with suitable terminals **56** in the peripheral wall **54**; the heating element **55** extends transversely in arcuate configuration around the inside of the peripheral wall **54** from one edge of the opening **53** to the other. With the object of making the drier as compact as possible, it is desirable to minimise the length of the enclosure **49** and to achieve this purpose, thus providing the longest possible travel for incoming air having a high flow rate, one end of a baffle plate **57** is secured to the inside of the peripheral wall **54** to bridge the end wall **51** and the opposed end wall **58** of the enclosure **49**; the baffle plate **57** exetnds inwards past the opening **53** and also the electrical element **55** to adopt a convolute form terminating at the edge of the opening **52**.

The cylindrical enclosure **49** offers a means for supporting the rear end of the rotatable drum **33**; for this purpose a circular U-shaped bracket **59** is secured to the end wall **51** to frame the opening **52**. In the manner explained previously with reference to the U-shaped bracket **29**, spaced apertures are provided in the U-shaped bracket **59** each holding a bearing pin **60** composed of polytetrafluroethylene; these pins **60** bear against the outer surface of the back wall **46** of the drum **33**. Also in a manner similar to that described with respect to the circular plate bearing **30** at the front end of the drum **33**, the flange **47** at the rear of the drum **33** bears against a circular plate bearing **61** supported by the inner face of the U-shaped bracket **59**.

To distribute the air evenly amongst the clothes, a frusto-conical member **62** having an axially disposed opening **63** is positioned as shown in FIGURE 1 in the rear of the drum compartment **33**. The opening **63** is axially disposed with respect to the opening **52** but is somewhat less in diameter whilst the wall of the conical member **62** is spaced from the flange **47** and extends into the drum **33** being preferably concave with respect to the axis of the conical member **62**. The wall of the conical member **62** in the drum **33** eventually merges into a vertical plane by flaring outwards towards the main peripheral wall **44** but terminating considerably short thereof. This form facilitates the attachment of the wall of the conical member **62** by suitable means, e.g. bolts to three vertical ribs **64** disposed at 120° with respect to each other and secured normally to the inside of the back wall **46** of the drum **33**, the vertical ribs **64** spacing the wall of the conical member **62** away from the back wall **46**. Since the upper diameter of the opening **63** in the frusto-conical member **62** is somewhat smaller than the diameter of the opening **52** in the cylindrical enclosure **49**, it will be appreciated that part of the heated air emanating from the latter will be divided into two portions by the wall of the frusto-conical member **62**; one portion will enter the drum **33** through the opening **63** whereas the other portion will be directed to the outer area of the drum **33** due to the flare of the wall of the conical member **62**, such air passing into the drum **33** through the apertures between the ribs **64**, which will also provide a swirling action on rotation. With this arrangement the requisite uniform distribution of the air will be achieved to give the proper efficiency together with the high speed of drying due to the use of high velocity air.

As shown in FIGURE 1, a fan **65** is contained in a sealed enclosure **66** which is conveniently supported by the members **50**. The sealed enclosure **66** communicates with a horizontal cylindrical enclosure **67** disposed below the drier drum **33**; the other end of the cylindrical enclosure **67** connects with the circular aperture. The cylindrical enclosure **67** offers an alternative position for a lint trap, not shown, in the event that the drier is positioned at table level. In order that such a trap may be easily removed, the cylindrical enclosure **67** is closed at its front end by means of a snap-on cover plate **68**.

The sealed enclosure **66** containing the fan **65** exits into a duct **69** disposed at the rear of the drum **33** in the cabinet **10**, the duct **69** extending vertically at one side of the enclosure **49** containing the electrical heating element **55**. As shown in FIGURE 2, the duct **69** at its upper end is conveniently flared towards the rear wall **12** of the cabinet **10** to accommodate a lint trap **70**. The duct **69** is closed at its top by a hinged cover plate **71** and the rear wall **12** is provided with suitable openings **72** to allow the air to escape after it has travelled through the lint trap **70**.

The fan motor shaft **73** mounts a pulley **74** and a belt **75** connects this pulley **74** with another pulley **76** attached to a suitably mounted drive shaft **77**; the other end of the shaft **77** has a pulley **78** carrying a belt **79** which surrounds the drum **33** to provide its means of rotation.

The operation of the drier should be clear from the above description but it may be pointed out that the clothes to be dried are inserted into the drum **33** through the circular opening cut away in the front wall **11**. When the door **24** is closed against the gasket **28**, the fan **65** is switched on and the drum **33** rotates; then air introduced through suitable apertures in the rear wall **12** enters the opening **53** after which it travels around the baffle plate **57** where it is heated to the required temperature. The air then exits through the openings **52** and **48** and, as explained above, it is conveniently distributed to the outer portions of the drum **33** due to the arrangement of the hollow frusto-conical member **62** and the ribs **64**; the remaining portion of the air passes through the hollow frusto-conical member **62** thus providing even distribution of the air in the drum **33**. The air then exits through the perforations in the face **38** of the drum **33** into the circular cavity **41** after which it travels along the horizontal cylindrical enclosure **67** into the duct **69**, through the lint trap **70** and then out through openings **72** in the rear wall **12**.

It will be understood and appreciated that although applicant has shown and described his invention in connection with one particular type of clothes drier, variations in the general drier structure may be made and are contemplated as being within the spirit and scope of the invention insofar as such variations are encompassed by the annexed claims.

What I claim is:

1. In a clothes drier having a cabinet, a substantially cylindrical drum in said cabinet mounted for rotation about a horizontal axis and having co-axial openings in the ends thereof, the forward end of said drum being perforated to communicate with said cabinet, a door in one wall of the cabinet closing the front opening in said drum, a fixed air heating enclosure positioned at the rear of said drum and embracing a first opening therein co-axial with said rear opening in said drum, said enclosure having a second opening to permit entrance of air and communicating with said first opening, a housing enclosed exhaust fan positioned in said cabinet outside said drum, said housing having openings connecting said cabinet with an exhaust duct and means positioned in said drum adjacent its rear opening for directing a portion of

the incoming air towards the peripheral walls of said drum, said means comprising an open-ended frusto-conical member axially disposed of said first opening with its wall spaced from said drum but flaring towards its periphery terminating short thereof and a plurality of spacing members in said drum attached thereto and secured to said wall of said frusto-conical member.

2. In a clothes drier having a cabinet, a substantially cylindrical drum in said cabinet mounted for rotation about a horizontal axis and having co-axial openings in the ends thereof, the forward end of said drum being perforated to communicate with said cabinet, a door in one wall of the cabinet closing the front opening in said drum, a fixed air heating enclosure positioned at the rear of said drum and embracing a first opening therein co-axial with said rear opening in said drum, said enclosure having a second opening to permit entrance of air and communicating with said first opening, a housing enclosed exhaust fan positioned in said cabinet outside said drum, said housing having openings connecting said cabinet with an exhaust duct and means positioned in said drum for directing a portion of the incoming air towards the peripheral walls of said drum, said means comprising an

open ended frusto-conical member axially disposed of the rear opening of said drum, with its walls spaced therefrom, but flaring towards its periphery terminating short thereof, the opening at the upper end of said frusto-conical member being adjacent to but less in diameter than said first opening and a plurality of spacing members in said drum attached thereto and secured to said wall of said frusto-conical member.

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