

April 11, 1950

P. E. GELDHOF ET AL
CLOTHES DRIER

2,503,329

Filed March 8, 1946

4 Sheets-Sheet 1

Fig-1

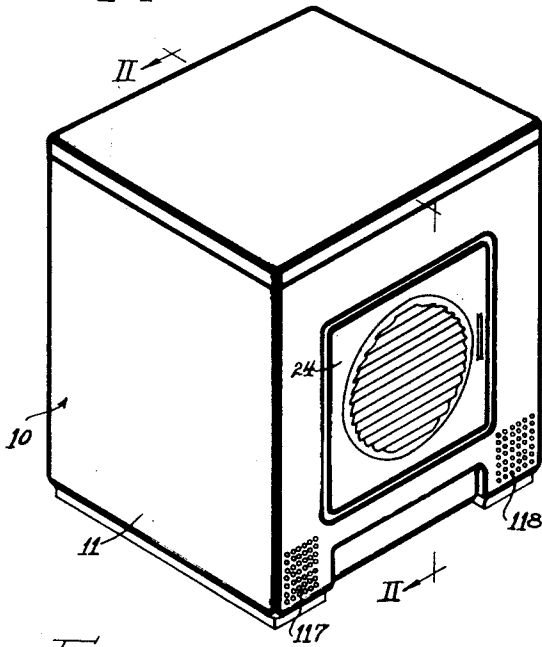


Fig-5

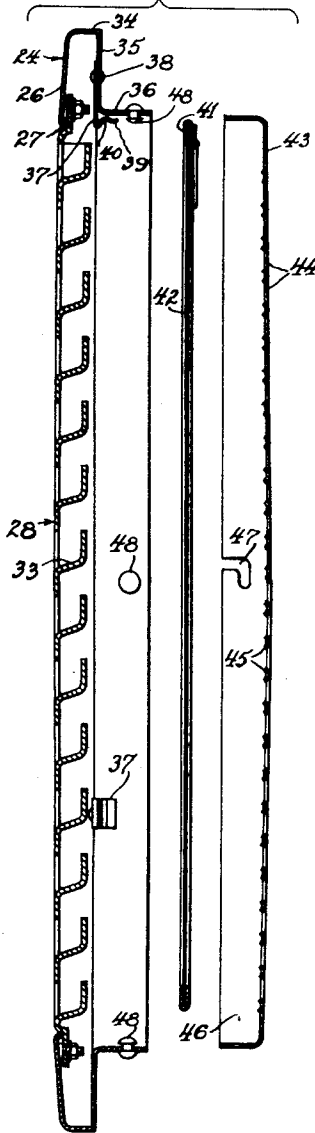


Fig-6

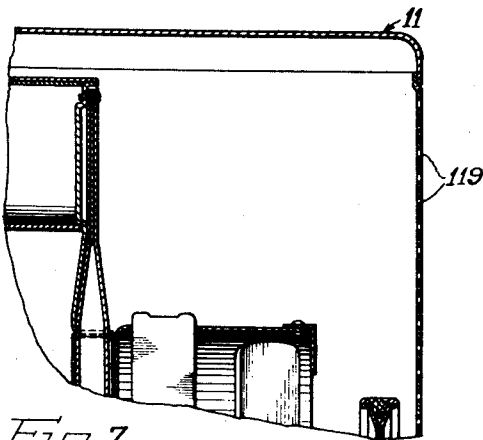
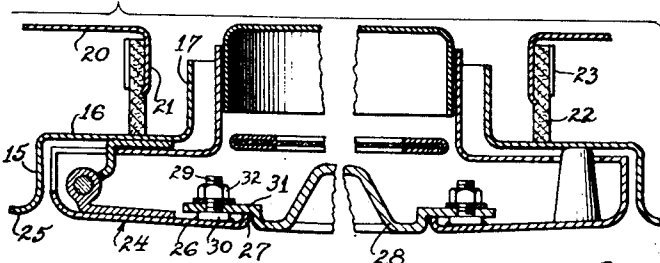


Fig-7



Inventors
Peter Eduard Geldhof
Charles E. Morgenstern

by *Charles E. Morganstern* Attys

April 11, 1950

P. E. GELDHOF ET AL
CLOTHES DRIER

2,503,329

Filed March 8, 1946

4 Sheets-Sheet 2

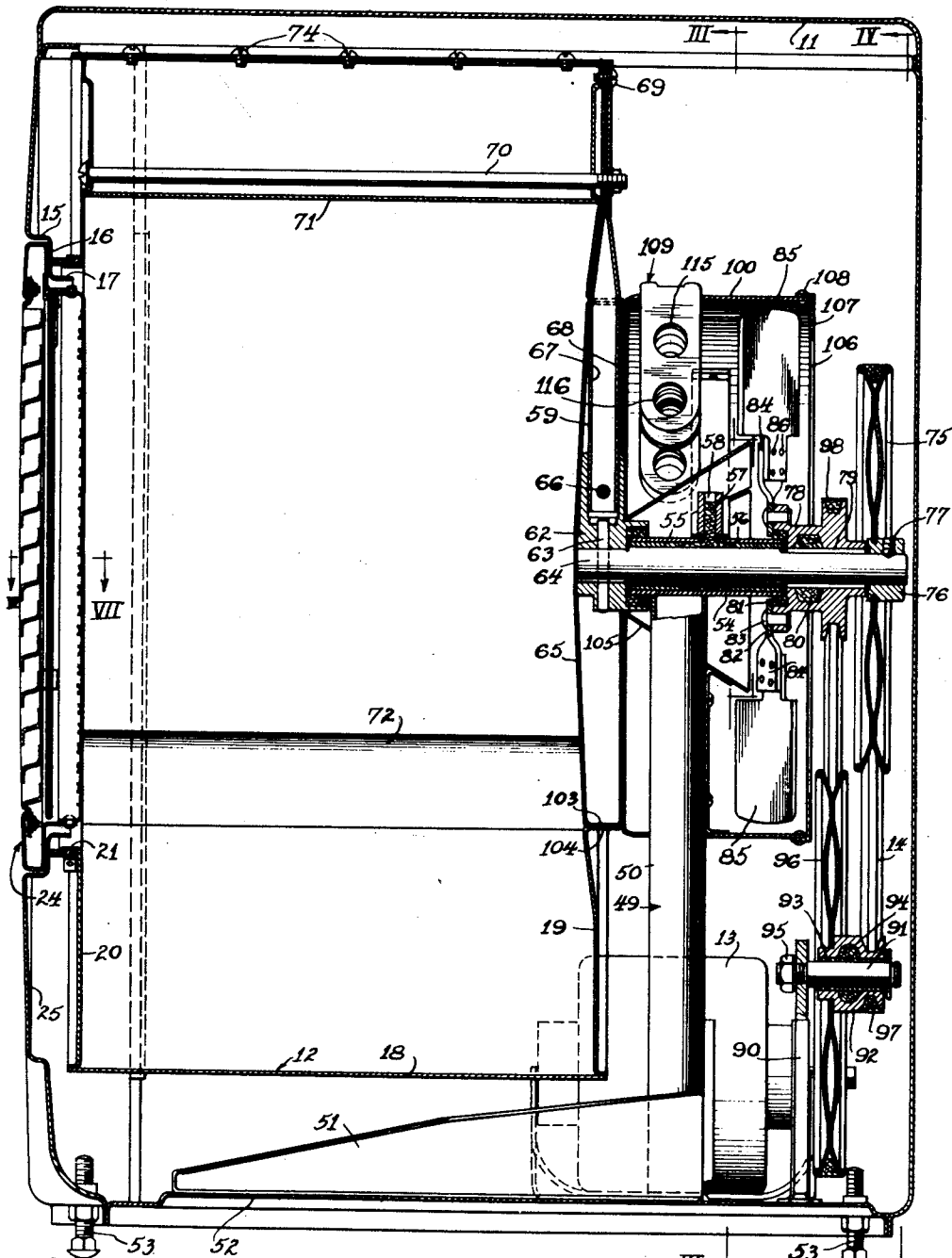


Fig-2

Inventors
Peter Edward Geldhof
Charles E. Morgenstern

by *The Firm of Charles H. Hill* Attys

April 11, 1950

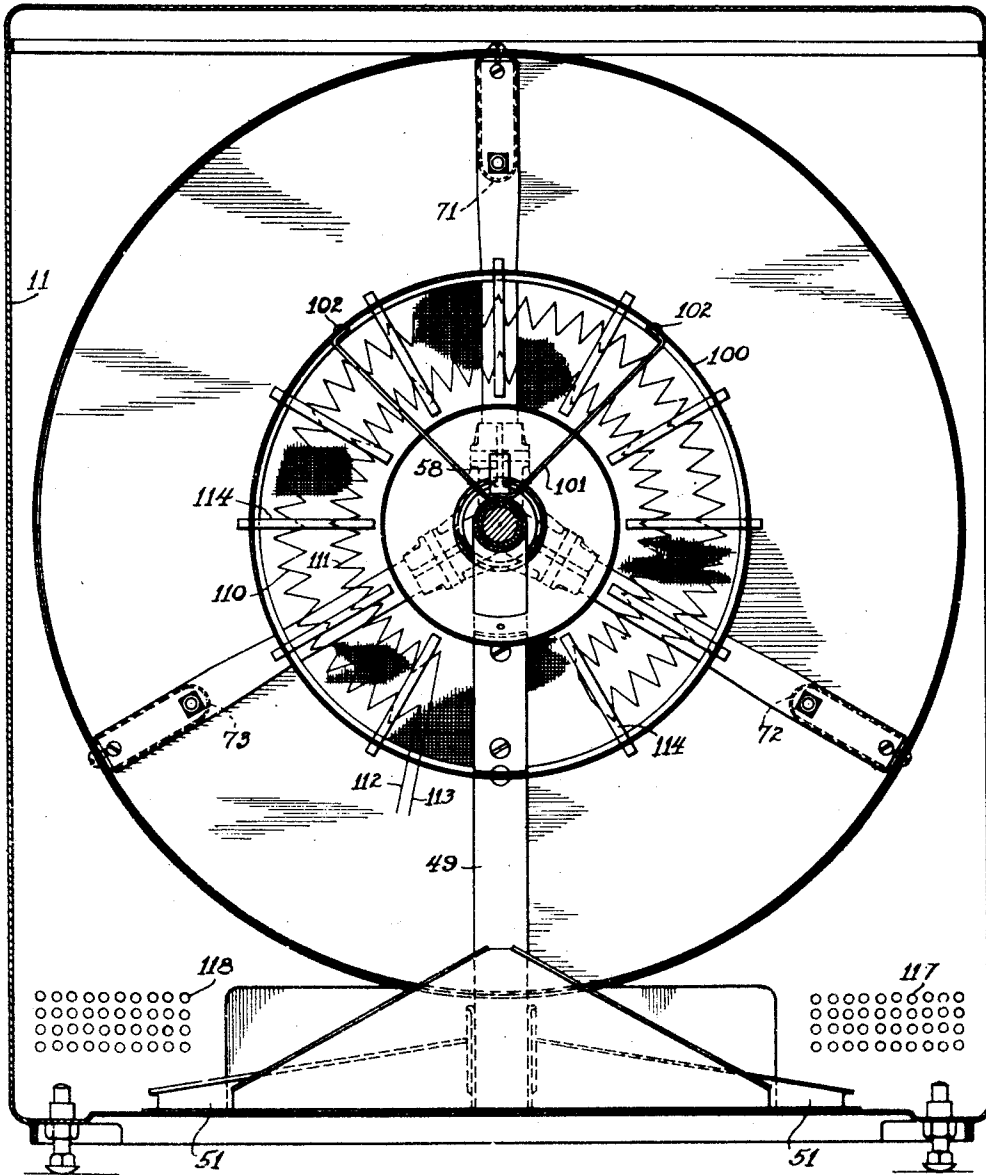
P. E. GELDHOF ET AL
CLOTHES DRIER

2,503,329

Filed March 8, 1946

4 Sheets-Sheet 3

Fig-3



Inventors
Peter Eduard Geldhof
Charles E. Morgenstern

by The Firm of Charles A. Hill Attys

April 11, 1950

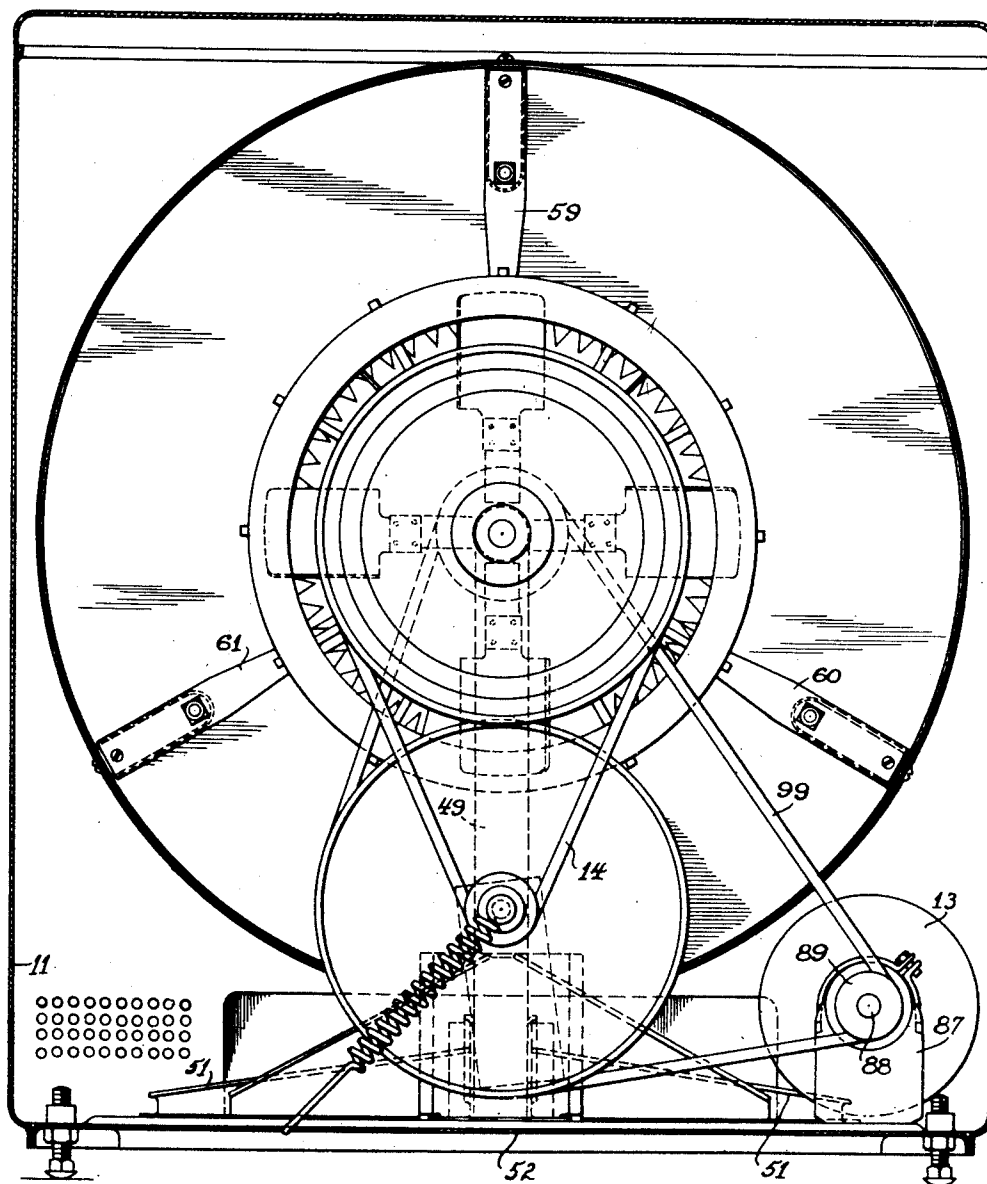
P. E. GELDHOF ET AL
CLOTHES DRIER

2,503,329

Filed March 8, 1946

4 Sheets-Sheet 4

Fig. 4



Inventors
Peter Eduard Geldhof
Charles E. Morgenstem

by *The Firm of Charles Mills* Attys

UNITED STATES PATENT OFFICE

2,503,329

CLOTHES DRIER

Peter Eduard Geldhof and Charles E. Morgens-
stern, St. Joseph, Mich., assignors to Nineteen
Hundred Corporation, St. Joseph, Mich., a cor-
poration of New York

Application March 8, 1946, Serial No. 652,863

5 Claims. (Cl. 34-133)

1

This invention relates to a clothes drier and more particularly to a small compact unitary clothes drier of the type which is suitable for ordinary household use in conjunction with any laundry machine or washing apparatus.

One type of clothes drier which is supplied for household use includes a rotating drum through which heated air is circulated. It is one of the principal features and objects of the present invention to provide a novel clothes drier of this general category which gives greatly improved results with a minimum expenditure of energy.

It is a further object of the present invention to provide a novel means for heating and circulating air in a clothes or article drier.

It is a still further object of the present invention to provide a clothes drier having novel structural features.

Another and further object of the present invention is to provide a novel drive means for the rotating drum of a clothes drier and for the air circulating means.

The novel features which we believe to be characteristic of our invention are set forth with particularity in the appended claims. Our invention itself, however, both as to its organization, manner of construction and method of operation, together with further objects and advantages thereof, may best be understood by reference to the following description, taken in connection with the accompanying drawings, in which:

Figure 1 is an isometric view of a clothes drier embodying the novel features and characteristics of the present invention;

Figure 2 is a vertical sectional view through the clothes drier as taken along the line II—II of Figure 1;

Figure 3 is a vertical sectional view taken at right angles to the view shown in Figure 2 and as taken along the line III—III of Figure 2;

Figure 4 is a rear view of the machine with the back wall panel removed and as viewed along the line IV—IV of Figure 2;

Figure 5 is an exploded vertical sectional view of the door assembly;

Figure 6 is an enlarged fragmentary view of a modified form of the present invention illustrating more particularly small air circulation openings in the rear panel of the casing; and

Figure 7 is a horizontal sectional view of the door assembly as taken along the line VII—VII of Figure 2.

As shown in the embodiment of the invention illustrated in the drawings, the clothes drier 10

2

includes an outer shell or cabinet 11 in which is mounted a rotating drum 12 which is arranged to receive clothes or other articles to be dried. The drum 12 is mounted for rotation about a horizontal axis and is arranged to be driven by a motor 13 through a belt drive 14. The details of this drum mounting and drive will presently be described in detail, but before doing so the general arrangement of the cabinet will be taken up.

The cabinet 11 of the drier 10 is provided with an opening in the front wall thereof opposite the drum 12. This opening is defined by a flange which extends first rearwardly as at 15, then towards the center of the opening as at 16, and finally rearwardly as at 17 (see Figs. 2 and 7). The drum 12 has a peripheral wall 18, a rear wall 19 and a forward wall 20. The forward wall 20 has a central opening therein which is defined by a forwardly turned lip or flange 21.

The forwardly turned lip or flange 21 of the drum 12 is disposed radially outwardly of the flange 17 on the cabinet, and is slightly spaced therefrom. The flange or lip 21 carries a felt ring 22 which is secured to the flange 21 by means of a band 23. This felt ring 22 extends forwardly beyond the flange 21 into engagement with the flange portion 16 of the cabinet 11. It will thus be understood that while the drum 12 rotates with respect to the cabinet 11, a reasonably good air seal is provided between the opening in the front wall 20 of the drum 12 and the forward wall of the cabinet 11.

In order to have access to the drum 12 so as to be able to introduce clothes or other articles into the drum through the opening defined by the lip or flange 21, a door 24 is provided for the cabinet 11. This door 24 is arranged to lie substantially flush with the front wall or panel 25 of the cabinet 11, and accordingly the door 24 is arranged to be nested within the flange portion 16 of the cabinet 11 so as to be seated substantially against the flange portion 16. The door 24 may be of any suitable shape from the standpoint of its general outline, but for purposes of illustration it has been indicated as being substantially square, since this shape gives an appearance which harmonizes with the general outline of the cabinet 11. The construction of this door 24 will be readily understood from an inspection of Figures 5 and 7 of the drawings.

This door 24 includes a main frame portion 26 which is in the form of a panel member having a relatively large circular opening, as defined by the slightly inturned lip 27. A grill 28 is fitted

3

into the opening defined by the lip 27 in the manner clearly shown in Figure 7. More particularly, a threaded stud or bolt 29 has a head portion 30 welded or otherwise suitably secured to the rear face of the panel 26. The grill 28 has a flange portion 31 which extends behind the panel portion 26 to a distance sufficient to be engaged by the bolt 29. A nut 32 is threaded onto each bolt 29 to secure the grill 28 in place.

The grill 28 may be of any suitable construction having air openings therethrough. By way of example, the grill 28 is illustrated as being provided with a plurality of louvres 33 which are disposed in spaced parallel relationship, as shown in Figures 1 and 5 of the drawings.

The frame 26 of the door 24 merges from the front panel portion into a rearwardly extending outer flange 34, a radially inwardly extending flange portion 35, and a rearwardly extending flange portion 36. A plurality of L-shaped fingers 37 are riveted as at 38 to the flange portion 35. The L-shaped fingers 37 include a rearwardly extending leg 39 having a radially outwardly bent portion 40 therein. The legs 37 are preferably three in number and are arranged to receive and secure a screen frame 41 having a screen 42 mounted therein. The screen frame 41 is arranged to be snapped under the leg portions 39 of the fingers 37 and to be received and secured in the bent portion 40 thereof.

The door assembly is completed by a perforated rear plate member 43 which is provided with a large number of openings 44 therein throughout the greater part of its body portion. The portion of the material in the rear plate 43 around each opening 44 is bent forwardly toward the outer panel of the door as at 45, thereby preventing any raw edges from coming into contact with the clothes or other articles being rotated in the drum 12. The rear door plate 43 has a forwardly extending peripheral flange 46 which is provided with a plurality of bayonet slots 47 arranged to engage with capped pins carried on the flange 36 of the main door frame. The rear door plate 43 may be quickly and easily removed from the door assembly and the screen 42 thereafter removed, to clean the latter, or to replace the screen with a new one.

One of the novel and distinctive characteristics of the present invention lies in the manner in which the rotatable drum, the heating unit and the air circulation means are mounted within the cabinet. As may be seen best in Figures 2, 3 and 4 of the drawings, the rotatable drum, the heating means and the air circulating means are all mounted on a single pedestal 49 which is in the form of an upstanding tubular member 50 having a pair of diverging legs 51. The diverging legs 51 are made up of a single channel-shaped bracket which is wrapped around the tubular member 50 and welded or otherwise suitably secured thereto. It will be observed that the legs 51 which form this bracket extend out well beneath the rotating drum 12 and thus supply a satisfactory rigid base for the rotating assembly. The legs 51 rest on the base plate 52 of the cabinet 11. The base plate 52 in turn is provided with a plurality of feet 53 in the form of adjustable bolts whose heads are arranged to rest on the floor which supports the entire drier 10. The legs 51 may be secured to the base plate 52 in any suitable manner, such as by spot welding or the like.

A bearing supporting sleeve 54 is seated on the top of the tubular member 50, the latter being cut away so as to fit snugly around a portion of

4

the sleeve (as is clearly shown in Figure 3). The sleeve 54 may be welded or otherwise suitably secured to the top of the tubular member 50.

Within the tubular sleeve 54 are disposed two bearing sleeves 55 and 56 which may, by way of example, be porous metal lubricant impregnated bearing sleeves. These bearing sleeves 55 and 56 are disposed at opposite ends of the stationary sleeve 54. In order to provide additional lubricant a wick formed of felt or other suitable material 57 is carried in a small tube 58 which is secured to the main sleeve 54. This wick 57 extends down and into the space between the inner ends of the bearing sleeves 55 and 56.

The rotating drum 12 is provided with a frame or spider in the form of three radially extending supporting arms 59, 60 and 61. These arms 59, 60 and 61 may be formed in any of a wide variety of manners, but in order to keep the weight of the rotating assembly at a minimum, and at the same time retain structural strength, they are shown as being fabricated from sheet metal parts. The inner ends of the arms 59, 60 and 61 are secured to a hub 62 which is pinned as at 63 to a shaft 64 extending therethrough and abutting the rear perforated panel 65 of the drum 12. Each individual arm 59, 60 and 61 is pinned to the hub by a pin 66.

Each arm 59, 60 and 61 is formed of a pair of spaced sheet metal members 67 and 68 which are spaced apart from the hub out to a portion near the outer edge of the drum 12. Here the sheet metal parts 67 and 68 come together (see Fig. 2) where they are bolted to the drum 12 by a small bolt 69 and by a large bolt 70 which extends clear through the drum from one end to the other. It will further be observed, from an inspection of Figs. 3 and 4 of the drawings, that the points at which the outer ends of the arms 59, 60 and 61 are secured are directly opposite the point where the large fins 71, 72 and 73 lie, respectively. These fins 71, 72 and 73 are formed of sheet metal and are bolted to the outer peripheral part 18 of the drum 12 as at 74 and are each formed of a sheet which provides a fin which is relatively thick and which extends radially inwardly for a substantial distance from the inner surface of the outer wall part 18 of the drum 12. These fins serve the dual purpose of providing means for tumbling the clothes within the drum and at the same time providing stiffening means for stiffening and reinforcing the entire drum.

By securing the outer ends of the arms 59, 60 and 61 to the points on the drum where these stiffening fins 71, 72 and 73 lie, a very strong assembly results.

The shaft 64 carried by the hub 62 extends back through the bearings 55 and 56 which are carried in the sleeve 54 at the top of the pedestal 49. The shaft 64 is somewhat longer than the sleeve 54 and accordingly extends out the rear end of the sleeve 54, as is shown in Figure 2 of the drawings.

A sheet metal pulley wheel 75 carried on a hub 76 is secured to the outer end of the shaft 64. The hub 76 is secured to the shaft 64 by means of a set screw 77 so that there is no relative rotation therebetween.

Between the sleeve 54 and the pulley 75, a combination fan hub and pulley 78 is mounted for free rotation about the shaft 64. To this end a bearing sleeve 79 is provided in the hub 78 and this bearing 79 presents a bearing surface to the shaft 64 for rotation therearound.

5

The bearing 79 may, for example, be a porous metal lubricant impregnated bearing, the lubricant being supplied thereto from a wick 80 retained in the hub 78.

The hub 78 is also provided with a recessed forward face and shoulder which retains a sealing ring 81 in conjunction with the fan blade mounting ring 82, as may be seen in Figure 2. The fan blade mounting ring 82 is riveted or otherwise suitably secured as at 83 to the hub 78. A plurality of arms 84 extend out from the mounting ring 82. These arms 84 are provided with fan blades 85 at their outer ends, which are riveted or otherwise suitably secured thereto as at 86.

The above described mechanism is so designed and arranged that the fan may be driven at a speed of rotation which is many times the speed of rotation of the rotating drum.

A single motor 13 is arranged to drive both the fan and drum. This motor 13 is mounted in a bracket 87 which is secured to the base 52 of the cabinet 11, (see Fig. 4). The armature shaft 88 of the motor is provided with a drive pulley 89. Directly to the rear of the pedestal 45 is a bracket 90 which is secured to the base panel 52 of the cabinet 11. This bracket 90 carries a short stub shaft 91 on which is mounted a hub 92 for free rotation. The hub 92 is provided with a bearing sleeve 93 which may conveniently be of a porous metal lubricant impregnated type. A wick 94 is provided in a recess in the hub 92 to supply lubricant to the bearing sleeve 93. The shaft 91 is threaded at its inner end in order that it may be secured by a complementary threaded nut 95 to the bracket 90.

The hub 92 carries a large sheet metal pulley 96 which is rigidly secured thereon in any suitable manner so that there is no rotation between the pulley 96 and the hub 92. The hub 92 is also provided with a V-shaped annular groove 97 which lies in the same plane as the large pulley 75 on the shaft 64. The large pulley 96 on the hub 92 lies in the same plane as the portion of the hub 78 which is provided with a V-shaped notch 98, as well as in the same plane as the motor pulley 89. One V-shaped belt 99 extends around the motor pulley 89, the pulley 96 and the V-shaped annular groove in the hub 78. A second V-shaped belt 14 extends around the large pulley 75 and around the hub 94 in the groove 97 thereof. Since the pulley 96 is substantially larger than the motor pulley 89 a speed reduction occurs in the drive from the motor pulley to the pulley 96. Since the pulley portion 97 of the hub 92 has no rotation with respect to the pulley 96, it will be seen that a further speed reduction occurs between the hub 92 and the large pulley 75 secured to the drum axle 64. It will be further noted, however, that the pulley portion 98 of the hub 78 is only slightly larger than the motor pulley 89, the fan 85 is driven at a much higher speed than is the drum 12, yet both are driven from the same motor which runs only at a single speed for any given operation.

In order to properly direct the air which is set into motion by rotation of the fan 85, a large sheet metal shroud 100 in substantially the form of a tubular casing member is mounted on the pedestal by means of a V-shaped bracket 101 (see Fig. 3). The V-shaped bracket 101 is secured to the top of the sleeve 54 by the threaded end of the small sleeve 58 which is threaded into

6

the large sleeve 54. The outer ends of the V-shaped bracket 101 are riveted as at 102 to the shroud 100.

It will be noted that the shroud 100 terminates just short of the rearwardmost portion of the rotating drum 12 and is substantially of the same diameter as the perforated panel 65. It will further be observed, from an inspection of Figure 2, that the panel 65 has a peripheral rearwardly extending flange 103 which is seated in a rearwardly extending flange 104 of the rear wall 19 of the drum 12. The tubular shell or shroud 100 extends up to a position in close proximity to the rearwardly extending flanges 103 and 104 of the rotating drum 12. It will furthermore be observed that the diameter of the tubular shroud 100 is substantially the same as the diameter of the circular opening formed by the flange 104, and thereby confines and directs the air from the fan 85 directly into the rear of the rotating drum 12.

A second conically shaped shroud 105 is provided interiorly of the shroud 100 to form a heat reflector or baffle plate for the heating means 109. This shroud 105 extends over the bearings 55 and 56 and up to a position in close proximity to the fan blades 85, the small end of the core being nearest the drum 12.

From an inspection of Figure 2 of the drawings, it will be seen that air is drawn into the rear opening 106 of the shroud 100, which opening is defined by a radially inwardly extending flange strip 107 riveted or otherwise suitably secured to the shroud 100 as at 108.

Between the tubular shroud 100 and the baffle or heat reflector 105 is an electric heating unit 109. This heating element 109 is formed of two heating coils 110 and 111 which are concentrically disposed and serially connected, as shown in Figure 3. Power for these serially connected heating elements 110 and 111 is supplied through conductors 112 and 113. The heating elements 110 and 111 are mounted in a plurality of radially extending mounting fingers 114 which are carried on the tubular shell or cowl 100. These fingers 114 may be formed of any suitable insulating material such as porcelain or the like. Each finger has a pair of holes 115 and 116 therein through which the heating elements 110 and 111 extend respectively, and are supported thereby.

In the form of the invention shown in Figure 1, air intake holes for the cabinet 11 are provided in the two lower front corners thereof, as at 117 and 118. It will thus be understood that in this form of the invention air is drawn in by the fan under the drum around the motor and other moving parts in the rear of the cabinet, then up into the tubular shell 100, over the heating elements 114 and 115, where the temperature of the air is raised, and then into the rotating drum over the clothes or other articles therein, and finally is passed out the front of the cabinet through the screen 42 and the louvers 33. This operation dries the clothes or other articles being tumbled in the rotating drum 12. Any lint, dust or other foreign material picked up in the circulating air is trapped on the screen 42, where it may be cleaned off and removed from time to time.

The use of the heat reflector or baffle 105 disposed in the manner shown has been found to increase the efficiency of the heating unit to such an extent that a conventional 110-volt household

7

supply may be economically used instead of the heretofore deemed necessary 220-volt supply.

A modified form of the invention, as shown in Figure 6, shows that air may be drawn in at the rear of the casing and passed directly through the tubular shell 100 into the rotating drum 12. This is done by providing a plurality of openings 110 in the rear wall of the cabinet 11.

From the above description, it will be seen that we have provided an extremely compact and efficient article drier. It will furthermore be understood that the construction and arrangement of the device is such as to be particularly suited for drying clothing and other fabric articles.

While we have shown certain particular embodiments of our invention, it will of course be understood that we do not wish to be limited thereto, since many modifications may be made, and we therefore contemplate by the appended claims to cover all such modifications as fall within the true spirit and scope of our invention.

We claim as our invention:

1. An article drier comprising a support, a drum rotatably mounted on said support, said drum having forward and rear end walls with openings therein through which air may circulate, a shroud disposed rearwardly of said drum and in close proximity thereto, a second shroud within said first shroud and spaced therefrom, the region between said first and second shrouds becoming larger as it approaches said drum, heating means within the region between said first and second shrouds, and air circulating means for causing air to pass between said shrouds and through said drum.

2. An article drier comprising a support, a drum rotatably mounted on said support, said drum having forward and rear end walls with openings therein through which air may circulate, a tubular shroud disposed rearwardly of said drum and in close proximity thereto, a second conically shaped shroud forming a baffle plate disposed within said first shroud, with the small end thereof toward said drum, heating means disposed between said first and second shrouds, and air circulating means for causing air to circulate through the region between said first and second shrouds over said heating means and then through said drum, said second shroud acting as a baffle to throw back heat into said drum.

3. An article drier comprising a support, a drum rotatably mounted on said support, said drum having forward and rear end walls with openings therein through which air may circulate, a tubular shroud disposed rearwardly of said drum and in close proximity thereto, a second conically shaped shroud forming a baffle plate mounted within said first shroud and near the forward end thereof, an electric heating element mounted within said first shroud and on said first shroud near the forward end thereof, a fan rotatably mounted within said first shroud and having blades located substantially at the rear end of said conical baffle shroud and radially out-

8

wardly thereof, and means for rotating said drum and said fan whereby air is circulated through said tubular shroud over said heating element into said drum.

4. An article drier comprising a support, a drum rotatably mounted on said support, said drum having forward and rear end walls, said forward end wall having a relatively large opening therein through which articles may be inserted into said drum, said rear wall having a central circular opening therein, a screen mounted in said circular opening, a tubular shroud of substantially the same diameter as said circular opening, said tubular shroud being disposed rearwardly of said drum and in close proximity thereto and having its axis substantially coincident with the axis of rotation of said drum, a second conically shaped shroud disposed within said first shroud, the outer conical surface of said second shroud extending at a substantial angle to the longitudinal axis of said tubular shroud and facing generally the outer marginal portion of said opening in said rear wall of said drum, an electric heating element mounted in the region between said first shroud and said second shroud, and means for circulating air through said first shroud over said heating element and then through said drum.

5. An article drier comprising a support, a drum rotatably mounted on said support, said drum having end walls and air circulating openings therein, heat reflecting means having a truncated conical shaped reflecting portion disposed opposite one end of said drum, said means having its outer peripheral surface directed toward said drum, heating means disposed in surrounding relation before said heat reflecting means in such a position that heat is radiated into said drum through said one end of said drum, and means for circulating air over said heating means and through said drum, whereby the interior of said drum is heated both by radiation and by conduction.

PETER EDUARD GELDHOF.
CHARLES E. MORGENSTERN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,001,832	Bandurski	May 21, 1935
2,017,728	Oskamp	Oct. 15, 1935
2,328,256	Breckenbridge	Aug. 31, 1943
2,372,790	Morgenstern	Apr. 3, 1945
2,380,652	Jorgenson et al.	July 31, 1945
2,389,433	Hough	Nov. 20, 1945
2,398,880	Brogie	Apr. 23, 1946
2,438,995	Forney	Apr. 6, 1948

FOREIGN PATENTS

Number	Country	Date
511,612	Great Britain	Aug. 22, 1939