June 30, 1942. M. CLAPP 2,288,227

HAIR DRIER

Filed Feb. 10, 1940 4 Sheets-Sheet 1

Fig. 1.

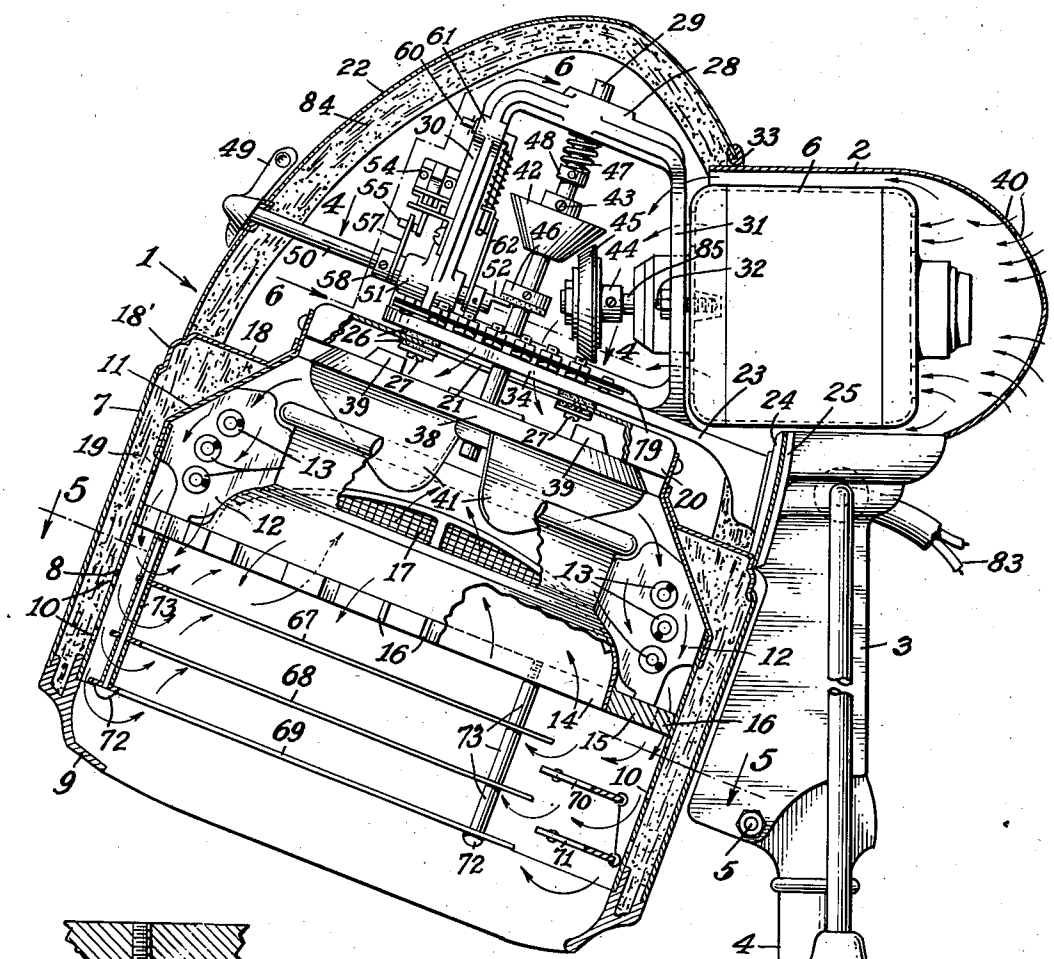



Fig. 2.

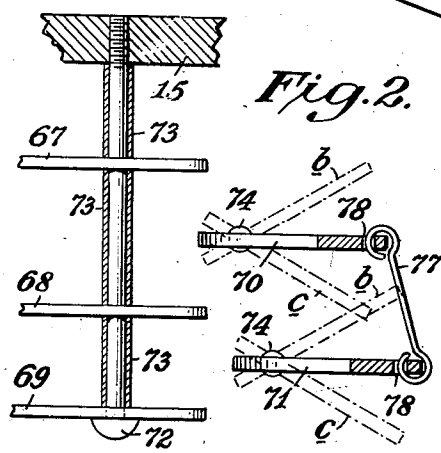
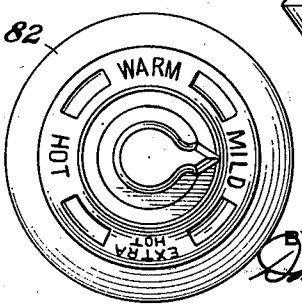



Fig. 3.




INVENTOR:
Melville Clapp
BY
Donald W. Robertson
his ATTORNEY

June 30, 1942. M. CLAPP 2,288,227

HAIR DRIER

Filed Feb. 10, 1940 4 Sheets-Sheet 2

*Fig. 4.*

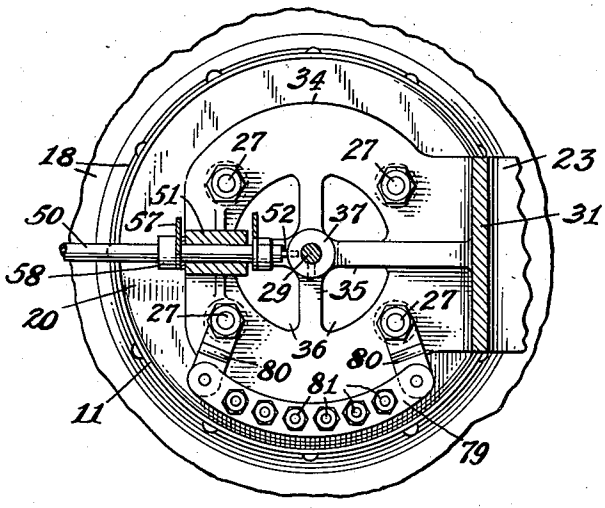
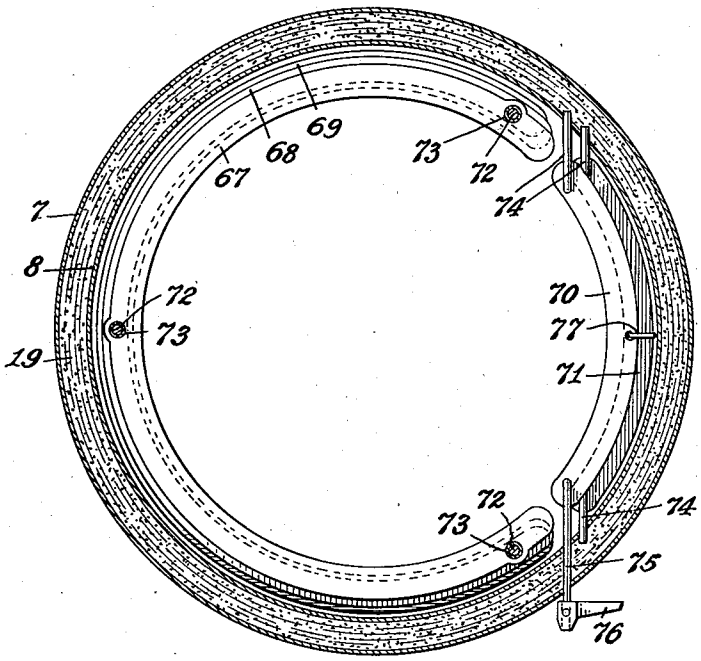



*Fig. 5.*




INVENTOR:
Melville Clapp
BY
Donald W. Robertson
his ATTORNEY

June 30, 1942. M. CLAPP 2,288,227

HAIR DRIER

Filed Feb. 10, 1940 4 Sheets-Sheet 3

Fig. 6.

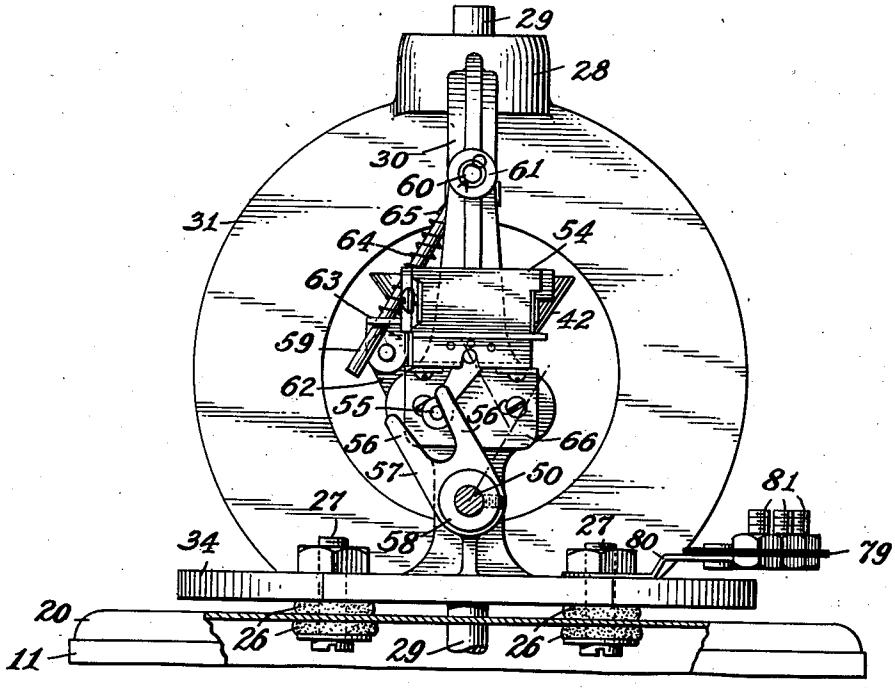



Fig. 8.

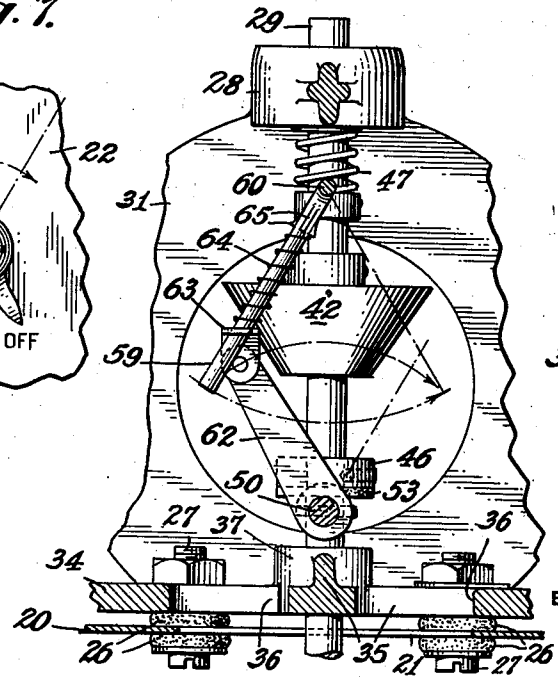



Fig. 9.

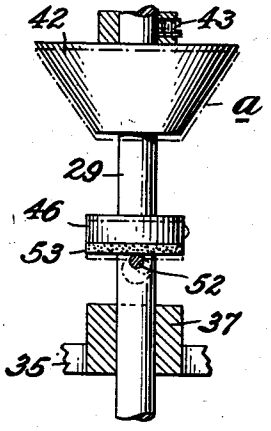
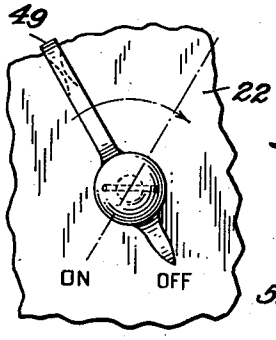



Fig. 7.




INVENTOR:
Melville Clapp
BY
Donald W. Robertson
his ATTORNEY

June 30, 1942. M. CLAPP 2,288,227

HAIR DRIER

Filed Feb. 10, 1940 4 Sheets-Sheet 4

Fig. 10.

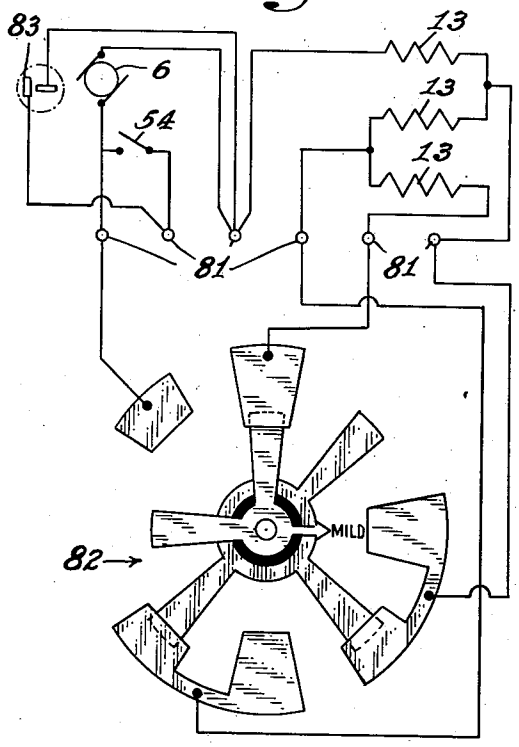



Fig. 11.

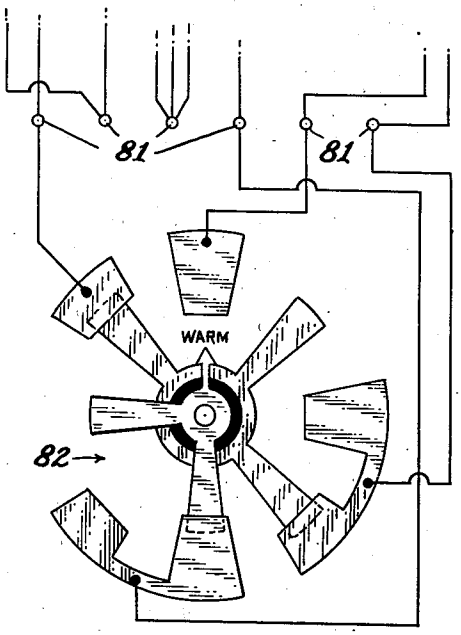



Fig. 12.

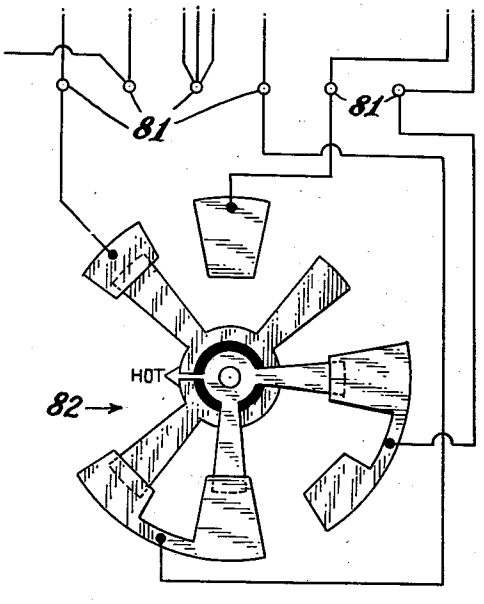
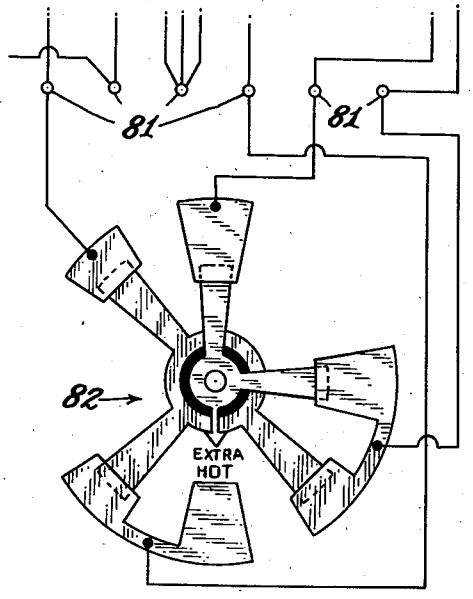



Fig. 13.




INVENTOR:
Melville Clapp
BY
Donald W. Robertson
his ATTORNEY

Patented June 30, 1942 2,288,227

# UNITED STATES PATENT OFFICE

2,288,227

## HAIR DRIER

Melville Clapp, Baldwin, N. Y., assignor to E. Frederics, Inc., Long Island City, N. Y., a corporation of New York

Application February 10, 1940, Serial No. 318,231

6 Claims. (Cl. 34—87)

The invention relates to hair driers, and more particularly to driers for use in commercial hairdressing establishments.

Conventional types of hair driers in general use today have a motor driven fan mounted within a hood adapted to surround, or partially surround, the head of the user. The motor is mounted within, or directly above, the hood, with its axis arranged substantially vertical (with reference to the position assumed when the drier is swung into its operating position). When the motor is mounted in this manner, it is located directly above the heating elements which are arranged within the hood. As a result of this arrangement the motor becomes very hot, so that the bearing lubricant therein dries up and leads to objectionable vibration and bearing wear. Also, because of the vertical disposition of the motor shaft, the hot lubricant sometimes leaks out, running down the shaft and onto the commutator, thus giving rise to other operating difficulties and increased maintenance expense. The problem thus presented is of a very serious character and has been given extended study by leading motor manufacturers; yet after years of experimentation, bearing wear and motor noise have not been satisfactorily eliminated.

I am aware that it has been proposed to mount the motor separately from the drier hood, connecting the motor shaft to a fan located within the hood through the medium of a flexible cable. This construction avoids overheating of the motor, but is undesirable for other reasons, being complicated and expensive to fabricate, and lacking the desired compactness. Moreover, the cable drive is likely to become noisy and give trouble due to wear, or for other reasons. It also has been proposed to arrange both the motor and fan with their axes in a horizontal plane. This construction is not suitable for a vertically-arranged drying hood, however, and does not solve the motor problem presented by this type of hood. Accordingly, it has been an object of my invention to provide a drier of the vertical type which has a motor and fan mounted in direct association with the hood, yet which avoids the difficulties discussed hereinabove.

A further object of my invention is to provide an improved motor mounting and fan driving connection which decreases noise, vibration, and bearing wear, while at the same time giving greater flexibility in fan operation.

Another object is to provide an improved drier assembly in which the motor and fan drive are so arranged as to make possible an interlocking control between the operating switch for the heating elements and the driving connection to the fan.

Another object is to provide a drier which is insulated against motor noise, and in which soundproofing insulation also assists in preventing overheating of the motor bearings.

Other objects and advantages will appear as the description proceeds.

In the drawings, which show a preferred embodiment of my invention,

Fig. 1 is a central vertical sectional view of a drier illustrating my novel motor mounting and fan driving mechanism together with other features to be described.

Fig. 2 is an enlarged detail sectional view of a portion of the drier shown in Fig. 1, illustrating the arrangement and operation of the vanes for controlling the recirculation of the air.

Fig. 3 is an enlarged face view of the customer heat control switch.

Figs. 4 and 5 are transverse sectional views taken on the lines 4—4 and 5—5, respectively, of Fig. 1.

Fig. 6 is an enlarged elevational view of the interlocking mechanism for operating the main heat control switch and the driving connection between the motor and fan. This view is taken as indicated at 6—6 in Fig. 1.

Fig. 7 is a detail view of the toggle lever for operating the mechanism of Fig. 6.

Fig. 8 is a rear elevational view of the mechanism shown in Fig. 6.

Fig. 9 is a detail view of the drive shaft for the fan, illustrating the means for producing axial movement thereof to disengage the driving connection from the motor.

Figs. 10 to 13, inclusive, are diagrammatic views illustrating the electrical connections between the motor, main heat control switch, customer heat control switch, and the several heating elements, for each position of the customer heat control switch.

Referring to Fig. 1, the preferred embodiment illustrated consists, in its general arrangement, of a drying hood 1 having associated therewith a motor housing 2 and a supporting or mounting bracket 3. Through the mounting bracket 3 the hood may be pivotally supported on a frame or standard 4, as by means of a bolt 5. In Fig. 1 the hood is shown in operating position in which it is tilted forward so that its axis is nearly vertical, or so that it is inclined slightly and is at the proper angle to surround the head of the customer. When the hood is in this position, it will

be observed, however, that the axis of the shaft of the motor 6 is horizontal.

The lower part of the hood 1 preferably is of double walled construction having an outer shell 7 and an inner shell 8 mounted in spaced relationship on a rim casting 9. The inner shell 8 is of foraminous or perforated construction, having apertures 10 distributed over its surface. Secured to the upper end of the inner shell 8 is a fan housing 11, forming a tapered or inclined extension of the inner wall of the hood, to which are attached supports 12 for the heater element or elements 13. The supports 12 also serve as spacers between the inner shell and the fan shield 14. Additional supporting and spacing means for the fan shield 14 are provided by the annular member 15 which is connected to the inner shell 8 by means of radial spokes 16 which are spaced so as to permit circulation of air between the shell 8 and shield 14. Shield 14 is provided with a central opening or openings, and may have a screen 17 to guard against contact with the blades of the fan. The particular construction and arrangement of the fan shield, heater elements and associated structure does not form a part of the present invention and since such constructions are well known in the art, it will be unnecessary to describe in further detail the form which has been selected merely for the purpose of illustration.

An inwardly projecting flange 18 which may be formed integrally with the outer shell 7, or as a part of a member 18' secured thereto, joins the outer shell to the housing 11 or to the upper part of the inner shell. The space defined by the outer and inner shells 7 and 8, rim 9, and member 18, is filled with a suitable sound deadening and heat insulating material 19. This material, in conjunction with the foraminous inner shell 8, provides a sound deadening construction which assists in eliminating noise created by the fan and fan driving means. It also serves another function which will be referred to hereinafter.

The fan housing 11 is provided with a cover or complementary housing member 20 extending across the top thereof and secured thereto in any convenient manner. The member 20 is provided with a central opening 21 through which the fan shaft projects, and which serves as the air intake of the fan housing. The driving and control mechanism is mounted above the fan housing and is enclosed within an upper shell 22, the lower edge of which engages the lower hood assembly. As shown, the shell 22 is mounted on the member 18' of the lower hood assembly.

The motor, fan, transmission and lower hood assembly are all carried by a frame 23 which is secured to the supporting bracket 3 through its base 24. The upper shell 22 of the hood is clamped between the base 24 of this frame and a lug 25 formed on the bracket 3, thus providing further support for the hood. The frame 23 and bracket 3 are secured together in any convenient manner, as by means of bolts or machine screws passing through the lug 25 of the bracket 3 and the shell 22 into the base 24 of the frame. The lower hood assembly is secured to the frame 23 through a resilient mounting in order to dampen vibration which might otherwise be transmitted to the hood from the fan and motor mechanism. For this purpose I have found it advantageous to employ resilient washers 26 of rubber or the like which are disposed at each side of the top 20 of the fan housing. Bolts or screws 27 pass through these resilient washers 26 securing the hood assembly to the frame 23.

The frame 23 conveniently may be made of trapezoidal form providing an upper portion 28 which serves as a bearing for the fan shaft 29, a connecting portion 30 which serves as a mounting for the main switch and transmission control mechanism, and a second connecting portion 31 on which the motor 6 is mounted, as by means of stud bolts 32. The upper shell 22 of the hood is apertured to receive the motor 6 and the motor housing 2. A resilient gasket 33 preferably is interposed between the motor housing 2 and shell 22. In the construction shown the gasket 33 assumes the form of a covering strip for the edge of the opening in the shell 22.

The main part 34 of the frame 23 is shown best in Fig. 4. It is of annular form with intersecting connecting ribs 35 providing openings 36 through which the air is drawn by the fan. The ribs 35 join at the center to provide a boss 37 which constitutes a second bearing for the fan shaft 29. A suitable fan 38 is keyed to the shaft 29 where the latter projects within the main part of the hood. In the embodiment illustrated, this fan comprises blades 39 acting as centrifugal impellers to drawing air in through openings 40 of the motor housing 2, this air passing through and around the motor 6 to cool it, thence through the openings 36 and 21 to be discharged by the fan around the outside of the shield 14. This air then passes over the heating elements 13 along with air which is being recirculated by the blades 41 of the fan. These blades draw air upwardly through the screen 17 and discharge it around the outside of the shield 14 where it passes over the heating element 13. The recirculated air along with the fresh air which is drawn through the motor housing, after passing over the heating elements 13, is then blown into the drying chamber.

A friction drive cone 42 is affixed to the shaft 29 as by means of the set-screw 43, this cone being driven by a friction wheel 44 secured to the shaft 85 of the motor 6. The friction surface of the wheel 44 preferably consists of a rubber element 45 having a conical surface for engagement with the surface of the friction cone 42.

The shaft 29 is mounted so as to be shiftable longitudinally to throw the friction elements 42 and 45 into and out of engagement. For this purpose, I have provided a collar 46 secured to the shaft 29, and means engaging the collar to lift the shaft against the action of a compression spring 47. The spring 47 surrounds the shaft 29, bearing at one end against the upper portion 28 of the frame and at the other end against a collar 48 on the shaft. This spring normally holds the friction cone 42 against the drive wheel 44. Disengagement of the friction drive is accomplished by a handle or knob 49 connected to an operating rod or shaft 50 passing through the shell 22 and having a bearing in a boss 51 on the side member 30 of the frame 23. A pin 52 is mounted on the end of the shaft 50 in a position which is eccentric with respect to the axis of this shaft. This eccentric pin engages the under side of the collar 46 and upon rotation of the shaft 50 raises the shaft 29 against the action of the spring 47 into the position shown in full lines in Fig. 9 to disengage the friction drive; or, alternatively, permits the shaft 29 to be lowered under the action of the spring 47 into the position shown in dot-dash lines at *a* in Fig. 9 to re-engage the friction drive.

A fibre collar 53 preferably is mounted underneath the collar 46. The handle 49, in addition to controlling the transmission through the friction drive elements, is used to operate the main heat control switch 54 (Figs. 1 and 6). This switch may be of the conventional form, operated by a toggle 55, and is mounted on portion 30 of the frame as by means of a bracket 66. The toggle 55 is engaged alternately by the furcations 56 of an arm 57 affixed to the shaft 50, as by means of a collar 58.

In order to avoid placing undue load on the switch spring which is used to force the toggle 55 into its limiting positions, an auxiliary toggle is provided. This auxiliary toggle comprises an arm 59 pivotally mounted in the section 30 of the frame as by means of a lateral extension 60 extending through a boss 61 therein, and an arm 62 (Figs. 1 and 8) affixed to the shaft 50. The arms 59 and 62 of this toggle are slidably connected together by means of an angle bracket 63 which may be secured to the arm 62 either rigidly or pivotally, and which has an aperture through which the arm 59 extends. A compression spring 64 surrounds the arm 59, engaging projections 65 thereon and bearing at the other end against the bracket 63. By reason of the spacing of the furcations 56 of the arm 57, the toggle 55 is not immediately engaged by these furcations upon operation of the handle 49, this engagement occurring only after the arms 59 and 62 of the auxiliary toggle are brought nearly into alignment. When these arms have been brought past dead center, the spring 64 then acts to move them into their limiting position in the other direction (as indicated by the dot-dash lines in Fig. 8). At the same time the toggle 55 is brought past its dead center and snaps into its other limiting position freely and without being required to support any of the load imposed by lifting the shaft 29 against the action of the spring 47. In this way the normal toggle action of the switch 54 is not interfered with, and there is no danger of it becoming stuck in an intermediate or dead center position.

Control of recirculation of the air within the drier hood is effected by means of vanes arranged adjacent the lower end thereof. Some of these vanes preferably are adjustable and others stationary. In the construction illustrated, I have provided concentric stationary vanes 67, 68, 69, and adjustable vanes 70, 71. The stationary vanes may conveniently be supported from the ring 15 by means of bolts 72. Spacers 73 in the form of sleeves surrounding the bolts 72 are disposed between the vanes 67, 68 and 69 and also between the vane 67 and ring 15. The vane 69 is separated slightly from the inner shell 8 of the hood; the vane 68 is spaced a slightly greater distance from the shell 8; and the vane 69 is spaced a still greater distance from the shell 8. This provides a stepped arrangement so that each vane will deflect part of the air discharged downwardly between the shell 8 and shield 14. The movable vanes 70 and 71 are provided with trunnions or supporting shafts 74, 75 having bearings in the inner shell 8 of the hood. The shaft 75 also extends through the outer shell 7 of the hood, and an operating handle 76 is attached thereto to control the position of the vanes. The vanes 70 and 71 are kept in parallelism by means of a link 77 which has an eyelet at either end engaging apertures 78 formed in the edges of these vanes. By adjusting the position of the handle 76, the vanes can be inclined into the positions shown in dot-dash lines at *b* and *c* in Fig. 2, or in other desired positions in order to direct the air toward the center of the hood or downwardly against the neck of the customer. Vane 70 is spaced a greater distance from the inner shell 8 of the hood than is the vane 71, so that each vane will deflect a portion of the air.

For convenience in making the necessary electrical connections between the motor, main heat control switch, customer heat control switch and heater elements, there may be provided an insulating panel 79 (Figs. 1 and 4). This panel may conveniently be supported by means of clips 80 secured to the main portion 34 of the supporting frame 23, as by means of the bolts 27 previously referred to. A series of binding posts 81 are arranged on the panel 79 (see Fig. 4 and Figs. 10 to 13 inclusive). The drier preferably is equipped with a customer heat control knob 82 which is arranged on an extension cord to be within easy reach of the customer. This knob consists of a four-position switch indicated diagrammatically in Figs. 10 to 13 inclusive, by means of which the customer can control the degree of heat. In practice, the heating elements 13 consist of a spirally wound resistance coil having electric connections thereto at intervals so that various parts of the coil can be heated as desired. For the purpose of illustration, however, the heating element may be regarded as made up of three separate electric resistance coils 13. In Fig. 10, the power source is indicated diagrammatically at 83, the motor at 6, and the main switch at 54. The construction of the customer heat control switch 82 does not form a part of the present invention, but it is illustrated diagrammatically in order to show one way in which the electrical connections can be made, and to indicate the electric connections between the main control switch 54 and the customer control switch. In this connection it will be remembered that the switch 54 is operated by the hand control 49 which also controls the engagement between the friction driving elements.

It will be observed that in accordance with my invention the motor, in addition to being arranged horizontally, is so disposed as to be quite effectively insulated from the heating elements. Thus the insulation 19 between the shells 7 and 8 and also between the fan housing 11 and flange 18 serves a dual function, namely, as constituting a part of the sound-deadening construction and also as heat insulation. If desired, similar insulating material may be provided at 84 around the inside of the upper shell 22.

Another advantage of my motor and drive arrangement is that it permits adjustment of the fan speed by changing the relative positions of the friction drive elements 42 and 44 on their respective shafts 29 and 85. This construction also permits the use of motor speeds which are lower than the R. P. M. of the fan, thus further decreasing the likelihood of troubles developing in the bearings of the motor. In this connection my invention results in improved motor bearing conditions from three standpoints, viz., horizontal disposition of the motor axis, arrangement of the motor in a position which allows it to be effectively heat insulated, and the possibility of employing lower motor speeds for a given fan speed. My invention also makes possible the provision of the interlocking control between the operating switch for the heating elements and the driving connection to the fan. With this in-

terlocking control the fan cannot be stopped without separating the friction elements **42** and **45**. Thus when the drier is not in use it is insured that the pressure between these elements produced by the spring **48** will be relieved. This, in turn, prevents the formation of a depression in the rubber element **45** as would otherwise be occasioned if the drier were to be allowed to remain out of operation for any length of time with the cone **42** bearing down into the rubber element **45**. Such a depression would interfere with proper operation of the friction drive when the drier is put back into use. This disadvantage is completely overcome by the interlocking control I have disclosed herein.

The terms and expressions which I have employed are used as terms of description and not of limitation, and I have no intention of excluding such equivalents of the invention set forth, or of portions thereof, as fall within the purview of the claims.

I claim:

1. A hair drier comprising a hood, a fan within the hood having its shaft extending lengthwise thereof, an air inlet at the upper end of the hood, a motor mounted at one side of the hood with its shaft extending at an angle to the fan shaft, a friction driving member mounted on the fan shaft, a complementary friction driving member mounted on the motor shaft for engagement with the first-named driving member, a heating element within the hood and a heat control switch therefor, and means for throwing one of said friction driving members into and out of engagement with the other, said means comprising a switch arm arranged to actuate said heat control switch simultaneously with engagement and disengagement of the driving elements.

2. In combination, a hair drier hood, a plurality of baffles disposed transversely of the hood adjacent the inner wall of the hood, a centrifugal fan for circulating air downwardly over the baffles, the baffles being arranged progressively closer to said inner wall in the direction of the open end of the hood so that each baffle is arranged to deflect part of the air toward the center of the hood for recirculation.

3. In combination, a hair drier hood, a series of fixed and adjustable baffles arranged transversely of the hood adjacent the inner wall of the hood, a fan for circulating air downwardly over the baffles, said baffles being spaced progressively closer to said inner walls in the direction of the open end of the hood.

4. A hair drier comprising a hood, a fan within the hood having its shaft extending lengthwise thereof, a motor mounted at one side of the hood with its shaft extending at an angle to the fan shaft, a friction driving member mounted on the fan shaft, a complementary friction driving member mounted on the motor shaft for engagement with the first-named driving member, a heating element within the hood and a heat control switch therefor, an operating rod having an arm arranged to actuate the heat control switch, and a member eccentrically mounted on said operating rod for lifting the first-named driving member out of engagement with the second driving member.

5. A hair drier comprising a hood, a fan within the hood having its shaft extending lengthwise thereof, a motor mounted at one side of the hood with its shaft extending at an angle to the fan shaft, a friction driving member mounted on the fan shaft, a complementary friction driving member mounted on the motor shaft for engagement with the first-named driving member, a heating element within the hood and a heat control switch therefor, an operating rod having an arm arranged to actuate the heat control switch, a member eccentrically mounted on said operating rod for lifting the first-named driving member out of engagement with the second driving member, and a spring toggle arranged to urge the operating rod into either of two limiting positions on opposite sides of the dead center position of said toggle.

6. A hair drier comprising a hood, a fan within the hood having its shaft extending lengthwise thereof, an air inlet at the upper end of the hood, a motor mounted at one side of the hood with its shaft extending at an angle to the fan shaft, a friction driving member mounted on the fan shaft, a complementary friction driving member mounted on the motor shaft for engagement with the first-named driving member, a heating element within the hood and a heat control switch therefor, and interlocking control means between said switch and said friction driving members, said interlocking control means comprising an operating rod having an arm movable to on and off positions in accordance with closed and open positions of the switch respectively, and a member eccentrically mounted on said operating rod for regulating the relative positions of said friction driving members so that they will be maintained in driving engagement only when the switch is closed.

MELVILLE CLAPP.