

April 28, 1964

I. JEPSON

3,131,281

HAIR DRYER

Original Filed April 17, 1957

4 Sheets-Sheet 1

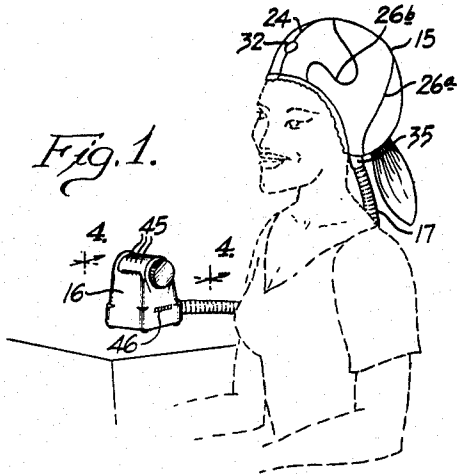


Fig. 1.

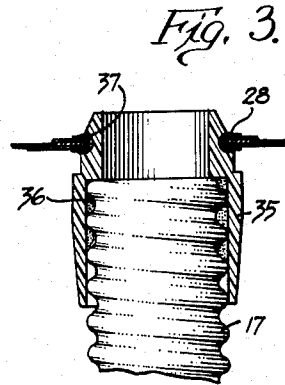


Fig. 3.

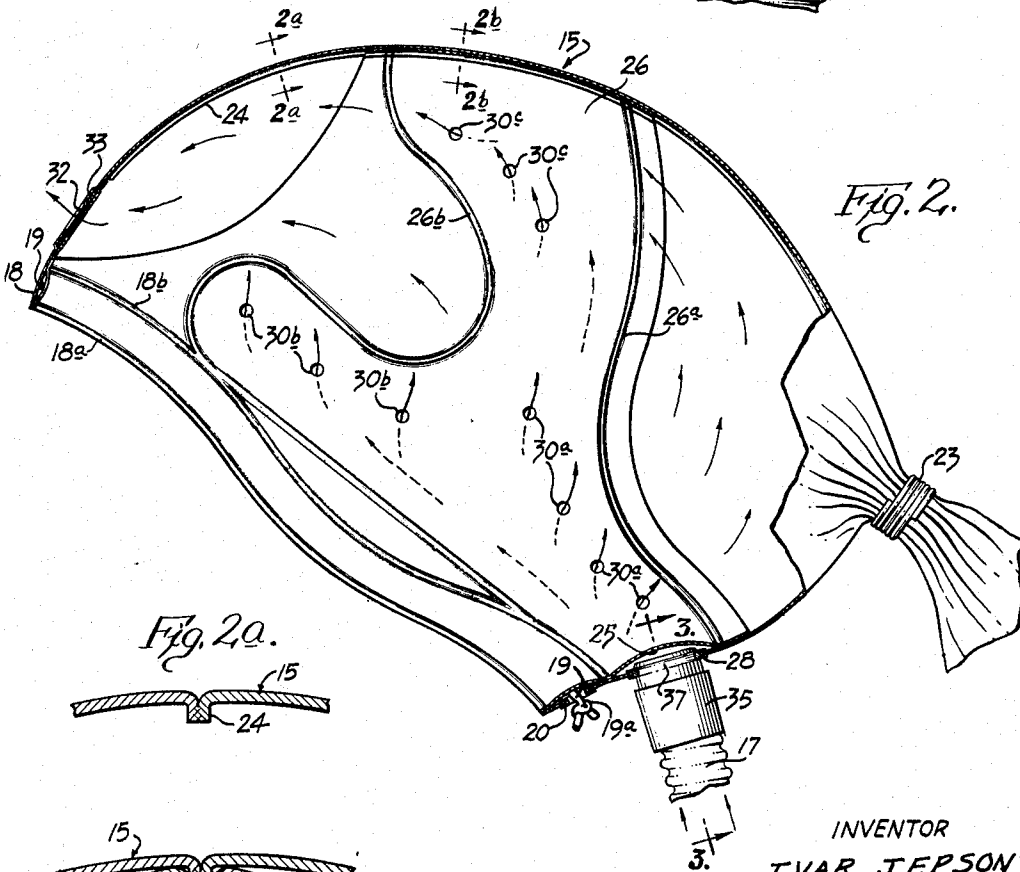


Fig. 2.

Fig. 2a.

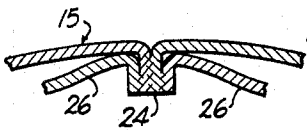


Fig. 2b.

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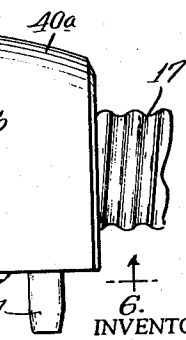
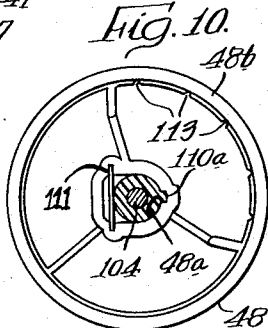
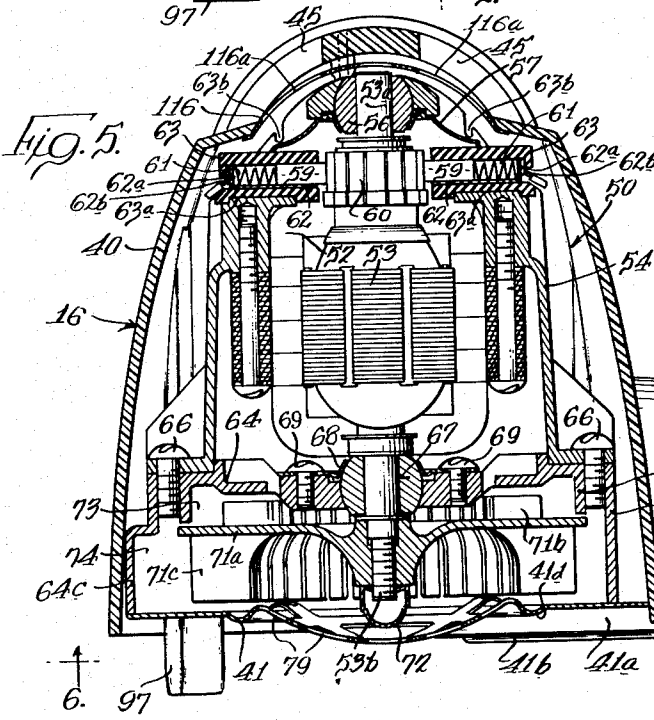
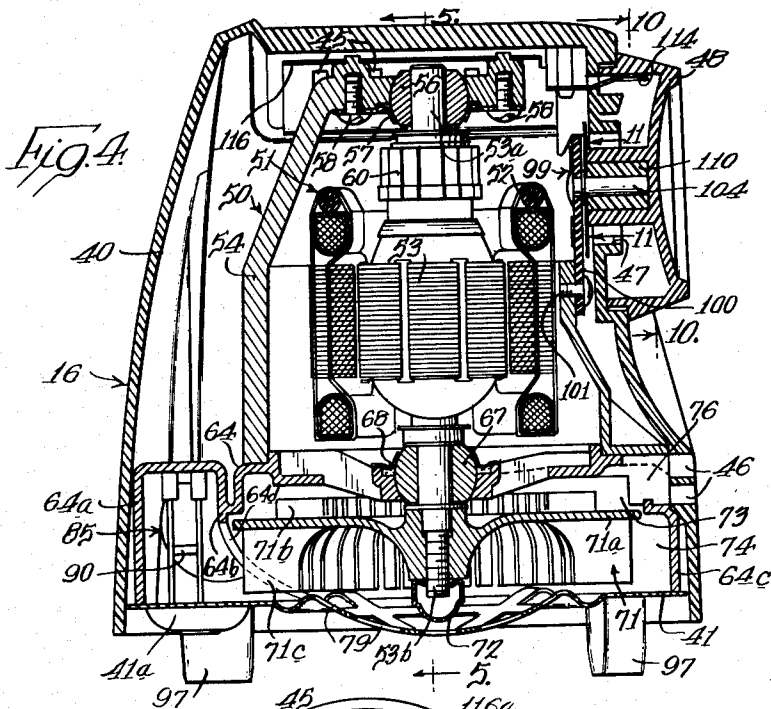
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Original Filed April 17, 1957

4 Sheets-Sheet 2



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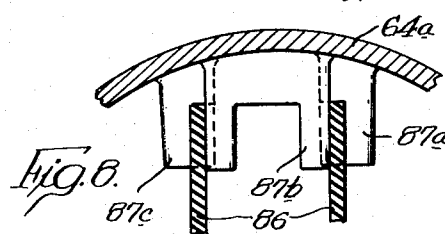
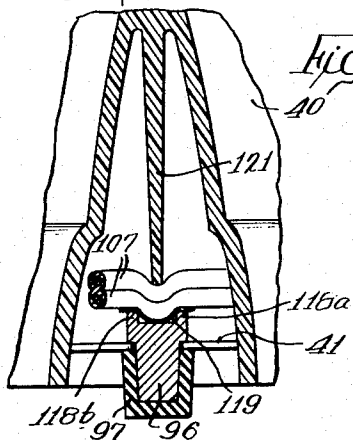
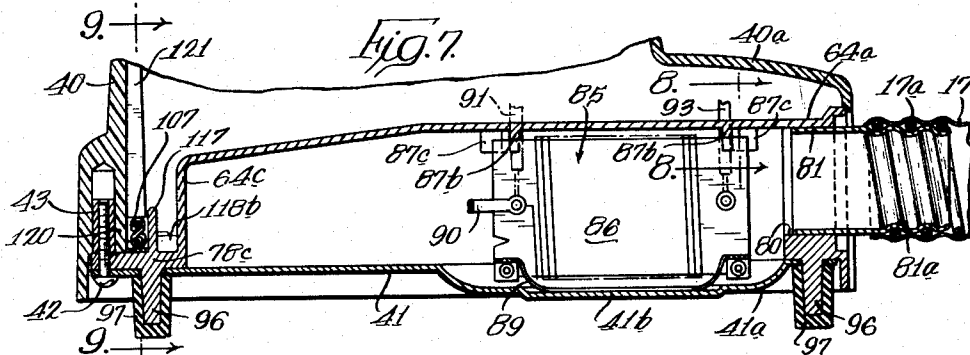
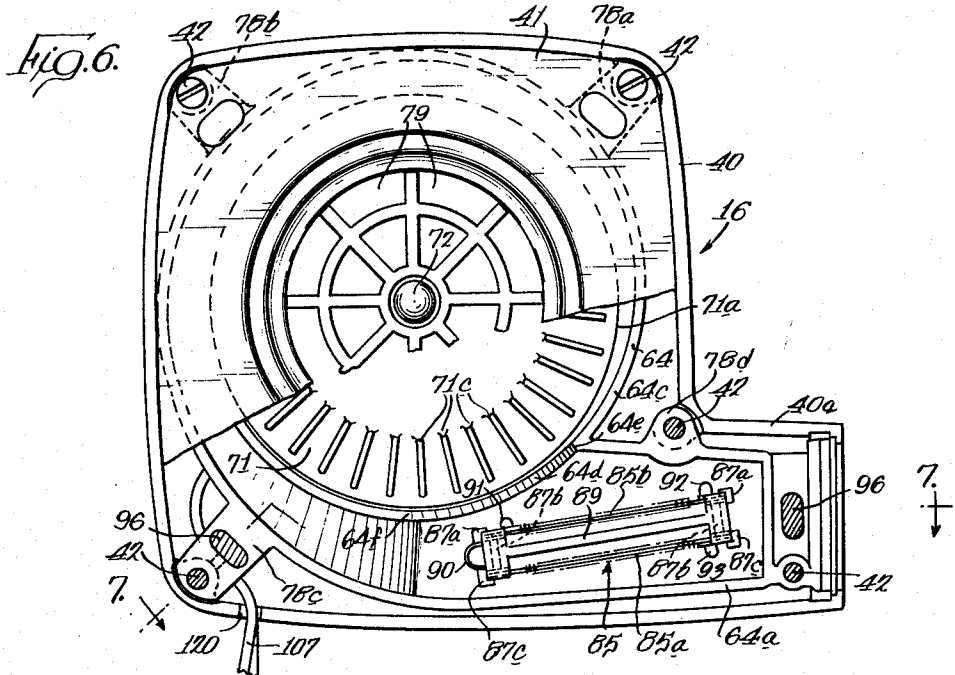
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HAIR DRYER

Original Filed April 17, 1957

4 Sheets-Sheet 3



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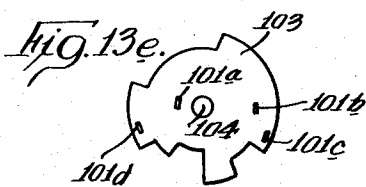
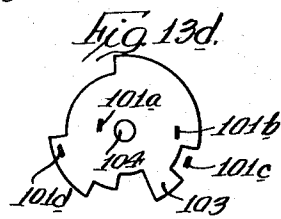
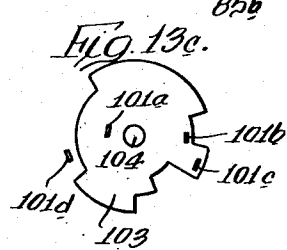
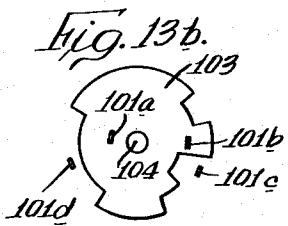
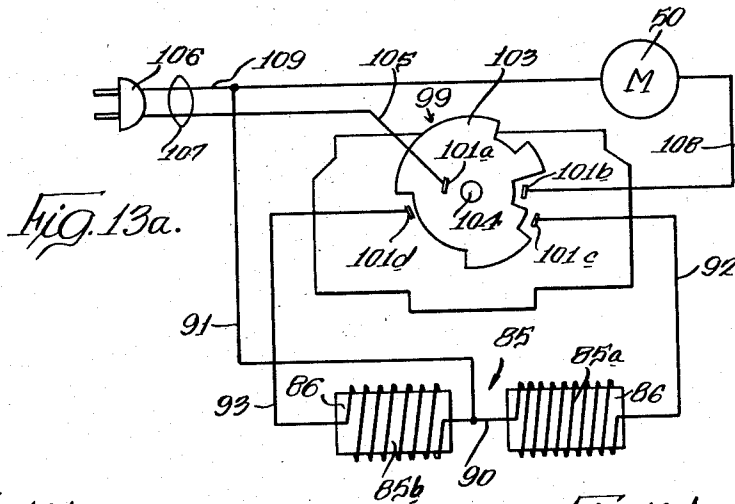
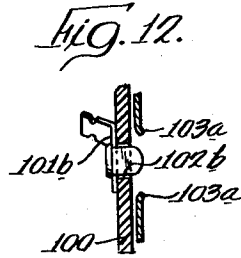
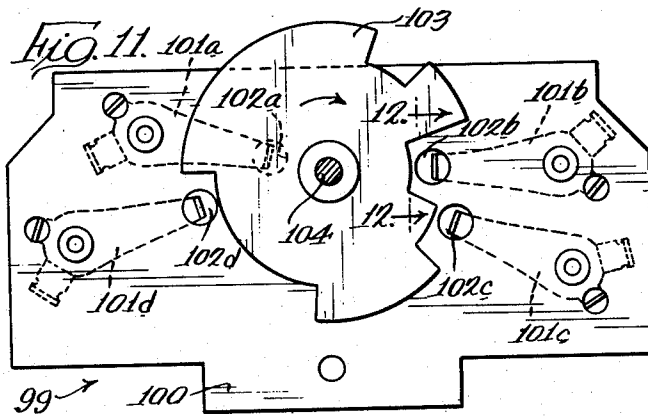
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HAIR DRYER

Original Filed April 17, 1957

4 Sheets-Sheet 4



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3,131,281

**HAIR DRYER**

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 Original application Apr. 17, 1957, Ser. No. 653,336, now Patent No. 3,006,079, dated Oct. 31, 1961. Divided and this application Feb. 16, 1960, Ser. No. 9,104  
 2 Claims. (Cl. 219—39)

The instant application is a division of my copending parent patent application Serial No. 653,336, filed April 17, 1957, now Patent No. 3,006,079, issued October 31, 1961, and assigned to the same assignee as the instant application. The improved cap per se of the present invention is claimed in said copending parent patent application.

The present invention relates to a hair dryer of the portable type which may have other uses in addition to that of drying hair.

There have been on the market for some years what might be termed three separate types of hair dryers for drying the hair on the head of humans. There is, first of all, the so-called professional dryer commonly found in beauty parlors and similar establishments, which generally comprises a heavy base for supporting a metal hood. Disposed within the metal hood are a fan and heating elements. The person's hair to be dried and a substantial portion of the head are inserted into such metal hood and hot air is blown down over the head. These professional type dryers have numerous disadvantages, particularly with respect to the nonuniform application of drying heat. Such dryers are known to subject the top of the head to unduly high temperatures, with the consequent discomfort and possible injury to the scalp while doing a very unsatisfactory drying operation to the hair adjacent to or below the scalp line. Furthermore, such professional dryers require the user to sit in a rather awkward and uncomfortable position, and the noise produced by the fan is such as to make it impossible for such person to carry on a conversation or do much of anything except to sit very straight in a constrained and uncomfortable position.

Another type of dryer which has been available on the market is the so-called hand dryer which involves a small blower for supplying heated air from a nozzle. This dryer is moved by the user around the head so that the air engages different parts of the hair and scalp for drying. Such dryers, although portable, are very inefficient and uncomfortable to use in that the user must hold them in awkward positions to get at parts of the scalp such as the rear and the top.

The third type of hair dryers involves the use of a flexible hood on the head of the user, to which hood is supplied heated air. Such a unit is disclosed and claimed in Nelson Patent No. 2,488,227, granted November 15, 1949, and assigned by mesne assignments to the same assignee as the instant application. The present invention is specifically concerned with an improvement on the arrangement disclosed in the aforesaid Nelson patent.

It would be desirable to provide a controlled heat hair dryer which overcomes the above-mentioned disadvantages of the professional dryer and yet which will give high-speed, controlled heat drying with complete comfort to the user. It will be appreciated that the drying of women's hair is more of a problem than that of drying men's hair due to the fact that fashions usually decree that women's hair be worn at a longer length than men's hair. To perform a most satisfactory drying operation, extensive studies have been made in connection with the present invention to determine the length and growth conditions of the hair in various areas of women's heads. It would be desirable to provide a hair dryer

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particularly adapted for drying women's hair in which the drying air enters the hair near those portions of the scalp where the hair is thickest and most difficult to dry, and is forced through the hair over those portions of the scalp. It would, furthermore, be desirable to provide an arrangement in which, unlike the professional hair dryer, little or no drying air is discharged upon the ears or in the areas immediately adjacent the ears. As a matter of fact, in the areas adjacent the ears the hair of the average person is relatively thin and it is both unnecessary and undesirable to discharge any extensive quantities of drying air.

In recent years a tremendous number of new appliances and devices of all sorts have been available on the market for home use. Obviously, each new device increases the storage problem for such appliances and devices when not in use. It would be desirable to provide a hair dryer which is very compact and which does not substantially add to the storage problem in the average home. Furthermore, hair dryers are often used by women in their bedrooms and it would be desirable for such a device to have a pleasing appearance so that, if exposed in such room, it will not detract from the appearance thereof, but, if anything, will enhance the appearance.

Accordingly, it is an object of the present invention to provide a new and improved hair dryer having the advantages enumerated above.

It is another object of the present invention to provide a new and improved hair dryer which may be worn with comfort by the user during a drying operation and which thoroughly dries the hair and scalp of the user in a minimum of time.

Still another object of the present invention resides in the provision of an improved hair dryer having a lightweight hair- and scalp-enclosing cap with improved means for distributing the heated air.

Still another object of the present invention is the provision of an improved hair dryer designed to cause no discomfort to the user.

A further object of the invention is to provide a hair dryer which may be selectively actuated to direct heated air over the hair of the user as well as air at ambient temperature, unheated in any way, such as by the motor of the hair dryer.

Still another object of the present invention resides in providing a hair dryer in which the cap or scalp-enclosing portion may be detached quickly from the remainder of the dryer to give freedom of movement to the user for emergencies such as telephone calls and the like.

A still further object of the invention is to provide a hair dryer having a quiet blower of large air capacity.

It is another object of the present invention to provide an improved hair dryer which is compactly arranged, comprising a lightweight unit which may readily be applied to the user and removed, and which may be stored in a very small space.

Still another object of the present invention resides in an improved hair dryer which is convenient to use, easily adapted to the user, economical to manufacture, and which will give long years of satisfactory service.

Further objects and advantages of the present invention will become apparent as the following description proceeds, and the features of novelty which characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of the present invention, reference may be had to the accompanying drawings in which:

FIG. 1 is a perspective view of the hair dryer of the present invention shown during use thereof;

FIG. 2 is a greatly enlarged view, partly in section, of the cap or bonnet portion of the hair dryer of the present invention;

FIGS. 2a and 2b are greatly enlarged fragmentary sectional views taken along lines 2a—2a and 2b—2b of FIG. 2, respectively, assuming that FIG. 2 shows the complete structure;

FIG. 3 is an enlarged sectional view taken on line 3—3 of FIG. 2, assuming that FIG. 2 shows the complete structure;

FIG. 4 is a greatly enlarged sectional view taken substantially on line 4—4 of FIG. 1;

FIG. 5 is a sectional view taken on line 5—5 of FIG. 4, assuming that FIG. 4 shows the complete structure;

FIG. 6 is a bottom view of the motor-driven fan portion of the hair dryer of the present invention looking in the direction of the arrows 6—6 of FIG. 5, assuming that FIG. 5 shows the complete structure, but with certain portions of the bottom cut away;

FIG. 7 is a somewhat enlarged sectional view taken on line 7—7 of FIG. 6, assuming that FIG. 6 shows the complete structure;

FIG. 8 is an enlarged fragmentary sectional view taken on line 8—8 of FIG. 7, assuming that FIG. 7 shows the complete structure;

FIG. 9 is an enlarged fragmentary view taken on line 9—9 of FIG. 7, again assuming that FIG. 7 shows the complete structure;

FIG. 10 is a sectional view taken on line 10—10 of FIG. 4, assuming that FIG. 4 shows the complete structure;

FIG. 11 is a greatly enlarged sectional view taken on line 11—11 of FIG. 4, assuming that FIG. 4 shows the complete structure;

FIG. 12 is a fragmentary sectional view taken on line 12—12 of FIG. 11;

FIG. 13a is a circuit diagram showing schematically the switch of FIG. 11; and

FIGS. 13b, 13c, 13d and 13e are fragmentary views of FIG. 13a showing different successive positions of the switch mechanism.

Briefly, the present invention is concerned with an improved hair drying cap or bonnet of the flexible head-conforming type which is designed to aid in supplying drying air to the human scalp in a manner so that those areas of the hair and scalp which require the maximum drying are supplied with the maximum amount of drying air, and that excessive quantities of drying air are not supplied to tender areas of the head and scalp and those areas having a minimum amount of hair. The flexible cap or bonnet is connected by means of a flexible hose to a compact unit for supplying drying air at four different temperatures including air at room temperature. A very compact motor unit is provided with heater means for selectively supplying air at different temperatures.

Referring now to the drawings, the improved hair dryer of the present invention essentially comprises three principal elements: a flexible cap or scalp-enclosing unit, generally designated at 15, which is designed to be worn by the user, a unit 16 for heating air and delivering it in a stream, and a flexible conduit 17 interconnecting the unit 16 with the cap or unit 15. Although the present invention is primarily described as a hair dryer, it is adapted for numerous other uses. For example, by disconnecting the flexible conduit or hose 17 from the cap 15, the drying air issuing from the flexible conduit 17 is excellent for drying nail polish, lingerie, gloves, liquid shoe polish, children's hair, pets, etc. Consequently, it is intended that the term "hair dryer" used in this application cover related uses of the device even though these uses may not actually involve drying hair.

Considering first the construction of the bonnet or cap 15, attention is directed to FIGS. 1, 2 and 3. The cap

15 comprises a generally conical-shaped fabric container which, at the large end of the cone, is open so as to receive therein the scalp portion of a human head for hair drying purposes. The periphery defining the open end is provided with a channel 18 for receiving a suitable drawstring 19, preferably formed of an elastic material so as to give a close fit around the head of the user. The drawstring should be adjusted initially so that when the cap is applied to the head of the user it snugly encloses at least the scalp portion thereof. As illustrated, the drawstring enclosing channel 18 terminates in an eyelet 20 through which the ends of the drawstring may extend so as to be accessible to the user, and the ends are preferably knotted together in the desired adjusted position as indicated at 19a.

For the purpose of insuring that the cap 15 has a minimum volume just sufficient to receive the scalp portion of the head and hair of the user, a ring clamp, generally designated at 23, is applied to the apex of the cone and slidable along the cone-shaped flexible material so as to reduce the volume of the cap to that required snugly to receive variable volumes of hair. The ring clamp 23 is illustrated as comprising a plurality of turns of a coil spring, with the ends bent in a manner so as not to interfere with applying the clamp to the cone. In an embodiment built in accordance with the present invention, the ends of the clamp were bent so as to extend across the central opening of the ring-shaped member 23, thereby to act as a sort of clamp to hold this member on the cone-shaped cap. This construction enables the cap 15 to be adjusted so it fits closely around the hair of the user whereby all air introduced into the cap flows through the hair.

The cap 15 may, obviously, be made of any flexible fabric. In an embodiment built in accordance with the present invention, the cap 15 is made from a single flat sheet of a taffetized virgin vinyl in any desirable color. This material lends itself very well to heat sealing operations so that the seams designated at 18a and 18b defining the drawstring receiving channel 18 are effectively formed by heat sealing two layers of material together, thus eliminating any requirement for sewing. In addition, the vinyl material is impervious to air and, hence, provides a good means for directing heated air in any desired manner. In a second embodiment built in accordance with the present invention, the cap or bonnet 15 is made from densely woven fabric of Dacron and nylon. This fabric is so tightly woven that it is substantially impervious to air up to or greater than about twelve pounds per square inch pressure, but permits water from the wet hair in contact therewith to seep rapidly therethrough to the exterior of the cap to accelerate the hair drying action.

For the purpose of supplying heated air to the scalp, the cap 15 is provided with a manifold designated at 25 defined by applying to the interior of the cap 15 a piece of material 26. The exterior shell of the cap 15, which is of conical configuration, is made from a single flat sheet of generally triangular shape including two identical sides or halves which are joined at their extremities as by heat sealing to form the seam 24 extending from the head receiving opening at the large end of the cone to the apex thereof. The effective portion of the material 26 may have a particular shape which, for one half of the cap, has somewhat a distorted mitten shape, as best shown in the cross-sectional view of FIG. 2 of the drawings. A comparable piece of material 26 will be included in the other half of the cap. The edges of the material 26, which preferably is the same as that from which the rest of the cap is formed, are heated-sealed to the remainder of the cap to define the seams 26a and 26b. The seam 24, the seams 26a and 26b, and the seams 18a and 18b are preferably simultaneously formed. The seam 24 between the seams 26a and 26b prevents interconnection of the manifold on each side of the cap at the top of the cap. The seams 26a and 26b effectively define the closed cham-

ber or manifold 25 which is connected to a relatively large opening in the exterior of the cap 15 but not in the material 26, adjacent to the nape of the neck of the user and at what would correspond to the base of the head of the user. This opening is defined by a grommet 28 which is suitably clamped to the edges of the material defining the opening. The grommet 28 thus comprises the air inlet opening to the manifold 25, and, when the cap is in place for use, the grommet 28 is almost horizontal so that the flexible conduit 17 hangs substantially vertically, thereby causing no discomfort to the user.

It should be understood that the material 26 may be coextensive with the exterior shell of the cap 15, if desired, so as to define two nested conical members heat-sealed along the seams 18a, 18b, 24, 26a and 26b.

In accordance with the present invention, the manifold 25 is provided inside the cap 15 with a plurality of air distributing openings 30a, 30b and 30c which are the only openings by which air supplied to the opening in the grommet 28 may escape into the cap and, hence, into the hair of the user. The particular location of these openings is very important and has been obtained after a great deal of study and experimentation. The holes are so located that the largest quantity of air is supplied to the portions of the scalp spaced immediately adjacent to where the hair is the thickest and most difficult to dry. Specifically, the holes are omitted in those portions immediately adjacent the ears so that no hot air is discharged onto the ears.

The holes 30a extend along a line under the base of the head of the user and are closer to the right-hand edge of the manifold 25, as viewed in FIG. 2, than to the left-hand edge thereof. Hence, as air is supplied to the manifold through the inlet grommet 28 and the manifold inflates somewhat, the holes are directed somewhat back and upwardly along the head rather than perpendicularly to the adjacent portions of the head. That is, the jets of air from the holes 30a are directed upwardly and at acute angles to the portions of the scalp adjacent thereto, and flow along the scalp into the heavy mass of hair at the back of the head. This air travels along the scalp and through the hair over the back of the head and the crown of the head to an outlet grommet 32 located just above the forehead.

The holes 30b form a line along the sides of the head near the top and just above and forward of the ears, and are adjacent to relatively thin hair areas. The holes 30b also are off-center to the right, as viewed in FIG. 2, in the portions of the manifold in which they are positioned, so that, as the manifold is inflated during use, the holes 30b face upwardly and to the right to direct the jets of air somewhat tangentially to the scalp. The air then flows up to the crown of the head toward the opening 32 and through the heavier masses of hair immediately adjacent the openings 30b.

The holes 30c are located over the crown of the head of the user just back of the mass of hair often accumulated on the forward portion of the head of a feminine user. The holes 30c are off-center in the manifold 25 to the left of the center of the manifold, as viewed in FIG. 2, so that, on inflation of the manifold which normally occurs during use, the jets of air from the holes 30c impinge tangentially on the scalp with substantial components of direction toward the outlet opening 32. Each of the uppermost ones of the two groups of holes 30c on each side of the seam 24 is spaced sufficiently far from this seam that these uppermost holes are not folded together or closed off as the manifold is inflated. The jets from the holes 30c strike the scalp just before the heavy forward mass of hair, and flow through that heavy mass of hair.

It should be noted that each series of openings 30a, 30b and 30c is so located that each opening directs a jet of air toward the scalp and generally toward the outlet opening 32, which jet impinges against the scalp just be-

fore a large accumulation of hair. That is, the openings 30a, 30b and 30c are at thin hair portions of the scalp immediately adjacent to heavy accumulations of hair, so that the jets flow directly into the heavy accumulations for most effective drying. In a device successfully embodying the present invention, there were employed ten of the holes 30a, three holes in each of the two groups of the holes 30b on opposite sides of the head, and three holes in each group of the holes 30c. Each hole was three-sixteenths of an inch in diameter. The holes of this size provide optimum drying jets of high velocity and direct a large volume of air per unit of time onto the scalp and through the hair. Air under a pressure of from six to nine inches of water was supplied to the manifold, and the manifold and closely fitting cap kept the air flowing toward the outlet opening 32 over all parts of the scalp. About fifteen to eighteen cubic feet of air per minute were forced through the manifold, which resulted in rapid drying of the hair.

In the modified construction of the present invention where the cap 15 comprises two nested conical members, as mentioned above, the inner conical member is provided with the holes 30a, 30b, and 30c, as described above, between the seams 26a and 26b. It is additionally provided with a few holes in portions thereof not between the seams 26a and 26b to permit the escape of any air which might get between the inner and outer conical members other than within the manifold 25 if by any chance there were some slight leakage along the seams 26a or 26b.

No holes 30a or 30b are provided in the manifold 25 for an area which would extend for an inch or so above the ears toward the crown of the head. The reason for this is that it has been found that the hair of the average person in these areas is relatively thin and these areas are not immediately adjacent to large accumulations of hair, and it is undesirable to discharge hot drying air into these areas. The manifold 25 is provided with relatively few openings 30c in the area adjacent the crown of the head, since a substantial portion of the air from the holes 30a also travels over the crown of the head. In any event, when air is supplied to the opening in the grommet 28 and consequently to the manifold 25, this air is discharged through the openings 30a, 30b and 30c, which are positioned so that substantial quantities of drying air are discharged against the scalp at portions of the scalp bordering heavy masses of hair in directions flowing along the scalp into such masses. Preferably, at least about one-half of the air going into the cap is discharged through the holes 30a against the scalp at the base of the head effectively to dry the large accumulations of hair at the rear portion of the head.

The opening 32 referred to above is provided at the upper front of the cap 15. This opening may be defined in any suitable manner as by a washer 33 sealed into the fabric or the like through which the air supplied to the cap 15 from the openings 30a, 30b and 30c in the manifold 25 may escape. Since the cap is otherwise closed by virtue of the drawstring 19, snugly embracing the head of the user, the opening 32 is the only opening through which such air may escape from the cap 15. The path of flow of drying air is as indicated in the drawings, with the result that warm dry air is concentrated on the back of the head adjacent the scalp where the hair is heaviest, and this air passes over the scalp carrying moisture through the escape opening 32. This escape opening is disposed as is shown in FIG. 1 of the drawings, so that the moist air is directed away from the face. It is, furthermore, clear that there can be no discomfort of heat on the face, neck or shoulders, since all the warm air escaping from the cap 15 is directed through the opening 32. Thus, with the cap 15 the drying air is directed where it is desired and it is unnecessary to hold a device in an awkward, arm-tiring manner, as was the case with one type

of prior art dryer. Furthermore, the hands of the user are completely free to do other things.

The flexible conduit 17 for connecting the cap 15 with the source of heated air may comprise any suitable conduit and is illustrated as a corrugated hose or conduit 17, reinforced by a spiral steel wire 17a (see FIG. 7) covered with a plastic material bonded to the hose which preferably is of a color matching that of the cap 15. For the purpose of connecting the flexible conduit 17 with the opening in the grommet 23, a suitable hose coupling 35, which might be formed from a suitable plastic material, is provided. The end of the hose is preferably received in the end of the coupling, as indicated in FIG. 3 of the drawings, and a suitable adhesive is applied as indicated at 35 to secure the hose coupling to the hose. Preferably, the hose coupling is provided with an annular recess 37 for receiving the grommet 23. If the coupling 35 is formed from a resilient material such as natural or artificial rubber or plastic, it can be distorted for ready insertion into the opening in grommet 23, with the result that the grommet snaps into the recess 37 and securely holds the hose coupling 35 connected to the manifold 25. This connection is readily removable, however, due to the resilience of the hose coupling 35.

It will be appreciated that the air under pressure in the conduit 17 forces the flexible piece of material 26 away from the mouth of the coupling 35 to permit unobstructed flow of the air into the manifold 25. This action is aided by the downward pull of the vertically depending portion of the conduit 17 adjacent the grommet 18. Thus, the upper end portion of the coupling 35 in the manifold 25 need not be slotted or perforated laterally to permit air flow into the manifold 25.

Considering now the unit 16 for supplying drying air of selectively different temperatures to the cap 15, attention is directed to FIGS. 4 to 10 of the drawings. As there illustrated, the unit 16 is a compact so-called fan heater comprising a molded one-piece housing 40 open at the bottom. The bottom opening of housing 40 is adapted to be closed by a suitable base plate 41. To secure the base plate 41 to the bottom open end of the housing 40, suitable screws or fastening means 42 are provided for engaging suitable tapped inserts 43 molded into the housing 40 or other suitable threaded means. Preferably, the housing 40 is molded from a suitable plastic material and may have a color corresponding to that of the hose 17 and the cap 15, if desired. Essentially, the housing or casing 40 comprises a somewhat dome-shaped shell having an open bottom with a lateral projection 40a at the bottom serving as an outlet passageway for heated air to be supplied to the hose 17. The top of the housing is provided with slotted openings 45 through which motor cooling air may enter the motor housing. The casing is also provided with discharge openings 45 through which the motor cooling air is discharged. Additionally, a relatively large opening 47 (see FIG. 4) is provided near the upper part of one side of the housing through which a suitable control shaft cooperating with a control knob 48 may extend.

For the purpose of operating a suitable fan for supplying drying air to the hose 17, there is disposed within the housing or casing 40 and forming an integral part of the unit 16 a motor and fan assembly generally designated at 50. This motor and fan assembly comprises an electric motor 51, which may be any suitable type of motor and is illustrated as comprising a field structure 52 and an armature 53. The field structure and armature are preferably suitably mounted in a die-cast housing 54. The armature 53 of the motor 51 is suitably mounted within the housing 54, with the axis of the armature shaft 53a thereof disposed in a generally vertical direction. The motor housing 54 is essentially a tubular structure open at the bottom and having spiderlike arms defining a suitable support for the upper bearing 56, which is held in place by a suitable bearing retainer 57, which in turn is

secured to the housing 54 by suitable fastening means 58. As is best shown in FIG. 5, the brackets that are provided to support the upper bearing 56 also support a pair of brushes 59 biased into engagement with a conventional commutator 60 by spring means generally indicated at 61, thus providing the means for making electrical connections to the armature. The field windings of the motor 51 may be arranged in any manner, such, for example, as in series with the armature.

The brushes 59 are slidable along bronze channels 62 seated in horizontally split boxes 63 of electrical insulating material. Bent-up ends 62a of the channels 62 have loops 62b formed by piercing and are electrically secured to suitable leads. Mechanically, they also serve as seats for the springs 61. Each box 63 has a bottom groove 63a fitting interlockably over the upper edge of the motor housing 54, and the boxes are pressed downwardly by spring arms of the bearing retainer 57. During assembly, pairs of notches 63b bracketing each brush box 63 support pins (not shown) to keep the arms of the retainer 57 raised up for insertion of the brush units.

To complete the motor housing and also to provide a fan housing and lower bearing support, there is provided a combined motor housing closure member and fan housing generally designated by the reference numeral 64, which is a sort of downwardly directed cup-shaped member having a tangential portion 64a defining a fan outlet and receivable within the portion 40a of the plastic housing 40. The combined fan housing and closure member 64 is suitably secured to the open end of the motor housing 54 as by fastening means 65, best shown in FIG. 5 of the drawings. This closure member includes means for receiving the lower motor bearing 67, which is preferably held in position by a lower bearing retainer 68 suitably secured to the member 64 as by screws 69. The lower closure member 64 is provided with two depending generally circular flanges, designated as 64b and 64c, respectively. The depending circular flange 64b effectively defines an upper fan chamber for a motor cooling fan, while the lower depending flange 64c cooperates to define a drying air circulating fan chamber which is connected to the tangentially disposed outlet section 64a. The armature shaft 53a is journaled in the bearings 56 and 67, respectively, and the lower end of this armature shaft extends into the fan housing defined by the member 64. Moreover, the lower end is illustrated as being threaded as indicated at 53b so that a suitable circulating fan 71 may be secured to the motor shaft 53a as by means of a suitable nut 72. Essentially, the fan 71 is a double fan having a circular disk portion 71a, the periphery of which corresponds to the periphery of the depending circular flange 64b and is disposed immediately below the depending flange 64b so as effectively to divide the fan housing into an upper fan chamber 73 and a lower fan chamber 74. Integrally formed with the disk 71a and on the upper face thereof are a plurality of fan blades 71b which are rotated in fan chamber 73 to draw cooling air through the openings 45 in the top of the plastic housing 40 in a direction generally parallel with the longitudinal axis of the motor shaft 53a and into the fan chamber 73. As best shown in FIG. 4 of the drawings, the fan chamber 73 is provided with a lateral opening 76 defined in the member 64 which is aligned with the openings 46 in the plastic housing 40.

From the above description it will be apparent that the peripheral depending lip or flange 64b and the cooperating disk portion 71a of the fan 71 effectively isolate the fan chamber 73 from the fan chamber 74 so that motor cooling air is kept completely out of the fan chamber 74 and, consequently, is kept out of the air supplied to the hose or flexible conduit 17. The drying air supplied to conduit 17 is delivered by virtue of the fan defined by a plurality of depending blades 71c integrally formed with disk 71a and blades 71b. The motor and fan assembly 50 is secured with the housing 40 by the same screws 42

which hold the base or closure plate 41 in position. The closure plate 41 is shaped so as substantially to close the bottom of the plastic housing 40 and, hence, it extends beyond the periphery of the flange 64c of member 64 in various places. As illustrated, the member 64 is provided with lateral projections 78a, 78b, 78c and 78d which have openings therein aligned with the tapped openings for receiving the screws 42. The center of the closure plate 41 is provided with a plurality of openings 79 at the vortex of the fan chamber 74 through which air may be drawn and discharged tangentially through the portion 64a of the combined fan housing and motor housing closure plate 64. The portion 64a terminates in a circular air discharge opening 80.

The flexible conduit 17 is connected to the discharge opening 80 by a metal sleeve 81 (FIG. 7) locked by press-fitting it in the opening 80. The flexible conduit is secured to the sleeve 81 by the spring steel wire 17a extending along a spiral groove or thread 81a and the corrugations in the flexible conduit 17 to key these elements together. The wire 17a, as the conduit 17 is screwed on the sleeve 81, tends to be drawn temporarily into a looser spiral on the sleeve 81, thus not obstructing the threading of the conduit onto the sleeve. However, when the conduit is grasped at a point away from the sleeve and it is attempted to unscrew the conduit from the sleeve, the wire is drawn more tightly on the conduit and the conduit is very difficult to remove. When the very end of the conduit on the sleeve is grasped and the conduit is turned in an unscrewing direction, the wire is not tightened and the conduit may be unscrewed. This construction prevents accidental removal of the conduit from the sleeve.

For the purpose of providing drying air, it is obvious that means must be provided to heat the air supplied to the conduit 17, and in accordance with the present invention a suitable multiheat heater, generally designated as 85, is disposed within the tangential housing extension 64a, as is best shown in FIGS. 4, 6 and 7 of the drawings. As there illustrated, the heater 85 comprises two separate heater elements designated as 85a and 85b. These heaters each comprise an insulating card 86 such as a mica card, having corrugated edges and about which is wrapped a suitable resistance wire, the corrugations causing the turns thereof to remain separated. Preferably, the heater element 85a is a higher resistance element so as to produce a lower wattage output, while the resistor 85b is a lower resistance element so as to produce a higher wattage output. In one embodiment constructed in accordance with the present invention, the cards 86 of both the heater elements 85a and 85b are identical and are wound with the same number of turns of resistance wires, but the wire of the heater element 85a is smaller in cross section than the wire of the heater element 85b. For the purpose of suitably supporting the heater 85 comprising the two separate elements 85a and 85b within the discharge portion of the fan chamber 74, the upper walls of the chamber are provided adjacent each end of the heater 85 with projections 87a, 87b and 87c so as to support the cards 86 in spaced parallel relationship, as best shown in FIGS. 4, 6 and 8 of the drawings. To similarly support the bottom of the insulating cards 86 defining the heater 85, a clip member or heater clip 89 is provided which comprises a sort of handle-shaped element having at each end thereof a pair of spaced recesses for receiving the insulating cards 86 and holding them in spaced parallel relationship in the same manner as the upper ends thereof are held by the projections 87a, 87b and 87c. To further support the lower end of the members, the cover or base plate 41 is provided with a depression 41a which has a centrally disposed smaller depression 41b thereof for snugly receiving the lower portion of the heater clip 89. Thus, in an assembly operation, the heater elements with the heater clip 89 secured thereto are inserted between the projections 87 and then the cover

or base plate 41 is put into position, which insures properly supporting the heater elements 85a and 85b in insulated relationship within the discharge portion of the fan chamber 74. The heater elements 85a and 85b are connected together by a suitable connector 90, and a conductor 91 connects the common terminal or terminal link 90 of the two heater elements to one side of the source for energizing the motor, while conductors 92 and 93 connect the other ends of the low heat heating element 85a and the high heat heating element 85b, respectively, to suitable control means. These leads 91, 92 and 93 enter the discharge portion 64a of the fan chamber 74 through suitable openings defined therein.

To aid in the assembly operation and also to serve as supporting feet for the unit 16, the member 64 is provided with a plurality of depending projections 96 which are preferably integrally formed therewith. These projections, as best shown in the drawings, are adapted to extend through suitable openings defined in the base plate 41. Suitable feet 97, formed of natural or artificial rubber, are adapted to slip onto the extensions 96. These feet are designed so as to grip the projections 96, and during assembly operation serve to hold the plate 41 in assembled relationship with the fan and motor housing until the screws 42 are applied to hold the motor and fan unit in the plastic housing 40 and the base plate 41 in position. The feet 97 additionally provide a resilient cushion so that no damage will occur to any support upon which the unit 16 is placed.

To keep the fan 71 very quiet, a large number of the blades 71b and 71c are provided, and the speed of the motor 50 is made high so that the blades 71b and 71c move past all points adjacent to the fan at a frequency higher than the frequency of sound. In a device built in accordance with the present invention, thirty-five blades 71b, and thirty-five blades 71c were employed with the fan rotating at about 12,000 r.p.m. Also, a curved rib 41d (FIG. 5) is defined in the base plate 41 around the air openings 79 to keep the air from sharply changing direction as it enters the fan. Further, a wedgelike baffle plate portion 64d of the flange 64a (FIGS. 4 and 6) extends into and helps define the outlet opening. The portion 64d tapers from full width at point 64e to substantially no width at point 64f. Thus, as the fan 71 rotates counterclockwise, as viewed in FIG. 6, the air flow to the tangential outlet from the blades 71c is gradually cut off. This construction keeps noise at a minimum.

For the purpose of selectively controlling the fan motor, and particularly for controlling selectively the temperature of drying air supplied to the conduit 17, there is provided a five-position switch generally designated as 99. As best illustrated in FIGS. 4, 11, 12 and 13a, this switch 99 comprises an insulating support 100, preferably in the form of a flat plate, which is secured as by a suitable screw 101 to the motor housing 50 in a position adjacent the opening 47 in that housing. Secured to one side of the insulating switch plate 100 are a plurality of spring fingers 101a, 101b, 101c and 101d. These spring fingers are secured to one side of the insulating support 100 as by a suitable rivet or the like, and the free end of the spring finger is bent at right angles and adapted to protrude through suitable openings 102 in the insulating support 100. These openings 102 are designated as 102a, 102b, 102c and 102d, corresponding to the spring fingers 101 bearing identical letter subscripts. It will be apparent that the free ends of the fingers 101 protruding through the openings 102 are engageable by suitable conducting means disposed adjacent that face of the insulating support 100.

For controlling an electrical circuit associated with the fingers 101, there is provided a rotatable conducting member or switch plate 103 rotatably supported on a suitable shaft 104 secured to the switch plate 100 and projecting through the opening 47 when the unit 16 is assembled. The rotatable switch member 103 is illus-

trated as a conducting disk of copper or other suitable material and designed to selectively contact one or more of the spring fingers 101. As illustrated best in FIG. 11 of the drawings, the conducting disk 103 has a plurality of notches in its periphery to control the selective engagement with the contact fingers 101. In order that these notches will not interfere with rotation of the disk into and out of engagement with the different spring fingers 102, the edges of the notches in the disk are bent up as indicated at 103a in FIG. 12 of the drawings. Thus rotation in either direction of the disk is obtainable without jamming of the spring fingers relative to the notches.

In order to understand the purpose of the individual contacts 101, reference may be had to FIGS. 13a, 13b, 13c, 13d and 13e of the drawings, where the electrical circuit diagram of the unit 16 is schematically illustrated. As there illustrated, the spring finger 101a is connected by means of a conductor 105 with one side of the power source which is indicated as being supplied to the unit by conventional plug connector 106 connected to a twin conductor 107. The switch 99 is so constructed that the contact 101a is always in electrical engagement with the rotating switch disk 103. The contact 101b is connected to the motor 51 by means of a conductor 108, which in turn is connected to one conductor of the twin conductor 107 by means of a conductor 109. The spring finger 101b controls the energization of the motor 50, and in the position of the switch 99 shown in FIG. 13b of the drawings, drying air will be supplied to the conduit 17 at room temperature, since the heater 85 is unenergized. FIG. 13a illustrates the condition of the unit when the switch 99 is in the "off" position.

FIG. 13c illustrates the condition where warm air is supplied to the conduit 17 and shows both the energization of the motor 50 as well as the low wattage element 85a of the heating unit 85. Thus, contact 101c controls the energization of this low wattage element 85a through a circuit comprising conductor 91, terminal link 90, heater element 85a, conductor 92, spring finger 101c, rotatable switch disk 103, spring finger 101b, conductor 108, and the motor circuit including conductor 109. It will be apparent that instead of energizing the low wattage heating element 85a, the high wattage heating element 85b alone can be energized, and this is controlled by spring finger 101d, as represented by FIG. 13d of the drawings. When the maximum heated drying air is desired, the switch 99 is moved to the position represented by FIG. 13e of the drawings, in which case the heating elements 85a and 85b are connected in parallel. In an embodiment built in accordance with the present invention, the low wattage heating element had a resistance of between 130 and 144 ohms, while the high wattage heating element 85b had a resistance between 82 and 90½ ohms.

For the purpose of manipulating the rotatable switch disk 103, this disk is secured to a suitable shank 110 which may be molded from a suitable plastic or the like and disposed in concentric relationship with the switch supporting shaft 104. Preferably, the shank 110 is provided with an integrally molded key 110a for cooperating with a suitable keyway 48a defined in the knob 48. The knob is provided with a knob retainer clip 111 which preferably tends to latch the knob 48 to the shank 110 in a manner that will permit removal thereof without the necessity of removing any screws or the like.

In order that the particular operating condition of the fan motor unit 16 is known, the knob 48 is preferably provided on its periphery with suitable indicia such as indicating the "off" condition and the four other conditions of the switch represented by FIGS. 13b to 13e, respectively. For the purpose of indexing the knob 48 in the various positions of the switch 99, as evidenced by FIGS. 13a to 13e, respectively, a portion of the interior of a peripheral flange 48b defined on the knob 48 is provided with notches 113, which notches may selectively engage a knob indexing spring 114 (see FIG. 1 of the

drawings) which may be secured to the housing 40 in any suitable manner at a point so as to engage the interior of the peripheral flange 48b.

For the purpose of providing an improved appearance and also to function as an air baffle, there is provided an arcuate baffle 116 having a plurality of elongated slots 116a therein secured to the top of the motor housing 54 by any suitable means. This baffle is illustrated as having the imperforate portions thereof disposed beneath the slots 45 in the plastic housing 40, and the perforate portions 116a are disposed beneath the imperforate portions defining the slots 45. The portion of the baffle 116 visible through the slots 45 is preferably polished or of a pleasing appearance. In an embodiment built in accordance with the present invention, this baffle had the appearance of polished brass.

For the purpose of providing a strain relief where the power cord 107 enters the housing 40 of the unit 16, the lug 78c attached to the fan housing 64 is provided with an upwardly directed projection 117 spaced from the peripheral flange 64c. In addition, a pair of integral spaced parallel flanges 118a and 118b (see FIGS. 7 and 9) extend on either side of projection 117 so as to define a somewhat channel-shaped member. The power conductor 107 is adapted to lie on top of the flanges 118a and 118b against one side of the lug 117, as is clearly shown in FIGS. 7 and 9 of the drawings. A suitable insulating clip 119 is preferably disposed between the conductor or power cord 107 and the parallel flanges 118a and 118b. The plastic cover 40 is provided with a notch 120 along the bottom periphery (see FIG. 6), so that when the plastic cover is assembled with the unit, the power cord may extend through the notch 120. To afford a satisfactory strain relief, the plastic casing 40 is provided with an integral shoulder-defining member 121 which is engageable with the top of the power cord 107, as clearly shown in FIGS. 7 and 9 of the drawings when the casing 40 is assembled with the motor and fan unit 50.

In view of the detailed description included above, the operation of the present invention will readily be understood by those skilled in the art. The user will adjust the cap 15 to the head in any desired manner, as best shown in FIG. 1 of the drawings, so as to snugly fit the head, and the spring clip 23 is adjusted as shown in FIG. 2 of the drawings. This adjusting ring or clip 23 is moved as close to the head as possible. Once this is done, no further adjustments are necessary. The drying operation is now ready to begin and it is recommended that the knob 48 be set to the highest heat position initially and thereafter can be set to any lower position which is most comfortable. If desired at the completion of the drying operation, cool air may be supplied to the scalp when the control switch is in the position shown in FIG. 13b of the drawings. The flexible cap 15 is completely washable, since it is made of a plastic material.

While there has been illustrated and described a particular embodiment of the present invention, it will be understood that numerous changes and modifications may occur to those skilled in the art. It is, therefore, aimed in the appended claims to cover any such changes and modifications as fall within the true spirit and scope of the present invention.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. In an air heater and blower unit having a fan for blowing air, a heater for heating the blown air, a motor for driving the fan, and a housing for enclosing the unit; the improvement of a casing for said motor, said housing being open at the bottom thereof for insertion of said casing and its motor into said housing, said casing being open at the bottom thereof, a downwardly facing generally cup shaped member secured to said casing to close the same and provide a fan chamber beneath said motor, a motor shaft extending from said motor through said cup shaped member into said fan chamber, said fan being dis-

posed in said fan chamber on said shaft, said cup shaped member being insertable into said housing through the bottom opening thereof with said motor casing, and a downwardly facing generally U-shaped lateral projection integrally formed on said housing adjacent the open bottom thereof, a downwardly facing generally U-shaped tangentially disposed exhaust channel integrally formed on said cup shaped member, said exhaust channel being insertable into said U-shaped lateral projection through the bottom thereof when said casing and cup shaped member are inserted into said housing, said heater being positioned in said exhaust channel, a single piece closure plate for closing said cup shaped member and exhaust channel and retaining said heater positioned in said exhaust channel, said single piece closure plate also closing the bottom of said housing and its lateral projection, first securing means comprising a plurality of depending support feet integrally formed on said cup shaped member, a plurality of apertures formed in said closure plate for extending said feet therethrough, and cup shaped rubberlike members positioned on said extending feet for temporarily retaining said closure plate against the bottom of said cup shaped member and its exhaust channel to retain said heater in assembled position, and second securing means comprising aligned openings formed in peripheral portions of said plate, cup shaped member and housing and fastening means extending into said aligned openings to complete the assembly of said closure plate to said cup shaped member and of said cup shaped member to said housing.

2. In an air heater and blower unit as in claim 1, wherein said heater comprises a pair of vertically disposed parallel and spaced insulating cards, a plurality of integral projections formed on the underside of said exhaust channel for retaining the upper edges of said cards parallel and spaced, a concave shaped supporting clip connected to the lower edges of said cards for retaining the lower edges parallel and spaced, and a depression formed in said closure plate for seating said supporting clip.

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