

[54] HAIR DRYER

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[51] **Int. Cl.**..... **A45d 20/24**

[58] **Field of Search**..... 34/90, 91, 96-101,
34/239

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[57] **ABSTRACT**

A portable hair dryer which includes a base, a head

supporting assembly and a dryer head assembly. The dryer head assembly includes a generally annular air distribution plenum therein for receiving drying air and directing it radially inwardly, and a cover which is movably mounted in respect to the annular plenum. The cover may be raised to increase the volume within the head assembly for accomodating the head of the user, and may be lowered to a storage position closely overlying the plenum. A squirrel cage blower is contained in an impeller housing disposed at the bottom of the head supporting assembly, the lower portion of which is mounted for adjustable movement with respect to the base. The upper portion of the head supporting assembly terminates in a tube having means engageable with portions of the plenum to provide for passage of air through the head support and into the interior of the plenum, while also permitting adjustment of the position of the head assembly with respect to the head mounting assembly. The cover unit includes an adjustable vent assembly permitting air to be exhausted from the interior of the assembly to the atmosphere after the drying air has escaped from the plenum. Means is provided to direct the flow of air to particular portions of the hair which are ordinarily difficult to dry.

39 Claims, 19 Drawing Figures

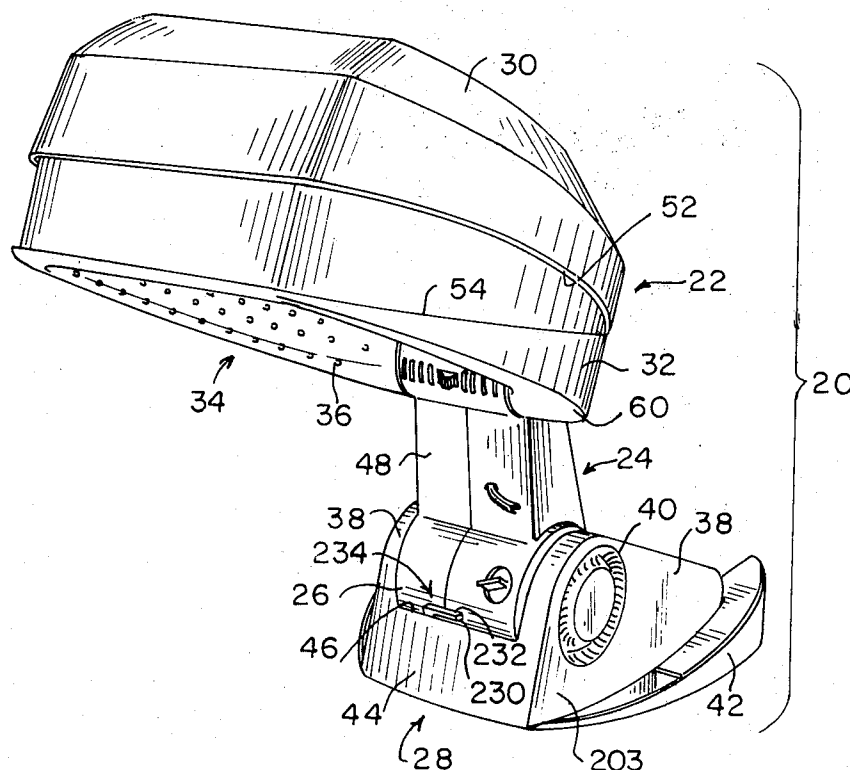


FIG. 2 -

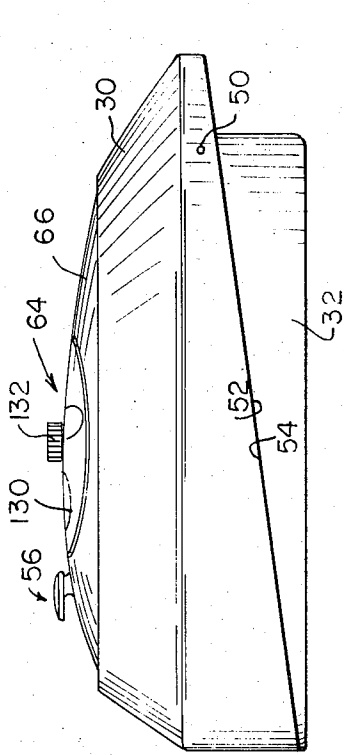


FIG. 3 -

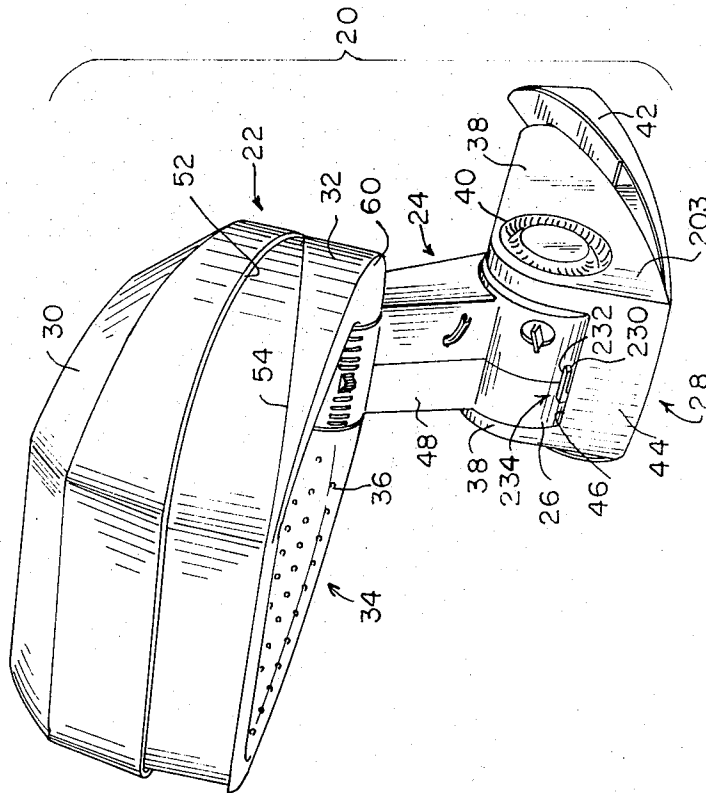
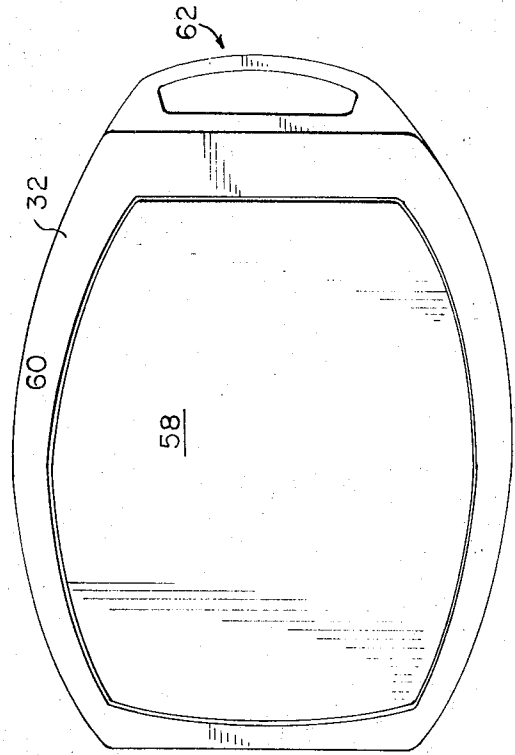


FIG. 1 -

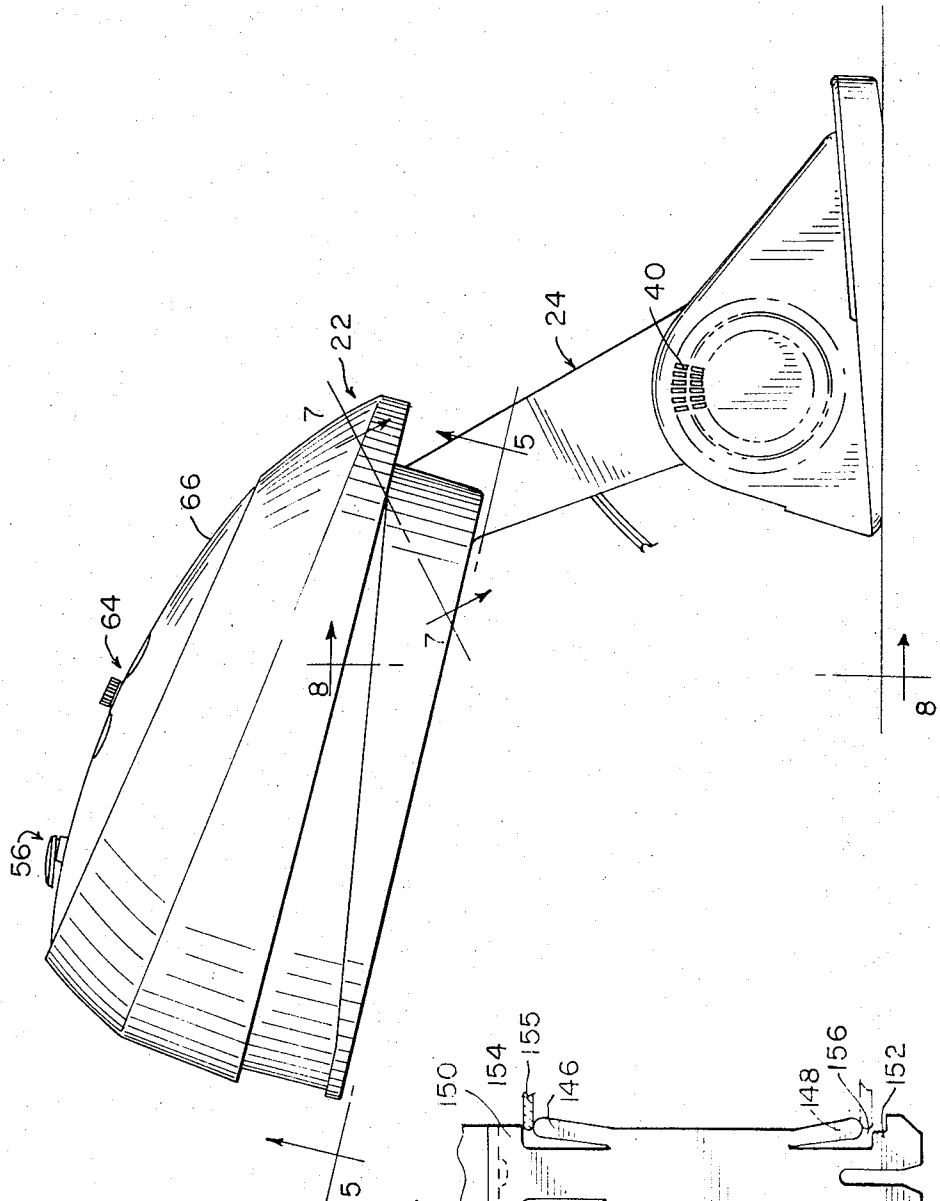


FIG. 5.

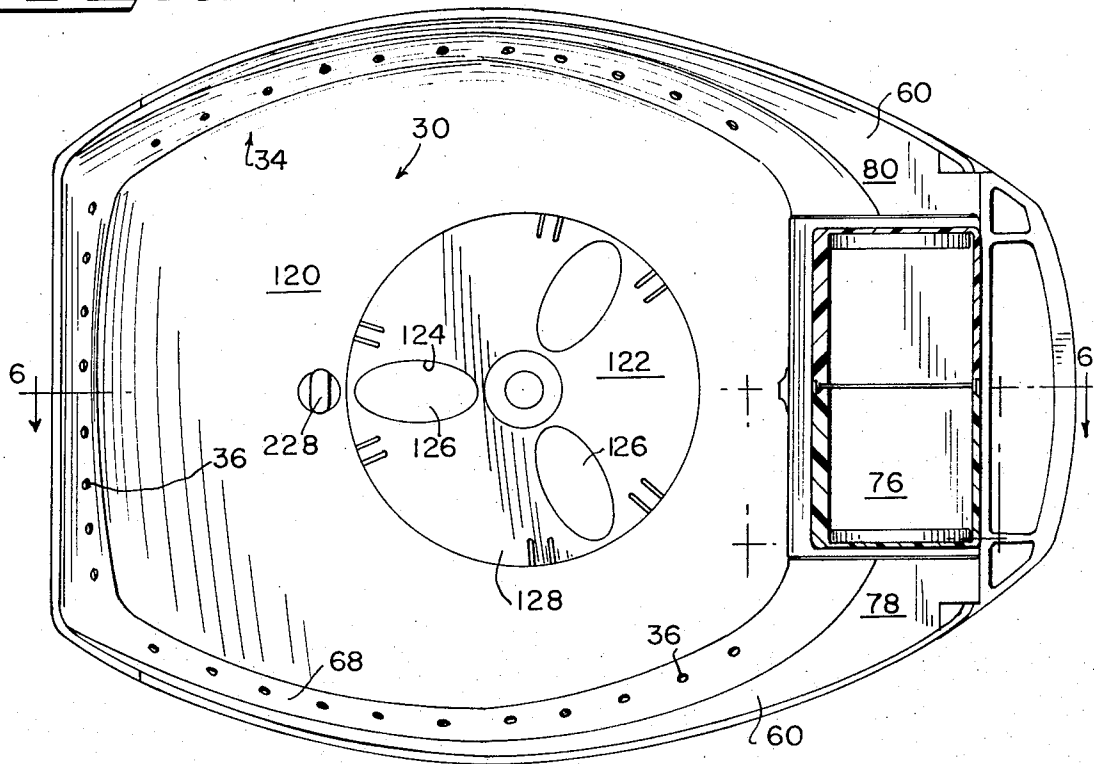


FIG. 7.

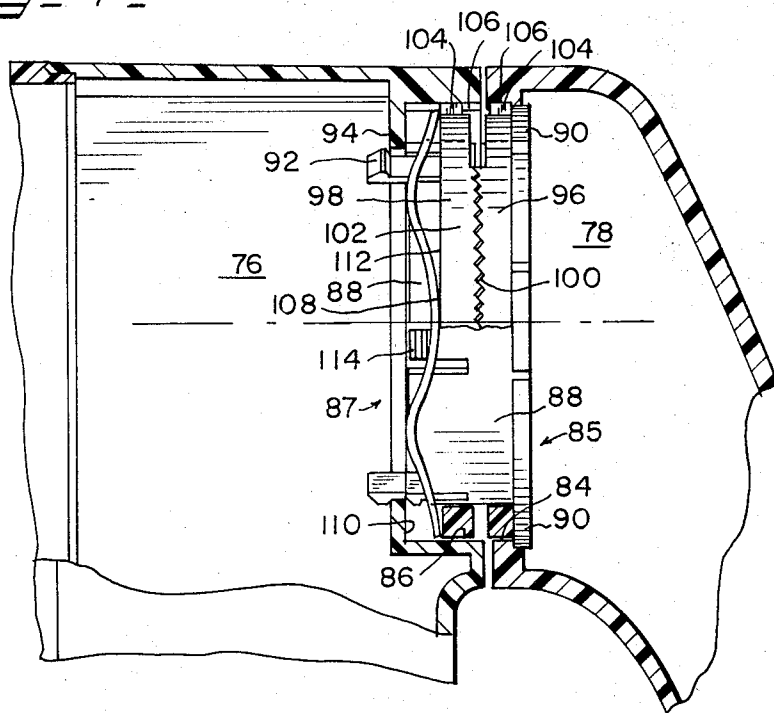
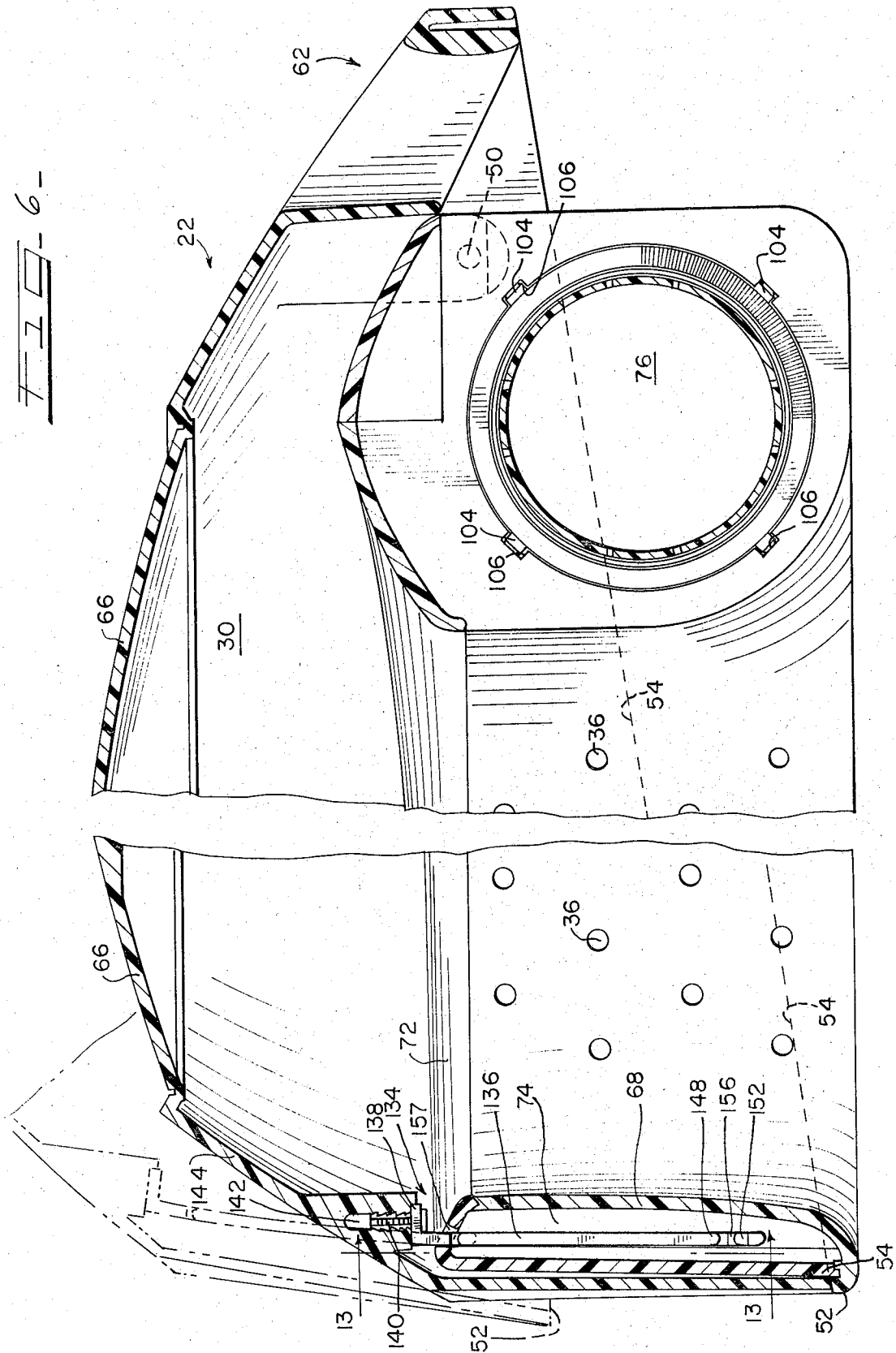


FIG. 6-



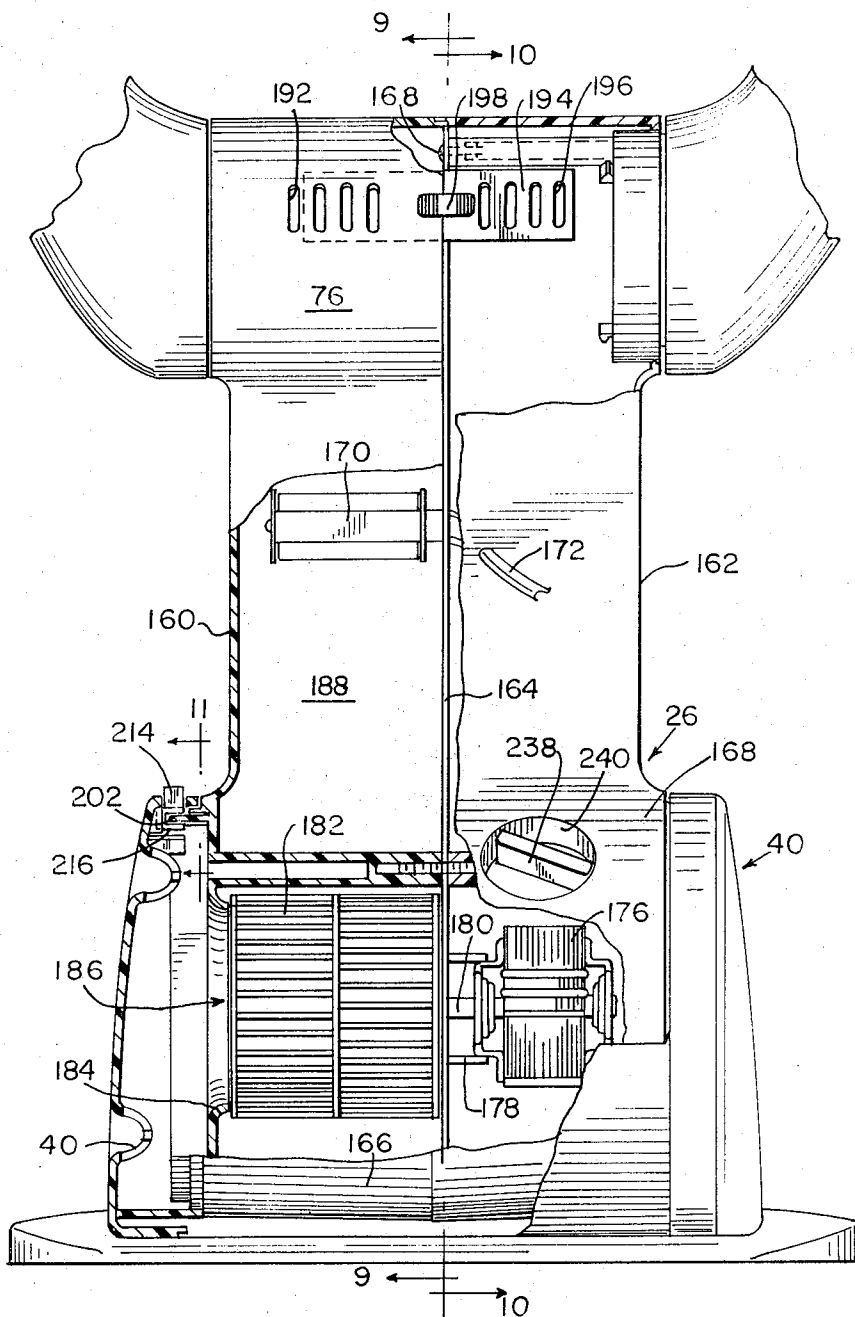


FIG. 8.

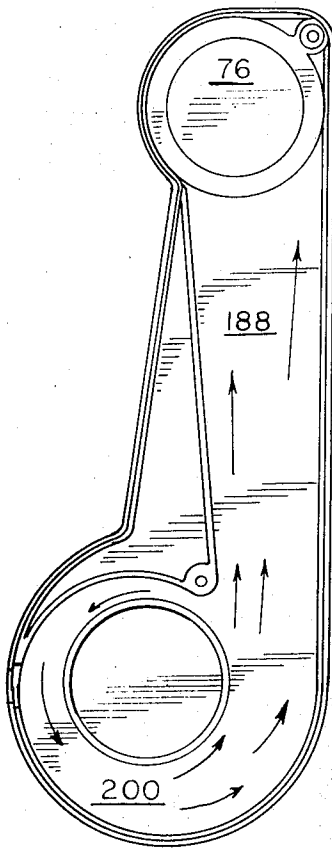


FIG. 9.

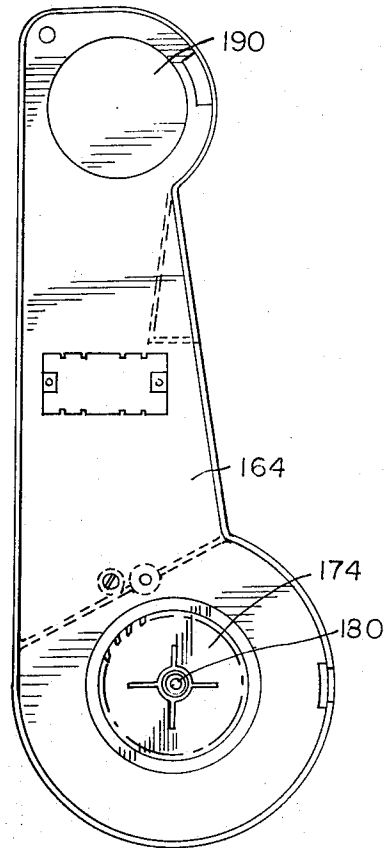


FIG. 10.

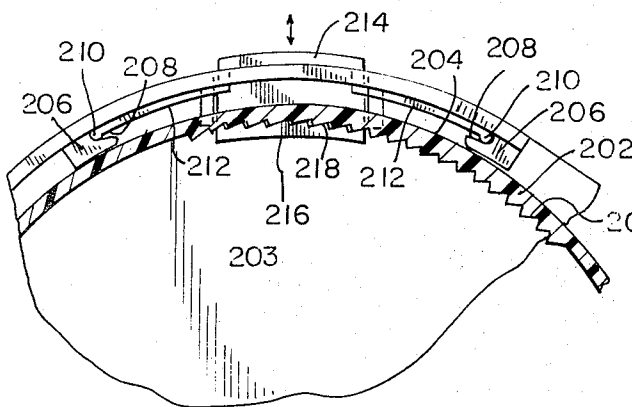


FIG. 11.

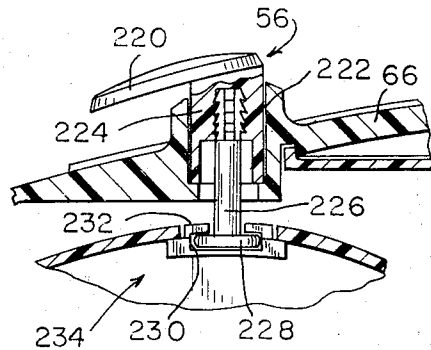


FIG. 12.

FIG. 14.

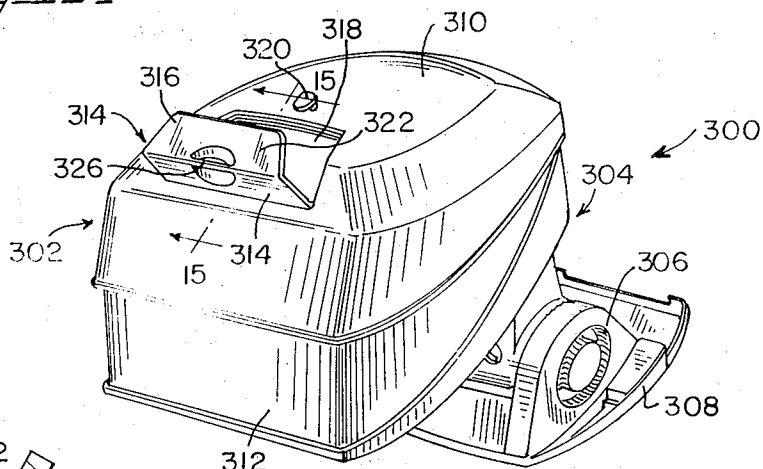


FIG. 15.

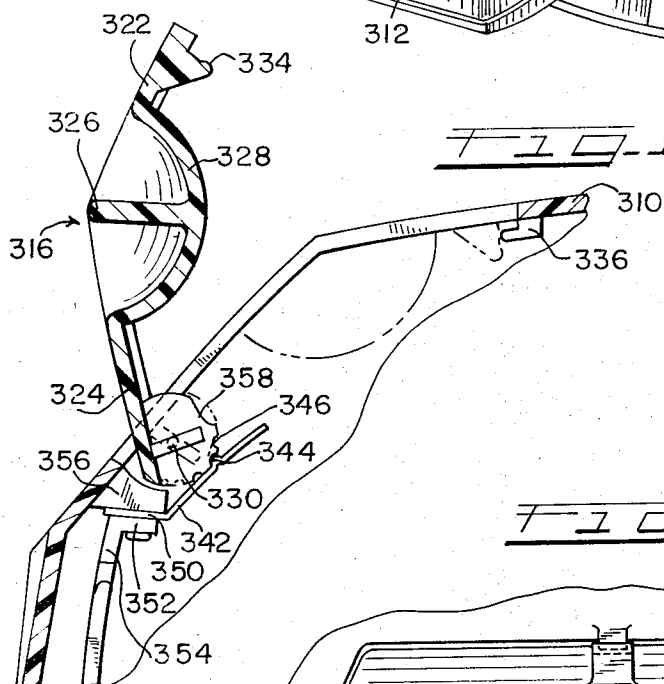


FIG. 16.

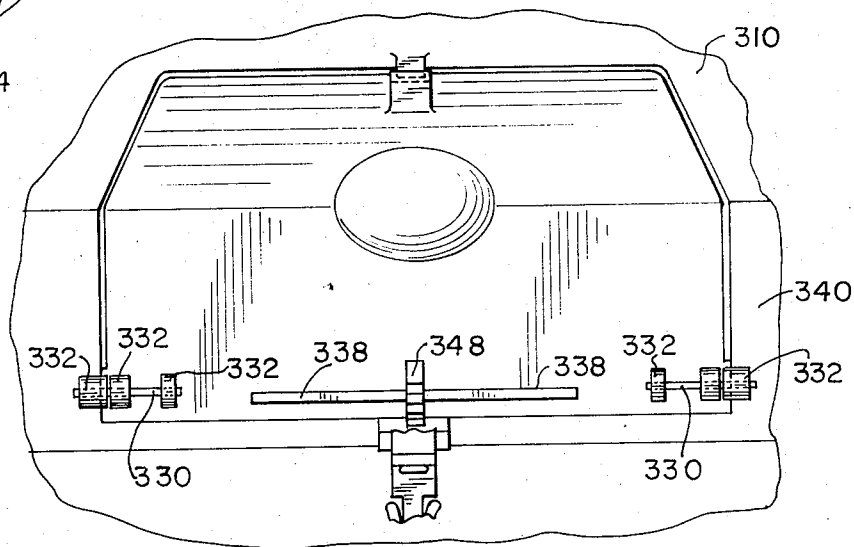


FIG. 17

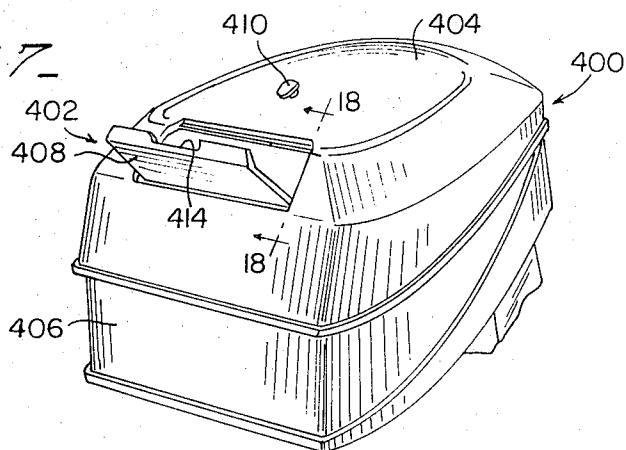


FIG. 18

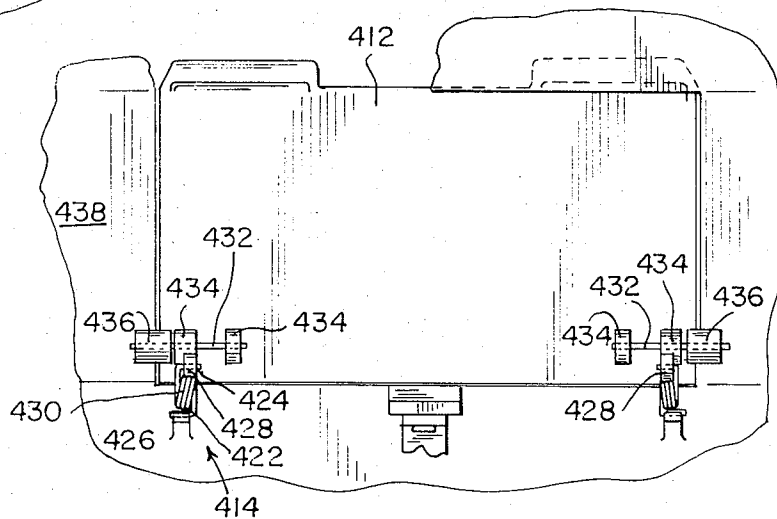
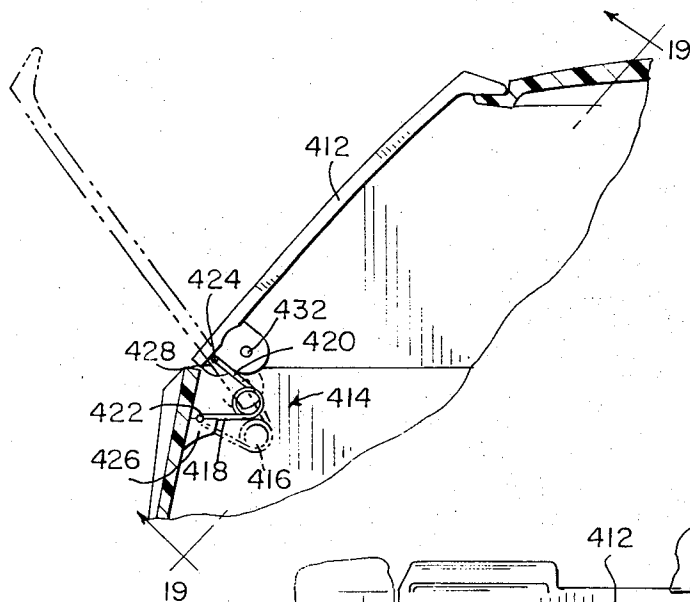


FIG. 19

HAIR DRYER**BACKGROUND OF THE INVENTION**

The present invention relates generally to hair dryers, and more particularly, to hair dryers having rigid dryer head assemblies which include portions adapted to surround at least a part of the head of the user and occasionally referred to in the trade as "hard hat" hair dryers. Such hard hat dryers are distinguished from other types of dryers, such as dryers having flexible bags or caps which surround the head of the user and which include a flexible hose-like conduit extending between the cap and a blower for heated air, and from dryers of the hand-held type, wherein no means is provided for surrounding any substantial portion of the head of the user.

Although hair dryers of both the hand-held type and the flexible cap type have proven acceptable to the trade, it is well known that hair dryers having rigid drying heads or hood units are superior in use, principally because they are sufficiently rigid to contain fixed physical structure which serves to direct the air to desired portions of the hair of the user in accordance with a predetermined pattern. Recently, hair dryers of the rigid head or hard-hat type have become relatively common home appliances, and have achieved a certain currency because they have been able to be manufactured and sold at reasonable prices. Such dryers are generally designed so as to overcome the drawbacks associated with commercial or heavy duty hair dryers, namely, substantial mass, lack of portability, and the requirement of using substantial amounts of electrical current.

However, although satisfactory hard hat hair dryers already exist, there is still room for considerable improvement in such units. For example, existing hard hat dryers could be improved by the provision of improved control of the air flow pattern and the air flow volume, and could be improved in respect to providing increased head room within the drying head as well as a more compact folded or storage and transport position. Moreover, the manner of mounting the dryer head with respect to the base or mounting portion and the folding mechanisms could be considerably improved in view of the drawbacks associated with the present-day hard hat dryers.

Accordingly, in view of the foregoing drawbacks and disadvantages of certain existing hard hat dryers and in view of the room for improvement in existing hair dryers, an object of the present invention is to provide an improved hair dryer of the rigid head or "hard hat" type.

Another object is to provide a dryer having a novel arrangement of parts providing improved ease of opening and closing and permitting ready adjustment between a variety of positions of use.

Still another object is to provide a dryer having improved means for controlling air flow therein.

A still further object is to provide a hair dryer of the type which, when not in use, may be folded into a very compact unit, particularly in view of the hair drying capacity of the machine.

Still another object is to provide an apparatus for drying hair which may be easily folded into a readily portable form and which may be easily transported about while locked safely in the folded position.

A further object is to provide a dryer having an improved arrangement of the air fan or impeller and the air ducting or distribution system.

A still further object is to provide a hair dryer which includes one or more controls whereby air flow to different portions of the interior of the drying head may be individually controlled.

Another object is to provide a hair dryer having a generally annular plenum lying entirely within the lower portion of the dryer head.

Still another object is to provide a hair dryer which functions well with heated or unheated air.

A further object is to provide a forced air hair dryer in which means is provided within the head assembly for regulating the flow of air after the air has passed through the plenum and into the interior of the dryer head.

A still further object is to provide a dryer having a head portion with a large volume plenum therein, and wherein the head as well as the dryer as a whole, is nonetheless readily folded into a very compact unit.

Another object is to provide a hair dryer having an improved motor and blower mounting arrangement and a novel air distribution system.

A further object is to provide a dryer having means permitting the direction of a relatively large volume of air to predetermined, difficult-to-dry areas of the user's hair.

Still another object is to provide a dryer which includes an annular, perforated plenum disposed about or contained within the lower portion of the head, and which includes a movably mounted cover or hood portion forming the remainder of the head.

Another object is to provide a dryer having a dryer head portion with a fixed part and a movable part which may be raised and lowered without affecting the air distribution system forming a part of the head assembly.

Another object is to provide a latch assembly for a movable hood with a part which may be moved fully into or partially withdrawn from the air plenum without causing loss of air therefrom.

A still further object is to provide a dryer having a dryer head with a movable hood having a portion adapted to lock the hood in the open position without causing air loss in the associated plenum.

Another object is to provide a dryer unit having a head portion wherein means is provided for controlling the escape of air from the interior of the shell after the air leaves the plenum.

Another object is to provide a dryer unit having an improved locking arrangement for holding a portion of the head to the dryer base.

Still another object is to provide a dryer unit having controllable openings in the upper part of the shell forming a cover for the dryer head.

A further object is to provide a dryer having a head portion in which the outer wall of the air plenum forms a lower shell for the dryer head and wherein the upper shell portion is separately made, while the inner walls of the lower portion are perforated so as to provide a plenum having controlled air flow therein.

A still further object is to provide a dryer having an air distribution system which includes a centrifugally acting blower and an air passage extending between the blower and the distribution plenum, with the passage

being of gradually increasing cross-section as it approaches the inlet to the distribution system.

Another object is to provide a dryer having means for adjusting the position of the head assembly relative to its supporting means and for adjusting the position of the base with respect to the support.

A further object of the invention is to provide a dryer which includes an annular, perforated plenum disposed about or contained within the lower portion of the head and wherein means is provided for controlling the flow of air within the interior of the head after the air has left the plenum.

A still further object of the invention is to provide a dryer which includes an annular plenum within the lower portion of the head and also includes a cover for the head which is movable independently of the plenum and which includes means for controlling the escape of air from the interior of the head portion.

The foregoing and other objects and advantages of the invention are accomplished by providing a hair dryer having a dryer head assembly in which the distribution plenum for the drying hair is disposed within a lower portion of the head, and in which the interior of the head assembly is further defined by an upper shell portion which is mounted for movement with respect to the lower portion of the head. Other and further objects are accomplished by the provision of a novel folding and locking mechanism, by an improved air distribution system in the dryer, and by an improved system for adjustably positioning the head assembly, the head support and the base units with respect to one another.

The manner in which these and other inherent objects and advantages of the invention are carried into practice will become more clearly apparent when reference is made to the accompanying detailed description of a preferred embodiment of the invention set forth by way of example and shown in the accompanying drawings, in which like reference numbers indicate corresponding parts throughout.

FIG. 1 is a perspective view of a preferred form of a dryer made according to the invention and showing the dryer head assembly, the head mounting unit, and the base portion, and showing the head with the upper shell or cover portion thereof in its extended or raised position of use;

FIG. 2 is a side elevational view of the dryer unit of the invention, showing the dryer in the folded position for storage and transportation, and showing the dryer head in the retracted position;

FIG. 3 is a bottom plan view of the unit in the folded position and showing the handle used for transporting the unit;

FIG. 4 is a side elevational view on an enlarged scale, showing the dryer unit in one position of use;

FIG. 5 is a bottom view, partly in plan and partly in section, and taken along lines 5—5 of FIG. 4 and showing the interior of the dryer head;

FIG. 6 is a greatly enlarged vertical sectional view, with portions broken away, showing details of the interior of the head, including the air distribution system, and taken along lines 6—6 of FIG. 5;

FIG. 7 is a greatly enlarged sectional view of the head mounting and adjusting means taken along line 7—7 of FIG. 4;

FIG. 8 is an enlarged front view, partly in section and partly in elevation, showing the base portion and the head supporting portion of the dryer of the invention,

and showing details of the motor, the impeller and the heater;

FIG. 9 is a vertical sectional view of one portion of the head supporting unit of the assembly, taken along lines 9—9 of FIG. 8;

FIG. 10 is a vertical sectional view of the head supporting unit of the dryer, taken along lines 10—10 of FIG. 8;

FIG. 11 is an enlarged fragmentary sectional view of a portion of the means for adjusting the head supporting portion relative to the base;

FIG. 12 is a greatly enlarged vertical sectional view of the mechanism used to lock the head to the head supporting unit for storage and transportation;

FIG. 13 is a front view of a latch assembly used to support the cover portion of the head in the raised position thereof;

FIG. 14 is a perspective view of a modified form of hair dryer of the invention;

FIG. 15 is an enlarged fragmentary sectional view of the air vent assembly in the cover of the modified form of dryer and taken along lines 15—15 of FIG. 14;

FIG. 16 is an enlarged elevational view of the vent assembly of FIGS. 14 and 15, taken from the inside of the dryer cover looking outwardly thereof;

FIG. 17 is a perspective view of the hood portion of the dryer of the invention, showing a still further modified form of vent arrangement associated with the cover unit;

FIG. 18 is a fragmentary sectional view, on an enlarged scale, showing the form of vent assembly used with the dryer of FIG. 17 and taken along lines 18—18 thereof; and

FIG. 19 is an elevational view of the form of vent assembly of FIG. 18, taken from the inside of the dryer and looking outwardly along lines 19—19 of FIG. 18.

DESCRIPTION OF THE PREFERRED EMBODIMENTS OF THE INVENTION

Although it will be understood that the invention may be embodied in a number of different forms, a description thereof will be made with reference to an embodiment wherein a head assembly, which includes a movably mounted cover surmounting a generally annular plenum and an improved air flow control system, is mounted for pivotal movement about a portion of the plenum disposed atop the head mounting unit, the lower portion of which also includes an impeller and motor housing and which is attached to a base unit. In the preferred construction, air is taken in through openings in the base, and is directed by the impeller upwardly through the head support, past the heater for distribution about the inner periphery of the head within an annular plenum, and thence outwardly from the interior of the head under the control of the adjustable cover vent. For storage and transportation the cover or shell portion of the head is moved downwardly to a position closely overlying the plenum, the mounting unit pivoting relative to the base as well as the head assembly to permit both the base and the head mounting unit to be received within the head assembly and retained therein by a novel locking mechanism.

Referring now to the drawings in greater detail, FIG. 1 shows the invention to be embodied in a dryer assembly generally designated 20 having a head assembly 20 pivotally mounted atop a head mounting assembly 24, the lower portion of which forms an impeller housing

26 received within a base unit 28. The head assembly 22 includes an upper cover or shell portion 30, and the exterior wall portion 32 of a somewhat elongated, generally annular, drying air distribution plenum 34 having a plurality of radially inwardly directed openings 36 therein. The base assembly 28 includes a pair of legs 38 each having a louvered annular inlet opening 40 for fresh air and each having a tray assembly 42 associated therewith for receiving pins, curlers, or the like. The front wall 44 of the base assembly 28 includes an edge portion 46 of reduced height, permitting the neck portion 48 of the head mounting unit 24 to be placed in various positions with respect thereto.

As shown in FIGS. 2 and 3, the dryer unit 20 may be collapsed for storage by pivoting the cover or shell 30 about a pivot point 50 to lower the cover 30 to a position wherein the lower edge 52 thereof closely overlies an inclined upper locating edge 54 formed on the wall 32. A locking assembly generally designated 56, which will be explained in detail elsewhere is manipulated to maintain the unit 20 in the position of FIGS. 2 and 3 for carrying or storage. When viewed from the bottom, it will be appreciated that the base plate 58 which extends between the legs 38 lies approximately flush with the bottom surface 60 of the lower shell 32, closing off the interior of the head assembly 22 from the bottom and leaving only the handle 62 exposed for gripping. By reason of the novel design of the principal elements of the dryer 20, the profile presented by the unit 20 in the retracted or collapsed position thereof is much lower than the profile able to be achieved with dryers of other designs, while the effectiveness of the dryer is improved in respect to prior art dryers by reason of the novel construction of the plenum 34 and the air flow control assembly 64 associated with the top surface 66 of the cover 30, all in a manner to be described elsewhere herein.

Referring now to FIGS. 5 and 6, further details of the hood assembly 22 are shown. As shown in FIG. 5, the plenum 34 is generally annular in form, and is somewhat elongated from front to rear. Openings 36 are spaced about on the inner wall 68 of the plenum, while the lower surface 60 thereof as well as the outer or exterior and upper walls 32, 72 of the lower plenum 36 are imperforate. Accordingly, it will be seen that the interior 74 of the plenum 34 is imperforate on three sides and includes openings 36 only on the generally inwardly directed wall 68 thereof.

By particular reference to FIG. 6, it can be seen that the upper wall 72 is spaced somewhat apart from the top wall 66 of the cover 30 even in the lowered position of the cover 30, while, in the extended or raised position of the cover 30, the upper surface 66 thereof is spaced considerably apart therefrom and that, at the front of the dryer, the lower surface 52 of the cover 30 is spaced several inches apart from the inclined, cover-receiving surface 54 of the plenum 34. Accordingly, at the forward portion of the dryer, the dryer profile in the lowered position of the cover 30 is several inches lower than is the profile in the storage position. Referring again to the plenum 34, it will be noted that the rear portion thereof is formed by a generally cylindrical tube 76 extending transverse to the neck portion 48 of the mounting unit 24 and communicating with oppositely directed portions 78, 80 of the plenum 36 where the entire upper hood assembly 72 is mounted by a pair

of pivot assemblies 82 to be described and which are mirror images of each other but otherwise identical.

Referring now to FIGS. 6 and 7, the details of the pivot assemblies 82 are shown. The axially inwardly directed end portion 78 of the plenum 34 includes a radially inwardly directed surface 84 defining an opening 85 therein, while a corresponding radially inwardly directed surface 86 on the outwardly directed end of the tube 76 also defines a circular opening 87 therein.

A cylindrical collar 88 having a plurality of radially extending flanges 90 on one end thereof is received within and extends between the openings 85, 87, and is held in position within the opening 87 by engagement between the fingers 92 thereof and a radial flange 94 extending inwardly from the surface 86. A pair of oppositely directed but otherwise identical positioning rings 96, 98 having radially extending ratchet teeth 100, 102 thereon are received over the collar 88 in concentric relation therewith and would be free to rotate relative thereto except for the engagement between the spaced apart radial lugs 104 thereon which lie within spaced apart locking recesses 106 disposed respectively about the inner peripheries of the surfaces 84, 86. A sinuous, axially acting annular spring 108 is also concentrically arranged with respect to the collar 88, and engages an axially directed wall 110 of the flange 94 as well as an axially directed face 112 of the ring 98. Moreover, the rings 98, 96 are held against substantial axial displacement by engagement between the outer edge of the ring 98 and a plurality of fingers 114 forming a part of the collar 88 and which are similar to the fingers 92 except that they are of somewhat reduced size and axial extent with respect to the other fingers 92.

FIG. 6 shows an end view of certain of the elements shown in FIG. 7, and, bearing in mind that the same assembly is disposed in the opposite end of the tube 76, it may be seen that the dryer head assembly 22 as a whole is supported for movement about the centerline of the tube 76. The springs 108 urge the rings 96, 98 together so that the head assembly 22 can be adjustably positioned or can be completely lowered to the storage position, as desired, while still being self-supporting.

Referring again to FIG. 5, it will be noted that the interior surface 120 of the cover 30 includes exhaust air flow control means in the form of a disc 122 having a plurality of wall sections 124 defining vent openings 126 therein. The disc 122 is mounted for rotation about the center thereof, with the outer margin 128 thereof being supported by opposed marginal portions of the top cover 66. Corresponding openings 130 (FIG. 2) are disposed in the top wall 66 of the cover 30. The plate or disc 122 may be rotatably positioned by movement of the knurled knob 132 (FIG. 2) to control escape or exhaust of air from the interior of the head after the air has entered the interior of the head assembly 22 from the plenum 34. Reference will be made elsewhere herein to the operation of the vent unit.

Referring now to another feature shown in FIG. 6, it will be noted that the upper cover 30 is mounted for pivotal movement about the point 50, and accordingly that it may be moved between the solid and phantom line positions shown therein. In order to maintain the cover 30 in both of the desired positions with respect to the plenum 34, a latch assembly generally designated 134 is provided. This assembly is shown to include a latch unit 136 having a flange 138 on the top thereof

through which is received a fastener 140 pressed within a recess 142 in the front wall 144 of the cover 30. The body of the latch unit 136 (See also FIG. 13) includes a pair of stiff but resilient fingers 146 on the upper portion thereof and oppositely directed but similar fingers 148 near the bottom thereof. Spaced apart from the ends of the fingers 146, 148 are a pair of oppositely directed shoulders 150, 152 with spaces 154, 156 being defined between the shoulders and fingers for reception of inwardly directed portions 155 of the top wall 72 defining an opening 157 therein.

Accordingly, the latch assembly 136 can be moved vertically between open and closed positions of the cover 30, with the margins 155 of the opening 157 being received in the notches 154 in the lowered position of the unit, and being received in the notches 156 of the latch when the cover 30 is in the raised position thereof. The opening 156 through which the latch unit moves between locked positions is sized so as just to permit movement of the latch, and accordingly, little or no air leaks from the interior 74 of the plenum 34 when the cover 30 is in the raised position. Moreover, the latch unit is preferably made of a stiff but resilient plastic material, contains no moving parts and is extremely simple and reliable in use.

Referring now in particular to FIGS. 8 and 10, details of the head mounting assembly 24 are shown. The mounting assembly includes mirror image left and right half shells 160, 162, with a motor mounting plate 164 disposed therebetween and affixed to the right hand half (FIG. 8) 162. Accordingly, the impeller housing 26 is formed by left and right hand lower portions 166, 168 of rounded cross section.

In the preferred form of the invention, the mounting plate 164 is secured, as by fasteners 168 to the right hand half 162, and serves to mount the heater unit 170 which receives electrical energy through an associated cord 172. Moreover, an opening 174 in the lower portion of the plate permits the motor 176 to be disposed thereon and mounted by ears 178 struck from portions of the plate 164. Disposed on the opposite side of the plate 164 from the motor 176 and supported with respect thereto by the rotatable shaft 180 is an impeller 182 in the form of a squirrel cage centrifugal blower or fan of a well known type.

An interior wall 184 defines an opening 186 through which air may enter the interior of the blower 182 after passing through the louvered opening 40 on the left side. As shown in FIG. 10, the opening 174 in the mounting plate 164 is occupied only by the shaft 180, and accordingly, air may also enter the squirrel cage blower 180 from the right hand side as shown in FIG. 8 after entering through the right hand louvered opening 40.

As may be seen from a consideration of FIGS. 8-10, a vertically extending plenum 188 is defined by the interior of the left hand housing 160 and the mounting plate 164 which is substantially imperforate except for the opening 174 and the upper opening 190 therein. The upper opening 190 is concentrically disposed with respect to, and of only slightly reduced size in relation to, the inner diameter of the tube 76. Accordingly, air flow from the squirrel cage blower will be directed as shown in FIG. 9, that is, first vertically through the vertical plenum area 188 and then into the distribution tube 76.

Disposed in a radially inwardly facing surface of the tube 76 are a plurality of vent openings 192 adapted to be closed off by an apertured slide 194 having corresponding openings 196 therein and movable between open and closed positions of vent opening 192 by a button 198. Accordingly, direct air flow is permitted from the tube 76 to the rear portions of the head of a user, where hair is ordinarily most difficult to dry; however, the air entering the interior of the head assembly 22 from vents 192 may be controlled to suit the desires of the user.

Referring now to FIG. 9, it will be noted that the lower and central portions of the vertical plenum or chamber 188 are of reduced cross sectional area with respect to the upper portions thereof, that is, the portions adjacent the tube. This construction, in combination with the scroll casing 200 formed in the lower portion 166 of the impeller housing 26 has proved very effective in distributing the air for drying, particularly when combined with the novel plenum 34.

Referring now to FIGS. 8 and 11, another feature of the invention is shown, namely, the means whereby the head mounting assembly 24 is pivotally mounted with respect to the base unit 28. As shown in FIG. 8, an annular flange 202 is formed on the outer portion of the lower left side half 166 of the shell 160. This flange 202 is received within a forward portion 203 of the leg 38, and is shown in FIG. 11 to include a plurality of ratchet teeth 204 on the lower surface thereof. The outer surface 205 of the flange 202 engages a pair of spaced apart blocks 206 on the leg 38 in a guiding relation. Received within a groove 208 in each block 206 are the end portions 210 of a pair of webs or leaves 212 connected at the inner ends thereof to an adjusting button 214 having a lower latch element 216 with serrations or teeth 218 on the upwardly directed surface thereof.

Accordingly, it will be seen that while the impeller housing 26 normally remains locked with respect to the base 28 by engagement between opposed teeth 204, 218, relative rotational movement is permitted when the button 214 is pushed downwardly, deflecting the leaves 212 and moving the latch 216 out of engagement with the teeth 204 on the flange 202. Therefore, when it is desired to adjust the position of the head mounting or supporting assembly 24 with respect to the base 28, the button is depressed and the mounting assembly 24 is moved to the desired position. For folding the dryer 20 into a closed position for storage and transport, the button 214 is depressed and the mounting assembly 24 is moved clockwise as in FIG. 4 to a greater extent than it would be moved for adjustment only. Since, as will be described, the dryer unit 20 will be held in this position by a separate locking mechanism, the teeth 204 are not required to be provided entirely throughout the entire extent of flange 202.

Referring now to FIGS. 1, 2 and 12, the locking assembly 56 which is used to hold the dryer in the closed position thereof will be described. This unit 56 includes a handle member 220 having an associated shank portion 222 received within an opening 224 in the top portion 66 of the cover 30. A stiff fastener element, such as a metal stud 226, is press-fit into the shank 224, and an oblong head 228 forms the lower end of the stud 226 (See also FIG. 5). The head portion 228 of the fastener 226 is adapted to be received within an opening 230 defined between opposite legs 232 of a latch assembly generally designated 234 and located on an outer sur-

face portion of the impeller housing 26. As shown in FIG. 1, the latch 234 is normally concealed from sight in the raised position of the dryer; however, upon moving the dryer to a folded position for storage, the latch 234 is exposed. Thereupon, the head 228 is moved into the opening 230 in one position thereof and thereafter rotated a quarter turn so as to be locked in place within the opening 230, securing the cover to the impeller housing 26. This maintains both the base 28 and the head mounting assembly 24 within the head assembly 22, to maintain the base plate 58 in a flush relation to the bottom of the unit. In this position, the dryer can be grasped by the handle 62 and carried about without danger of damage thereto.

Referring now to the operation of the dryer unit, it will be assumed that the unit is in the locked storage position of FIGS. 2 and 3 and that it is desired to use the unit. The latch mechanism 56 is rotated on quarter turn, releasing the impeller housing 26 from the cover 30 by releasing the latch assembly 234. This permits the base unit 28 to be removed from its position of storage inside the head assembly 22. The button 214 is depressed as contact is made between the opposed teeth 216, 204 which serve to position the mounting assembly 24 in respect to the base 28, and the unit is moved until the neck portion 48 is in the desired angular relation to the base 28. Thereafter the button 214 is released. Next, the head assembly 22 is positioned as desired by the user, the ratcheting action provided by engagement of the opposed teeth 100, 102 with one another serving to support the head assembly 22 in any desired position.

Thereupon, the cover 30 is grasped by the lower edge portion 52 thereof or by the latch mechanism 56 and raised until engagement is made between the notches 152 on the latch assembly 134 and the portions of the plenum top wall 72 defining the opening 157. This supports the cover 30 in the desired position of use. The multiple position, main operating switch 238, which is received within a recess 240 is manipulated so as to energize the motor. The switch is a multiple-position switch of any well known type and also serves to energize or de-energize the heating element 170, depending upon the selected position thereof. The impeller thereupon receives air through the louvered annular openings 40 in the legs 38 of the base unit 28, and impells the air vertically in the plenum 188, towards the transverse tube 76 which communicates with the end portions 78, 80 of the plenum 34. This causes distribution of air entirely throughout the inner periphery of the plenum and begins the hair drying process. The button 198 is manipulated as desired to admit more or less air directly through the openings 192 to the back of the neck.

One important feature of the invention is that the plenum is of annular construction rather than hemispherical construction, and therefore, the drying air received in the interior of the head assembly 22 may be exhausted therefrom through the cover 30 without sacrificing drying capacity. Accordingly, the disc 122 is indexed to a desired position to align the openings 126 therein with the openings 130 in the top surface 60 of the cover 30. This permits moist air to escape from the interior of the dryer head 22 only after the air has been directed toward the hair of the user.

This is in contrast to conditions in most other hair dryers, such as the flexible cap type, wherein an open-

ing necessarily permits drying air to escape therefrom prior to the time it is directed to the hair. Likewise, in those hard hat prior art dryer constructions wherein the plenum is formed entirely within the hemispherical or approximately hemispherical interior of the dryer hood, air escape is not possible without sacrificing loss of drying capacity. In this respect, it will be noted that escape of air from the front or top portion of the cover is advantageous in that it enables true fresh air circulation to occur within the dryer. Moreover, it enables a lower temperature to be maintained inside the dryer head without sacrificing dryer capacity. After use of the dryer, the steps described above are repeated in reverse order, and the dryer is readily folded into a compact structure.

Referring now to FIGS. 14-16, another or modified form of dryer unit generally designated 300 is shown, and it will be seen that this form of dryer is generally similar to that shown in FIGS. 1-13, that is, the modified dryer 300 includes a head assembly 302 supported for pivotal movement about a mounting assembly 304, the lower portion of which includes an impeller housing 306 forming a part of a base unit 308. The head assembly 302 includes an upper shell 310 disposed above a generally annular plenum 312, the interior of which is similar to its counterpart in the dryer assembly 20 shown in FIGS. 1-13. However, the form of dryer shown in FIGS. 14-16 includes a modified vent assembly 314 having a door unit 316 serving to cover, in the closed position thereof, an opening 318 lying in the upper and forward portion of the cover 310 ahead of the latch button 320. As shown in FIGS. 14 and 15, the door unit 316 includes upper and lower portions 322, 324 joined to each other along a generally transversely extending line, the center portion of which includes a door handle unit 326.

Referring now particularly to FIGS. 15 and 16 it may be seen that the handle 326 extends outwardly from a curvilinear, inwardly extending recess 328 in the door unit 316, and that the door 316 pivots about a pair of hinge pins 330 extending through openings in a pair of mounting ears 332 on the inside surface 340 of the cover 310. A latch 334 is integrally formed in the upper portion 322 of the door unit 316 for cooperation with a detent 336 formed in an upper surface of the cover 310 to retain the door in the closed position thereof.

In order to provide for multiple open positioning of the door assembly 316, a leaf spring unit 342 is provided which includes a transverse rib 344 therein which is received in use within one or more grooves 346 in a partially circular cam unit 348 disposed on the inside surface of the door 316 and supported by gussets 338. The spring 342 also includes a flange portion 350 held between one leg 352 of the cover positioning latch 354 and a mounting boss 356 located on the inner surface 340 of the cover 310. Preferably, the latch unit 354 is the same as or similar to the latch assembly shown in FIGS. 6 and 13; it will be understood that this latch mechanism operates in the same manner as its earlier described counterpart.

In use, the form of venting assembly 314 shown in FIGS. 14-16 operates somewhat differently than the form of vent unit shown in FIGS. 2, 4 and 5, inasmuch as a significant continuous lateral portion of the cover 310 is opened for venting. Whereas the form described earlier permits the escape of a certain amount of air, the form just described permits significantly more air to

escape because of air flow patterns within the cover 310. Thus, in the earlier form, air approaching the vents 126, 130 is already flowing substantially parallel to the surfaces in which the vents are formed, and thus does not tend to change flow direction so as to escape in a great quantity.

However, the form of vent assembly 314 permits more air to escape and also provides better control thereof, not only by reason of the size of the opening, but also by reason of the placement of the door in the forward and upper portion of the cover unit. When it is desired to operate the vent, user grips the handle 326 to lift the door from the closed or phantom line position of FIG. 15 and rotate the door assembly 316 to the left as shown in FIG. 15 until the rib 344 engages a desired groove 346, whereupon the door remains locked in one or the other of the plural positions permitted by the multiple grooves 346. When closed, the rib 334 lies within the enlarged groove 358 and the spring 342 is under substantially no tension.

Referring now to FIGS. 17-19, a still further modified form of dryer unit 400 is shown, and it will be noted that this form of dryer is similar to the two forms described earlier, differing principally only in the construction features of the vent assembly 402. Thus, the modified form of dryer 400 includes a cover 404 disposed above the plenum 406, and shows a door assembly 408 to be disposed in the upper and forward portion of the cover 404, forwardly of the latch 410.

As shown in FIGS. 17-19, the door assembly 408 includes a front panel 412, a reentrant or notch 414 in the upper surface thereof to facilitate gripping, and a spring assembly generally designated 414. The spring assembly 414 includes a spring unit 416 having a pair of legs 418, 420 extending outwardly from the coil position 430 thereof at an acute included angle and with respective end portions 422, 424 of the legs 418, 420 being received within suitable openings disposed respectively in a mounting lug 426 and a mounting ear 428 in the lower portion of the door panel 412.

The central coil portion 430 of the spring 416 has an axis parallel but spaced apart from the pivot axis of the door 412, and the coil portion urges the legs of the spring apart from each other. Since the door unit 408 is mounted for pivotal movement about the axis of a pair of hinge pins 432 which are received respectively within mounting ears 434 on the door panel 412 and ears 436 on the inside surface 438 of the hood 404, the end portions 424 of the spring legs 420 move through an arc as the door moves between open and closed positions, as does the coil portion 43 of the spring. These positions are shown in the solid and phantom line positions of FIG. 18.

Therefore, a snap-over-center action is provided whereby, once the door 408 is in the open or phantom line position of FIG. 18, outward spring force exerted on the ear 428 tends to keep the door in the open position, that is, to rotate the bottom portion of the door counterclockwise about the axis formed by the pin 432. On the other hand, when the door is in the closed position, the force urging the two spring legs 418, 420 apart exerts a force on the ear 424 which tends to rotate it clockwise about the axis of the pin 432. Thus, the door is normally urged closed when in a closed position and is urged normally open when in an open position.

The form of door shown in FIGS. 17-19 is not shown to include means permitting plural open positions, al-

though this feature might be achieved by the provision of the structure shown in FIGS. 14-16, or other structures adapted for the same purpose.

In use, the vent assembly of FIGS. 17-19 functions in a manner which is similar to that of the vent of FIGS. 14-16, that is, it permits the escape of relatively large volumes of air and permits excellent control of comfort for the user whose head is disposed beneath the cover 404. As in the case of the other vent constructions, the removal of the heated, moisture-laden air under certain conditions improves the effectiveness of the drying action as well as providing increased comfort for the user.

Referring now to other features of the invention, it will be noted that the plenum is somewhat elongated, allowing the user to position her head either more or less forwardly within the unit as desired, for reasons of comfort. It will also be noted that the plenum is of enlarged cross section at the rear thereof adjacent the point where the air enters the interior 74 thereof and that the plenum is of reduced cross section adjacent the front. These features have proved to provide most effective air flow in the plenum. It has also been noted that the gradually increasing cross section in the vertical plenum 188 has proved to provide improved air flow conditions. The squirrel cage form of blower providing excellent results and is readily adapted to be placed in the impeller housing where it may readily receive fresh air directed axially thereof and force it into the plenum 188 by centrifugal action.

In use, it has been determined that, other things remaining equal, a dryer made according to the invention is improved over prior art dryers in respect to drying capacity, comfort, economy of construction, and the ability to be folded to a compact position for storage and transport.

It will therefore be seen that the present invention provides an improved hair dryer having a number of advantages and characteristics, including those specifically pointed out herein and others which are inherent in the invention. A preferred embodiment of the invention having been described by way of example, it is anticipated that certain modifications or changes in construction may occur to those skilled in the art, and it is anticipated that such alterations and modifications may be made without departing from the spirit of the invention or the scope of the appended claims.

We claim:

1. A portable hair dryer unit having means for forcing drying air into a defined region for receiving the head of a user, said dryer having a dryer head assembly with a rigid, generally annular plenum having imperforate exterior walls and plural openings in the radially inwardly directed walls thereof, and a cover for said plenum, said cover being mounted for movement relative to said plenum, whereby said cover may be raised to increase the volume in said region to accommodate the head of a user and may be lowered to a position of reduced height to decrease the volume in said region for storage of said dryer.

2. A hair dryer unit as defined in claim 1 wherein said cover unit is of a rigid, self-supporting construction.

3. A hair dryer unit as defined in claim 1 wherein said cover unit is mounted near one end thereof for pivotal movement between said raised and said lowered positions.

4. A hair dryer unit as defined in claim 1 wherein said plenum is somewhat elongated from front to rear.

5. A hair dryer unit as defined in claim 1 wherein said plenum is of increased cross section adjacent the air inlet thereof, and of reduced cross section in the areas farthest spaced from the inlet, said plenum being approximately circular in cross section adjacent the inlet end thereof and being oval in cross section in said spaced areas.

6. A hair dryer unit as defined in claim 1 wherein said cover includes means lying generally in the top surface thereof for permitting escape of air from said region.

7. A hair dryer as defined in claim 1 wherein said cover includes means in the top thereof for permitting drying air to be exhausted from said interior region of said head assembly, said means permitting control of the volume of air permitted to escape therefrom.

8. A dryer unit as defined in claim 1 wherein said exterior wall of said plenum includes a generally upwardly directed surface for receiving a counterpart, downwardly directed surface on a lower portion of said cover unit, whereby said cover unit may be supported by the exterior of said plenum in said lowered position.

9. A dryer unit as defined in claim 1 wherein said plural openings in said inwardly directed walls include openings having means associated therewith for controlling the air flow therethrough.

10. A hair dryer unit as defined in claim 1 wherein said plenum includes a generally tubular section having means associated therewith for permitting relative movement between said tubular section and the remainder of said plenum, and means permitting adjustment between said tubular section and said remainder of said plenum.

11. A hair dryer unit as defined in claim 1 which includes means in the form of a stiff but resilient latch having one end thereof fixed to said cover and another end thereof receivable within said plenum.

12. A hair dryer unit as defined in claim 1 which includes means in the form of a stiff but resilient latch having integrally formed fingers thereon for engaging a portion of said plenum in both raised and lowered positions of said cover.

13. A dryer unit as defined in claim 1 which further includes vent means associated with said cover, said vent means including a door unit and a vent opening disposed at least partially within the upper surface of said cover and at least partially within a forwardly directed surface of said cover.

14. A dryer unit as defined in claim 1 which further includes means for permitting air to escape from said cover under controlled conditions, said means including an opening in said cover and a door unit disposed thereover and having means associated therewith permitting the door to be moved to any one of a plurality of different opened positions.

15. A hair dryer unit as defined in claim 10 wherein said means permitting adjustment includes relatively movable portions having means for maintaining them in a locked together position with sufficient force to prevent unintentional relative movement between said portions.

16. A dryer unit as in claim 14 wherein said means for permitting plural open positions of said door includes a leaf spring having a rib thereon and a cooperating cam unit having plural grooves therein for reception of said rib, one of said ribs and said cam being mounted on said door and the other being mounted to a portion of said cover.

17. A dryer unit as defined in claim 14 wherein said door unit has single means associated therewith for biasing said door alternately into open and closed positions thereof.

18. A unit as defined by claim 17 wherein said means for biasing said door into said alternate positions includes a spring unit having a center coil portion and two legs extending therefrom, with one end portion of one of said legs being received in said door and the end of said other leg being received in said cover, said spring unit being mounted for movement of said coil and one of said ends through an arc upon door movement so as to provide a snap-over-center action to bias said door alternately in said open and closed positions thereof.

19. A portable hair dryer unit having means for forcing drying air into a defined region for receiving the head of a user, said dryer having a dryer head assembly with a rigid, generally annular plenum having imperforate exterior walls and plural openings in the radially inwardly directed walls thereof, and a separate cover for said plenum, said separate cover having an upper portion thereof which defines a top portion of said defined region, said cover having means in an upper surface thereof permitting air to be exhausted from said region.

20. A hair dryer unit as defined in claim 19 wherein said means permitting said air to be exhausted includes means for controlling the volume of air passing there-through.

21. A hair dryer unit as defined in claim 19 wherein said means for permitting said air to be exhausted includes plural openings in said cover unit, a plate mounted for movement with respect to said cover unit, and openings in said plate, said movement permitting registration of said plate openings with said cover openings to permit the control of air exhausted from said region.

22. A portable hair dryer comprising, in combination, a base unit, a head mounting assembly having one end portion thereof received by said base, and a dryer head assembly attached to the other end of said head mounting assembly, an air impeller housed within said one end portion of said mounting assembly, means in said mounting assembly for directing air from said one end of said assembly to said other end thereof, means in said other end for cooperation with a portion of said head assembly to permit relative movement between said head assembly and said other end, a generally annular plenum formed in part by portions of said head assembly and in part by said other end of said mounting assembly, said plenum having imperforate exterior walls and plural openings on the radially inwardly directed walls thereof, a cover element disposed over said plenum and defining, with said plenum, the interior of a region to which drying air is directed by said impeller, means mounting said cover for relative movement with respect to said plenum, and means permitting relative movement between said head mounting portion and said base unit.

23. A portable hair dryer as in claim 22 wherein said means mounting said cover for movement are arranged to permit pivotal movement thereof, whereby the front portion of said cover may be moved between raised and lowered positions thereof.

24. A portable hair dryer as defined in claim 22 wherein means are provided in said other end for controlling the volume of air flow into said region.

25. A portable hair dryer comprising, in combination, a base unit, a head mounting assembly having one end portion thereof received by said base, and a dryer head assembly attached to the other end of said head mounting assembly, an air impeller housed within said one end portion of said mounting assembly, means in said mounting assembly for directing air from said one end of said assembly to said other end thereof, means in said other end for cooperation with a portion of said head assembly to permit relative movement between said head assembly and said other end, a generally annular plenum formed in part by portions of said head assembly and in part by said other end of said mounting assembly, said plenum having imperforate exterior walls and plural openings on the radially inwardly directed walls thereof, a cover element disposed over said plenum and partially defining, with said plenum, the interior of a region to which drying air is directed by said impeller, means permitting relative movement between said head mounting portion and said base unit, and means in said cover for permitting drying air to be exhausted from said region.

26. A portable hair dryer as defined in claim 25 wherein said means is arranged to permit control of the volume of air exhausted from said region.

27. A portable hair dryer unit having means for forcing drying air into a defined region for receiving the head of a user, said dryer having a dryer head assembly with a rigid, generally annular plenum having imperforate exterior walls and plural openings in at least the radially inwardly directed walls thereof, and a cover for said plenum, said cover closing off the upper portion of said dryer head and being of single wall construction so as to be entirely free of means for receiving or directing said forced air into said defined region.

28. A portable hair dryer comprising, in combination: A base unit; a head mounting assembly having one end portion pivotally received by said base unit; a dryer head assembly pivotally attached to the other end of said head mounting assembly, said dryer head assembly including a defined region for receiving a portion of the head of a user therein; hinge articulation means for moving said head assembly and base unit back and forth between a plurality of operating configurations and a storage configuration in which the head assembly and said base unit nest together with said head mounting assembly positioned therebetween in said region; and releasable locking means for temporarily immobilizing said hinge articulation means when the dryer is in a desired operating configuration.

29. The portable hair dryer of claim 28 in which said hinge articulation means comprise upper and lower pivot means for connecting ends of said mounting assembly to said head assembly and said base unit, respectively, wherein said pivot means have substantially parallel, horizontal axes, and wherein said respective first and second pivot means are connected to said head assembly and said base unit at respective portions thereof which are located at opposite portions of said region when said head assembly and said base unit are in said storage position; said releasable locking means comprising means for temporarily immobilizing each of said pivot means when the dryer is in a desired operating configuration.

30. The dryer of claim 28 which includes releasable latch means for securing said dryer in said storage configuration.

31. The dryer of claim 28 in which said releasable locking means includes ratchet and releasable pawl means.

32. The portable hair dryer of claim 28 in which said base unit includes tray assembly means for receiving pins, curlers, and the like, said tray assembly means being positioned to be covered by a portion of said head assembly when said dryer is in said storage configuration.

33. The portable hair dryer as defined in claim 28 in which said upper and lower pivot means include a hollow portion thereof; said dryer including a squirrel cage air impeller housed within said lower pivot means; motor means for driving said impeller around an axis which is substantially parallel to said pivot axes, said motor means also being housed within said hollow portion of said lower pivot means; said dryer also including an air intake means for admitting air to the hollow portion of said lower pivot means from both ends of said pivot means, and conduit means in said mounting assembly for directing air from said impeller in said lower pivot means to the upper pivot means thereof, and means in said upper pivot means for distributing air passing through said mounting assembly to said head assembly.

34. The portable hair dryer as defined in claim 33 wherein means for heating said air are positioned in said conduit means in said mounting assembly.

35. A portable hair dryer comprising, in combination: a base unit; a head mounting assembly having one end portion thereof received by said base unit; a dryer head assembly attached to the other end of said head mounting assembly, said dryer head assembly including a defined region for receiving a portion of the head of a user therein; hinge articulation means for moving said head assembly and base unit back and forth between operating configurations and a storage configuration in which said head assembly and said base unit nest together with said head mounting assembly positioned therebetween in said region; said hinge articulation means comprising upper and lower pivot means for connecting respective ends of said mounting assembly to said head assembly and said base unit respectively, wherein said pivot means have substantially parallel horizontal axes, and wherein said respective first and second pivot means are connected to said head assembly and said base unit respectively at respective portions thereof which are located at opposite portions of said region when said head assembly and base unit are in said storage configuration; said upper and lower pivot means including a hollow portion thereof, said lower pivot means having air conduit means for admitting air inwardly through both ends thereof, including centrifugal blower means including a squirrel cage blower, and motor means for rotating said squirrel cage blower about an axis which is substantially parallel to said pivot axes, said blower means and said motor means being housed in said hollow portion of said lower pivot means; said head mounting assembly having conduit means for directing air from said blower to the other end of said mounting assembly; said upper pivot means including air distribution means extending through said hollow portion thereof axially outwardly through opposite ends of said upper pivot means to distribute air from said conduit means to said head assembly; and releasable locking means for temporarily im-

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mobilizing each of said pivot means when the dryer is in a desired operating configuration.

36. The portable hair dryer of claim 35 which includes heating means for heating said air, said heating means being positioned within said conduit means in said head mounting assembly.

37. The portable hair dryer of claim 35 which includes releasable latch means for securing said dryer in said storage configuration.

38. The portable hair dryer of claim 35 in which said

releasable locking means includes ratchet and releasable pawl means.

39. The portable hair dryer of claim 35 in which said base unit includes tray assembly means for receiving pins, curlers, and the like, said tray assembly means being positioned to be covered by a portion of said head assembly when said dryer is in said storage configuration.

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