April 4, 1950 V. F. HRIBAR 2,503,113

VACUUM HAIR DRIER

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Fig. 2.

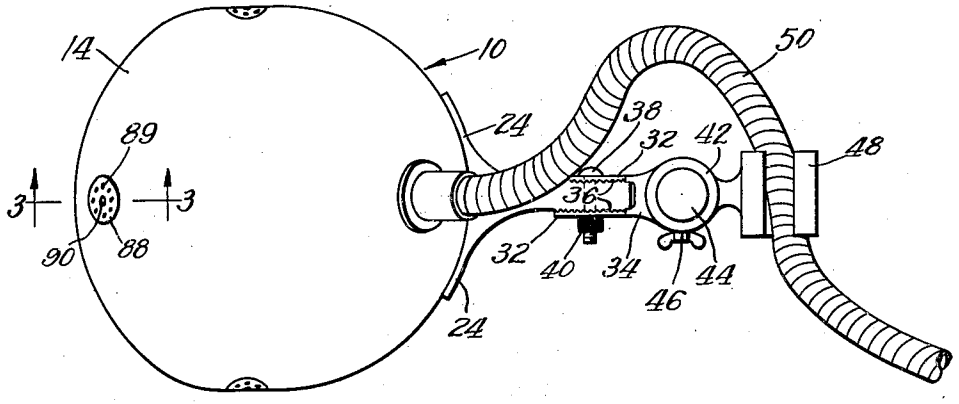
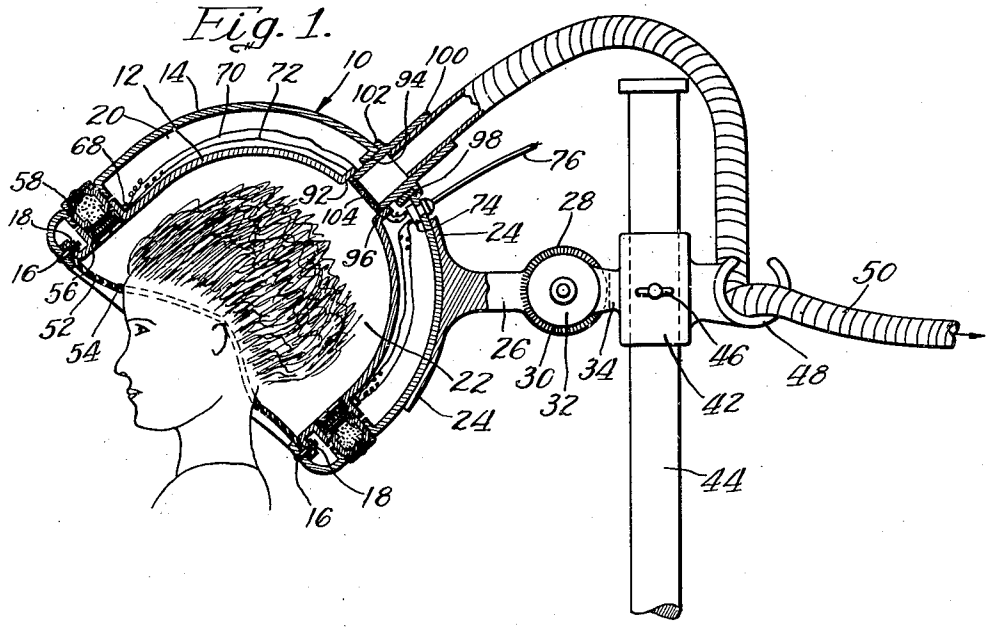


Fig. 1.



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Fig. 3.

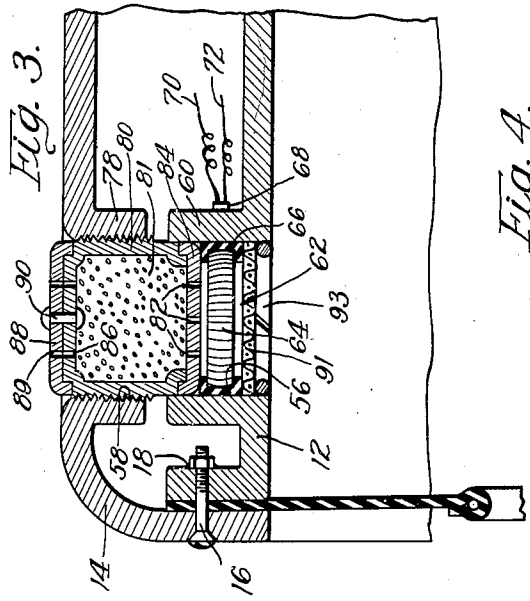


Fig. 4.

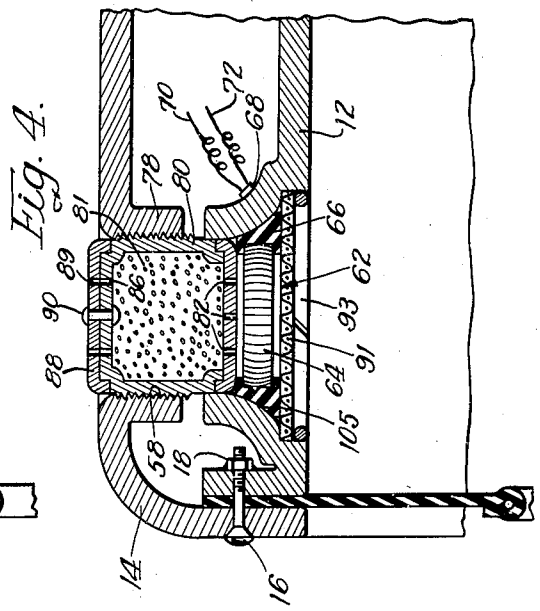
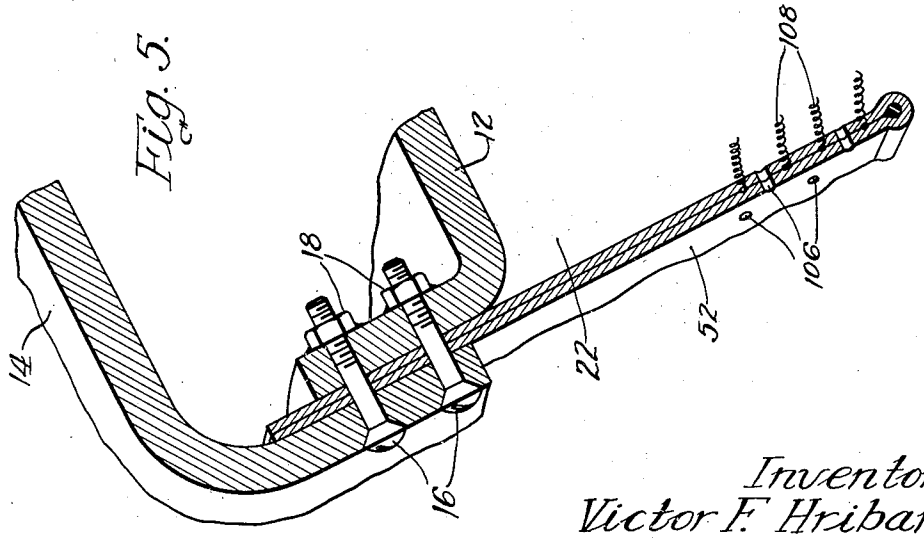


Fig. 5.



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UNITED STATES PATENT OFFICE

2,503,113

VACUUM HAIR DRIER

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Application April 24, 1947, Serial No. 743,543

7 Claims. (Cl. 34—80)

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My invention relates to an apparatus for drying hair and, more particularly, to an apparatus for drying hair in the presence of a partial vacuum.

Shampooing hair to clean and beautify it and to maintain the scalp in a clean and healthful condition is widely practiced. Since, under the usual atmospheric conditions of temperature and humidity, the washed hair will not dry for a long time, various devices for speeding up evaporation of water from the hair and scalp have been proposed. These devices comprise, essentially, means for heating air and blowing it upon the hair and scalp. A popular form of hair dryer for home use comprises a casing containing a heating element, a blower and a delivery nozzle by which heated air may be applied to local areas of the hair and scalp. Because these blowers are frequently supported by the hand of the user, they must be light weight. Consequently, they are small and their delivery of air is limited. Not only is the limited delivery of air—due to the small size of the blower and the air outlet of the casing—a disadvantage, but so also is the extreme heat of the air which is employed to make up for lack of volume of air. A still further disadvantage is the great length of time required to provide any satisfactory degree of dryness of the hair, since but a limited area may be treated at one time.

Larger forms of driers, such as are in common use in so-called "beauty parlors" or "hair dressing shops," comprise large helmet shaped casings which frequently include a plurality of air inlets, one or more blowers for drawing air through the inlets and circulating it within the casing, and one or more heating elements for heating the air as it is drawn inwardly. Although larger blowers and heating elements may be incorporated in such hair drying equipment, the noise of the blowers and the great amount of heat applied to the scalp and hair is extremely uncomfortable. Much of the hot air which is blown on to the hair is recirculated within the casing after the air has picked up as much moisture as it can hold. When such air is recirculated, it slows down the evaporation of the water which still remains on the hair and scalp. Furthermore, since there is no means for so directing the hot air as to keep it from blowing on to portions of the head which are not wet, the constant application of heat at temperatures varying from 120° F. to 150° F. frequently causes dizziness and nausea. Because air temperatures up to 150° F. are frequently employed in the present

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day dryer, the whole drying mechanism becomes very hot, particularly the many metal parts. and it is necessary to place pads between the forehead, temples and neck of the user and the adjacent metal surfaces of the casing. Furthermore, much of the hot moist air which is ultimately discharged from the helmet-like casing flows down over the face, temples and neck of the user, causing additional discomfort.

The employment of very hot air for extended periods of time for drying the hair and scalp is also unhealthful, since it removes the natural oils from the scalp and hair, causing them to become, respectively, flaky and brittle. In addition, the great temperature differential between the heated air of the drying mechanism and the outdoor air into which a person may go following the hair drying procedure frequently causes head colds. Occasionally, heat transmitted by radiation, or actual contact with portions of the hot equipment, will cause a burning sensation or actual burning of the flesh and hair.

One of the most objectionable features of the hair drying procedure from the user's point of view is the great length of time required to dry the hair. Depending upon the length and thickness of the hair the time required may vary from 30 minutes to over an hour. From the hairdresser's point of view, the length of time required for drying client's hair means that fewer clients can be served each day.

To eliminate the discomforts, delays, dangers and unhealthful conditions referred to above, as well as to increase the number of clients which may be served in a given time by beauty shop operators, I have invented a new method and means for drying hair. It is a primary object of this invention to hasten the drying of the hair and scalp. After the hair has been shaken and wrung to remove a large part of the water clinging to it, it is then rubbed with a towel to absorb more of the water. Following this, the remainder of the water is to be removed by evaporation. It will be appreciated that in referring to water on the hair, there is meant to be included other liquids such, for example, as "wave setting" solutions which are used to help "set" the hair into a particular configuration after the hair has dried.

The rate of evaporation of a liquid depends upon a number of factors besides the nature of the evaporating liquid itself. These factors are: (1) the extent of the exposed surface of the liquid, (2) the density of air or other gas above the

evaporating surface, (3) the degree of saturation of the space into which evaporation takes place, (4) the extent of air circulation above the surface of the liquid, and (5) the temperature of the evaporating liquid.

In accomplishing the primary object of my invention, namely, to hasten drying of the hair and scalp, I dispose the upper portion of the head, bearing the hair to be dried, in an enclosed space in which a vacuum is created and maintained. Preferably, this is done after the hair has first been shaken and rubbed with a towel. The vacuum is a partial vacuum, but hereinafter in the description and claims it will, for convenience, usually be referred to as "vacuum". While air is being withdrawn from the enclosed space to create and maintain a vacuum, air in restricted quantities is admitted to the enclosure at a plurality of locations so that there may be continuous circulation of air above the hair and scalp, as well as through the hair. By thus reducing the density of the air above the wet surface, evaporation is greatly hastened and, by providing circulation of such air, evaporated water is carried off, thus maintaining the degree of saturation of the space above the hair at a low level to continuously maintain conditions favorable to rapid rate of evaporation.

Simultaneously, I prefer to heat and dehydrate the air which is admitted in restricted quantities to the enclosure in which the hair is located, since the rate of evaporation is thereby increased, said rate of evaporation being governed, in part, by the degree of saturation of the space above the evaporating surface and by the temperature of the evaporating liquid itself. Heating of the air entering the enclosure transfers heat to the water on the hair and scalp by conduction and convection. To add further heat, I may transmit it by radiation, since the reduced amount of air in the enclosure, due to the conditions of vacuum, reduces the amount that may be transmitted by conduction and convection.

Since the walls of the enclosure are sufficiently spaced from the hair and scalp, the hair may be shaken out or "fluffed up" in order to increase the exposed surface of the liquid on the hair. Thus, it will be seen that by my invention I provide conditions which make advantageous use of all five factors, named above, which increase the rate of evaporation of water, or other liquids, on the hair or scalp.

Another object of my invention is to protect the health of the person whose hair is being dried. This is made possible by reducing operating temperatures of the equipment and air employed, eliminating high velocity blasts of air, and reducing the length of time the user is required to sit under the hair drying apparatus. By creating a vacuum within the enclosure in which the hair is dried, it is possible to employ temperatures within the enclosure which are comfortable, while yet greatly reducing the time required in evaporating water from the hair and scalp.

Temperature differentials existing between the enclosure and the room or outdoors are thereby greatly reduced, thus eliminating a common cause of head colds. Moreover, the partial vacuum has a tendency to draw more blood to the scalp for nourishment of the tissues and roots of the hair. Also, natural oils in the scalp and on the hair are less subject to evaporation as a consequence of lower temperatures.

Other objects and advantages of my invention will become apparent from the following description when taken with the drawings in which:

Figure 1 is a view, partially in section and partially in elevation, showing a person's head positioned within the hair drying apparatus of my invention;

Figure 2 is a plan view of the hair drying apparatus of Figure 1;

Figure 3 is an enlarged, fragmentary, sectional view, taken on the line 3—3 of Figure 2, showing the air heating and air dehydrating means;

Figure 4 is an enlarged, fragmentary view, partially in section and partially in elevation, showing a modification in the air heating and air dehydrating means of Figure 3; and

Figure 5 is an enlarged, sectional, fragmentary view, in perspective, illustrating a modified form of head-gripping band.

Like reference numerals have been employed in the several views to indicate the same or similar elements.

Referring now to Figures 1, 2 and 3 of the drawings, the dome-shaped casing of the hair drying apparatus is indicated generally by the reference numeral **10** and comprises an inner shell **12** and an outer shell **14**, suitably secured together, as by bolts **16** and nuts **18**, or other suitable means, which permit the shells to be separated when desired. An air space **20** is defined between the inner shell **12** and outer shell **14** and serves as an insulating medium to prevent loss of heat from within the enclosed space **22** in which the upper portion of the head of the user is disposed. Since the shells **12** and **14** are made of metal, their surfaces may be polished, if desired, to reduce loss of heat from enclosure **22** by reason of radiation.

The dome-shaped casing **10** is secured, as by welding, to the arms **24** of a supporting bracket **26** which has a flat circular flange **28** with radial serrations **30** on either side. Flange **28** is mounted between a pair of disk-shaped arms **32** of clevis **34**, which arms have serrations **36** on their inner sides which correspond in size and shape with the serrations **30** on flange **28**. The flange **28** and arms **32** have centrally positioned, co-axial passageways so that a bolt **38** may pass through them and connect them together for relative rotation. A knurled nut **40** may be threaded on the end of bolt **38** to press the arms **32** into engagement with the flange **28** of bracket **26**. When this is done, the matching serrations of the flange **28** and arms **32** prevent the bracket **26** and the dome-shaped casing **10** from rotating about the bolt **38** as an axis. However, when the casing **10** needs to be tilted to a different angle, it is necessary merely to loosen the nut **40** and let the arms **32** of clevis **34** spread apart sufficiently to disengage their serrations **36** from the serrations **30** of the flange **28**. The bracket **26** and casing **10** is then rotated about the bolt **38** to the desired angle and then the nut **40** is tightened up again, to re-engage the serrations **30** on the flange **28** with the serrations **36** on the arms **32** of clevis **34**.

Clevis **34** is integrally formed with a transversely extending sleeve **42** which is adapted to have a sliding fit with a supporting post **44**. A set screw **46** having a handle is carried by the sleeve **42** for positioning the sleeve on the post **44** at the desired level. The post is supported on a suitable base (not shown). Integrally connected to sleeve **42** on the side opposite the clevis **34** is a supporting hook **48** in which the hose **50** (to be described at greater length hereinafter) may be supported. As an alternative to hook **48**, there may be em-

ployed, if desired, a releasable clamp. It will be understood that the mechanism shown for supporting the casing 10 is but one of a number of ways which might be employed for adjustably mounting said casing.

An annular band 52 is gripped at its outer edge between the peripheries of the inner shell 12 and outer shell 14. The bolts 16 which secure said shells together pass through matching apertures in the band 52. The band at its inner circumference has one or more elastic rings 54, or expansible coil springs, which are adapted to cause the band 52 to fit snugly about the head of the person whose hair is being dried. The smaller diameter of the band is such that it is smaller than the smallest diameter of the head of any user. It is not necessary that band 52 grip the head in air-tight relation. In fact, it is not desirable to have the band bind the head so tightly that circulation of the blood thereto is impaired. As will be described hereinafter, it is contemplated that a small amount of air may flow between the head and the band 52 and into the enclosure 22 where the band does not grip the head closely. The band may be formed of air-tight fabric or flexible plastic material and is replaceable.

Through the two shells 12 and 14 a plurality of aligned apertures 56 and 58 are formed. The apertures 56 of shell 12 and apertures 58 of shell 14 permit the passage of air from outside of casing 10 into the enclosure 22. About each aperture and extending toward the other aperture are tubular extensions or flanges of the respective shells, each extension being threaded internally. The extensions or flanges 60 about apertures 56 in shell 12 each secure in place a heat transfer unit 62, such as an electric heating coil 64 carried by an annular flanged ring 66 of insulating material, by means of threaded connection with insulating ring 66. The lead wires of the heating coil 64 may pass through apertures or openings in the flange 60 to a terminal block 68 of insulating material which is secured to the external surface of said flange. From the terminal block 68 wires 70 and 72 may extend to a junction or junctions with wires of other heating coils in other apertures 60 and ultimately may connect at the central terminal block 74 with the wires which are carried by the sheathed cable 76 and are connected to a source of electrical power (not shown) exteriorly of the hair drying apparatus.

The threaded flanges or extensions 78 about the apertures 58 of shell 14 each secure in place a canister 80 containing a dehydrating agent 81, of a known type, which will not pass through the apertures 82 in the lower removable cover 84 of the canister 80 and which will not be harmful, in any state, to the hair or scalp. At the upper end of each canister 80 are apertures 86 which may be closed off by a rotatable cover 88 which is connected to the canister 80 by a rivet 90. The cover 88 has apertures 89 which may be partially or fully aligned with the apertures 86 of canister 80 in order to control the passage of air through the canister, past the heat transfer unit 62 and into the enclosure 22 of casing 10. The rotatable cover 88 is adapted to have limited movement in either direction relative to canister 80 and may, therefore, be employed to thread and unthread the canister 80 within the threaded flange 78. By making the canisters readily removable, it takes but a few seconds to replace them with canisters containing fresh or re-activated, dehydrating agent. The canisters which are moisture laden, by reason of having taken moisture out of the incoming air, may then be re-activated or refilled with fresh, dehydrating material. It will be noted that the lower cover 84 of the canister seats within the flange 60 and against the flanged rim of the insulating ring 66 of the heat transfer unit 62.

A screen 91 is preferably employed over each aperture 56 of the shell 12 in order to prevent accidental contact of wisps of hair with the heat transfer units 62. Each screen may be removably held in place by a split ring 93 in order to provide ready access to the heat transfer units.

Centrally of the casing 10, the shells 12 and 14 have, respectively, aligned apertures 92 and 94, and extending inwardly of the apertures the shells 12 and 14 have tubular extensions or flanges 96 and 98, the latter being threaded internally to engage a threaded sleeve 100. Sleeve 100 has a flange 102 which limits the distance which the cylinder may be threaded through aperture 94 by its bearing against the outer surface of shell 14. A flexible, reinforced hose 50 is connected in an air-tight relationship with the cylinder 100 and leads to suitable mechanism (not shown) for withdrawing air from enclosure 22 of casing 10. Intermediate its connection with said mechanism and the cylinder 100, the hose 50 may find support and guidance in the supporting hook 48. A screen 104 preferably covers aperture 92. It will be understood that more than one air outlet or hose could be employed if desired.

In the operation of the mechanism, it will be assumed that canisters containing fresh, dehydrating material have been placed in the casing 10 and that the operator has adjusted the cover 88 of each canister 80 to align, partially or completely, the apertures 89 of the cover with the apertures 86 of the canister. The person who has had her hair washed and then partially dried with a towel inserts the upper portion of her head into the enclosure 22 by spreading the resilient edge of the annular band 52. When the scalp and all the air is within the enclosure 22, the band 52 is released so that it engages the forehead, sides of the head and back of the neck. If the hair to be dried is long, it is usually pinned up on top of the head, in order to easily insert it into enclosure 22. The heat transfer units are placed in operation and the vacuum pump or other suitable air withdrawing mechanism is started.

Air is withdrawn from the enclosure 22 through hose 50 at a rate greater than the rate at which air is admitted through the canisters or through leakage past the side of the head, so that a vacuum is produced and maintained in the enclosure 22. Air which passes into the enclosure through the canisters 80 is dehydrated and is also heated by passing over the heating elements of the heat transfer units 62. The air inlets are all so located relative to the air outlet that the heated dehydrated air passes over the scalp and over and through the hair to pick up water before it passes to the air outlet. Although more than one outlet could be employed, I find it satisfactory to use a single, centrally located outlet with the air inlets being disposed adjacent the open end of the casing. The vacuum in the enclosure, admission of heated, dehydrated air for circulation through the hair, heating of the water by radiation, and steady withdrawal of the evaporated water results in a rapid drying of the hair and scalp under healthful and comfortable conditions.

If a maximum amount of heat is to be transferred to the water on the hair and scalp by radia-

tion, the apertures 56 of shell 12 may be flared outwardly as at 105, (see Figure 4) toward the enclosure 22 to remove, as much as possible, all obstructions to the radiant heat emitted by the heating coils 64.

In Figure 5 is shown a modification of the annular head-encircling band 52. A series of small apertures 106 through the band permit a restricted quantity of air to be drawn continuously into the enclosure 22 through the hair which lies close to the scalp along the forehead, temples and neck. To heat this air, heating wires 108 are located adjacent the apertures in the band 52 which is shown as being formed of a double layer of material, with the wires being secured in place between the two plies. Since the flow of air through the canisters 80 may be governed by their rotatable covers 86, the operator of the hair drying apparatus may still regulate the amount of vacuum produced in the enclosure 22, even though apertures 106 are open at all times.

Experimentation with this method of drying hair has been carried out and indicates the following:

An average head of woman's hair contains approximately 150 grams of water after rinsing and shaking off of the excess water by hand following a shampoo. After the hair is dried by an absorbent towel, approximately seventy per cent of the 150 grams of water still remains on the hair. This leaves, roughly, 100 grams of water to be lost by evaporation. Experiments conducted with my invention show that seventy-five to eighty-five per cent of this water is removed in 10 minutes when operating with three inches of "vacuum" at 120° F.

Although I have shown a preferred embodiment of my invention for purposes of description, my invention is not to be limited thereto, except insofar as the appended claims are so limited, since modifications and changes will suggest themselves to those skilled in the art.

I claim:

1. Hair drying apparatus comprising, in combination, a casing adapted to fit over the hair and in substantially air tight relation with respect to the head of the user, a restricted passageway for the admission of air to the interior of the casing, means for varying or shutting off the admission of air through said restricted passageway, dehydrating means and heat transfer means in series in said passageway between the exterior and interior of said casing, an outlet passageway for said casing, and means in communication with said outlet passageway for withdrawing air from the interior of said casing at a rate sufficient to maintain a vacuum within said casing.

2. Apparatus for drying the hair and scalp comprising, in combination, a casing adapted to fit over the hair and scalp in substantially air tight relation with respect to the head of the user, a plurality of passageways for admitting air to the interior of the casing, dehydrating means disposed in each of said passageways, heat transfer means disposed in each of said passageways inwardly of the dehydrating means for heating the air being admitted to the interior of the casing and for radiating heat to the water on the wet hair and scalp, an outlet passageway for said casing, and means in communication with said outlet passageway for withdrawing air from the interior of said casing at a rate sufficient to maintain a vacuum within said casing.

3. Apparatus for drying the hair and scalp comprising, in combination, a casing adapted to fit over the hair and upper portion of the head, said casing being formed with a double wall having a dead air space between the walls, flexible means connected with the outer end of the casing and having an aperture adapted to fit about the head of the user in substantially air tight relation, a restricted passageway traversing the double wall for the admission of air to the interior of the casing, dehydrating means and heat transfer means in said passageway, an outlet passageway for said casing, and means in communication with said outlet passageway for withdrawing air from the interior of said casing at a rate sufficient to maintain a vacuum within said casing.

4. Apparatus for drying the hair and scalp comprising, in combination, a casing adapted to fit over the hair and upper portion of the head, a flexible band connected with the open end of said casing and having an aperture adapted to fit about the head of the user in substantially air tight relation, a plurality of small openings in said flexible band for admitting air to the interior of the casing, a heating element carried by the flexible band adjacent said openings, air outlet means for the casing, and means in communication with said outlet means for withdrawing air from the interior of said casing at a rate sufficient to maintain a vacuum within said casing.

5. Apparatus for drying the hair and scalp comprising, in combination, a casing adapted to fit over the hair and upper portion of the head, a flexible band connected with the open end of said casing and having an aperture adapted to fit about the head of the user in substantially air tight relation, a plurality of small openings in said flexible band for admitting air to the interior of the casing, a heating element carried by the flexible band adjacent said openings, a plurality of passageways for admitting air to the interior of the casing, dehydrating means disposed in each of said passageways, heat transfer means disposed in each of said passageways inwardly of the dehydrating means for heating the air which is admitted to the interior of the casing and for radiating heat to the water on the hair and scalp, air outlet means for the casing, and means in communication with said outlet means for withdrawing air from the interior of said casing at a rate sufficient to maintain a vacuum within said casing.

6. Apparatus for drying the hair comprising, in combination, a casing adapted to fit over the hair and in substantially air tight relation with respect to the head of the user, said casing being formed with a double wall having a dead air space between the walls, a plurality of passageways traversing said double wall for the admission of air to the interior of said casing adjacent the hair line of the user, dehydrating means disposed in each of said passageways, heat transfer means disposed in each of said passageways inwardly of the dehydrating means for heating the air which is admitted to the interior of the casing and for radiating heat to the water on the hair, air outlet means for the casing adjacent the crown of the head, and means in communication with said outlet means for withdrawing air from the interior of said casing at a rate sufficient to maintain a vacuum within said casing.

7. The combination of claim 6 wherein the passageways are wider adjacent the interior of the casing so that heat may be radiated at a wider angle from the heat transfer means, and wherein the dehydrating means in each passageway is

disposed in a removable container which defines, in part, the passageway in which it is disposed.

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