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(54) HAIR DRYING APPLIANCE

(71) We, BRISTOL MYERS COMPANY, a Corporation organized and existing under the laws of the State of Delaware, United States of America, of 345 Park Avenue, New York, N.Y. 10022, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention pertains to appliances for drying hair and, more particularly, to hand held hair drying appliances adapted to have attachments mounted thereon to facilitate styling or shaping of hair.

Hand held hair drying appliances normally include a housing in which are disposed a motor driving a fan to impel air past a heating element and through an outlet in the housing such that heated air is expelled from the housing for use in drying hair. In order to permit such hair drying appliances to be utilized to style or shape hair, attachments such as brushes, combs, nozzles, and the like have been mounted thereon to act on the hair as heated air is supplied to the hair.

In order to provide sufficient air flow for effective drying, prior art hair drying appliances have utilized housing and brush and comb geometry normally of a rectangular configuration in that the heated air provided by the hair drying appliances is normally expelled in a direction transverse to the longitudinal axis of the housing thereby requiring the use of centrifugal, cross-flow or tangential fans with housings shaped to accommodate the same. Accordingly, prior art hair drying appliances have had the disadvantages of not being useful in shaping the hair due to their configurations and, further, of being bulky and awkward to handle by the user.

In order to overcome the above-mentioned disadvantages, it has been proposed to utilize an axial fan to blow air over the

heater thereby permitting the housing to have a cylindrical configuration; however, the use of an axial fan in a housing having a diameter small enough to be utilized in the styling or shaping of hair has not been found to supply sufficient air flow for effective drying. That is, styling or shaping of hair is a function of the diameter of the mandrel over which the hair is wound, and a housing for an axial fan of dimensions to provide sufficient hot air for drying is too large for effective use in styling or shaping hair. Attempts to reduce the diameter of the housing while maintaining a cylindrical configuration have included the use of double-staged fans and varying blade angles among others; however, such attempts have not been effective in increasing the volume of heated air expelled from the hair dryer.

The present invention provides a hand held hair drying appliance overcoming the above-mentioned disadvantages of the prior art while having a sleek, tubular e.g. cylindrical housing with a diameter sufficiently small to permit its use as a mandrel in the styling or shaping of hair.

Some of the advantages of the hand held hair drying appliance of the present invention over the prior art are that a sufficient volume of heated air for drying hair can be supplied while maintaining a sleek, cylindrical configuration, a single conventional, low cost motor can be utilized to drive the hair drying appliance, and the hair drying appliance can be easily handled by a user with one hand during hair styling or shaping.

The present invention provides a hand held hair drying appliance comprising a tubular housing having a first inlet therein, a second inlet therein spaced from said first inlet and an outlet therein disposed between said first and second inlets; heating means disposed in said housing between said first and second inlets; first and second fans arranged in said housing to force air from

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said first and second inlets towards said outlet; and drive means for driving said first and second fans and located on a side of one of said fans which is opposed to the side which faces the other fan, whereby air is drawn into said housing through said first and second inlets, moved past said heating means and expelled through said outlet to provide heated air for drying hair.

10 The present invention further provides a hand held hair drying appliance comprising a tubular housing having a first inlet therein, a second inlet therein spaced from said first inlet, an outlet in the peripheral wall of said housing and disposed between said first and second inlets and a tubular handle portion formed by said housing; heating means disposed in said housing between said first and second inlets; first and second fans arranged in said housing to force air from said first and second inlets toward said outlet; said first and second fans each having blades extending radially from the axis of rotation thereof, said blades of said first fan having a pitch opposite the pitch of said blades of said second fan such that said first and second fans form oppositely directed currents of air when rotated in the same direction; and motor means disposed in said handle for driving said first and second fans and located on a side of one of said fans which is opposed to the side which faces the other fan, whereby air is drawn into said housing through said first and second inlets, moved past said heating means and expelled through said outlet to provide heated air for drying hair.

25 The present invention even further provides a hand held hair drying appliance comprising a tubular housing having first and second spaced inlet openings therein for passage of air drawn into said housing and an outlet opening therein disposed in said space between said first and second inlet openings for passage of air expelled from said housing; heating means disposed in said housing in said space between said first and second inlet openings and adjacent said outlet opening; and first and second fans disposed in said housing for drawing a first current of air into said housing through said first inlet opening and directing said first air current toward said outlet opening and for drawing a second current of air into said housing through said second inlet opening and directing said second air current towards said outlet opening, said first and second air currents extending axially along said tubular housing in opposite directions, and for expelling said first and second air currents past said heating means through said outlet opening to provide heated air for drying hair, and drive means for driving said first and second fans and located on a side of one of said

fans which is opposed to the side which faces the other fan.

A preferred hand held hair drying appliance in accordance with the present invention will now be described by way of example, with reference to the accompanying Drawings, in which:—

Figure 1 is a longitudinal section of the hand held hair drying appliance, and

Figure 2 is a section taken along line 2—2 of Figure 1.

A preferred embodiment of a hand held hair drying appliance 10 according to the present invention is illustrated in Figures 1 and 2 and includes a housing 12, which can be constructed of upper and lower housing members, and forms a cylindrical handle 14 and a cylindrical head 16 having a diameter slightly greater than the diameter of handle 14 and connected thereto at a neck 18.

A cylindrical extension 22 engages the open end of handle 14 and a switching circuit 24 is mounted therein and operated by an actuator 26 which is controlled by a rod 28 extending from an end cap 30 engaging extension 22 and rotatable relative thereto. Rotation of the end cap causes movement of the rod 28 to control actuator 26, and switching circuit 24 includes conventional circuitry responsive to the position of actuator 26 for providing the hair drying appliance 10 with various modes of operation, such modes of operation being preferably denoted by indicia carried on the surface of the extension 22 for alignment with an indexing mark on end cap 30.

Adaptors 32 and 34 are mounted in axially spaced relation within handle 14 to support therebetween a DC electric motor 36 by means of O-rings 38 and 40. The DC motor 36 receives electricity from switching circuit 24 through a rectifier 42. A rotor 44 of motor 36 is fixed to a flexible coupling 46 which carries a pin diametrically fixed to a shaft 48 such that rotation of the rotor 44 of the motor 36 is imparted to the shaft 48.

Head 16 has an end cap 50 mounted thereon, the end cap 50 having a bearing 52 therein in which is journaled the end of shaft 48, the shaft 48 also being journaled in a bearing 54 mounted in adaptor 32 such that the shaft 48 is maintained in precise coaxial alignment with the housing 12.

A heating assembly 55 is mounted in head 16 and includes a mica support structure 56 across which a plurality of hot wire heating elements 58 extend in a direction substantially parallel to the longitudinal axis of the housing 12. The heating elements 58 are connected with switching circuit 24 by suitable wires, not shown, such that the voltage supplied to the heating elements can be controlled by rotation of the end cap 30.

A plurality of inlet openings 60 is formed in the periphery of housing 12 along handle 14 at neck 18, and a plurality of inlet openings 62 is formed in end cap 50 spaced from inlet openings 60. An outlet opening 63 is formed by a longitudinally extending slot or slots in the periphery of head 16 such that the outlet opening 63 is disposed in the space between inlet openings 60 and 62 to permit air flow through the head 16 in opposite directions to be expelled through outlet opening 63 after movement past heating assembly 55. A pair of axial fans 64 and 66 are fixed to shaft 48 and disposed in head 16 adjacent inlet openings 60 and 62, respectively. Fan 64 has a hub 68 spaced from the end of adaptor 32 by a spacer 70 and blades 72 radially extending from hub 68. Adaptor 32 is formed with an arcuate peripheral surface 74 to channel air into the housing 12 through inlet openings 60 past the fan 64, the channel formed by the arcuate peripheral surface 74 having an annular configuration corresponding to the radial length of the blades 72. Axial fan 66 similarly has a hub 76 spaced from end cap 50 by a spacer 78 and blades 80 radially extending therefrom. The inlet openings 62 formed in end cap 50 correspond in size to the radial length of blades 80 in order to channel air past the fan 66. The blades 72 of fan 64 have a pitch (or "Rand") opposite to the pitch of the blades 80 of fan 66 such that rotation of both fans in the same direction creates oppositely directed air currents, such air currents drawing air into the housing through inlet openings 60 and 62, respectively, in opposite directions when the common drive shaft 48 for the fans is rotated in the direction indicated by arrow 82. If desired, baffles 84 can be symmetrically formed within head 16, as shown in phantom in Fig. 1, to aid in the deflection of the axial air currents formed by fans 64 and 66 to expel heated air transverse to the axis of the housing.

In operation, end cap 30 is rotated in order to align the indexing mark thereon with the desired indicia carried on extension 22 with the rotation of the end cap moving the actuator 26 to set the switching circuit 24 to operate the hair drying appliance in the selected mode of operation. To this end, switching circuit 24 supplies electricity to heating elements 58 with a predetermined voltage to control the temperature thereof; and, similarly, controls the DC voltage supplied to electric motor 36 to control the speed of rotation thereof. A suitable attachment for styling or shaping hair, such as a brush, comb, or nozzle, can be mounted on head 16 of the housing 12 in alignment with outlet opening 63; and, thereafter, the hair drying appliance can be utilized to dry and style or shape the

hair as desired, it being appreciated that the cylindrical configuration of the head 16 of the housing permits the head to be used as a mandrel in styling or shaping the hair.

The motor 36, shaft 48 and fans 64 and 66 form a blower disposed in the housing for drawing first and second currents of air into the housing through the inlet openings 60 and 62 and directing the first and second air currents along the axis of the housing in opposite directions towards the space between the fans with the air being heated by the heating assembly 55 and radially expelled through the outlet opening 63 in a direction transverse to the axis of the housing. The total area of the inlet openings 60 and 62 is preferably one and a half times as great as the area of the outlet opening 63; and, if desired, further inlet openings can be disposed along the handle 14 such that air flows past the motor 36 for cooling.

The hand held hair drying appliance 10, as described above, thus provides a high volume of heated air without requiring a large or irregularly configured housing; and, accordingly, the tubular housing 12 preferably has a cylindrical configuration with a diameter conforming to the diameter of the fans 64 and 66 in order to provide an elongate, sleek configuration, round in cross-section that is easily held and manipulated by a user. For instance, it has been found that heated air can be expelled at a rate of 40 cu. ft./min. with the head of the housing having a diameter of 1 $\frac{1}{4}$ " thereby providing sufficient heated air flow to effectively dry hair while the diameter and configuration of the housing are such as to be utilized in the styling or shaping of hair.

Inasmuch as the present invention is subject to many variations, modifications and changes in detail within the ambit of the following claims, it is intended that all subject matter described above or shown in the accompanying drawings be interpreted as illustrative and not in a limiting sense.

WHAT WE CLAIM IS:—

1. A hand held hair drying appliance comprising a tubular housing having a first inlet therein, a second inlet therein spaced from said first inlet and an outlet therein disposed between said first and second inlets;

heating means disposed in said housing between said first and second inlets;

first and second fans arranged in said housing to force air from said first and second inlets towards said outlet; and

drive means for driving said first and second fans and located on a side of one of said fans which is opposed to the side which faces the other fan, whereby air is drawn into said housing through said first and second inlets, moved past said heat-

A plurality of inlet openings 60 is formed in the periphery of housing 12 along handle 14 at neck 18, and a plurality of inlet openings 62 is formed in end cap 50 spaced from inlet openings 60. An outlet opening 63 is formed by a longitudinally extending slot or slots in the periphery of head 16 such that the outlet opening 63 is disposed in the space between inlet openings 60 and 62 to permit air flow through the head 16 in opposite directions to be expelled through outlet opening 63 after movement past heating assembly 55. A pair of axial fans 64 and 66 are fixed to shaft 48 and disposed in head 16 adjacent inlet openings 60 and 62, respectively. Fan 64 has a hub 68 spaced from the end of adaptor 32 by a spacer 70 and blades 72 radially extending from hub 68. Adaptor 32 is formed with an arcuate peripheral surface 74 to channel air into the housing 12 through inlet openings 60 past the fan 64, the channel formed by the arcuate peripheral surface 74 having an annular configuration corresponding to the radial length of the blades 72. Axial fan 66 similarly has a hub 76 spaced from end cap 50 by a spacer 78 and blades 80 radially extending therefrom. The inlet openings 62 formed in end cap 50 correspond in size to the radial length of blades 80 in order to channel air past the fan 66. The blades 72 of fan 64 have a pitch (or "Rand") opposite to the pitch of the blades 80 of fan 66 such that rotation of both fans in the same direction creates oppositely directed air currents, such air currents drawing air into the housing through inlet openings 60 and 62, respectively, in opposite directions when the common drive shaft 48 for the fans is rotated in the direction indicated by arrow 82. If desired, baffles 84 can be symmetrically formed within head 16, as shown in phantom in Fig. 1, to aid in the deflection of the axial air currents formed by fans 64 and 66 to expel heated air transverse to the axis of the housing.

In operation, end cap 30 is rotated in order to align the indexing mark thereon with the desired indicia carried on extension 22 with the rotation of the end cap moving the actuator 26 to set the switching circuit 24 to operate the hair drying appliance in the selected mode of operation. To this end, switching circuit 24 supplies electricity to heating elements 58 with a predetermined voltage to control the temperature thereof; and, similarly, controls the DC voltage supplied to electric motor 36 to control the speed of rotation thereof. A suitable attachment for styling or shaping hair, such as a brush, comb, or nozzle, can be mounted on head 16 of the housing 12 in alignment with outlet opening 63; and, thereafter, the hair drying appliance can be utilized to dry and style or shape the

hair as desired, it being appreciated that the cylindrical configuration of the head 16 of the housing permits the head to be used as a mandrel in styling or shaping the hair.

The motor 36, shaft 48 and fans 64 and 66 form a blower disposed in the housing for drawing first and second currents of air into the housing through the inlet openings 60 and 62 and directing the first and second air currents along the axis of the housing in opposite directions towards the space between the fans with the air being heated by the heating assembly 55 and radially expelled through the outlet opening 63 in a direction transverse to the axis of the housing. The total area of the inlet openings 60 and 62 is preferably one and a half times as great as the area of the outlet opening 63; and, if desired, further inlet openings can be disposed along the handle 14 such that air flows past the motor 36 for cooling.

The hand held hair drying appliance 10, as described above, thus provides a high volume of heated air without requiring a large or irregularly configured housing; and, accordingly, the tubular housing 12 preferably has a cylindrical configuration with a diameter conforming to the diameter of the fans 64 and 66 in order to provide an elongate, sleek configuration, round in cross-section that is easily held and manipulated by a user. For instance, it has been found that heated air can be expelled at a rate of 40 cu. ft./min. with the head of the housing having a diameter of $1\frac{1}{4}$ " thereby providing sufficient heated air flow to effectively dry hair while the diameter and configuration of the housing are such as to be utilized in the styling or shaping of hair.

Inasmuch as the present invention is subject to many variations, modifications and changes in detail within the ambit of the following claims, it is intended that all subject matter described above or shown in the accompanying drawings be interpreted as illustrative and not in a limiting sense.

WHAT WE CLAIM IS:—

1. A hand held hair drying appliance comprising a tubular housing having a first inlet therein, a second inlet therein spaced from said first inlet and an outlet therein disposed between said first and second inlets;

heating means disposed in said housing between said first and second inlets;

first and second fans arranged in said housing to force air from said first and second inlets towards said outlet; and

drive means for driving said first and second fans and located on a side of one of said fans which is opposed to the side which faces the other fan, whereby air is drawn into said housing through said first and second inlets, moved past said heat-



ing means and expelled through said outlet to provide heated air for drying hair.

2. A hand held hair drying appliance as claimed in claim 1 wherein said outlet is formed by at least one longitudinally extending slot in the periphery of said housing such that air is expelled from said outlet in a direction substantially transverse to the axis of said housing.

3. A hand held hair drying appliance as claimed in claim 1 or claim 2, wherein said first and second fans are adapted to provide oppositely directed currents of air through said first and second inlets toward the general direction of said outlet, respectively.

4. A hand held hair drying appliance as claimed in any one of claims 1 to 3 wherein said housing has a substantially cylindrical configuration.

5. A hand held hair drying appliance as claimed in any one of claims 1 to 4 wherein said drive means includes a common drive shaft fixed to said first and second fans and a single motor for rotating said drive shaft.

6. A hand held hair drying appliance as claimed in claim 5, wherein said motor is attached to said drive shaft at a location exterior to portions of the drive shaft disposed between said first and second fans, said fans being adapted to force air axially inwardly in an opposite direction with respect to each other, and wherein the opposing streams of air upon meeting each other are deflected in a direction substantially perpendicular to the axis of said drive shaft.

7. A hand held hair drying appliance as claimed in claim 5 or claim 6 wherein said first inlet is formed by openings in the periphery of said housing and said second inlet is formed by openings in an end of said housing.

8. A hand held hair drying appliance as claimed in claim 6 or claim 7 wherein said housing includes an end cap rotatably mounting an end of said common drive shaft adjacent said second inlet and an adaptor rotatably mounting said common drive shaft adjacent said first inlet, said adaptor having an arcuate configuration to channel air from said openings forming said first inlet toward said outlet.

9. A hand held hair drying appliance as claimed in claim 8 wherein said housing includes a head having a cylindrical configuration with said end cap mounted at one end thereof and a handle having a cylindrical configuration with a diameter less than the diameter of said head, said head being connected, at its end opposite said one end, with said handle by a neck, said openings forming said first inlet being disposed adjacent said neck, said openings forming said second inlet being disposed in said end cap

and said motor being disposed in said handle.

10. A hand held hair drying appliance as claimed in any one of claims 5 to 9, wherein said motor is an electric motor.

11. A hand held hair drying appliance as claimed in any one of claims 1 to 10 wherein said fans are axial-flow fans.

12. A hand held hair drying appliance as claimed in any one of claims 1 to 11 wherein said fans are of opposite pitch.

13. A hand held hair drying appliance comprising a tubular housing having a first inlet therein, a second inlet therein spaced from said first inlet, an outlet in the peripheral wall of said housing and disposed between said first and second inlets and a tubular handle portion formed by said housing; heating means disposed in said housing between said first and second inlets; first and second fans arranged in said housing to force air from said first and second inlets toward said outlet; said first and second fans each having blades extending radially from the axis of rotation thereof, said blades of said first fan having a pitch opposite the pitch of said blades of said second fan such that said first and second fans form oppositely directed currents of air when rotated in the same direction; and motor means disposed in said handle for driving said first and second fans and located on a side of one of said fans which is opposed to the side which faces the other fan, whereby air is drawn into said housing through said first and second inlets, moved past said heating means and expelled through said outlet to provide heated air for drying hair.

14. A hand held hair drying apparatus as claimed in claim 13 wherein said motor means includes a common drive shaft fixed to said first and second fans and a single motor rotating said drive shaft.

15. A hand held hair drying appliance comprising a tubular housing having first and second spaced inlet openings therein for passage of air drawn into said housing and an outlet opening therein disposed in said space between said first and second inlet openings for passage of air expelled from said housing; heating means disposed in said housing in said space between said first and second inlet openings and adjacent said outlet opening; and first and second fans disposed in said housing for drawing a first current of air into said housing through said first inlet opening and directing said first air current toward said outlet opening and for drawing a second current of air into said housing through said second inlet opening and directing said second air current towards said outlet opening, said first and second air currents extending axially along said tubular housing in opposite directions, and for expelling



5 said first and second air currents past said heating means through said outlet opening to provide heated air for drying hair, and drive means for driving said first and second fans and located on a side of one of said fans which is opposed to the side which faces the other fan.

10 16. A hand held hair drying appliance as claimed in claim 15 wherein said first and second fans are axially aligned and

have radially extending blades with opposite pitches.

17. A hand held hair drying appliance substantially as herein described with reference to the accompanying drawing.

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