

[54] **HAIR DRYER**
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[22] Filed: **Feb. 20, 1973**

[21] Appl. No.: **333,488**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 231,503, March 3, 1972.

[30] Foreign Application Priority Data

Apr. 5, 1972 Germany..... 2216314

[52] U.S. Cl. 219/370, 34/99

[51] Int. Cl. F24h 3/04

[58] Field of Search..... 34/90, 91, 96-101;
 24/735 A, 257; 132/9, 57, 144, 145;
 165/122, 124, 125; 219/366-372, 374, 375;
 248/74 A, 316 D; 415/203; 417/242

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Primary Examiner—J. V. Truhe

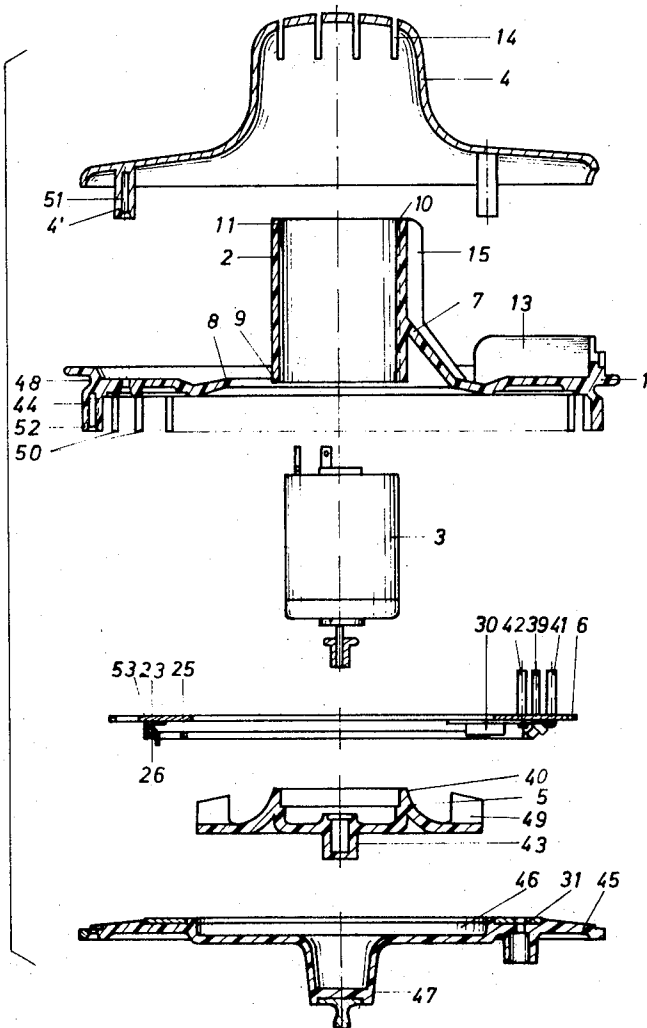
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[57] ABSTRACT

Hair dryer with a low voltage direct current motor driving a blower in a housing to whose air outlet opening is detachably secured a double-walled inflatable hood having an inner jacket provided with several air outlet openings. A ring shaped heating resistor is mounted concentrically with respect to the impeller. The housing includes a ring-shaped cover plate spaced from and coaxial with a base plate forming a first ring gap for serving as an air intake opening for the blower and a second ring-gap as the air outlet opening for the blower.

7 Claims, 6 Drawing Figures



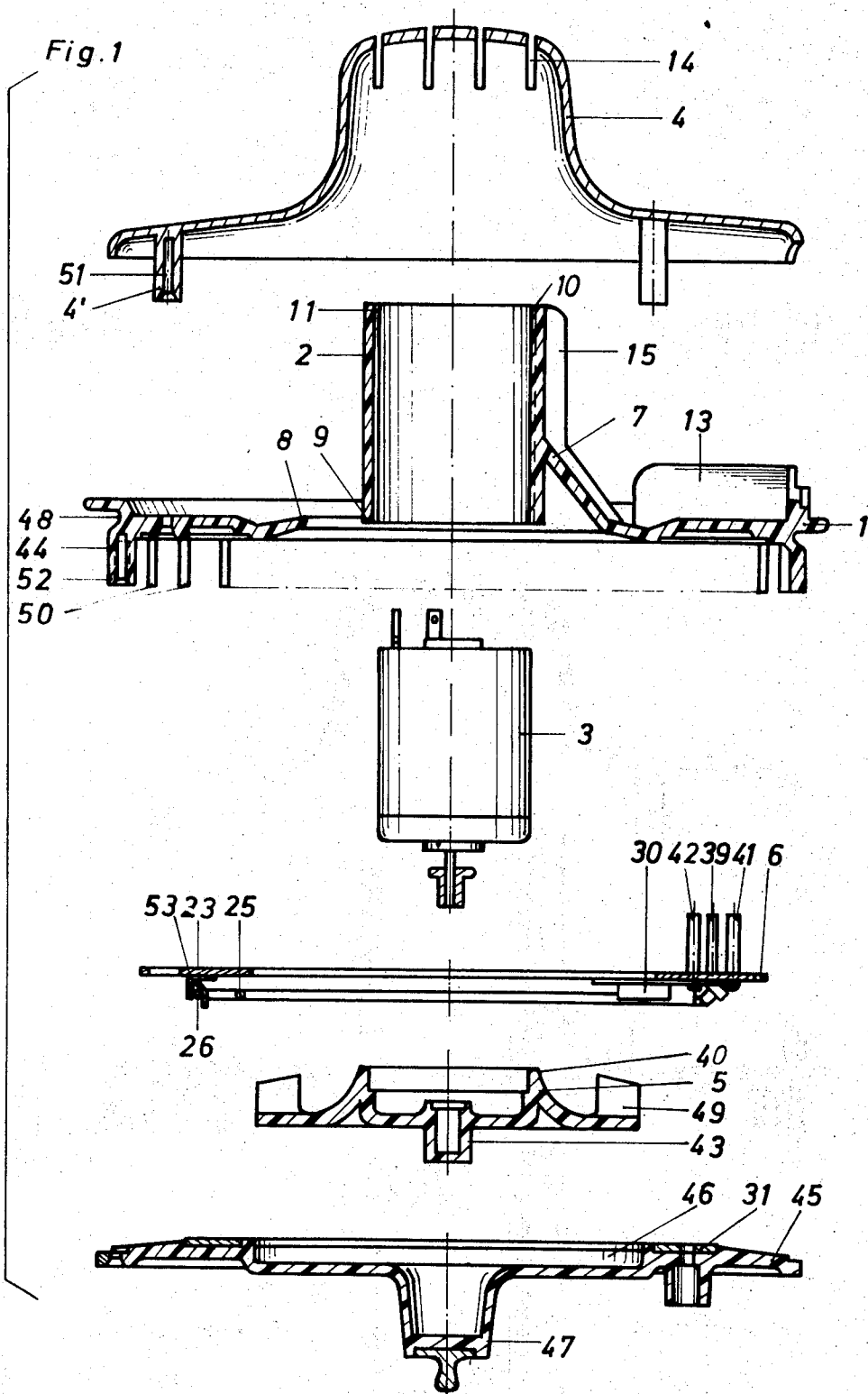


Fig. 2

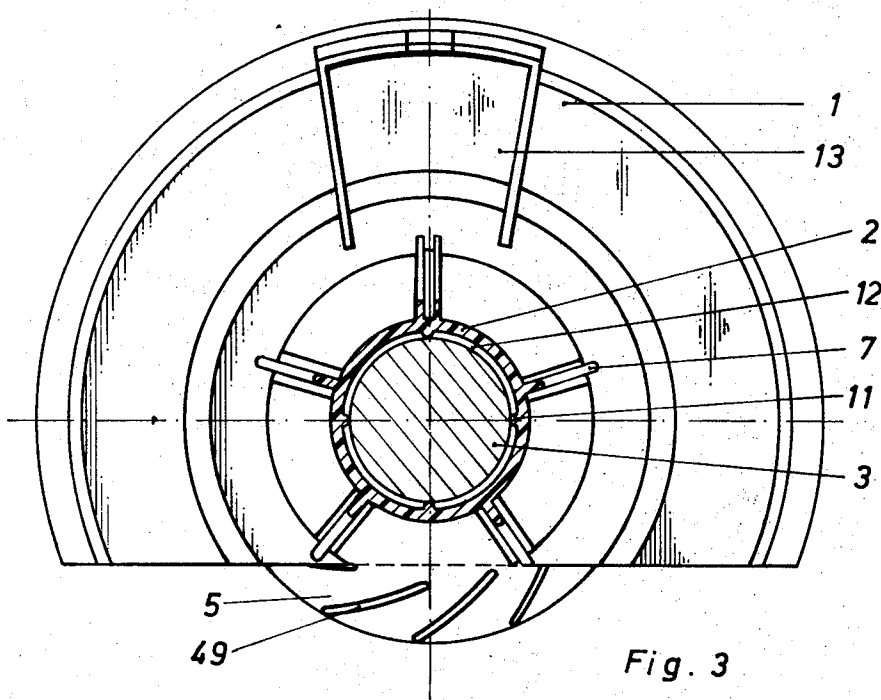
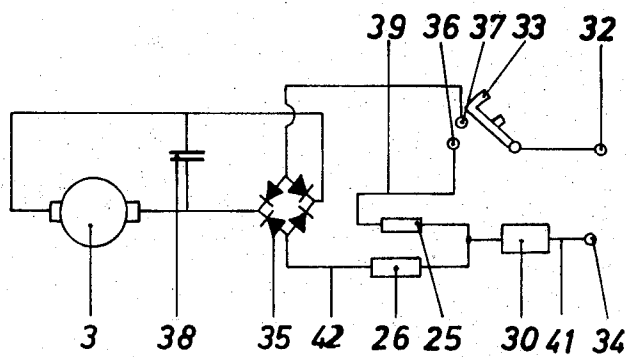


Fig. 3

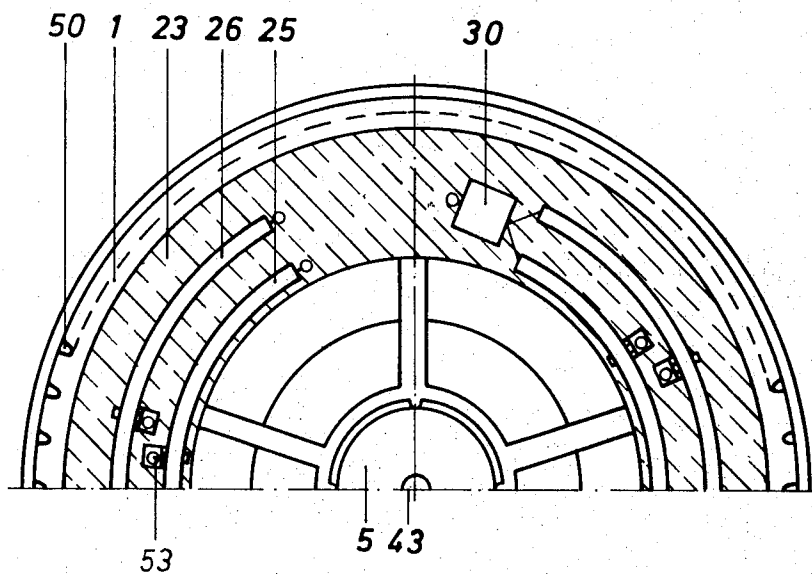


Fig. 4

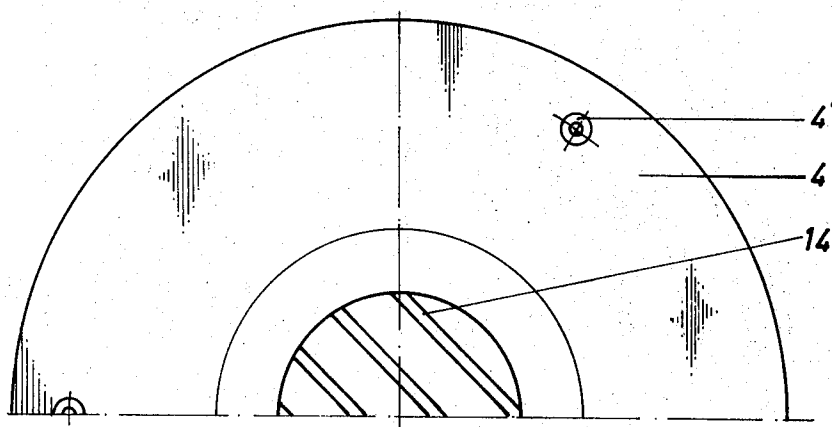


Fig. 5

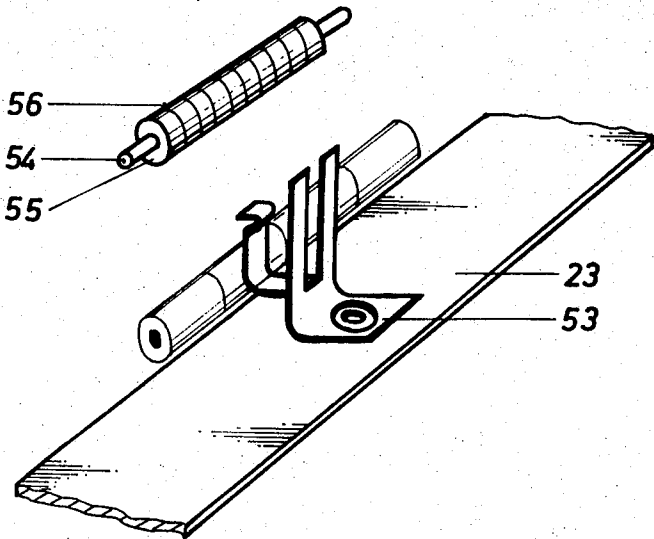


Fig. 6

HAIR DRYER

REFERENCE TO RELATED APPLICATIONS

This application is co-pending with and is a continuation-in-part of the U.S. Pat. application of OTTO HUBNER, Ser. No. 231,503, filed Mar. 3, 1972, for HAIR DRYER CAP.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention involves a hair dryer with a low-voltage dc motor with permanent magnet, a blower, and a heating unit in a housing to whose air outlet opening is fastened, in detachable manner, the air intake opening of the outer jacket of a double-walled inflatable hood whose inner jacket is equipped with several air outlet openings which are distributed over its surface.

2. Description of the Prior Art

Basically, hair dryers of this type are already known, (German Utility Model Pat. No. 6,607,466). These hoods are subdivided on the sides, by means of longitudinal seams, into cells which open up into a common bottom chamber. A blower fills them with warm drying air which fills the hood and makes it taut. Due to their considerable weight, these hair dryers are supported by a tripod during use. After use, the hood may be folded up in a space-saving manner, but tripod and blower-housing still need quite some space so that the advantage of space-saving storage becomes virtually insignificant.

Another familiar method (German DAS Pat. No. 1,282,251) consists of using, for the tripod and the tightening elements of the hood, stretchable wires equipped with link-chain type sleeves, which form solid supports when stretched. In this manner, space-saving storage in a relatively small container is possible, but freedom of movement of the user during the drying process is restricted considerably since, for the purpose of space-saving storage as indicated, the hood is made relatively small and the tripod relatively short.

In order to increase freedom of movement, a familiar method (German DT-OS Pat. No. 1,902,622) proposes for dryers, to attach the housing with blower and heating unit, in detachable manner, to a cap-like double-walled hood having an inner and an outer jacket, in the neck area. The inner jacket has openings and is connected, near a band that passes around forehead and neck, with the outer jacket at specified points, through the forming of holes that pass through both jackets. The band keeps the hood from sliding off the head so that no tripod is needed.

In use, a blower suctions in air which flows via the motor to the heating unit. Subsequently, the heated air flows into the space formed by inner and outer jackets, inflates the hood, and flows through the openings of the inner jacket onto the hair to be dried, and leaves, finally, saturated with moisture, the hood through the outlet openings at the rim of the band.

The arrangement of the blower in the housing as the cap-like design of the hood result in a high resistance to air flow so that the blower-motor must be made correspondingly powerful and is thus, of course, very heavy, and a band or similar device is always needed to secure the hood.

Another familiar method (U.S. Pat. No. 3,383,700) consists of using, for a portable hair dryer, a low-voltage-dc motor with permanent magnet, mounted in a plastic housing, as an axial blower whose air outlet is connected directly to a cap-like drying hood consisting of a single jacket. Due to the specific type of the motor, the drying hood is of light weight, but it is impossible to avoid that a large amount of the air coming from the blower streams onto the hair in the immediate area of the outlet opening of the housing, with the result that the hair dries unevenly for the most part.

Another familiar method as set forth in U.S. Pat. No. 3,032,891 for portable dryers with a single jacket hood consists of arranging the axial blower sufficiently distant from the head by means of a spacer, and of using a pipe socket with perforated walls and closed front as the blower-outlet opening. The pipe socket may be equipped with an asbestos plate at the front in order to avoid large heat losses.

Aside from the fact that the blower along with its housing cause the hood to be quite tall, the air-reversal at the front of the closed pipe socket necessitates additional output to be delivered by the blower, so that the latter must be designed correspondingly. Thus, such hoods have an awkward shape and are too heavy for easy and unhampered wear on the head.

SUMMARY OF THE INVENTION

The present invention is based on the problem to design, in a hair dryer of the type indicated at the beginning, the blower and its housing in such a manner that a direct air stream onto the hair underneath the air outlet opening of the housing without additional reversal areas is avoided, and the air in the immediate area of the air outlet opening rather flows mainly along the hair surface and the inner surface of the hood, respectively; and at the same time to keep air flow resistance in housing and hood so low that a blower-motor with low output and high number of revolutions can be employed. In addition, the blower and the housing should be of light weight and of flat design with a low center of gravity so that a hair dryer so equipped may be worn on the head during use freely without additional auxiliary devices such as bands or the like, and does not have to be supported by a stand.

This problem is solved according to the invention by a radial blower, a ring-shaped heating resistor mounted concentrically with respect to the impeller, and a housing which consists of a base plate and a ring-shaped cover plate which is mounted coaxially with and at a distance above the base plate and supports the motor, whereby one ring-gap between motor and cover plate forms the air intake opening of the blower, and a second ring-gap between cover and base plate forms the air intake opening of the blower, while the coverplate serves to attach the outer jacket of the hood. The concentric design of radial blower and heating unit results in a flat, two-piece housing with low center of gravity, as well as a circular-symmetrical drying-air stream which is let out mainly in parallel to the base plate of the housing. The individual parts of the housing are made of plastic material.

Due to its low total weight, low center of gravity, and symmetrical shape, the housing lends itself particularly well to be supported by a helmet-like inflatable hood without the danger of the hair-drying hood sliding off the head or exerting undue pressure on the head.

According to the invention, the motor rests in a receptacle whose lower rim forms, with the inner rim of the ring-shaped cover plate, the boundary of the first ring-gap.

In a suitable further development, the lower rim of the receptacle is placed on a plane with the inner rim.

Air flow resistance is reduced decisively by mounting the motor on top of the ring-gap that forms the air intake opening.

The inner wall of the motor receptacle is equipped with longitudinal bars which, on the one hand, provide ventilation and, on the other hand, serve to support the motor.

According to the invention, receptacle and ring-shaped cover plate are connected by means of spokes, whereby the spokes may connect the inner rim of the ring-shaped cover-plate with the outer wall of the receptacle.

Transfer of motor noises to other parts of the housing and to the hood is largely prevented by mounting the motor in the receptacle at a distance from the ring-shaped cover plate.

In a suitable execution of the invention, a housing cap which covers the motor-receptacle, is mounted coaxially with respect to the ring-shaped cover plate and forms a third ring-gap which communicates with the first ring-gap and forms the air intake opening of the housing. This procedure results in a three-piece housing whose air intake opening has a larger diameter than the first ring-gap and may thus be designed flat enough to prevent foreign bodies from entering the blower.

In a suitable continuation of the design of a three-piece housing, the spokes are extended along the outer wall of the receptacle up to about its upper rim, to serve as spacers for the housing cap. According to the invention, the housing cap is equipped with ventilating slots at its front.

According to the invention, the impeller is designed as a circular disk which, in the center of that of its surfaces which is turned towards the ring-shaped cover plate, is equipped with a shaping which encircles the hub, and whose outer rim diameter is virtually the same as the outer diameter of the receptacle, and which is equipped, at its rim, and at a distance from the shaping, with a bucket ring. Since the rim of the shaping and the receptacle have virtually the same outer diameter, turbulence of the suctioned-in air is prevented in these areas.

According to the invention, the heating resistor consists of a wire coil which is wound on a glass-fiber-sheathed steel cord. This design makes it possible to mount the heating resistor self-supporting in the exhaust-duct of the blower where air flows around it from all sides, without the danger of deformation, for example during a short overload before the safety switch is tripped.

For the purpose of mounting the ring-shaped cover plate, the under-side of the ring-shaped cover plate of the housing is equipped, in the area of the heating resistor, with a flat insulating ring which on one surface carries several spring clips which hold the heating resistor at a distance on top of that surface. Suitably, these clips are, in each case, made from an angled sheet metal strip whose one leg is riveted to the insulating ring, and whose other vertically extending leg is subdivided into at least three prongs; the center prong is bent

at right angles for the purpose of spring-supporting the heating resistor in parallel to the plane of the two other prongs.

The insulating ring is made sufficiently large to protect the under-side of the ring-shaped cover plate against the heat radiation from the heating resistor. The clips according to the invention hold the heating resistor at a predetermined distance from the insulating ring and permit very simple mounting of the heating resistor which is, in each case, inserted between the prongs of the clips at low contact pressure.

Suitably, the heating resistor consists of two ring-shaped sectional resistors which are mounted concentrically with respect to each other and constitute the two heating steps of the blower.

In a further execution of the invention, a temperature-limiting switch — suitably a bimetal switch actuated by external heat — is mounted on the insulating ring in series-circuit with the heating resistor. The temperature-limiting switch cuts off the current supply to the heating resistor when excessive heating-up occurs, which might be caused, for example, through interruption of the air supply or through jamming of the air intake opening with foreign bodies; in this manner, damage to the hair dryer and danger to the persons handling it is prevented.

The bimetal switch actuated by external heat is independent from the current load of the heating resistor and responds only to its radiation heat.

Insulating ring, clips, heating resistor or resistors, and temperature-limiting switch form one single unit which is attached to the under-side of the ring-shaped cover plate, for example by bonding or riveting.

According to the invention, the base plate, too, is equipped with an insulating ring in the area of the heating resistor, as a shield against the heat radiation of the heating resistor.

The ring-shaped cover plate has, on its jacket-surface, a ring groove which accommodates the rim of the air intake opening of the outer jacket of the hood, while the base plate has, on its under-side, a lug for snap-fastening the inner jacket of the hood.

Further characteristics and advantages of the invention are explained in greater detail in the drawings, based on an example of execution for a three-piece housing.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded elevational view of a hair dryer according to the invention

FIG. 2 is a circuit diagram for motor and heating resistor;

FIG. 3 is a top view of the upper side of the partly broken ring-shaped cover plate and the impeller;

FIG. 4 is a plan view of the under-side of the ring shaped cover plate;

FIG. 5 is a plan view of the under-side of the housing cap; and

FIG. 6 is a perspective view illustrating a section of the insulating ring with the heating resistor.

DETAILED DESCRIPTION OF THE INVENTION

With continuing reference to the accompanying drawings wherein like reference numerals designate similar parts throughout the various views, receptacle 2 for motor 3 is mounted, by way of forming the first ring-gap, on top of ring-shaped cover plate 1. On the

receptacle rests, at a distance from the ring-shaped cover plate, housing cap 4 which is held by separators 4' on the upper side of the ring shaped cover plate, while forming the third ring-gap. Cover plate 1 and base plate 45 are also mounted with a distance between each other, thus forming the second ring-gap.

The second ring-gap which communicates with the first ring-gap, forms the air intake opening of the housing, while the second ring-gap forms the air outlet opening. The cylindrical space whose boundaries are the ring-shaped cover plate and the base plate contains the motor-driven impeller 5 and heating unit 6. Cover plate with shaped motor receptacle, base plate, and fan wheel are made of light-weight plastic material.

Spokes 7, lying on the surface of a truncated cone, extend from the inner rim 8 of the ring-shaped cover plate 1 to the area above the lower rim 9 of the outer wall of receptacle 2. The outer diameter of receptacle 2 is smaller than the inner diameter of the inner rim of the ring-shaped cover plate. Inner rim 8 and rim 9 are in the same plane and form the boundaries of the first ring-gap.

Spokes 7 extend to the upper rim 10 of the receptacle and serve as separators for housing cap 4 which is mounted on them and which is equipped with ventilating slots 14 at its front. On the under-side of the housing cap, near the rim, are the shapings of separators 4' which support the housing cap on the upper side of the ring-shaped cover plate, forming the third ring-gap. The receptacle is, on its inner wall, equipped with longitudinal bars 11 (FIG. 3) unto which motor 3 is pushed, forming ventilating gaps 12.

At the rim of the upper side of the ring-shaped cover plate a chamber 13 is shaped which contains a terminal strip (not shown) to which on the one hand the electrical wiring of the motor and heating coil, and on the other hand the line cord with plug are connected.

The motor is a low-voltage-dc motor with permanent magnet and is connected to the terminal strip via a capacitor 38 and a rectifier 35 (FIG. 2). For this purpose, one of the spokes 7 of the receptacle contains a groove 15 which accommodates the electrical wires that come from the motor and go through the front of the motor-receptacle.

The motor is an internal rotor type with a rotational speed of about 7,000 to 8,000 rpm, whereby the blower puts through about 30 to 40 m³ per hour.

An external rotor motor, too, may be mounted underneath the housing cap, whereby receptacle 2 is omitted and the housing cap is used as additional motor support.

According to FIG. 4, the ring-shaped cover plate carries, on its under-side, heating coil 6 which is designed as one unit. It consists of a ring-shaped mica disk 23, which is the insulating ring; on one of its sides, two rows of clips 53 are riveted parallel to the rims of the ring; the clips hold the heating resistor at a distance above this surface.

As FIG. 6 shows, each clip 53 consists of an angle-shaped sheet metal strip one of whose legs is riveted to the insulating ring. The other leg extends vertically with respect to the insulating ring and is subdivided into three prongs; the center prong is bent at right angles with respect to the plane of the two other prongs. The three prongs form a fork-shaped receptacle for the heating resistor which consists of a wire coil 56 which is wound on a steel cord 54 sheathed with glass fiber

55. The heating resistor is subdivided into two sectional resistors 25 and 26 which are bent to almost a full circle and mounted concentrically with respect to each other, and which form the two heating steps.

Insulating ring 23 also carries, in series circuit with the heating resistor, a temperature-limiting switch 30 which is a bimetal switch actuated by external heat which responds to heat radiation, so that it is insensitive to varying current loads which might be caused, for example, by switching-in one or both sectional resistors, respectively.

The base plate carries a ring-shaped mica plate 31 which serves as insulating ring and is also mounted in front of the heating coil.

The width of the two insulating rings is such that they protect the corresponding housing parts against the heat radiation of the heating resistor.

Motor and heating coil are connected in a common circuit which in turn can be connected to the power line through a linecord and plug. According to FIG. 2, one leg 32 of the power line is, after plugging in, connected to switch 33, while the other leg 34 is connected to the input of the temperature-limiting switch 30. The output of the temperature-limiting switch is, on the one hand, connected to the two ends of the two sectional resistors 25, 26, while the other end of sectional resistor 26 is connected to the input of power line rectifier 35, and the other end of sectional resistor 25 to contact 36 of switch 33 which has a second contact 37 to which the other input of the power line rectifier is connected. The power line rectifier is the familiar full-wave rectifier.

Motor 3 with capacitor 38 in parallel-circuit is connected to the output of the power line rectifier.

When switch 33 is closed, connection is made at first with contact 37 so that the motor is actuated and heating resistor 26 is heated up. In the second position of the switch, both contacts 37 and 36 are closed so that the motor as well as both heating wires are switched on.

Wires 39, 41, 42 from the sectional resistors and from the temperature-limiting switch are guided through the mica plate to its other side and from there through a hole at the rim of the ring-shaped cover plate into chamber 13 where they are connected to the terminal strip after insulating ring 23 has been riveted to the under-side of the cover plate.

Impeller 5 is mounted concentrically, between the ring-shaped cover plate and the base plate, on the surface which is encircled by the inner rim of insulating ring 23 (FIG. 1 and FIG. 3). It is designed as a circular disk which has, in the center of that of its surfaces which is turned towards the ring-shaped cover plate, a shaping 40 which encircles hub 43; the outer diameter of the disk at its rim is virtually the same as the outer diameter of the motor-receptacle, and it carries, at its rim, at a distance from the shaping, a bucket ring 49.

Motor 3 protrudes partially into this shaping and its shaft-end rests on hub 43 which projects from the underside of the impeller. An air-gap is provided between the lower rim of the shaping and the rim of the motor-receptacle so that air that flows over the motor may be suctioned off. Air is supplied through ventilating slots 14 at the front of the housing.

The inner rim of the ring-shaped cover plate is, in the area of the buckets, bent upwards in the shape of a

truncated cone (FIG. 1). The ring-shaped cover plate is equipped, at the rim of its under-side, with separators 44 which enable it to stand on base plate 45. In addition, teeth 50 which prevent unintentional touching of the heating unit, are provided at the rim.

Base plate 45 is equipped with a cut-out 46 to accommodate the circular-disk-shaped flange of the impeller whose hub 43 is supported by a blind hole-type shaping 47.

The rim of the ring-shaped cover plate is equipped with a ring groove 48; at the base plate, shaping 47 is designed as a snap-fastener. In this manner, a double-walled hood can, on the one hand, engage through the rim of the air intake opening of the outer jacket with the ring groove, while, on the other hand, the inner jacket of the hood can be snap-fastened to the base plate.

Assembly of the individual parts is performed in such a manner that first of all insulating ring 23 with heating resistor and temperature-limiting switch mounted on it is riveted to the ring-shaped cover plate. After the motor has been inserted in its receptacle, the electrical connections in chamber 13 are completed. The impeller is mounted on the shaft-end of the motor and the housing cap is placed over the motor-receptacle and bolted down by means of screws which are lead through the ring-shaped cover plate and engage with inner threads 51 which are provided in separators 4'. Subsequently, the base plate which is equipped with holes which are congruent to the inner threads 52 of separators 44 on the under-side of the ring-shaped cover plate, is bolted together with the ring-shaped cover plate.

If cap 4 were to be left out of the housing as shown in FIG. 1, a two piece formation is evolved.

A latitude of modification, substitution and change is intended in the foregoing disclosures, and in some instances, some features of the present invention may be employed without a corresponding use of other features.

I claim:

1. Hair dryer for use in combination with a double-walled inflatable hood whose inner jacket is equipped with air outlet openings which are distributed over its surface; comprising a motor, a radial blower driven by said motor and having an impeller, a ring-shaped heating resistor mounted concentrically with respect to said impeller, and a housing including a base plate and a ring-shaped cover plate mounted coaxially to and at a distance above said base plate, said cover plate including a single receptacle for same motor, the diameter of said receptacle being less than the inner diameter of

said cover plate so that a first ring-gap between said receptacle and said cover plate forms an air intake opening for said blower, a plurality of radially spaced upwardly and inwardly extending spokes integrally interconnecting said receptacle and said cover plate, and a second ring-gap between said cover plate and said base plate forms an air outlet opening for said blower, said cover plate having means for attaching an inflatable hood thereto, said motor being inserted in said receptacle whose lower rim together with the inner rim of the ring-shaped cover plate forms the boundary of the first ring-gap, said bars holding said motor in spaced relationship to the inner wall of said receptacle, said lower rim being located in the same plane with respect to said inner rim, and a housing cap covering said receptacle and being mounted coaxially to said cover plate, said spokes engaging said cap and separating said cap from said cover plate forming a third ring gap which communicates with said first ring-gap and forms the air intake opening of said housing, said housing cap having ventilating slots therein.

2. Hair dryer according to claim 1, wherein one of the spokes of the receptacle is equipped with a groove to accommodate the electrical wires from the motor which are lead in at the upper front of said receptacle.

3. Hair dryer according to claim 1, wherein said impeller is a circular disk whose outer diameter at the rim is virtually the same as the outer diameter of the receptacle.

4. Hair dryer according to claim 1, wherein said heating resistor is a wire coil which is wound on a steel cord sheathed with glass fiber, said heating resistor further including a flat insulation ring provided with several spring clips which hold said wire coil at a distance above said flat insulating ring.

5. Hair dryer according to claim 4, wherein said clips each consist of an angle-shaped sheet metal strip, one of whose legs is riveted to the insulating ring, and whose other vertically extending leg is subdivided into at least three prongs, whose center prong is bent at right angles for the purpose of spring-supporting said resistor parallel to the plane of the two other prongs.

6. Hair dryer according to claim 1, wherein said attaching means includes on said ring-shaped cover plate a ring-groove with which the rim of the air intake opening of the outer jacket of the hood engages.

7. Hair dryer according to claim 6, wherein said base plate is equipped, on its underside, with a lug for the purpose of snap-fastening of the inner jacket of the hood to it.

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