ELECTRIC SHAVER WITH VACUUM COLLECTOR

Fig. 5.

Fig. 6.

INVENTOR.

Donald L. Fox.

BY

William J. Riehan

ATTORNEY.
This invention relates to an electric shaver and, more particularly, to improvements in an electric shaver of the reciprocating cutter bar type.

An outstanding and well known disadvantage of conventional type electric shavers is that they do not provide a very close shave, such as that obtained by a straight razor or a safety razor. This is due, at least in part, to the cutter bar and shaving head construction, which does not permit a shaving action very close to the surface of the skin sufficiently near the root of the hairs.

A still further disadvantage of electric shavers of well-known construction is that the cut hairs tend to accumulate in the cutter bars and soon interfere with their cutting action and efficiency by providing resistance to the cutting action of the cutter bars.

A still further disadvantage of common types of electric shavers is that they are complicated in construction, difficult to take apart, and do not provide access for easy servicing or replacement of the various parts.

An object of my invention is to provide a novel electric shaver which is devoid of the above-mentioned disadvantages of the conventional type electric razors.

A more specific object of my invention is to provide an electric shaver with a rotating head which allows rolling action rather than frictional or rubbing action against the skin, therefore provides a very comfortable type of shave.

A still further object of my invention is to provide an electric shaver having novel reciprocating cutter heads which coat with the rotating head in a manner so as to provide a very smooth shave, cutting hair very close to the surface of the skin.

Another object of my invention is to provide an electric shaver with a vacuum cleaning attachment which will effect constant withdrawal of hair from the vicinity of the cutter bars and therefore prevent interference of the cutter bar action by the cut hairs.

A still further object of my invention is to provide an electric razor having relatively simple and inexpensive parts which are easily accessible and removable for replacement and repair and which are relatively easy to assemble or disassemble.

Other objects and advantages of my invention will become more apparent from a study of the following description taken with the accompanying drawings wherein:

Fig. 1 is a fragmentary, perspective view, with parts shown cut-away, of an electric shaver embodying the principles of the present invention.

Fig. 2 is a perspective view of the rotating shaving head shown in Fig. 1.

Fig. 3 is a perspective view of the cutter bars of Fig. 1, shown spread apart to more clearly illustrate the saw-tooth construction on opposite sides of each cutter bar, as well as the gears on their confronting faces, forming racks.

Fig. 4 is a perspective view of the trough or support element for the cutter bars shown in Fig. 3, but showing the cutter bars removed to more clearly illustrate the construction of the trough.

Fig. 5 is a perspective view showing the hinged cover of the electric razor in the open position and showing the housing of the vacuum creating means partly cut-away to illustrate the blower construction inside thereof.

Fig. 6 is a side view of the electric razor with one of the side covers removed to more clearly illustrate how reciprocating action of the cutter bars is obtained from the motor drive.

Fig. 7 is a side view showing the opposite side of that illustrated in Fig. 6 with the other side cover removed, and

Fig. 8 is a longitudinal, cross-sectional view of the electric razor with certain parts shown cut-away to more clearly show the internal construction of the razor.

Referring more particularly to Figs. 1 to 5 inclusive of the drawing, numeral 1 denotes a casing or housing of an electric shaver, which casing is made of plastic or other suitable material. Casing 1 is provided with removable side covers 1a and 1b, respectively, as shown more clearly in Fig. 5, which may be readily and easily removed simply by unscrewing screws, such as 1f.

Within the bottom portion of the casing 1 there is mounted an electric motor 2 of any well known construction whose rotor has rigidly secured thereto a knurled starting wheel 3 which projects from the armature, centrally of the base portion of the casing 1, so that the operator may quickly spin the rotor by the use of his thumb to effect starting of the motor, in a well known manner.

On one end of the motor shaft is rigidly mounted an eccentric wheel 4 provided with an eccentric weight 5. Rotation of wheel 4 will effect reciprocating movement of a crank arm or link 7 by virtue of the eccentric mounting of the connecting pin 6 emerging from the wheel. The other end of the connecting arm 7 is connected, by an eccentricaly mounted pin, to a gear 8 so as to effect short oscillations of the gear 8. Gear 8 meshes with the teeth 9 of an oscillating lever 9. Teeth 9b are provided which mesh with a rack 11, thereby causing reciprocating movements of rack 11 in a direction at right angles with the longitudinal axis of lever 10. A drive pinion 12 engages the opposite teeth of the rack 11, whereby it will oscillate through a small radial angle. By virtue of the geared relationship between drive pinion 12 and teeth 13a on the confronting faces of cutter bars 13 and 14, these cutter bars will be given short reciprocating strokes in opposite directions.

Each of the cutter bars 13 and 14 has saw-toothed cutting edges 13a and 14b, respectively, on both sides thereof so that the two cutter bars 13 and 14 will provide four saw-tooth, side, cutting edges. The outer surfaces of the cutter bars 13 and 14 are machined to provide quarter round surfaces which provide a bearing surface for the rotating shaving head 22 journaled thereon, to be described more fully hereinafter.

As shown more clearly in Fig. 1 taken with Fig. 4, the cutter bars 13 and 14 are slidable mounted on and supported by trough 16 on its mouth portion 15c so that the cut hairs will fall into the trough. Cutter bars 13 and 14 are adapted to slide in grooves 16a and 16b, on one end of the trough and in similar grooves on the other end.

A frame-like pedestal 18 is slidable mounted within and guided by tracks 1c, which tracks are integrally formed on one side of the casing 1 and preferably also of plastic material. Rigidly mounted on the pedestal 18 is a ball bearing or roller bearing supporting rim 19 which provides an anti-friction mounting for rim 22c of the rotatable, hollow, cylindrical head 22. Head 22 has arcuate slots 22c supported between portions 22d of
the head, and in side-by-side, staggered relationship. Likewise on the opposite side of the razor there are provided integral track elements 12 (Fig. 7) for guiding sliding movements of a similar frame like pedestal 20, which pedestal has rigidly secured to the end there of a ball bearing supporting rim 19 which provides an anti-friction bearing support for the rim 22b.

Means are provided for firmly yieldingly the rotatable shaving head 22 against the bearing surfaces provided by the quarter round outer surfaces of cutter bars 13 and 14. Such means includes a cross bar 37 which pushes against the inner marginal edges of pedestals 18 and 19 and which has a central cylindrical stub 38 which acts as a holder for one end of spring 39. The other end of the spring is seated in a well formed in the stationary partition 36 (Fig. 8). Since the trough 16 is rigidly mounted on the stationary partition 36 by means of screws 36a and since pedestals 18 and 20, together with the rotatable head 22, are pushed by spring 39 in a direction away from the head, the spring will firmly hold the head 22 against the bearing surfaces on cutter bars 13 and 14.

Thus there is not only a free rolling movement of the shaving head 22 on the face of the user so as to provide a comfortable and easy feel, but there is also a constant, firm holding of the shaving head against the bearing surfaces provided by the cutter bars which improves the shearing action of the cutter bars and provides a very close shave.

The motor also, drives a vacuum cleaning arrangement for continually withdrawing hairs from the shaving head. This comprises a drive including a pulley 23 connected to the motor shaft which drives belt 24 which, in turn, drives a pulley 25 on a shaft 26 which rotates a blower having blades 27 enclosed by housing 28. The blower sucks air through hole 28a of an enclosed chamber and through a perforated partition 29, which air is drawn through the walls of a filter bag 30 having a rigid mouth portion 31 which provides an air-tight, slip fit into a grooved portion of the housing. A semi-circular collar 36b provides a support for the inner edge of mouth portion 31. This provides for easy removal of the filter bag for emptying of its contents and provides a dust-tight detachable connection between collar 36b and the adjacent surface of element 16.

The interior of filter bag 30 communicates with hole 32 and grooves or channels 33 and 34 (Fig. 8), thence with the trough portion of element 16 into which the hairs drop and are collected after they are sheared by cutter bars 13 and 14.

Thus, by virtue of the suction created by the blades of blower 27, air is sucked into housing 28 and is exhausted through the exhaust opening covered by a wire mesh screen 35. Blower 27 will suck the cut hairs from trough 16 into the filter bag so as to keep the trough and cutter bars constantly clean of hairs. When the filter bag becomes full, the lid 1g (Fig. 5) is pivoted to the open position, as shown in Fig. 5, and the filter bag is pulled outwardly at right angles to the plane of Fig. 8, and emptied.

Thus it will be seen that I have provided an efficient electric shaver which has a rotatable head providing a rolling action on the face, which head is spring biased at all times into tight engagement with supporting bearings formed on the cutter bars so as to provide a very close shave; furthermore I have provided an electric shaver incorporating a vacuum cleaning arrangement so as to continually withdraw cut hair from the cutter bars and their supporting trough so as to improve the cutting efficiency and greatly improve shaving; furthermore I have provided a rotating head having grooves staggered spirally so as to be always grooves through which hairs may extend into the cutter bars.

While I have illustrated and described a single specific embodiment of my invention, it will be understood that this is by way of illustration only, and that various changes and modifications may be made within the contemplated scope of my invention and within the scope of the following claims.

I claim:

1. An electric shaver comprising a trough, said trough having a mouth portion, a pair of reciprocable cutter bars mounted on said mouth portion of said trough so as to collect hair clippings made by said cutter bars, a cylindrical, perforated shaving head surrounding said trough and cutter bars and mounted so as to freely rotate as the result of frictional engagement with the face of the person shaving, a motor and drive connection for reciprocating said cutter bars, said shaver including an interior chamber, a blower and a removable filter bag contained in said chamber, the mouth of said filter bag being in communication with one end of said trough, said blower and filter bag being in closely spaced relationship and disposed so that the blower will suck air from the filter bag and allow hair clippings to be drawn from said trough to said bag for collection in the latter.

2. An electric shaver comprising a body portion, a pair of frames slidably mounted along opposite sides of said body portion, an anti-friction bearing supported at the end of both of said frames, a hollow cylindrical shaving head rotatably mounted on said bearings, cutter bar means reciprocated by an electric motor mounted in said body portion, said cutter bar means surrounded by said head, spring means for biasing said pedestals in a direction so as to firmly hold said head against said cutter bar means and thereby provide a close shave.

3. Apparatus as recited in claim 2 wherein said cutter bar means comprises a pair of oppositely reciprocable bars, tooth cutting edges on each cutter bar, and top portion on each bar which forms a bearing support for said rotatable shaving head.

4. An electric shaver comprising a casing having a pair of pedestals slidably mounted on opposite sides of said casing, a ball bearing support hub rigidly connected to each of said pedestals, a hollow, cylindrical shaving head rotatably mounted on said hubs so as to freely rotate upon frictional engagement with the face of the shaver, a pair of cutter bars located within said head and having rounded faces serving as bearing surfaces for said head and having saw toothed cutting edges on opposite sides of each bar, an electric motor for effecting reciprocating motion, in opposite directions, of said cutter bars, said head having arcuate slots disposed substantially along circular paths in side-to-side relationship and having an axis common with that of the head.

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