United States Patent

Yamaoka

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[54] **ELECTRIC DRY SHAVER WITH MOVABLE COMB**

[72] Inventor: **Goichi Yamaoka**, Okayo-shi, Japan

[73] Assignee: **Kabushiki Kaisha Suwa Seikosha**

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[52] **U.S. Cl.** **30/43.92**, 30/346.51

[51] **Int. Cl.** **B26b 19/10**

[58] **Field of Search** 30/34.1, 43.2, 43.91, 43.92, 30/43.8, 43.9

[56] **References Cited**

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Primary Examiner—Travis S. McGehee

Assistant Examiner—K. J. Ramsey

Attorney—Blum, Moscovitz, Friedman & Kaplan

[57] **ABSTRACT**

An electric dry shaver in which the comb is movably or slidably mounted to the head frame and pressed thereagainst by holding plates so that the resistance of the comb to movement is substantially constant. The reciprocating cutter is biased into engagement with the comb whereby the comb and cutter can move together during shaving to assure constant engagement between the comb and cutter.

6 Claims, 6 Drawing Figures

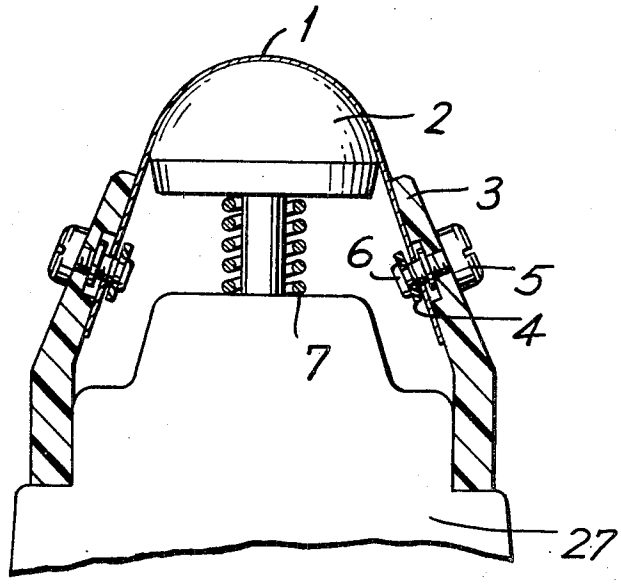


FIG. 1

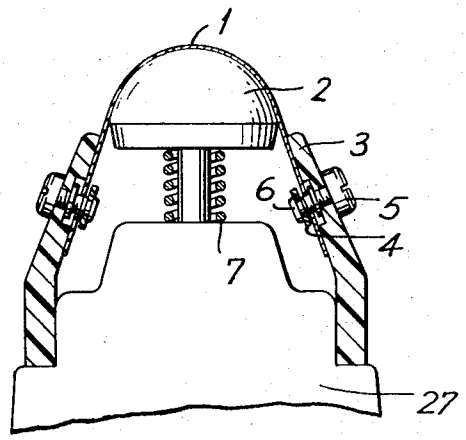


FIG. 2

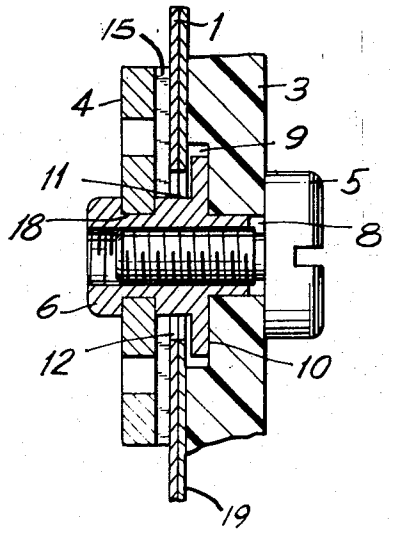


FIG. 3

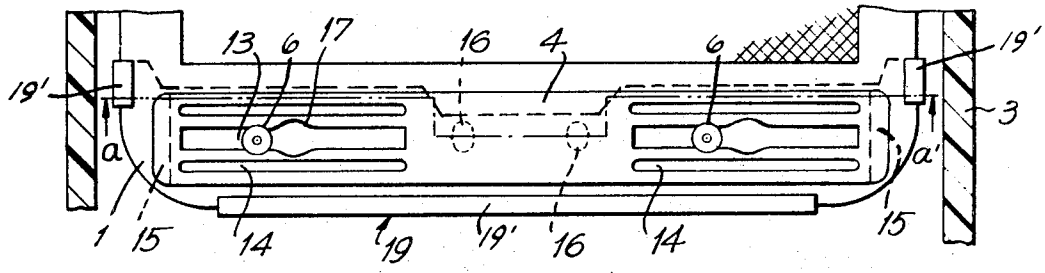


FIG. 4

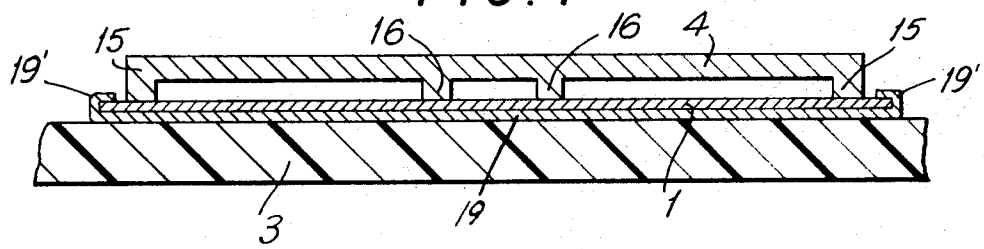


FIG. 5

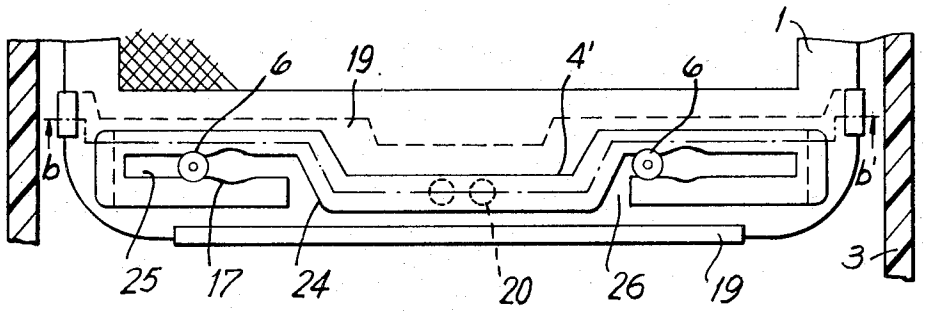
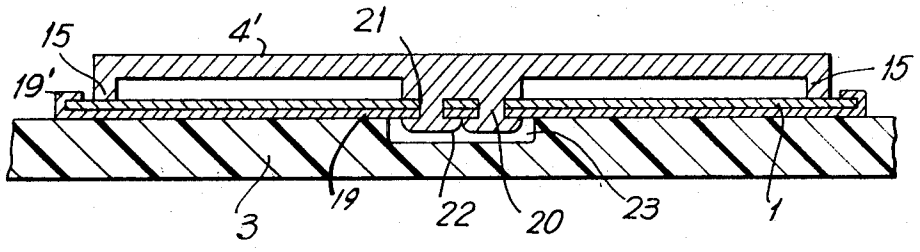


FIG. 6



ELECTRIC DRY SHAVER WITH MOVABLE COMB

BACKGROUND OF THE INVENTION

This invention relates generally to an electric dry shaver and more particularly to the head construction wherein the comb is movable and is mounted for constant sliding friction so that the comb will stay in close contact with the reciprocating cutter. The comb is so mounted as to adapt itself to provide a uniform sliding contact between the comb and the reciprocating cutter.

In conventional dry shavers, the comb is normally fixed or stationary with respect to the head frame and the cutter is urged against the comb by spring means such as leaf springs or coil springs. When pressure is applied to the relatively thin comb during shaving, portions of the comb may be pushed downwardly and the cutter, which is pressed upwardly by spring means is also shifted downwardly by the pressure. During such occurrence, contact between the comb and cutter lacks uniformity and the shearing efficiency of the shaver is decreased. It has been found that shavers in which the comb does not follow the movement of the cutter do not give a comfortable shave.

It has been known in the art to construct a shaver which permits the comb to move within the head frame. However, in such structures, uniform frictional resistance to movement of the comb has not been obtained. If friction is too great, the comb cannot properly follow the movement of the cutter, which is the same condition as when the comb is fixed. If friction is too low, excessive vibration of the comb and abnormal metallic noise results.

SUMMARY OF THE INVENTION

Generally speaking, in accordance with the invention, the comb of a dry shaver is slidably mounted to the head frame and is held in position by resilient holding plates which are so constructed and arranged to apply a substantially constant holding force to the comb so that the frictional resistance to movement of the comb will be substantially constant. The comb is free of engagement with the elements that mount the holding plates to the head frame so that the fixed mountings do not interfere with the sliding action of the comb.

Accordingly, it is an object of this invention to provide a dry shaver with a movable comb and improved means for mounting the movable comb.

Another object of the invention is to provide means for movably mounting a shaver comb to the head frame whereby the sliding friction between the comb and head frame remains substantially constant.

A further object of the invention is to provide an improved head construction for an electric dry shaver in which the comb will remain in intimate contact with the reciprocating cutter.

Still other objects and advantages of the invention will in part be obvious and will in part be apparent from the specification.

The invention accordingly comprises the features of construction, combinations of elements, and arrangement of parts which will be exemplified in the constructions hereinafter set forth, and the scope of the invention will be indicated in the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

For a fuller understanding of the invention, reference is had to the following description taken in connection with the accompanying drawings, in which:

FIG. 1 is a sectional view of a shaver head constructed in accordance with a preferred embodiment of the invention;

FIG. 2 is a partial sectional view, at an enlarged scale, of the comb-mounting arrangement of the embodiment of FIG. 1;

FIG. 3 is a partial, longitudinal cross-sectional view of the mounting arrangement of FIG. 2;

FIG. 4 is a sectional view taken along lines *a—a'* of FIG. 3;

FIG. 5 is a view similar to FIG. 3 showing a modified mounting construction; and

FIG. 6 is a sectional view taken along lines *b—b'* of FIG. 5.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIGS. 1–4, shaver body 27 has head frames 3 extending upwardly therefrom. Reciprocating cutter 2 is mounted on the shaver body for reciprocation by the drive means (not shown) and a spring 7 acts against the cutter to bias it outwardly from the body. A comb 1 in the form of a flexible foil element over fits cutter 2 and is mounted to head frame 3 for relative movement between the comb and the head frame. A holding plate 4 is provided at each side of the comb for securing the comb to each head frame 3. Each holding plate is secured by two assemblies as will now be described with reference to FIGS. 2–4. A nut 6 is mounted to the inside of frame 3 with the inner extremity thereof extending into an opening 8 in the head frame. Nut 6 is held in position by screw 5 threadedly engaged with the nut. An undercut 9 in the frame receives a collar 10 on the nut to position the nut with respect to the frame.

Nut 6, intermediate its ends, is formed with a cylindrical portion 11 which is over fitted by an aperture 12 in the comb. Aperture 12 is larger than cylindrical portion 11 so that movement of the comb with respect to the nut is not impaired. Aperture 12 acts to limit movement of the comb by engagement with cylindrical portion 11. Also, the longitudinal length of cylindrical portion 11 is substantially greater than the thickness of comb 1 so that the nut assembly does not apply a drag force to the comb. Nut 6 is also provided with a annular groove 18 which receives slot 13 in holding plate 4. Annular groove 18 accurately positions holding plate 4 and maintains the plate spaced from the comb except for the projections to be hereafter described.

Referring especially to FIGS. 3 and 4, slots 13 are provided with enlarged portions 17 which will clear the outwardly projecting end of nut 6 to permit holding plate 4 to be assembled over and removed from the nut. Holding plate 4 (FIGS. 3 and 5) is put in position or removed by moving the plate until the enlarged portions 17 are in register with nuts 6. Note also from FIG. 2 that when the holding plate is removed, aperture 12 is sufficiently great to permit complete removal of the comb for cleaning of the shaver head.

Referring again to FIGS. 3 and 4, holding plate 4 is provided with a plurality of longitudinally extending slots 14 located on opposite sides of slots 13 to resiliently mount the holding plate to head frame 3 through nut 6. In other words, when the holding plate is mounted through slots 13 on second shoulder 18, the centers and ends of the holding plate can readily deflect with respect to the fixed mounting. The ends of holding plate 4 are provided with projections 15 and the center with projections 16 which extend toward head frame 3 and engage the surface of comb 1 to press the comb into engagement with the head frame to thereby apply a frictional force to the sliding action of the comb. As comb 1 is generally formed of very thin screenlike sheet material, a reinforcing plate 19 can be secured to the bottom portions of the comb to minimize the possibility of tearing the foil of which the comb is fabricated. The reinforcing plate 19 is held to the comb 1 by the tabs 19' and, when present, is considered part of the comb since it moves in unison with the comb. The lower edge of the reinforcing plate 19, except for the tabs 19', coincides with that of the comb. The upper edge of the reinforcing plate 19 is shown by the broken line between the side tabs 19'. It should be noted that the reinforcing plate 19 is present in the embodiment of FIG. 2, but not in the embodiment of FIG. 1.

With the foregoing construction, the mounting members for holding plate 4 generally considered as nut 6 and screws 5 securely hold plate 4 in position but such fixed members do not apply any force whatsoever to comb 1. The holding and frictional drag force is applied to the comb through projections 15 and 16 on the holding plate and the holding plate is resiliently mounted on nut 6.

A modified arrangement of the holding plate is shown in FIGS. 5 and 6 wherein holding plate 4' is connected to comb 1 centrally of the holding plate. Projections 20 are formed on holding plate 4' which project through apertures 21 and the

comb is held on to projections 20 by means of heads 22. Head frame 3 is provided with an undercut 23 whereby heads 22 do not come into contact with the head frame.

The holding plate 4' shown in FIGS. 5 and 6 is supported on the head frame by means of the same nut and screw assemblies shown in FIG. 2. Slots 25 are formed in holding plate 4' with the slots having enlarged portions 17 for assembling the holding plate over nuts 6. Due to the connection between the holding plate and the comb, the comb is biased into engagement with head frame 3 at the center of the holding plate and, in addition, projections 15 are also provided for engagement with the comb. As shown in FIG. 5, holding plate 4' is formed with arms 24 which impart resiliency to the center, the holding plate and notches 26 further aid in imparting elasticity to the holding plate. Also, the elasticity of arms 24 tend to bias the comb downwardly and also facilitate its assembly due to the connection between the holding plates and the comb.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in the above constructions without departing from the spirit and scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. In a shaver of the type having a frame, a comb carried by said frame, and a cutter biased into engagement with said comb, the combination comprising resilient holding plates and attachment means for securing said holding plates to said frame, each of said holding plates being provided with projections spaced from said attachment means, said projections engaging portions of one side of said comb and pressing portions of an opposite side of said comb into engagement with a surface of said frame, whereby said comb is slidably and frictionally mounted on said frame, and wherein said attachment means includes fastening elements and means for securing said fastening elements to said frame, each fastening element having a cylindrical portion of a first cross-sectional size and an annular groove of a second cross-sectional size, said cylindrical portion passing through said comb with clearance whereby movement of said comb will not be limited by said first shoulder except at the limit of travel, and said annular groove carrying a holding plate therein.

2. A shaver as claimed in claim 1 wherein the cross-sectional size of said cylindrical portion is greater than the cross-sectional size of said annular groove.

3. A shaver as claimed in claim 1 wherein the portion of each holding plate carried in the corresponding annular groove is provided with an elongated slot, the width of said slot being generally substantially the same as the cross-sectional size of said annular groove, said slot having an enlarged portion to permit disconnection of said holding plate from said fastening element.

4. A shaver as claimed in claim 3 wherein said attachment means consist of two said fastening elements for each of said holding plates, and said projection are provided at least at the opposite ends of said holding plates.

5. A shaver as claimed in claim 4 wherein each of said holding plates has two slots for receiving said two fastening elements, said slots being in longitudinal alignment and spaced from one another, said slots being termed primary slots, each of said holding plates having additional projections intermediate the ends of said primary slots, each of said holding plates further including secondary slots transversely spaced on opposite sides of each of said primary slots.

6. A shaver as claimed in claim 4, wherein each of said holding plates has two slots for receiving said two fastening elements, said slots being in longitudinal alignment, each of said holding plates further including means intermediate the ends of said slots for securing each of said holding plates to said comb, said slots intermediate said last-named projections and each of said fastening elements being open through a side of each of said holding plates whereby to impart greater resiliency to each of said holding plates.

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