ELECTRIC DRY SHAVING WITH AN ELONGATED MEMBER
PIVOTED TO THE INNER CUTTER AND SPRING
BIASED AGAINST THE CUTTER AND THE
DRIVING MEMBER COUPLED THERETO

FIG. 1

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March 24, 1970
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3,501,836
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Filed Nov. 1, 1967

FIG. 2

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3,501,836 ELECTRIC DRY SHAVER WITH AN ELONGATED MEMBER PIQUED TO THE INNER CUTTER AND SPRING BIASED AGAINST THE CUTTER AND THE DRIVING MEMBER COUPLED THERETO

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Filed Nov. 1, 1967, Ser. No. 679,875
Claims priority, application Switzerland, Nov. 2, 1966, 15,826/66
Int. Cl. B26B 19/02

7 Claims

ABSTRACT OF THE DISCLOSURE

An elongated member of rigid material extends lengthwise of an inner cutter having a generally U-shaped cross-section and is pivoted at one end to the sidewalls of the cutter, the other end being free for movement toward and away from the cutting face. A spring extends lengthwise of the inner cutter between the cutting face thereof and the elongated member, and engages the inner cutter near the ends thereof. The elongated member engages the spring intermediate the ends thereof. A reciprocating driving member is coupled to the elongated member by a projection on one member and a cooperating indented section on the other shaped for tapered engagement therebetween. The elongated member is dimensioned to flex the spring to bias the inner cutter against the outer shear comb and bias the projection and cooperating indented section into engagement.

SUMMARY OF THE INVENTION

The present invention provides a simple and effective mechanism for driving the inner cutter of an electric dry shaver in a positive manner while maintaining contact of the inner cutter with the stationary shear comb and eliminating play in the coupling between the driving means and the inner cutter.

A cutting head is mounted at one end of a casing forming a handle and has at least one linearly-extending stationary shear comb and a movable inner cutter cooperating therewith. The inner cutter has a cutting face and sidewalls of a generally U-shaped cross-section. An elongated member of rigid material, preferably a synthetic plastic, extends lengthwise of the inner cutter between the sidewalls thereof. One end of the elongated member is pivoted to the sidewalls near one end of the cutter, and the other end is free for movement toward and away from the cutting face. A spring extends lengthwise of the inner cutter between the cutting face thereof and the elongated member, and engages the inner cutter near the ends thereof. The elongated member is shaped to engage the spring intermediate the ends thereof.

Driving means is provided which includes a driving member reciprocating lengthwise of the shear comb in a path fixed with respect to the casing. Coupling between the driving member and the inner cutter is provided by a projection on one end of the driving and elongated members and a cooperating indented section on the other, the projection and indented section being shaped for tapered engagement therebetween. The elongated member is dimensioned to flex the spring when the cutting head is in shaving position to thereby bias the movable inner cutter against the shear comb and at the same time bias the projection and cooperating indented section into engagement.

In the specific embodiment the inner cutter has a pair of slots in the sidewalls thereof near each end of the cutter. The elongated member has a pair of projecting bosses or chapes on the sides thereof at each end. The bosses at one end fit into the slots of the cutter at that end and the slots are rounded at the points of engagement with the bosses to provide a pivotal mounting. At the other end, the bosses move in the slots of the cutter at that end and a pair of projections at the openings of the slots retain the bosses therein. A leaf spring extends between the pairs of slots and has transverse legs seating in the bottoms of the slots at each end of the spring. An indented section is formed in the elongated member at the center thereof and a projection on the reciprocating driving member is tapered to engage the indented section.

In shaving position the center of the leaf spring is engaged by the center portion of the elongated member and bias the inner cutter against the shear comb and at the same time biases the indented section against the tapered projection of the driving member.

In this manner the elongated member positively drives the inner cutter through the pivotal connection there-from, while the spring presses the inner cutter against the outer shear comb and at the same time insures that there will be no play in the tapered connection with the driving projection. A simple leaf spring suffices and the elongated member may readily be molded of a synthetic plastic. Overall, the mechanism is very simple and relatively inexpensive and the need for excessively close tolerances is avoided.

The accompanying drawing represents by way of example one embodiment of the present invention:

FIGURE 1 is a longitudinal cross-section of the head;
FIGURE 2 is a vertical cross-section passing by the axis of symmetry of FIGURE 1;
FIGURE 3 is a cross-sectional view of the cutting elements;
FIGURE 4 is a cross-sectional taken along line B—B of FIGURE 3.
FIGURE 5 is a side view of the movable inner cutter assembly.

The shaving head represented in FIGURES 1 and 2 comprises essentially an eccentric cam 1 affixed to a shaft 2 rotated by a motor not shown, a lever 3 having two wings 3a surrounding cam 1 and pivoting around shaft 4 mounted in a support 5 which is maintained in casing 6 by means of tongues 10a, a slider 7 engaged by the upper end of lever 3 and provided with claws 8 in a number corresponding to the cutting elements and sliding on three balls 9, a cover plate 10 the folded extremities of which form securing tongues 10a and a removable cutter assembly (shown separately in FIG. 3) fastened by means of two legs 11 in support 5.

This removable cutter assembly comprises five linearly-extending stationary shear combs 12 extending parallel to the pivoting plane of lever 3 and which are mounted in such a way that their upper face be inscribed in a cylindrical envelope. These combs 12 are formed by U-shaped sections perforated by a series of slots 12a perpendicular to the axis of the comb and forming a grill through which pass the hairs that the shaver must cut. Each of these combs 12 is additionally separated from the neighbouring comb by a cross piece 13 made of synthetic material and the visible part of which can be covered by a metallic coating. The extreme left and right combs (as seen in FIG. 1) are additionally covered on their outer lateral surface by a coating element 14.

Each comb 12 is welded on a corresponding section 15 but the opening of which faces towards the inside of the comb. Sections 15 are secured side by side on a single base plate 16 having in its central part an opening 17
permitting claws 8 to project toward the movable inner cutters 19 of the head. Perpendicular to this opening, each section 15 is cut out on its bottom by a longitudinal slot 15a intended also for the passage of claws 8.

The fastening of section 15 on plate 16 is made on the left (FIG. 1) by bent up lugs 16c of plate 16 provided with slots into which extend projections 15b at the extremities of sections 15. On the right, the sections are held together by a piece 18 secured under the plate and having tongues in a number corresponding to the sections and folded thereon. Alternatively they are maintained in side parallel points.

Inside each shear comb 12 is a movable inner cutter 19 formed also by a U-shaped piece the cutting face of which forms the perforated part of the comb with which it is intended to cooperate, and is provided with transverse slots 19a cutting the hafts of the user by a shearing action with the corresponding slots of the comb.

At the two ends of its sidewalls, each inner cutter 19 has two cut outs or slots 20 and 21 (FIGURE 3). Each cut out 20 is slightly restricted in its lower part and then flares circularly above this part along a radius corresponding to that of change or boss projecting from each side of the right hand extremity of an elongated member or stirrup 23 made of plastic material and provided in its central part by a cut out 24 in which engages the corresponding driving claw 8.

Each slot 21 has edges parallel and has dimensions slightly greater than the width of a second shape or boss 25 projecting on each side of the left hand extremity of stirrup 23. These bosses are retained in slots 21 by a little projection 26 at the open end of each slot 21.

In the central part of this upper surface, stirrup 23 forms a kind of boss by means of which it contacts a spring blade 27 to the extremities of which are provided with transverse legs 27a (FIG. 5) engaging on both sides in slots 20 and 21 and which is long enough to permit the bending of this blade downwardly when the cutting head is removed from the shaver, as illustrated in FIG. 5. It occupies the position illustrated in FIGURE 3 as soon as the corresponding claw 8 is inserted in the indented section 24 of the elongated member or stirrup 23, that is when the head is in operating position.

The mounting of stirrup 23 takes place very simply by placing, after having placed spring 27 in slots 20 and 21, stirrup 23 perpendicularly to the longitudinal axis of the knife and engaging its chapes or bosses in the slots 20 of the cutter. The stirrup is then tipped over clockwise and the chapes or bosses 25 are engaged in the slot 21 by forcing slightly the stirrup by elastic deformation during passage past the projections 26.

FIG. 5 shows a side view of the inner cutter assembly when removed from the corresponding shear comb. Spring 27 biases the elongated member or stirrup 23 to its downward position in which each boss 25 (one on each side of 23) is prevented from further movement by a projection 26 on each sidewall of the cutter 19, thereby being retained in slots 21. The leaf spring 27 is retained in position by legs 27a which seat in the bottoms of slots 20 and 21 at each end of the spring. The inner cutter assembly of FIG. 5 can be inserted in the corresponding shear comb from the end thereof, stirrup 23 being pressed upwards so that one side of the indented section 24 can pass over the projection or claw 8 of the driving mechanism.

The elongated member or stirrup 23 is dimensioned so that, when it is in operating position as shown in FIG. 5, claw 8 presses the elongated member or stirrup 23 upwards against the spring 27 to flex the spring. Consequently the spring biases the inner cutter 19 against the shear comb 12 to provide positioning action. Also, the spring biases the stirrup 23 against the claw 8. Since claw 8 and the indented section 24 engage in tapered relationship, the spring biasing eliminates any play at this point. The pivotal connection between stirrup 23 and

the sidewalls of the inner cutter 19 provided by bosses 22 and the rounding of the slots 20 at the points of engagement with the bosses allow these biasing actions to take place.

As shown in FIGS. 1 and 4, the pairs of bosses 22 and 25 project beyond the sidewalls 19 of the inner cutter and engage sections 15 which are welded to the sidewalls of each stationary comb and extend longitudinally therealong with fixed spacing therebetween. Consequently, when the inner cutter is reciprocated, the bosses slide along sections 15 and provide lateral guidance for the inner cutter.

To facilitate the correct positioning of the removable cutter assembly, cover plate 10 has two studs 28 which engage in corresponding openings 29a of plate 29 attached to plate 16 and the folded extremities of which form legs 11 disposed in the center of the assembly of the five cutting elements.

To prevent hairs from passing toward the motor through slots 10a in plate 10, securing legs 11 are provided at their upper end with a joint 30 which bears against the edges of these slots when the head is in shaving position. When the removable assembly shown in FIGURE 3 is removed from the device, springs 31 push outwardly the push buttons 32 controlling the position of the removable element relative to support 5 so that the push button surfaces close the slots of plate 10.

As for the watertightness of the openings made for the passage of the driving claws 8, the same is obtained by placing a plate of synthetic foam 33 between slider 7 carrying the claws and cover plate 10.

It should be noted that support 5 is made of particularly heavy material in order to balance the weight of the handle of the shaver, not shown, which contain transformation elements for obtaining direct current, control means and the motor driving the shaft.

In operation, the cutting head assembly is in the position shown in FIGS. 1 and 2. The rotation of shaft 2 oscillates lever 3 through cam 1 and the wing surfaces 3a. This causes the opposite end 3b of the lever arm to oscillate and thereby reciprocate the slider 7. Claws 8, which are projections on the slider 7, consequently reciprocate in a path which is fixed with respect to the casing, and in a direction lengthwise of the respective stationary shear combs 12. Claws 8 engage indented sections 24 of stirrups 23 in tapered relationship and are biased toward each other by spring 27, thereby eliminating any play in the driving connection. Each stirrup 23 is pivoted at its end to the corresponding inner cutter by bosses 22 and reciprocates the respective cutter 19. Spring 27 at the same time biases the inner cutter against the shear comb 12 as described above.

What is claimed is:

1. A dry shaver comprising
   (a) a casing forming a handle,
   (b) a cutting head mounted at one end of said casing and having at least one linearly-extending stationary shear comb and a movable inner cutter cooperating therewith,
   (c) said inner cutting having a cutting face and sidewalls of a generally U-shaped cross-section,
   (d) an elongated member of rigid material extending lengthwise of said inner cutter between the sidewalls thereof,
   (e) one end of said elongated member being pivoted to said sidewalls near one end of the cutter and the other end being free for movement toward and away from said cutting face,
   (f) a spring extending lengthwise of said inner cutter between the cutting face thereof and said elongated member and engaging the inner cutter near the ends thereof,
   (g) said elongated member being shaped to engage said spring intermediate the ends thereof,
   (h) driving means including a driving member recipro-
cating lengthwise of said shear comb in a path fixed with respect to said casing, (i) a projection on one of said driving and elongated members and a cooperating indented section on the other of the members shaped for tapered engagement therebetween, (j) said elongated member being dimensioned to flex said spring when the cutting head is in a shaving position to thereby bias said movable inner cutter against said shear comb and bias said projection and cooperating indented section into engagement.

2. A dry shaver according to claim 1 in which said projection and cooperating indented section engage intermediate the ends of said inner cutter.

3. A dry shaver according to claim 2 in which said inner cutter has a pair of slots in the sidewalls thereof near one end thereof, and said elongated member has a pair of projecting bosses on the sides thereof at said one end fitting into said slots, said slots being rounded at the points of engagement with said bosses to provide a pivotal mounting thereof.

4. A dry shaver according to claim 3 in which said inner cutter has a second pair of slots in the sidewalls thereof near the other end thereof, said elongated member has a second pair of projecting bosses on the sides thereof at said other end moving in said second pair of slots, and a pair of projections at the openings of said second pair of slots for retaining the second pair of bosses in the slots.

5. A dry shaver according to claim 4 in which said spring is a leaf spring extending between said pairs of slots and having transverse legs seating in the bottoms of said slots at each end of the spring.

6. A dry shaver according to claim 5 in which said indented section is in said elongated member.

7. A dry shaver according to claim 3 including a pair of support members secured to said stationary shear comb along the sides thereof, respectively, and extending longitudinally therealong with fixed spacing therebetween, and in which said inner cutter has a second pair of slots in the sidewalls thereof near the other end thereof and said elongated member has a second pair of projecting bosses on the sides thereof at said other end moving in said second pair of slots, said pairs of bosses extending laterally beyond the sidewalls of said inner cutter and engaging said pair of support members for laterally guiding the inner cutter along said stationary shear comb.

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