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J. H. JACOBS
ELECTRIC RAZOR WITH MULTIPLE ROTARY CUTTER
HEAD AND OSCILLATING COMBS
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Fig. 1

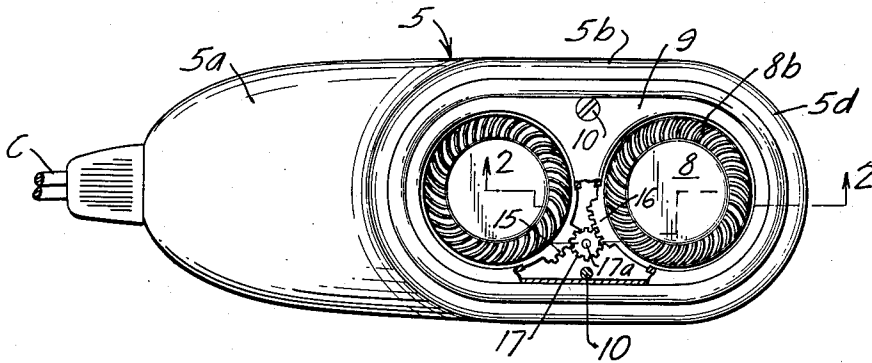


Fig. 2

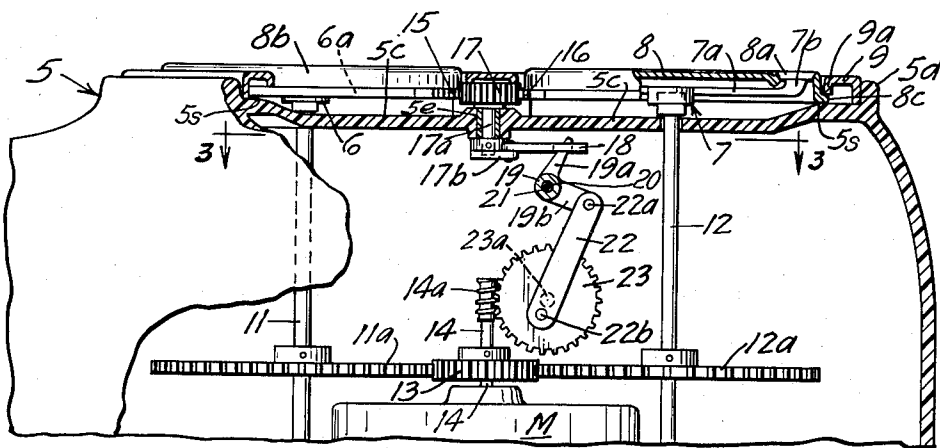
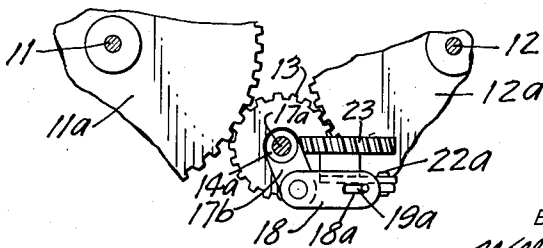


Fig. 3



INVENTOR
BY JOSEPH H. JACOBS
Williamson, Schroeder & Palmatier
ATTORNEYS

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ELECTRIC RAZOR WITH MULTIPLE ROTARY CUTTER HEAD AND OSCILLATING COMBS

Joseph H. Jacobs, Fort Myers, Fla.

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3 Claims. (Cl. 30—43)

This invention relates to small power-driven safety razors often referred to as electric dry shavers or razors for operation upon a human beard. A number of different electric razors are used extensively today, all having in common a blade unit or units driven across the bottom or bottoms of a closely apertured, skin-engaging guard plate or comb.

One type of electric razor now in use employs a rigid housing with conveniently shaped handle or hand-engaging medium and provided with a depressed, elliptical cutter-head-face wherein a double cutter-head unit is mounted. The double cutter-head unit consists in two revolving shearing blade structures disposed in slightly spaced side-to-side relation and each carrying a plurality of edged shearing blades mounted at the ends of radial arms which are affixed to rigid shafts driven at high speed from the motor. The guard plate structure of this electric shaver comprises a pair of stationary comb rings, one for each revolving shearing blade structure and disposed outwardly and concentrically of the series of blades of each shearing structure. The comb rings are provided with closely interspersed, diagonally transverse slots or apertures for accommodation of the individual hairs as the housing is manipulated across the user's face, with the comb rings pressed against the skin.

The chief objection to all of said power-actuated dry shavers or razors is that even with very closely interspersed hair-accommodating apertures or slots, many hairs are missed on one or several strokes of the cutter head across the face or beard of the user. Thus, in conventional dry shavers, the cutting head must be manipulated back and forth and in many directions many times before the hairs are closely cut in any area of the beard.

It is an object of my invention to overcome the objection previously noted, by supplying an efficient cutting head for dry shavers, driven by a motor or the like where the said guard plate or comb ring for receiving and guiding the individual hairs of the beard is oscillated on an axis substantially normal to the plate and preferably concentric with a comb ring in that type of razor to rapidly change the relative positioning of the apertures or slots thereby confining and guiding a far greater percentage of the hairs of the beard in any stroke of the razor over the face.

While my invention is applicable to any electric dry shaver which employs a substantially planar or close to planar apertured guard plate, it is particularly applicable to electric shavers which employ one or more annular comb rings or comb bars with shearing blade or blades driven across the apertured under surfaces thereof.

A further object of my invention is to provide an improved construction of the class described which will lend itself readily to utilization in conventional electric dry shavers now in wide use without requiring substantially alteration of driving means for the cutter or shearing blades.

The foregoing and other objects with regard to the invention will appear more clearly from the following de-

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scription made in connection with the accompanying drawings in which like reference numerals refer to similar parts throughout the several views and in which:

Fig. 1 is a front elevation showing my invention embodied in a dual cutter head type of rotary electric shaver;

Fig. 2 is a view mostly in vertical section taken on the line 2—2 of Fig. 1 with some portions of the housing and electric motor broken away; said view being taken on a larger scale; and

Fig. 3 is a horizontal cross section taken on the line 3—3 of Fig. 2 showing the driving connections for oscillating the guard or comb rings as well as the driving connections for the respective cutter or shearing blade structures.

In the embodiment illustrated, all working parts of the electric dry shaver are housed within or upon a rigid housing 5 having a longitudinal handle portion 5a and a laterally protruding cutter head portion 5b of generally oval shape, and having a depth to accommodate and having rigidly mounted therein, the motor case of a small electric motor M. Service cord C extends longitudinally through the handle portion of housing 5a and electrically connects (not shown) to the terminals of motor M.

The housing 5 has a depressed oval shaped cutter head face 5c defined peripherally by an outstanding, narrow flange 5d of oval shape and having defined in the depressed portion shallow recesses for receiving the cutting or shearing head units identified as entireties by the numerals 6 and 7 respectively. Each of the cutting units or shearing structure as shown, consists in a central hub carrying a plurality of radial arms 6a and 7a (in the two units shown) which terminate at their outer ends in outwardly projecting blades 6b and 7b respectively, having edges which circumferentially sweep across the slotted annular portions 8a of respective skin-engaging guard plates 8 mounted for independent oscillation upon annular shoulders 5s provided in the depressed portion 5c of the cutter face of the housing. It is to be understood that one of said annular shoulders is provided for each of the cutter heads.

The identical guard plates 8 for the two cutter units comprise slightly raised comb rings 8b concentrically disposed of the cutter heads 6 and 7 in each instance and slightly raised from the central flat portions of the guard plates. As shown, the comb rings are transversely slotted along obliquely curved lines closely interspersed to guide and accommodate in the slots, individual hairs of the beard. The circular guard plates which include the comb rings 8b have narrow, outturned annular flanges 8c which are mounted for oscillation on the annular shoulders 5s of the depressed portion of the housing and which underlie and slidably engage depending annular shoulders 9a of a retaining and cover plate 9 which is generally oval in marginal shape and has formed in the body thereof, two enlarged annular openings for accommodating the guard plates 8 with the comb rings 8b protruding therefrom. Said depending annular shoulders 9a extend inwardly or downwardly from the said openings for accommodating the guard plates. The cover and retaining plate 9 may be suitably affixed to the housing as by screws 10 which threadedly engage bosses or lugs formed in the depressed cutter head face 5c of the housing.

The hubs of the two rotary cutter units 6 and 7 are rigidly affixed to the outer ends of rotary shafts 11 and 12 respectively, which are suitably journaled at their outer ends in the depressed, rigid face portion 5c of the housing and have affixed near their lower or inward extremities driven gears 11a and 12a respectively. Said gears 11a and 12a are in mesh with the relatively small gear or pinion 13 affixed to the output such as the armature shaft 14 of the motor M. Said shaft 14 as shown, extends outwardly for some distance beyond and above the pinion

13 and has formed on the outer portion thereof, a worm 14a. The gears 11a and 12a being of several times the diameter of the pinion 13 are driven at relatively lower speed, ranges of from 1200 to 2500 r.p.m. being desirable where the cutter heads carry from 4 to 6 blades 7b.

I provide simple driving means powered from the motor shaft 14 as shown, for oscillating the circular guard plates 8 and of course the slotted cutter combs 8b formed integrally therewith. Various mechanisms may be successfully applied and in the form illustrated, I provide peripheral portions of the circular peripheries of the guard plates 8 with gear segments 15 and 16 respectively, said gear segments being both meshed at opposite sides with a small pinion 17 which is affixed to a rock shaft 17a journaled in a tapped boss 5e formed at an appropriate point in the depressed face 5c of the housing. The shaft 17a extends downwardly below the face 5c of the housing and has affixed at the inner end thereof a short rocker arm 17b which is pivoted at its outer end to a shift link 18. This shift link 18 has a longitudinal slot 18a adjacent its outer end which accommodates the upstanding arm 19a of a bell crank lever indicated as an entirety by the numeral 19 and pivoted on a horizontal stub shaft 20 which extends from a heavy bearing boss 21 (see Fig. 2) integrally cast or otherwise rigidly secured to one of the side portions of the interior of housing 5. The lower arm 19b of the bell crank lever is pivoted at its outer end by a pin 22a to the upper end of a pitman link 22 which has its lower end pivoted by a pin 22b to an eccentric point on one face of a worm gear 23. Worm gear 23 is in mesh with the worm 14a carried by the armature shaft of the motor. The worm gear is affixed to a transverse shaft 23a which is journaled (not shown) in an elongated stud or rigid member which is affixed to or integrally cast with the side of the interior of the housing 5 opposite from the housing side from which the bearing boss 21 projects for mounting and journaling the bell crank lever 19.

The speed-reducing effect through driving of the worm gear 23 from the worm 14a of the motor shaft 14 is such that the worm gear 23 is revolved somewhere in a range between 250 and 500 revolutions per minute, this of course because of the pitman connection precisely determining the oscillations of the two hair-receiving and guiding comb rings 8b at substantially slower speed than the revolution of the cutter heads 6 and 7.

While oscillation of the comb rings 8b through various fractions of a revolution are all successful for the purposes desired, it is adequate to achieve highly successful results if the oscillation varies between 15 and 30 degrees.

From the foregoing description it will be obvious that when the motor M is driven the two multi-bladed cutter head mechanisms or shearing structures will be revolved at high speed with the several edged blades 6b and 7b respectively thereof, circumferentially moving across and in working contact with the bottom annular portions of the guard plates and cooperating with the hair-receiving apertures or slots of the respective comb rings to efficiently shear the entrained individual hairs. The cutter face of the housing may be manipulated back and forth across the beard at cheeks, neck, chin, etc., and while the cutter heads are rapidly revolving, the circular guard plates and more particularly the comb rings 8a are oscillated at substantially slower speed than the revolution of the cutter heads, but nevertheless are oscillated a number of times each second. Yet in such oscillations of the comb rings the positioning of the hair-receiving apertures and slots is constantly changed, thereby causing a large percentage of all of the hair of the beard to be engaged and guided as the shaver is pressed against the skin and moved in one direction.

The gained efficiency obtained through the combinative manipulation of the overall housing in one direction and the rapid oscillation of the comb rings or guard plates

in rotative and opposite directions achieves unexpected results and has very high efficiency in the cutting of hair. In this connection the oscillation of an annular, closely slotted or apertured guard plate or comb is particularly advantageous to engage and project the hairs in the beard into the paths of the cutter heads when the device is manipulated in more or less linear movement.

With my improved construction the time required to obtain a clean cut shave of the entire beard may be reduced by at least 40% as contrasted with the time required in conventional dry shavers of the general type of my structure illustrated.

While my invention may be applied to numerous types of power driven safety razors where the guide plate or plates is or are disposed substantially in planar relationship, it is particularly adapted for highest efficiency to a multi-cutting-head razor of the type illustrated where two or more closely apertured or slotted comb rings are disposed in side by side relation. In this connection it will be noted that the simultaneous oscillation and constantly variable positioning of the comb rings with the diagonally transverse slots therein is in opposite directions on the two rings, due to the fact that opposite sides of the small oscillating pinion 17 are meshed with the respective gear segments 15 and 16. This combination with the dual cutting mechanisms in the manipulation of the overall device upon the beard, produces engagement, guiding and entrainment of the maximum number of hairs during each stroke of the dual cutter face.

From the foregoing description it will be seen that I have provided simple but highly efficient improvements for so-called electric dry shavers adapted to be applied to a number of different structures now in commercial use. My invention is not limited to a rotary cutter head assembly or to the shifting in opposite directions by oscillation of a circular guard plate. The reverse shifting of the guard plate accomplished by my invention does contemplate reciprocating shifting of the guard plate in a plane as distinguished from bodily swinging of a frame or mounting on an axis disposed parallel to the center line or other line of the plate.

It will of course be understood that various changes may be made in the form, details, arrangement and proportions of the parts without departing from the scope of my invention.

What is claimed is:

1. In a power safety razor, a housing having a cutter-head-face and an exterior portion of a configuration to be grasped and guided by human hand, a pair of substantially circular skin-engaging guard plates mounted in closely spaced, side by side relation across said face for independent oscillations therein and each having an outstanding comb ring provided with closely interspersed generally transverse hair-receiving slots, a driven cutter head for each of said guard plates having edged blade means movable circumferentially across the inner surface of the associated comb ring, an electric motor mounted within said housing and having a power takeoff shaft, driving connections between said power takeoff shaft and said two cutter heads, and oscillating mechanism drivingly interposed between said power takeoff shaft and both of said circular guard plates, said mechanism including speed reduction means and mechanical movement media for converting constant rotary power from said shaft to rotatively oscillatory movement of both of said circular guard plates in opposite directions simultaneously and through in each case, small circular segments.

2. In a power safety razor, a housing having a cutter-head-face and an exterior portion of a configuration to be grasped and guided by human hand, a pair of substantially circular skin-engaging guard plates mounted in closely spaced, side by side relation across said face for independent oscillations therein and each having an outstanding comb ring provided with closely interspersed generally transverse hair-receiving slots, a driven cutter

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head for each of said guard plate shaving edged blade means movable circumferentially across the inner surface of the associated comb ring, an electric motor mounted within said housing and having a power takeoff shaft, driving connections between said power takeoff shaft and said two cutter heads, and mechanism connected for driving with said motor-power-takeoff shaft and having an oscillatory output terminal connected with both of said guard plates for simultaneously oscillating said guard plates of the two cutter units in opposite directions through small circular segments at a substantially slower speed than the speed of said cutter heads.

3. In a power safety razor, a housing having a cutter-head-face, a pair of substantially circular skin-engaging guard plates mounted in side-by-side relation across said face for independent oscillations therein and each having a comb ring provided with closely interspersed hair-receiving slots extending transversely of the ring, a cutter head for each of said guard plates having edged blade means movable circumferentially across the bottom of the associated comb ring, said cutter heads being mounted within said housing, an electric motor mounted within said hous-

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ing and having power takeoff means, driving connections between said power takeoff means and said two cutter head units, said circular guard plates having gear segments thereon on opposed marginal portions thereof, an oscillating pinion mounted in said housing adjacent said face and meshed on opposite sides thereof with said respective gear segments and driving connections between said pinion and said power takeoff means for oscillating said pinion through partial revolutions in opposite directions during the operation of said motor and cutter heads.

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