May 14, 1963 J. A. GALVAO 3,089,236

ELECTRIC SHAVER WITH IMPROVED TUBULAR COMB AND ROTOR TYPE CUTTING HEAD

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FIG. 1

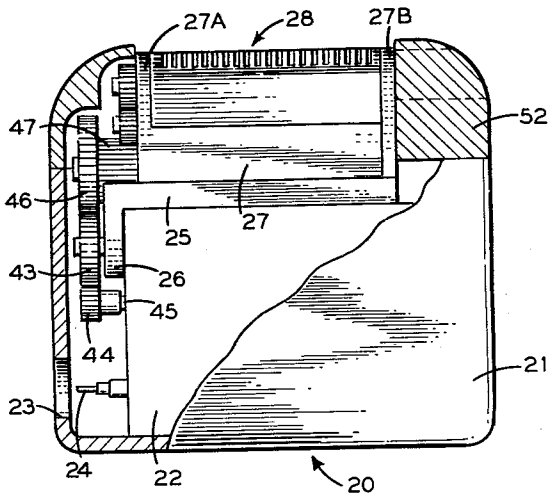


FIG. 3

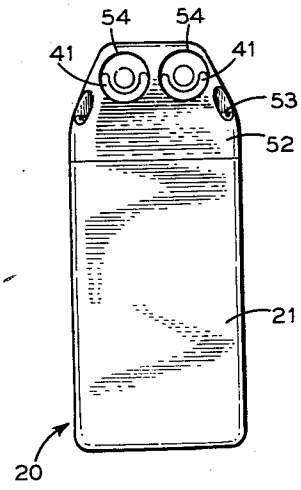


FIG. 2

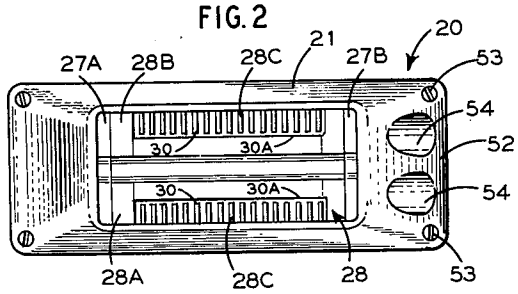


FIG. 4

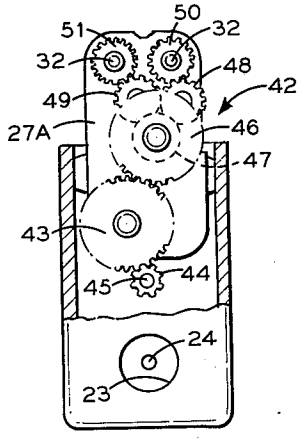


FIG. 7

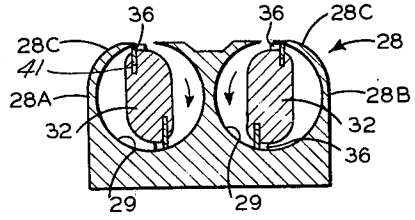
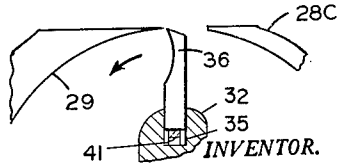


FIG. 17



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ELECTRIC SHAVER WITH IMPROVED TUBULAR COMB AND ROTOR TYPE CUTTING HEAD

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FIG. 8

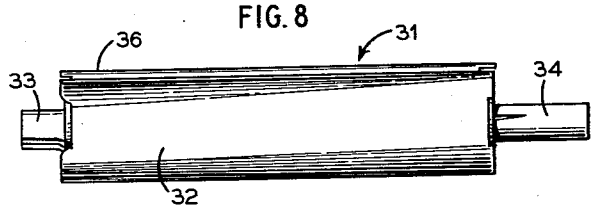


FIG. 9

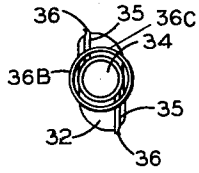


FIG. 16



FIG. 10

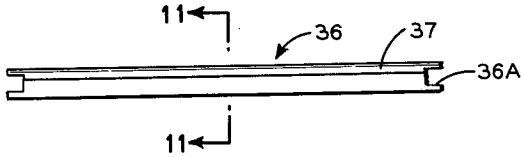


FIG. 11

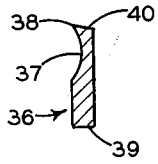


FIG. 12

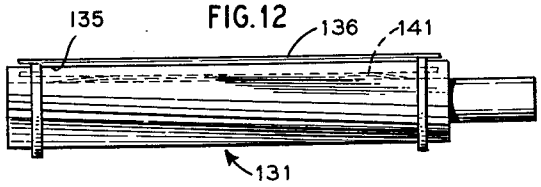


FIG. 13

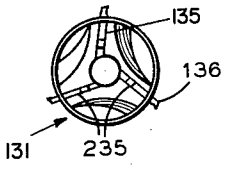


FIG. 14

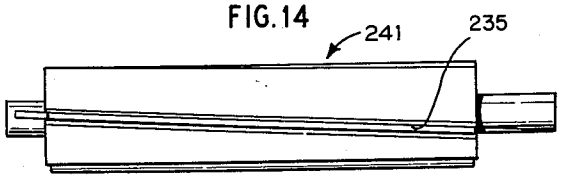


FIG. 15

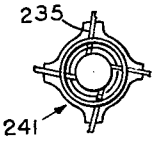


FIG. 6

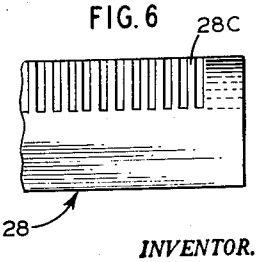
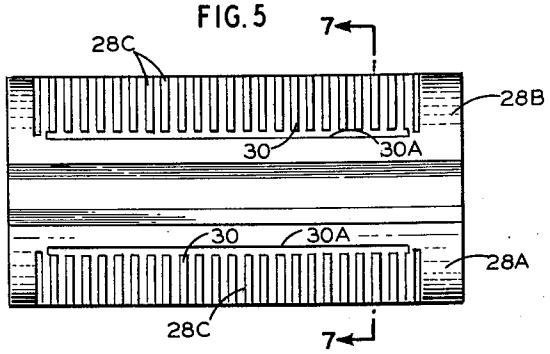


FIG. 5



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ELECTRIC SHAVER WITH IMPROVED TUBULAR COMB AND ROTOR TYPE CUTTING HEAD

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3 Claims. (Cl. 30—41)

This invention relates generally to an electrically operated shaving device. More particularly it is directed to an electric shaver having an improved shaving head of the rotary type, and it constitutes an improvement of the device described in my Patent No. 2,574,472 for a Motor Operated Shaving Device.

An object of this invention is to provide an electric shaver with an improved head construction which comprises a plurality of tubular combs, each having a plurality of blades detachably secured to a rotor journaled in each of the combs.

Another object is to provide an improved shaving head in which the hairs are cleanly severed by a shearing action.

Another object is to provide an improved shaving head in which the rotating cutters positioned within each tubular comb are constructed and arranged so as to actually touch the skin without breaking the same during a shaving operation to insure a smooth, clean, close shave.

Another object is to provide a shaving head having a plurality of tubular combs in which the rotating cutters are counter-rotative.

Still another object is to provide a multiple shaving head in which each comb is self-cleaning during a shaving operation.

And another object is to provide an improved rotor having a plurality of readily removable and replaceable hollow ground cutting blades retained thereto.

A feature of this invention resides in a gear train to impart counter-rotation to the multiple cutters within adjacent combs.

The various features of novelty which characterize this invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there is illustrated and described a preferred embodiment of the invention.

In the drawings:

FIG. 1 is a front elevation view of the improved shaver, having parts broken away and shown in section.

FIG. 2 is a top plan view of FIG. 1.

FIG. 3 is the right end view of FIG. 1.

FIG. 4 is the left end view of FIG. 1 illustrating a specific gear train for counter-rotating the rotating cutters of the respective combs.

FIG. 5 is a detail plan view of the tubular multiple comb head.

FIG. 6 is a fragmentary front elevation view of FIG. 5.

FIG. 7 is a section view taken along line 7—7 of FIG. 5.

FIG. 8 is a detail elevation view of a cutting blade rotor in accordance with this invention.

FIG. 9 is an end view of the rotor of FIG. 2.

FIG. 10 is a detail elevation view of the cutting blade of this invention.

FIG. 11 is a section view of the blade taken along line 11—11 of FIG. 10.

FIG. 12 is a front elevation view of a modified rotor.

FIG. 13 is an end view of FIG. 12.

FIG. 14 is a detail front elevation view of still another modified rotor.

FIG. 15 is an end view of FIG. 14.

FIG. 16 is a detail view of the blade spring.

FIG. 17 is a partial enlarged detail view of FIG. 7.

Referring to the drawings, numeral 20 designates an electric shaver which comprises a lower housing or casing 21 in which an electrically operated motor 22 is encased. In one end of the casing at the bottom thereof there is provided an opening 23 through which the wire cord (not shown) is connected to the motor male plug 24. Above the motor 22 is a bracket 25 which has a depending flange 26, and a head block 27 is secured to the bracket 25. Between the upright ends 27A and 27B of the block there is positioned the shaving head 28, which is accordance with this invention comprises a multiple tubular comb head of two or more. However, for descriptive purposes, the illustrated head includes only a pair of integrally connected tubular combs 28A and 28B.

As shown in FIGS. 5 to 7, the two tubular combs 28A, 28B each include an inner annular wall surface 29, an outer portion of which is defined by a plurality of transversely extending spaced teeth 28C which terminate in a slot 30 extending longitudinally of each comb 28A, 28B. In the illustrated arrangement the width of each slot 30 is approximately .01 of an inch or less. As shown in FIG. 7, the ends of each comb teeth taper to a fine edge, with the top of each comb machined flat to provide an extended surface which is adapted to be pressed against the portion of the body to be shaved.

Co-operating with each tubular comb 28A, 28B is a rotor 31 which comprises an elongated blade holder 32. As shown in FIGS. 8 and 9, the blade holder 32 has a pin 33, 34 extending beyond either end thereof by which the blade holder 32 is rotatably journaled to end pieces 27A and 27B of the head block 27. End piece 27B is rendered readily detachable to facilitate assembly. In this form the blade holder 32 is provided with a pair of radially disposed grooves 35 spaced 180° apart. Each groove 35 extends longitudinally of the blade holder and it is constructed so as to traverse a segment of a helix.

In accordance with this invention an improved blade construction is detachably retained in each of the grooves 35. Referring to FIGS. 10 and 11 the blade 36 consists of a spring steel metal blank which is hollow ground at 37 along the longitudinal upper edge thereof to provide a sharp cutting edge 38 thereat. The bottom 39 of the blade is squared whereas the top 40 of the blade is angled or sloped downwardly. The blade is sufficiently flexible so that it readily assumes the helical segment of the retaining groove 35 when placed therein. The ends of the blade are provided with notches 36A and if desired a retaining or split ring 36B may be fitted in the end grooves 36C of the holder and serve to loosely retain the blade within the groove.

A best seen in FIG. 17, disposed between the bottom of each groove 35 and its respective blade 36 is a flat leaf

spring 41 which normally exerts a force tending to urge the blade 36 out of its groove 35. With the blade and spring fixed to the blade holder 32 and the blade holder within its respective comb 28, the spring 41 normally urges the cutting edge 38 of the blade 36 into engagement with the inner annular wall 29 of the respective comb 28.

As shown in FIGS. 7 and 9, the blade 36 is positioned within its respective groove 35 so that upon rotation of the rotor, any hairs projecting into the slots 30 are severed by a shearing action produced as the blade's helically disposed cutting edge rotates past the inner edge 30A of the longitudinally extending slots 30. It is to be noted that the slope 40 of the upper end of the blade permits only the cutting edge 38 to engage the inner annular wall surface 29 of the respective combs in a line contact therewith, thus reducing friction.

The end piece 27B in which one end of the blade holder 32 is journaled is provided with a crescent shaped opening 41 through which the cut hairs are ejected. It will be noted that the twist imparted to the blades due to the helical grooves 35 not only functions to co-operate to shear the hairs, but also functions in the nature of a screw to direct the hairs out through openings 41, thus rendering the shaving head self-cleaning.

Means for counter-rotating each rotor 32 include a gear train 42. As illustrated, the train 42 comprising a relatively large diameter gear 43 is journaled to the flange 26 of the bracket 25; and it is in driving relationship with the drive pinion 44 connected to the motor armature shaft 45. In meshing relationship with gear 43 is a second or intermediate gear 46 journaled to the block 27. A smaller speed reducing gear 47 fixed to the gear 46 is rotated therewith. Meshing with the speed reducing gear 46 are a pair of twin, relatively small diameter gears 48, 49 which mesh with each other and with the driven gears 50 and 51, respectively, journaled to the longer journal pin of the respective rotors 32. Thus it will be noted that rotary movement of the motor armature shaft 45 is transmitted through the illustrated gear train to impart counter-rotation to the respective rotors 32.

FIGS. 12, 13 and 14, 15 illustrate modified embodiments of a blade holder which may be disposed within the tubular comb. In FIGS. 12, 13 the blade holder 131 is constructed to hold three blades 136 positioned at angular intervals of 120°. The blade grooves 135 of this embodiment likewise constitute a segment of a helix and the blades 136 retained therein are similar in construction as hereinbefore described. Also spring means 141, as described, are provided to urge the blades 136 against the inner annular wall of the tubular comb.

The blade holder 241 embodiment of FIGS. 14, 15 is similar, except that it is provided with four radially disposed grooves 235 each being fitted with a flat spring and blade as hereinbefore described.

Completing the shaver assembly is a closure or cap member 52 which is detachably connected to the lower housing 21 by a plurality of screws 53. As shown this closure 52 is provided with a pair of openings 54 in one end thereof that are in alignment with openings 41 through which the hairs are ejected.

While in accordance with the provisions of the statutes there is illustrated and described herein the best form and mode of operation of the invention now known to the inventor, those skilled in the art will understand that changes may be made in the form of the apparatus disclosed without departing from the spirit of the invention covered by the claims, and that certain features of the invention may sometimes be used to advantage without a corresponding use of other features.

What is claimed is:

1. A shaver comprising a housing, a motor means positioned in said housing, said motor means having a pinion gear connected to the end of the motor shaft, a shaving head operatively connected to said motor, said shaving head comprising a plurality of tubular combs, each having an inner annular wall surface, and transversely extending comb teeth terminating at a slot extending longitudinally of the respective combs, a cutting means rotatably mounted in each of said combs, each cutting means including an elongated blade holder rotatably journaled to said head, each of said holders having a plurality of longitudinally extending, radially disposed grooves, each of which twist to comprise a segment of a helix, a flat straight cutting blade having a hollow ground cutting edge positioned in each of said grooves and adapted to assume the helical twist of said groove, a flat spring lead positioned in each groove normally urging said cutting blade into contacting relationship with the inner end of its respective tubular comb, means for loosely retaining each of said blades in its respective groove, a pinion gear connected to each of the blade holders at one end thereof, a gear train in meshing relationship with said motor drive pinion gear and said blade holder driven pinion gears to impart counter-rotation to said blade holders, and means through which the cut hairs are automatically ejected during a shaving operation.

2. An electric shaver comprising a housing, an electric motor positioned in said housing, said motor having a pinion gear connected to the end of the motor armature, a bracket connected to said motor, a head block secured to said bracket, said head block having an integrally formed upright end piece on one end thereof and a readily detachable end piece connected to the other end, a shaving head secured to said head block between the end pieces thereof, said shaving head comprising a plurality of tubular combs, each having an inner annular wall surface and transversely extending comb teeth terminating at a slot extending longitudinally of the respective combs, and a cutting means rotatably mounted in each of said combs, each cutting means including an elongated blade holder rotatably journaled in the end pieces of said block, each of said holders having a plurality of longitudinally extending, radially disposed grooves, each of which twists to comprise a segment of a helix, a straight edge cutting blade having a hollow ground cutting edge positioned in each of said grooves and adapted to assume the helical twist of said groove, a flat spring leaf positioned in each groove normally urging said cutting blade into contacting relationship with the inner end of its respective tubular comb, means for loosely retaining each of said blades in the grooves of its respective holder, a pinion gear connected to each of the blade holders at one end thereof, a gear train in meshing relationship with said motor drive pinion gear and said blade holder driven pinion gears for counter-rotating said blade holders, and one of said end pieces having an opening adjacent a journaled end of said blade holder through which the cut hairs are automatically ejected during a shaving operation.

3. For use in an electric shaver, an improved self-cleaning shaving head comprising a tubular comb having an inner annular wall surface and transversely extending comb teeth terminating at a slot extending longitudinally of said tubular comb; and a cutting means arranged to rotate through a complete revolution of 360° within said tubular comb, said cutting means including an elongated blade holder having a longitudinally extending groove traversing a segment of a helix, a readily detachable and expendable straight edge cutting blade positioned in said groove to assume the shape of said helix, said blade being hollow ground along the upper edge thereof to define a sharp cutting edge, said blade being squared at the bottom and downwardly sloped from its cutting edge at the top thereof, said blade having notched end portions, a flat spring means acting on said blade within said groove normally urging said cutting blade into contacting relationship with the inner annular wall of said tubular comb, and retaining means engaging said notched end portions of said blade for loosely retaining said blade in said groove to said holder, said retaining means including readily releasably split rings adapted to be fitted into end grooves

formed in the ends of said blade holder, and means for rotating said cutting blade.

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