

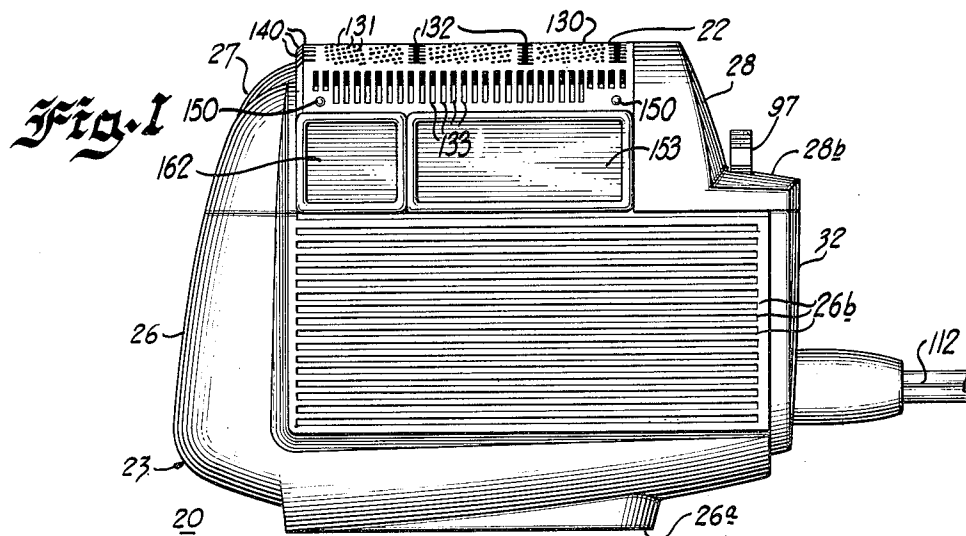
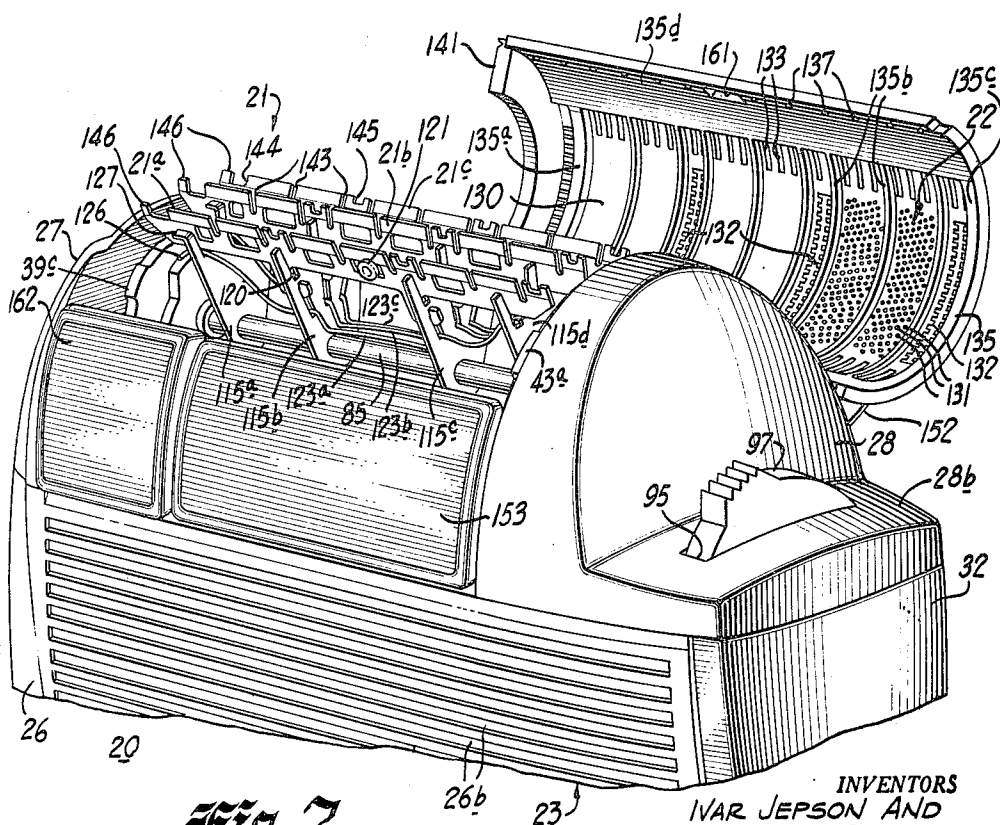
July 27, 1965

I. JEPSON ETAL
ELECTRIC DRY SHAVER

3,196,539

Filed May 12, 1961

6 Sheets-Sheet 1



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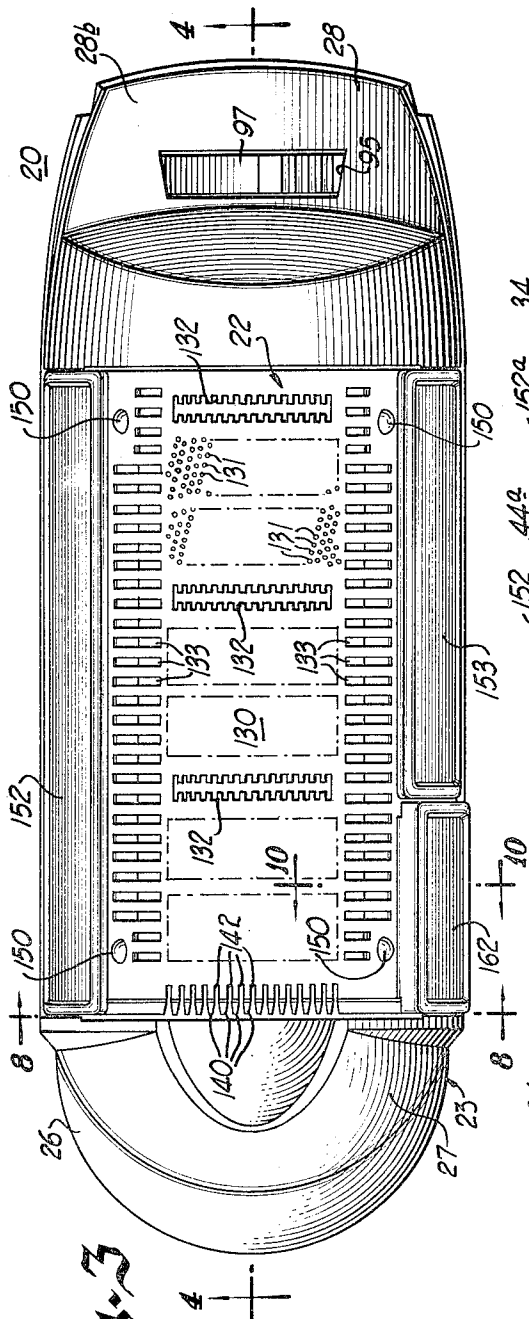


Fig. 3

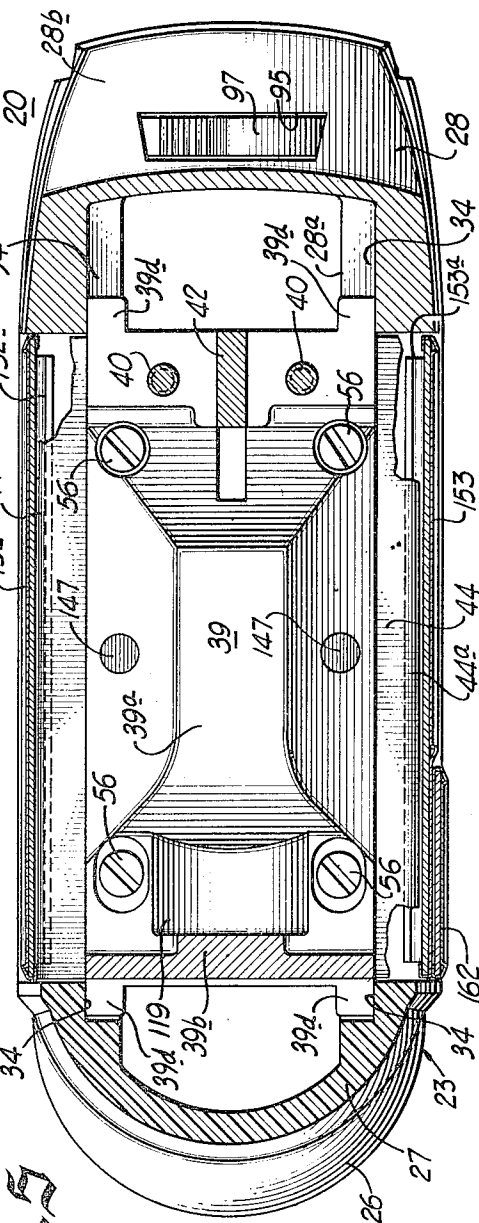


Fig. 5

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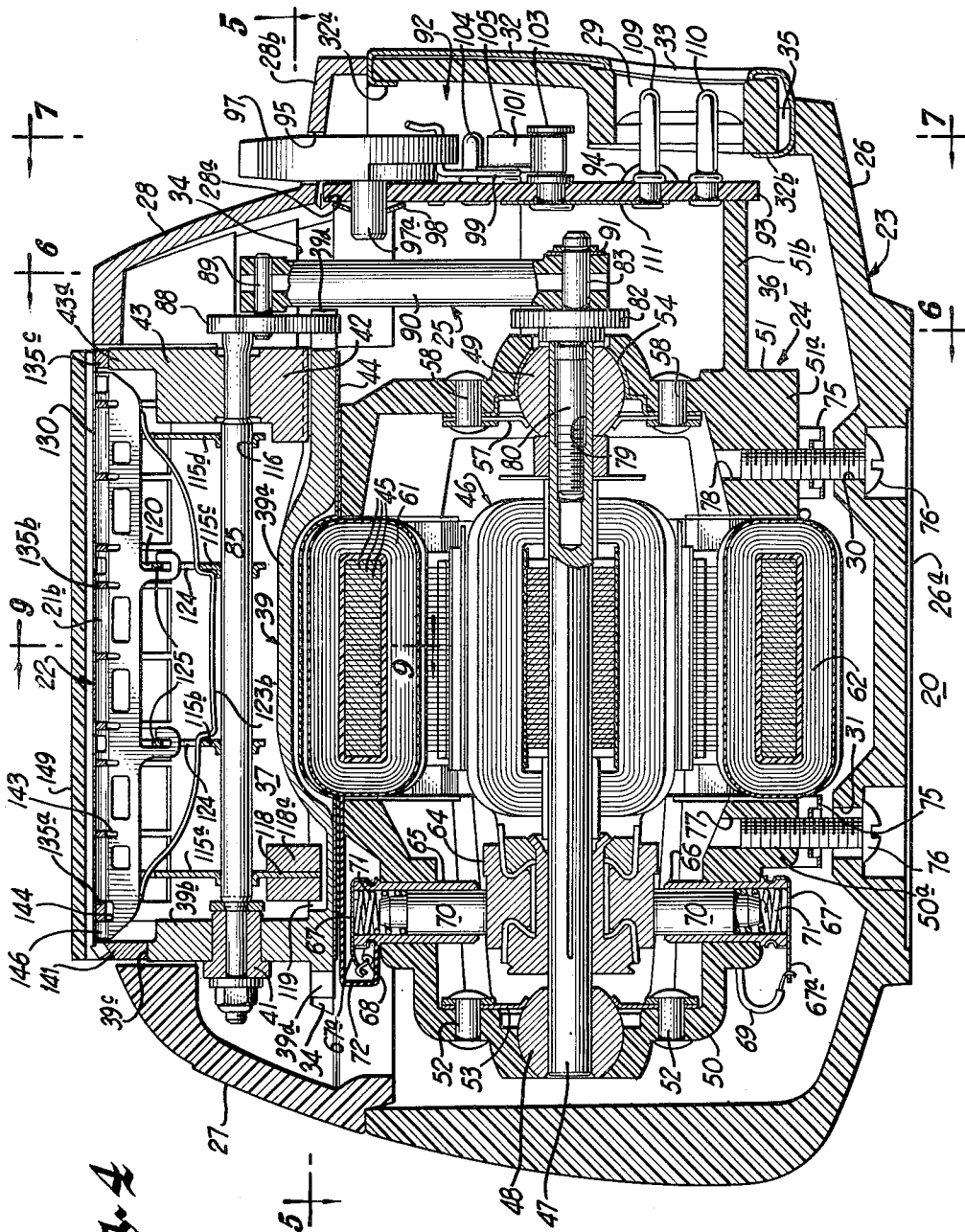


Fig. 4

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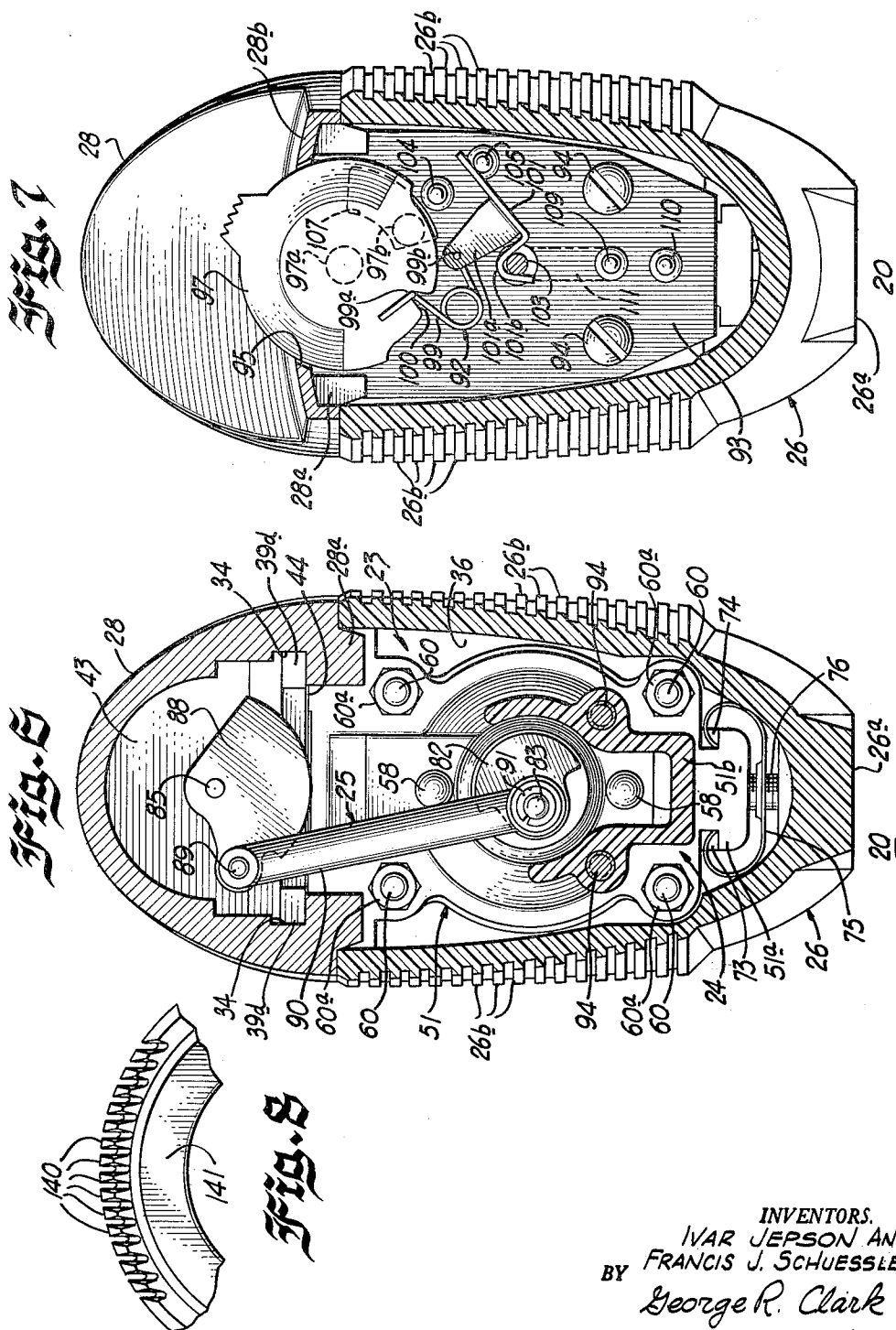
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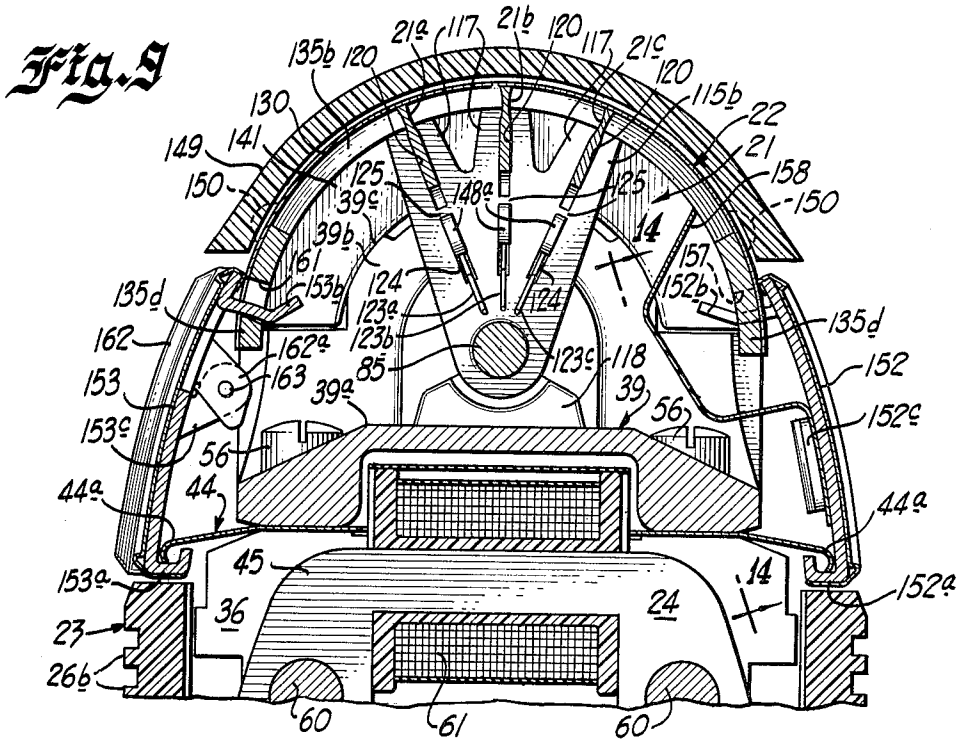
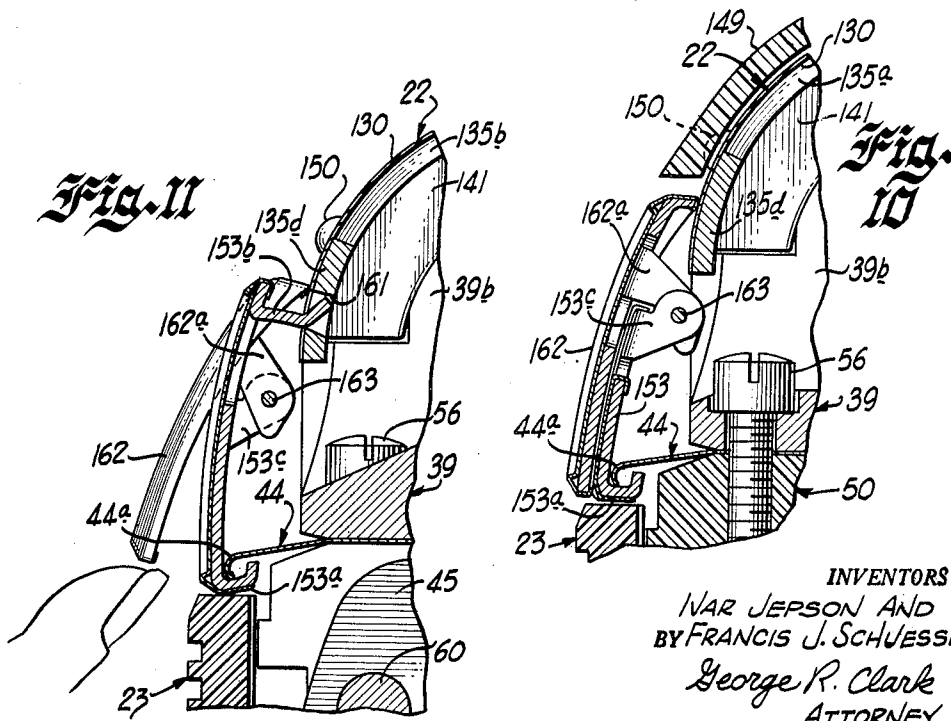
I. JEPSON ETAL

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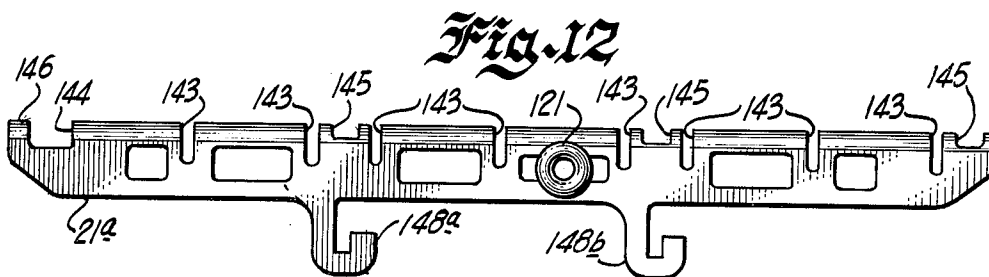
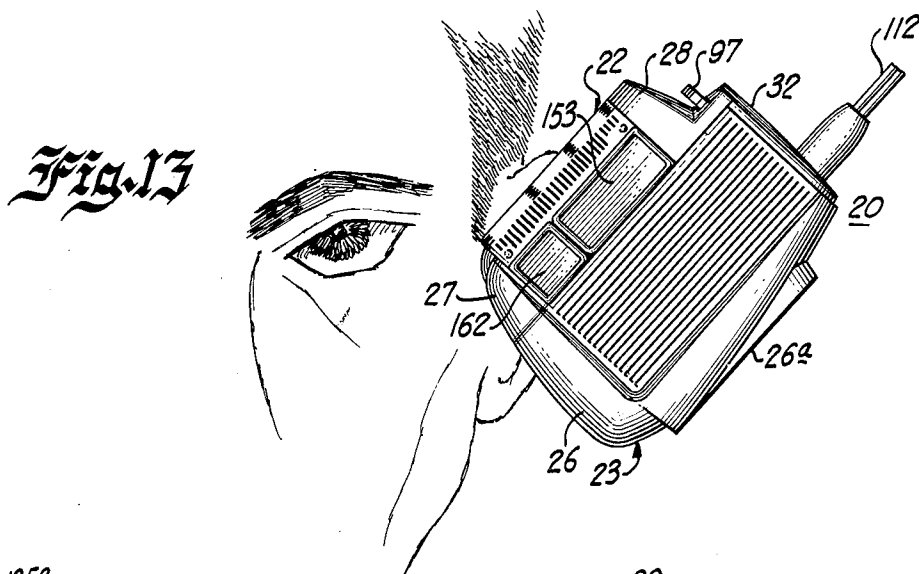
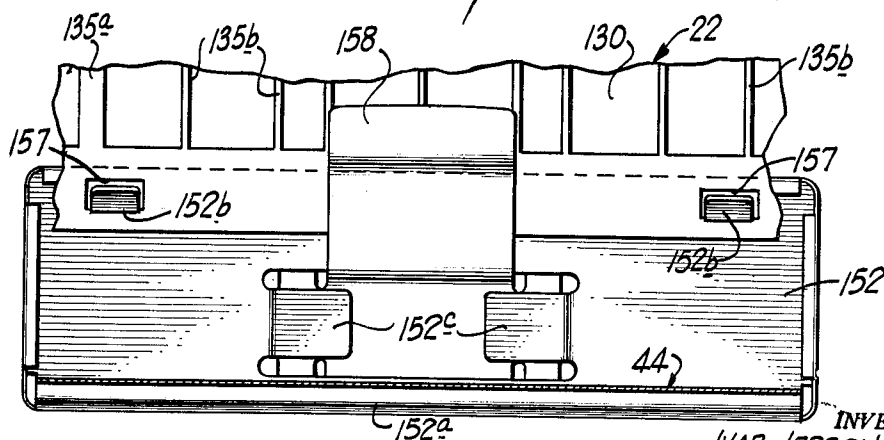
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6 Sheets-Sheet 6



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3,196,539

ELECTRIC DRY SHAVER

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Filed May 12, 1961, Ser. No. 109,551

13 Claims. (Cl. 30—43.9)

This invention relates to apparatus for removing beards or face hair as well as effecting depilation of hair on the arms, legs and other portions of the human body, and is generally referred to as an electric dry shaver. More particularly, the present invention is in the nature of an improvement on the electric dry shaver disclosed and claimed in Jepson Patent No. 2,688,184, granted September 7, 1954 and assigned to the same assignee.

Electric shavers of several different types are extensively employed by many persons as the sole means of shaving. The type of electric shaver disclosed in the above-mentioned Jepson patent has proved to be unusually satisfactory for reducing shaving time while still furnishing a very satisfactory shave. Moreover, this shaver has been designed so that it may be held comfortably and conveniently in the hand of the operator. Proof of the desirability of this design is evidenced by the fact that all major electric shavers sold on the market today are essentially of the general shape and configuration of the shaver shown in the Jepson patent which was a radical departure from preceding shaver designs.

The type of shaver disclosed in the above-mentioned Jepson patent is one in which the beard enters the shaving head through a curved comb perforated with a network of small holes. An oscillated cutter travelling back and forth across the comb at high speed and thrown by centrifugal force against the inside surface of the comb whisks off the beard. The cutter floats in a cutter header and shaft assembly that is oscillated by a powerful electric motor having speeds in excess of 8000 cycles per minute.

It would be desirable in a shaver of the type shown in the above-mentioned Jepson patent to provide improved means for removing the hair or clippings accumulated by the shaver, to provide improved cutting means and to provide means whereby the clipping of a mustache, sideburns and the like can be accomplished with greater ease and accuracy.

Accordingly, it is an object of the present invention to provide a new and improved electric dry shaver.

It is another object of the present invention to provide an electric dry shaver having improved cutting means.

It is a further object of the present invention to provide an improved electric dry shaver having a plurality of oscillating cutting blades.

Still another object of the present invention resides in an electric dry shaver having a trimming portion for cutting long hairs on the neck, ears, nose and sideburns, as well as for trimming a mustache or the like, which trimmer is completely safe with no moving parts exposed.

A still further object of the present invention resides in an improved mounting means for the curved comb for removing the accumulated hairs collected after repeated operations of the electric dry shaver.

Still another object of the present invention resides in an electric dry shaver having an improved switch means incorporated as a part thereof so that by a mere actuation of the switch the shaver is turned on and off.

Further objects and advantages of the present invention will become apparent as the following description proceeds and the features of novelty which characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

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For a better understanding of the present invention, reference may be had to the accompanying drawings in which:

FIG. 1 is a side elevational view of the electric shaver of the present invention with the start-stop switch in the open position;

FIG. 2 is an enlarged perspective view of the upper portion of the shaver of FIG. 1 shown with the comb in the open position;

FIG. 3 is an enlarged top plan view of FIG. 1;

FIG. 4 is a sectional view taken on line 4—4 of FIG. 3, but with a comb guard shown over the comb and the start-stop switch in the closed position;

FIG. 5 is a sectional view taken on line 5—5 of FIG. 4, assuming that FIG. 4 shows the complete structure;

FIG. 6 is a sectional view taken on line 6—6 of FIG. 4, again assuming that FIG. 4 shows the complete structure, but with the comb guard removed;

FIG. 7 is a sectional view taken on line 7—7 of FIG. 4, also assuming that FIG. 4 shows the complete structure, but with the comb guard removed;

FIG. 8 is a fragmentary view looking in the direction of the arrows 8—8 of FIG. 3;

FIG. 9 is an enlarged fragmentary sectional view taken on line 9—9 of FIG. 4, again assuming that FIG. 4 shows the complete structure;

FIG. 10 is a fragmentary sectional view taken on line 10—10 of FIG. 3;

FIG. 11 is a fragmentary view of a portion of FIG. 9 illustrating how one releases the comb latch of the present invention;

FIG. 12 is an elevational view of an outside one of the plurality of cutting blades of the electric dry shaver of the present invention;

FIG. 13 is a view somewhat similar to FIG. 1 showing the dry shaver of the present invention used in a trimming operation for trimming sideburns; and

FIG. 14 is a sectional view taken on line 14—14 of FIG. 9 to illustrate the mounting of the comb to the comb lock.

Briefly, the present invention is concerned with an electric dry shaver having a plurality of oscillating cutting blades cooperating with a perforated comb and depending upon centrifugal force and spring means for moving the cutters into engagement with the comb. The shaver includes an ON-OFF switch of improved design for controlling the same and an improved means of locking and supporting the comb and releasing the same for cleaning out accumulated clippings. It further includes an improved arrangement being merely an extension of the same cutting blades for providing a trimming function. The entire mechanism is mounted in a compact casing which is easy to manipulate and provides a large shaving area to insure high speed removal of hair.

Referring now to the drawings, the present invention is illustrated as embodied in an electric dry shaver generally designated by the reference numeral 20. Essentially, the shaver comprises a cutting assembly or mechanism, generally designated at 21, comprising a plurality of cutters 21a, 21b and 21c, coacting with a comb or cutting surface 22. The comb and cutter mechanism are associated with a suitable casing, generally designated at 23, and the comb 22 preferably comprises a substantial portion of the surface of the casing 23. Housed within the casing 23 is a suitable electric motor, generally designated at 24, which is adapted to be connected by suitable driving means, generally designated at 25, with the cutting or cutter mechanism 21 in order to cause oscillation of this cutter mechanism at a speed in excess of 8000 cycles per minute.

As is fully disclosed in the aforesaid Jepson patent,

the casing 23 is of boxlike configuration so that it may be readily held in the hand of the user and no further discussion of this feature is included herewith.

For ease of assembling the electric shaver 20 of the present invention, the casing 23 essentially comprises three parts designated as 26, 27 and 28, respectively. The casing portion 26 is a rectangular cup-shaped portion, preferably molded from a suitable plastic material, and having an open top and a closed bottom. The bottom of the casing portion 26 preferably includes a flat portion 26a, which provides a surface for supporting the shaver in the upright position shown in FIG. 1 of the drawings. Preferably the sides of the casing portion 26, where likely to be engaged by the operator's fingers, are provided with raised ribbed portions 26b (FIGS. 2, 6 and 7) to make it easier to manipulate and also for the additional purpose of providing a more pleasing appearance.

The casing section or portion 26 is provided at a lower corner thereof with a flanged opening 29 (FIG. 4), the purpose of which will become apparent from the ensuing description. A pair of countersunk openings 30 and 31 are provided in the flat bottom portion 26a of the casing section 26 to accommodate suitable fastening screws described hereinafter. The opening 31 is slightly elongated, as clearly shown in FIG. 4 of the drawings, to provide for the manufacturing tolerances in connection with fastening means to be described hereinafter. If desired to improve the appearance, a suitable decorative cap member 32 may be provided for one end of the casing section 26. This cap member is provided with an opening 33, aligned with the opening 29. The cap member is held in position by suitable tabs 32a and 32b; the tab 32a extending around the top edge of casing portion 26, while the tab 32b extends through an opening 35 provided in the casing portion 26. It will be appreciated that these tabs, upon assembly, are bent to the positions indicated to hold the decorative cap 32 in place.

The casing portions 27 and 28 are effectively end caps, the former being molded of a suitable plastic in the same manner as the casing 26, while the latter is preferably a die casting of metal or the like having the same appearance as the decorative cap 32 described above. When the entire electric dry shaver 20 is assembled, certain interlocking parts cooperate to hold the casing portions 26, 27 and 28 in assembled relationship.

As in the aforementioned Jepson patent, the casing 23 is effectively divided into a motor chamber, generally designated at 36, and a cutter chamber, generally designated at 37. The motor chamber 36 is substantially all disposed within the housing section 26, although, as is obvious from FIG. 4, a small portion thereof extends slightly above the portion 26 into the space between the end caps 27 and 28. The principal space between the end caps 27 and 28 comprises the cutter chamber 37. As was mentioned above, the end caps 27 and 28 have interlocking portions much the same as described in the above-mentioned Jepson patent for maintaining them in position with the rest of the housing 23 without the necessity of any fastening means of the nature of screws or the like. Briefly, as in the disclosure of the above-mentioned Jepson patent, each of the end caps 27 and 28 is provided with a pair of side notches 34 (FIGS. 4, 5 and 6) for receiving lugs or extensions of a support portion of the cutting assembly described hereinafter. Also, the rim of casing portion 26 interlocks with cooperating flange portions or shoulders on end caps 27 and 28, as best shown in FIGS. 4, 6 and 7 of the drawings.

For the purpose of effectively separating the motor chamber 36 from the cutter chamber 37, there is provided a head or head member 39 which preferably is a die cast member having a horizontally disposed portion 39a effectively defining a wall between the motor chamber 36 and the cutter chamber 37. This head 39 includes at one end an integral upstanding end portion 39b for supporting a suitable cutter shaft bearing 41. The up-

standing portion 39b also includes an arcuate surface with projecting lugs designated at 39c (FIGS. 2, 4 and 9) which provides a support for one end of the comb 22. Supported on the other end of the head member 39 and suitably secured thereto by fastening means 40 (FIG. 5) is a head bearing seat 42 and a head bearing cap 43, both of which are formed of powdered bronze or the like so as to form an oilless bearing for the end of the cutter shaft opposite to and aligned with the bearing 41. The bearing cap 43 is provided with an arcuate projection 43a defining a comb support, similar to the comb support 39c but of a larger radius.

Preferably, the head 39 is fastened to the motor 24 by suitable fastening means 56, so that the motor 24 and the head 39 form a subassembly which is readily removable and insertable into the casing section 26. The head 39 is provided at each end with lugs 39d (FIGS. 4, 5 and 6) for interlocking engagement with the notches 34 described above. As in the above-mentioned Jepson patent, there preferably is interposed between the head 39 and the motor 24 a comb lock spring 44 which is clamped between the head 39 and the motor 24 and held in position by the same fastening means which hold the motor and head in assembled relationship. The comb lock spring has a central opening to accommodate the portion of the motor 24 which extends above the upper edge of the casing 26, but it includes end portions 44a, best shown in FIG. 9 of the drawings, which are adapted to cooperate with suitable comb locks described hereinafter substantially in the identical manner as disclosed in the above-mentioned Jepson patent.

The motor 24, which is fully described in Jepson Patent No. 2,688,184, briefly comprises a field structure of generally rectangular cross section formed of a plurality of laminations 45 encircling an armature 46. The armature 46 is supported by a shaft 47 suitably journaled in self-aligning bearings 48 and 49 which are supported respectively by end bearing blocks 50 and 51. The bearing block 50 is preferably designated the commutator end bearing block, while the bearing block 51 is designated as the crank end bearing block, the reason for which will become apparent from the following description. The end bearing blocks are preferably molded of a suitable plastic material. The commutator end bearing 50 is preferably molded with a suitable recess to receive the self-aligning bearing 48, which is preferably held in position by suitable bearing retainer 53 held in position by rivets 52. The bearing 49, on the other hand, is suitably supported in a bearing cup 54 having a configuration corresponding to the exterior of the bearing 49 and the interior of crank end bearing block 51. Bearing 49 is held in position by a bearing retainer 57, and the bearing cup 54 and bearing retainer 57 are suitably secured to crank end bearing block 51 by rivets 58. It will be appreciated that at least the shaft engaging portions of the self-aligning bearings 48 and 49 are formed of a material which provides what is commonly referred to as an oilless bearing.

To provide a unitary motor assembly, the laminations 45 forming the field structure are clamped together by field studs 60 (FIG. 9), which field studs have threaded extensions at each end thereof for receiving nuts 60a and clamping the bearing blocks 50 and 51 into the position shown in FIG. 4 of the drawings. Supported on the field structure defined by the laminations 45 and in diametrically opposed relationship are a pair of field coils 61 and 62, best shown in FIG. 4 of the drawings. These field coils energize the field structure during the operation of the motor and are electrically connected in series with each other in a manner to produce the desired field polarity. The motor 24 is preferably what is commonly termed a universal motor operable on either alternating or direct current power and is illustrated as the direct series commutating type. Consequently, associated with the armature 46 is a commutator 64, the latter being secured to

the motor shaft 47 and effectively housed within the commutator and bearing housing 50.

Supported in diametrically opposed relationship in the commutator end bearing block 50 are a pair of brush holders 65 and 66 which are in the form of tubes or sleeves having the longitudinal axes thereof in alignment and extending from the interior to the exterior of the commutator end bearing block 50. The outer end of each of the tubes or sleeves forming the brush holders 65 and 66 are formed with a circumferential bead so as to be clampingly engaged by resilient fingers forming part of removable conducting caps 67, which interfit with the beads or circumferential enlargements in a manner clearly shown in the drawings. Each of the caps 67 is provided with an extension 67a which provides a ready means to which conductors connected to the field coils 61 and 62 can be connected. Such leads are indicated as 68 and 69, respectively, in FIG. 4 of the drawings. Reciprocally movable in each of the brush holder sleeves 65 and 66 are brushes 70, arranged to electrically engage the commutator 64 with a pressure determined by suitable springs designated at 71.

For the purpose of insulating the conducting cap 67 associated with brush holder 65 and insuring that it will not come into electrical contact with the head 39, there is preferably provided an insulating sheet 72 (FIG. 4) which is clamped between the motor 24 and the head 39 and includes a portion which preferably may be clamped to the commutator end bearing block 50 by the same screws 60 which hold the laminations 45 and bearing blocks 50 and 51 in assembled relationship. This insulating sheet 72, in effect, encloses the conducting cap 67 and the uninsulated portion of the lead 68 electrically connected thereto. If desired, similar insulating means may be provided in connection with the conducting cap 67 associated with the lower brush holder sleeve 66.

In order to support the motor 24 and the cutter assembly, to be described hereinafter, within the housing 23, the end bearing blocks 50 and 51, as best shown in FIG. 6, are each provided at the portions adjacent the bottom 26a of casing section 26 with a T-shaped extension designated as 50a in case of the end bearing block 50, and 51a in case of the end bearing block 51. These T-shaped extensions define opposed grooves 73 and 74 (FIG. 6) for receiving therein portions of a clamp member 75 having a configuration such as is clearly shown in FIG. 6 of the drawings. These clamp members 75 are provided with an opening to receive a screw or similar fastening means 76 which are inserted into the counterbored openings 30 and 31 described above, thereby suitably securing the motor assembly comprising the motor 24 and the associated cutter assembly within the housing 23. Preferably, the end bearing blocks 50 and 51 are provided with suitable openings 77 and 78 which will permit the fastening means 76 to extend therein. With this arrangement it is obvious that a very simple and inexpensive means for securing the motor to the casing is provided without the necessity of molding threaded inserts into the bearing blocks or the necessity of threading suitable openings defined therein.

For the purpose of converting rotary motion of the motor shaft 47 to oscillating motion of the cutter assembly 21, the former is provided with a coaxial recess 79 for receiving a crankshaft 80, which crankshaft supports a combined crank and counterweight 82 and a crankpin 83. Preferably the end of the crankshaft 80 remote from the crank 82 is threaded for engaging with cooperating threads defined within the axial recess 79.

For imparting oscillatory motion to the cutter mechanism 21, there is provided a cutter shaft 85 which has one end thereof supported by the bearing 41 described above and the other end supported by the bearing defined between the head bearing seat 42 and the head bearing cap 43. This cutter shaft 85 is mounted in spaced parallel relationship with the motor shaft 47 and is substantially

coextensive therewith. It will be understood that during the assembly operation the end of the cutter shaft 85 adjacent the commutator end bearing block 50 is inserted into the bearing 41 and the other end is then placed on the head bearing seat 42 after which the head bearing cap is placed in position and then both the head bearing seat and head bearing cap are clamped to the head 39, thereby defining a major portion of the head assembly. The end of the cutter shaft 85 adjacent the crank end bearing block 51 is rigidly connected with a crank arm assembly comprising a combined counterweight and crank arm 88 with a crank arm pin 89 disposed in coextensive spaced parallel relationship with the crankpin 83 so that the crankpins may be interconnected by a connecting rod 90. The connecting rod 90 is preferably of the type disclosed in the above-mentioned Jepson patent being molded from a suitable material, such as nylon, and being hollow from end to end thereof. The space within the hollow connecting rod can then be packed with grease or a suitable lubricant, thereby eliminating a lubrication problem. Suitable means, such as spring clip 91 cooperating with a groove in crankpin 83, serve to hold connecting rod 90 in operating position.

In accordance with the present invention, there is mounted within the motor chamber 36 a suitable control switch generally designated by the reference numeral 92, which switch includes a rigid platelike insulating support or plate 93 which might be referred to as a switch plate, best shown in FIGS. 4 and 7 of the drawings. In addition to serving as a switch mounting member, the insulating plate 93 also performs an assembly function in that it cooperates with means already described to lock the end cap 28 in assembled position. In this connection the end cap 28 is provided with a pair of vertically disposed side grooves defined between shoulder portions 28a, which grooves receive the side edges of the upper end of the switch plate 93, as viewed in FIG. 4 of the drawings. This arrangement also insures proper positioning of the upper end of switch plate 93. The lower portion of the switch plate 93 is secured to an integral troughlike extension 51b (FIGS. 4 and 6) of the crank end bearing block 51 which partially encloses the crank 82 and crankpin 83, as well as the lower end of the connecting rod 90. This integral troughlike extension 51b abuts against the insulating switch plate 93, and suitable screws or fastening means 94 secure the switch plate to the crank end bearing block 51.

The end cap 28 includes a shelflike portion 28b having an elongated opening 95 therein. This opening 95 permits a portion of a pivotally mounted switch knob 97 to extend therethrough, as best shown in FIGS. 2, 4 and 7 of the drawings. For pivotally supporting the switch knob 97, it includes an integral projecting stud portion 97a which extends through an opening in the switch plate 93. To maintain knob 97 in position, a suitable spring fastening member 98 is secured to the end of stud 97a. An overcenter spring 99, best shown in FIGS. 4 and 7 of the drawings, has one end 99a thereof received in a notch 100 defined in the switch knob 97, while the other end 99b is connected to a projection 101a of a snap-acting switch blade 101. The switch blade 101 includes an integral hook-shaped portion 101b which is adapted to receive within the hook-shaped portion thereof a pivot stud 103 suitably secured to the switch plate 93. The overcenter spring 99 tends to maintain the switch blade 101 with its hook-shaped portion 101b in engagement with the pivot stud 103. The free end of the switch blade 101 is movable between a stop pin 104 and a contact pin 105. The contact pin 105 is electrically connected by a suitable conductor, not shown, with the field winding 61. The stop 104, on the other hand, is electrically insulated from the other parts of the switch by the switch plate 93 and merely serves as a stop. It will be appreciated that as the switch knob 97 is rotated, the switch blade 101 will be moved

with a snap action in either direction between pins 104 and 105.

For the purpose of limiting the pivotal movement of the knob switch 97, the insulating plate 93 is preferably provided with an arcuate opening 107 (FIG. 7) for receiving another integral projection 97b of the knob switch 97. The projection 97b is movable in arcuate opening 107 upon pivotal movement of switch knob 97, and by engaging the ends of this opening 107, limits the maximum pivotal movement of the knob switch 97.

In order that electrical connections to the motor 24 may be made, a pair of terminal pins 109 and 110 project from the switch plate 93 from which they are supported in spaced parallel relationship. These pins 109 and 110 are so mounted on the switch plate 93 as to extend into the opening 29 defined in the casing section 26. The pin 110 is preferably connected with the field winding 62 by a suitable electric conductor, not shown, while the pin 109 is electrically connected by conducting bridging member 111 (FIGS. 4 and 7) with the pivot stud 103 and, hence, with the switch blade 101. Bridging member 111 may be what is commonly termed a "printed circuit" suitably deposited on switch plate 93. A suitable power cord 112 (FIG. 1) is provided with a female-type connector for engaging the terminal pins 109 and 110 in a manner readily understood by those skilled in the art. With this arrangement the electric motor may be electrically connected with a suitable source of current, either alternating or direct, and the energization of the motor can then be controlled by the switch 92.

For supporting the cutters 21a, 21b and 21c for oscillation with the cutter shaft 85, the cutter shaft 85 is provided with four upwardly extending supports 115a, 115b, 115c and 115d. As best shown in FIGS. 2, 4 and 9, these supports are each of somewhat triangular shape with a flanged opening 116 defined essentially at the apex of the triangle through which the cutter shaft 85 extends. Moreover, the supports 115a, 115b, 115c and 115d are rigidly fastened to the cutter shaft so as to be disposed in spaced parallel relationship and furthermore so as to provide a unitary cutter supporting structure. The supports 115a, 115b, 115c and 115d are each provided with three angularly spaced projecting tines 117 (FIG. 9). To insure proper balance of the movable portions of the cutter head assembly, the support 115a adjacent the commutator end of the shaver motor 24 is provided with a downwardly extending portion 118 to which is secured a counterweight 118a (FIG. 4). The head 39 adjacent the counterweight 118a is preferably provided with a recess 119 for receiving the counterweight and permitting movement thereof in response to oscillations of the cutter shaft 85.

Each of the supports 115a, 115b, 115c and 115d is provided in each tine 117 thereof with a slot or groove 120, the slots in each tine of all the supports being aligned for receiving therein the cutter blades 21a, 21b and 21c in parallel angularly disposed relationship, as best shown in FIGS. 2 and 9 of the drawings. Essentially these cutter blades are identical, as shown in FIG. 12 of the drawings, the only exception being that the cutter blades 21a and 21c provided with an identifying eyelet 121 whereas the cutter blade 21b has no such eyelet. From the above description it will be apparent that the cutter supports 115a, 115b, 115c and 115d removably received in the slots 120 the three blades 21a, 21b and 21c, thereby maintaining the latter in parallel angularly disposed relationship so that the cutting edges thereof may be disposed in an arcuate manner for engaging the comb 22.

For the purpose of resiliently supporting the cutter blades 21a, 21b and 21c within the slots 120 in the spaced supports 115a, 115b, 115c and 115d there is provided for each blade resilient spring designated as 123a, 123b, and 123c, collectively referred to as springs 123. These springs, as best shown in FIGS. 2 and 4 of the drawings,

are in the form of a wire of spring material deformed to the configuration best shown in FIG. 4 with the central U-shaped portion adapted to be disposed between the supports 115b and 115c and within slots 124 formed in these supports. These slots 124 would be extensions of slots 120 except for narrow wall portions 125 separating them as best shown in FIG. 4 of the drawings. Somewhat upwardly extending angular end portions of springs 123a, 123b and 123c are adapted to be received within the slots 120 of supports 115a and 115b beneath cutter blades 21a, 21b and 21c. It will be apparent that the supports 115b and 115c differ from the supports 115a and 115d in that they include the slots 124 separated from the slots 120 by the narrow wall portions 125, which slots 124 accommodate the central portion of the springs 123, as is clearly shown in FIG. 4 of the drawings. The ends of each of the springs 123 include a laterally projecting portion, designated as 126 in FIG. 2 of the drawings, so as to surely engage the underside of the associated blades, such as 21a, 21b and 21c, respectively. Furthermore, this laterally projecting portion 126, when the associated blade 21 is removed, engages an integral lug or lateral projection 127 provided on the tines 117 of the end supports 115a and 115d. In this way when the blade is removed the springs remain locked in position. Of course, the center portion of the spring is held in the slots 124 by the wall portions 125. It will be understood that the centrifugal force produced as a result of high speed oscillation of the cutter blades 21a, 21b and 21c will cause them to be forced against the inside surface of the comb 22 insuring engagement therewith in accordance with the principle set forth in Patent No. 2,081,694. This centrifugal force is, of course, combined with the force of the springs 123a, 123b and 123c.

The comb 22 is in most respects very similar to the comb disclosed in Jepson Patent No. 2,688,184, referred to above. As illustrated and as best shown in FIG. 3 of the drawings, the comb 22 comprises a cutting surface 130 formed of very thin flexible material perforated by one or more punching operations with a large number of hair receiving openings 131 particularly well adapted for receiving short beard hairs, and a plurality of elongated slots 132 having serrations or teeth along the edges thereof for receiving long hairs. The area provided with the openings 131 and 132, best shown in FIG. 3 of the drawings, comprises the cutting area, which area defines a substantial portion of the casing surface and smoothly conforms thereto. Flanking the cutting area are a plurality of openings 133 effectively disposed adjacent the lower edge of the cutting chamber which are hair discharge openings. These openings are relatively large.

Since the cutting surface 130 of the comb 22 is formed of relatively thin material, it tends to conform itself to the shape of the surface with which it is in contact and, therefore, must be supported by a suitable supporting structure or frame, generally designated at 135, comprising a plurality of parallel arcuate ribs 135a, 135b and 135c spaced from one another in a direction along the longitudinal axis of the cutting blades 21a, 21b and 21c, and each terminating in a parallel horizontally extending frame portion 135d. The ribs 135a and 135c are effectively end frame members and are somewhat wider than the ribs 135b. The ribs 135b are uniformly spaced except adjacent the elongated slots 132 where closer spacing for satisfactory support is necessary. The cutting surface portion 130 of the comb 22 is suitably riveted or otherwise secured to the comb frame 135, and specifically to the portions 135d so as to provide a relatively rigid removable unit sufficiently sturdy so as not to be damaged when handled in a normal manner. Although the end rib or frame member 135a defines the end of the shaving area, in order to provide a trimming area the comb 22 is provided with an extension beyond the rib 135a in the form of a plurality of spaced arcuately positioned cut-

ting teeth 140 (FIGS. 3 and 8) which are defined as part of an arcuate end support 141 which rests on the projecting lugs of arcuate surface 39c. The thin comb plate 130 has elongated slots 142 which are effectively continuations of the slots defined between the teeth 140.

In order that the cutter blades 21a, 21b and 21c may make shearing contact with the inner surface of the arcuate-shaped comb 22, and particularly the flexible comb portion 130 thereof without interfering with the ribs 135a and 135b, as is clearly shown in FIG. 4 of the drawings, the cutter blades are provided with a plurality of notches 143 and 144, as best shown in FIG. 12 of the drawings, the notch 144 being a relatively large notch to accommodate the end rib 135a. Thus, the portions of the cutting blade between the notches 143 and also between the notch 144 and the adjacent notch 143 provide cutting surfaces engageable with the inside surface of the flexible comb portion 130. As shown in FIG. 12, the blades also comprise a plurality of notches 145 which are located adjacent the elongated slots 132. These notches are provided so as not to interfere with the entry of long hairs into the elongated openings or slots 132.

In accordance with the present invention, each of the cutter blades 21a, 21b and 21c includes an end cutting portion, designated as 146, which cooperates with the inside surfaces of the teeth 140 previously described so as to provide a trimming cutting action over the arcuate area at the end of comb 22 adjacent the end cap 27. In FIG. 13 there is clearly illustrated the manner in which the dry shaver of the present invention is used for trimming sideburns, and in a similar manner it can be used for trimming mustaches and for removing long hair in the ears, nose and the like.

In accordance with the present invention, the cutter blades 21a, 21b and 21c are adapted to be locked into place when inserted in the slots 120 in a manner so that they may readily be removed when desired. To this end, each of the blades 21a, 21b and 21c has a pair of integral hook-shaped projecting portions 148a and 148b, as best shown in FIG. 12 of the drawings. These hook-shaped extensions 148a and 148b extend from the back of the cutter, or in other words, from the edge opposite the cutting edge and are spaced the same distance apart as are the center cutter supports 115b and 115c. The cutter blades are adapted to be inserted in the slots 120 with the open sides of the hook-shaped portions to the left of the supports 115b and 115c, respectively, as viewed in FIG. 4 of the drawings. The cutter blades are then pushed downwardly into the slots 120 against the force of springs 123 so that the open ends of the hooks 148a and 148b are below the wall portions 125, whereupon the entire blade is moved slightly to the right as viewed in FIG. 4 so that the hook-shaped portions 148a and 148b move beneath the wall portions 125. Then, upon release of the pressure forcing the blades into the slot 120, the hook-shaped portions 148a and 148b will engage the wall portions 125 and removably lock the blades in position.

For best shaving action it is desired that the cutter blades 21a, 21b and 21c are always used in the same relative position in the cutter assembly and to this end, as was mentioned above, the cutter blades 21a and 21c are provided with eyelets 121 which preferably are of different color and correspondingly colored indicia, such as 147 (FIG. 5), on the head 39 may be provided so that the blade 21a may always be inserted in the slot containing the spring 123a and the blade 21c in the slot containing the spring 123c. The third blade, which does not have the eyelet 121, is always inserted in the slots having associated therewith the spring 123b. Obviously the hook-shaped extensions 148a and 148b and the trimmer ends 146 insure that the blades will always be inserted in the same direction.

For the purpose of protecting the cutting surface when

the electric dry shaver is not in use, a comb guard 149, shown in FIGS. 4, 9 and 10 of the drawings, may be employed, which is preferably formed of a suitable molded plastic or the like and of an arcuate configuration so as to conform to the shape of the comb 22. Preferably suitable protrusions or dimples 150 provided on the comb 22 engage corresponding notches or recesses on the comb guard 149 to removably secure the same in the position shown in FIGS. 4 and 9 of the drawings.

From the above description, the comb 22 has the arcuate rib 141 at one end and the end frame member 135c at the other end supported on the cooperating arcuate projections of the head assembly, specifically the arcuate surfaces 39c and 43a. To hold the comb 22 in position on these surfaces, there are provided a pair of comb locks 152 and 153, one disposed on either side of the head assembly. The lower edge of each of the comb locks 152 and 153 is provided with a longitudinally extending hook-shaped portion 152a and 153a, respectively, for engaging the corresponding hook-shaped portions 44a of the comb lock spring 44 in a manner to provide a sort of hinge support whereby the comb locks 152 and 153 may be pivoted between the closed position shown in FIG. 9 of the drawings and the open position of at least comb lock 152 shown in FIG. 2 of the drawings. The open position is, of course, a hair removing position. In accordance with the present invention, the comb lock 152 is provided with means to secure the comb 22 thereto so that upon moving the comb lock 152 to the open position the comb 22 is effectively moved therewith, as clearly shown in FIG. 2 of the drawings. To this end the comb lock 152 is provided with a pair of tabs or projections 152b, adapted to engage suitable cooperating openings 157 in the frame portions 135d of the comb 22 (FIGS. 9 and 14). A comb retention spring 158 secured to the comb lock 52 by the clamping action of a pair of tabs 152c integral with the comb lock has a portion engageable with the inside of the comb to removably hold the lugs or tabs 152b in engagement with openings 157. With this arrangement the comb 22 is effectively secured to the comb lock 152 so that upon moving the comb lock 152 to the open position the comb is automatically moved to a position free from the shaver but not free from the comb lock, and yet which will permit easy cleaning of hair particles and the like therefrom (FIG. 2). At the same time the comb retention spring 158 permits ready removal of the comb 22 from the comb lock 152 by merely distorting the same sufficiently for removal of the tabs 152b from the openings 157. This is accomplished when the comb lock is in the open or semi-open position, at which time one side of the comb is lifted to disengage the opening 157 on that side from the tab or lug 152b also on that side by merely stressing the comb retention spring 158. By subsequently lifting the other side of the comb the other opening 157 can then readily be released from the other tab 152b, and, of course, in installing the comb, the reverse procedure is utilized.

It will be understood that the comb retention spring tends to bias the comb lock 152 and, hence, the associated comb 22, when secured thereto to the open position, so that when the comb lock 153 is released the comb retention spring 158 tends to move the comb to the open position of FIG. 2 of the drawings.

The comb lock 153 is essentially similar to the comb lock 152 but includes only a single centrally disposed tab or lug 153b engageable with a cooperating opening 161 at the center of the frame portion 135d. For the purpose of readily releasing the comb lock 153, there is provided a movable comb latch 162 pivotally mounted, as indicated, to the comb lock 153 by a hinge pin 163. The comb lock 153 has a pair of spaced parallel projecting lugs 153c (one shown in FIGS. 9 and 11, and the other in FIG. 10) which support in aligned openings the hinge pin 163. Similarly, the comb latch 162 has cooperating

spaced lugs 162a with aligned openings for receiving hinge pin 163. The comb latch 162 is designed so that a finger nail may be inserted, as clearly shown in FIG. 11 of the drawings, to tend to pivot outwardly the lower part of the comb latch 162 with the result that the upper part thereof bearing on the comb 22 acts as a lever to pry outwardly the comb lock 153, releasing tab 153b from opening 161. When this happens the comb retention spring 158 can readily bias the comb to the open position shown in FIG. 2 of the drawings.

In view of the detailed description included above, the operation of the electric dry shaver 20 will be apparent to those skilled in the art. It will furthermore be apparent that a dry shaver has been disclosed comprising readily assembled parts, each of very sturdy construction which will give long and foolproof operation. By virtue of the use of a plurality of cutter blades with end trimming members, there is provided a more efficient shaver which can perform hair cutting operations in a much better manner than was heretofore possible. Furthermore, with the improved arrangement of comb support and comb lock, the shaver may be cleaned of excess hair with a minimum of trouble and in a very simple and expeditious manner.

While only a single embodiment of the present invention has been shown, it will be understood that various changes and modifications will occur to those skilled in the art, and it is contemplated in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the present invention.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A dry shaver comprising an electric motor, a cutting assembly secured to said motor including an oscillating blade supporting means, means drivingly interconnecting said motor and said blade supporting means, a casing comprising a cup-shaped member and a pair of end caps, said cup-shaped member having an open end, one of said end caps including a laterally extending shelflike portion having an opening defined therein, means for securing said motor within said cup-shaped member with said cutting assembly projecting from the open end of said cup-shaped member, said end caps being disposed one at either end of said cutting assembly with said shelflike portion of said one end cap remote from said cutting assembly, switch means for controlling said electric motor including an insulating switch plate and manually actuable switch knob pivoted to said plate, and means for securing said switch plate to said motor in said casing with said knob projecting through said opening defined in the shelflike portion of said one end cap.

2. In an electric dry shaver, an electric motor, a cutting assembly including movable cutting means, means secured to said motor drivingly interconnecting said motor and said cutting means, a casing for said motor including a cup-shaped member for enclosing said motor, said motor including a T-shaped extension disposed adjacent the bottom of said casing, and means for securing said motor within said cup-shaped member including a U-shaped clamping means secured to said casing for engaging said extension.

3. A shaver of the type having a uniformly curved comb and a cutter adapted to be moved along the inner side of said comb in shearing engagement therewith, the combination of a shaft provided with spaced apart supports extending radially therefrom, each of said supports having a slot at the end thereof which is remote from said shaft, an elongated spring having opposite end portions thereof loosely received in said slots, means for supporting an intermediate portion of said spring with respect to said shaft, said spring having a lateral extension at each end thereof, said cutter being loosely disposed in said slots between said spring and said comb whereby said cutter is biased in engagement with said comb, and means on the ends of said supports remote from said shaft for limiting

the maximum movement of said lateral extensions when said cutter is removed from said slots.

4. The shaver of claim 3 wherein said last-mentioned means comprises an integral lug projecting from said supports.

5. A shaver having a stationary perforated cutting member and an elongated cutter, means for moving said cutter in shearing engagement with said stationary member, a cutter shaft provided with a plurality of supports extending radially therefrom and spaced apart longitudinally thereof, the ends of said supports each having a slot in a plane parallel to the axis of said shaft for receiving said elongated cutter therein, a somewhat U-shaped wirelike spring member having the central portion supported by at least one of said supports and the ends thereof extending into said slots of two other of said supports, portions of said spring engaging said cutter when said cutter is received in the slotted ends of said supports whereby said cutter is biased into shearing engagement with said stationary member, and interlocking means on the ends of said spring member and said two other supports for retaining said end portions of said spring member within said slots of said two other supports without interfering with the action of said spring member with respect to biasing said cutter into shearing engagement with said stationary member.

6. In an electric shaver, the combination of a casing, a comb secured to said casing, an elongated cutter blade adapted to be moved along the inner side of said comb in shearing engagement therewith, a shaft mounted on said casing and provided with a plurality of spaced apart supports extending radially therefrom, each of said supports having a slot adjacent the end thereof which is remote from said shaft, said cutter blade being loosely disposed in said slot, spring means for biasing said cutter into engagement with said comb, said cutter blade including a hook-shaped projection extending therefrom, and means on one of said supports engageable by said hook-shaped projection for releasably locking said cutter blade in said slots.

7. A shaver comprising a casing, a comb secured to said casing, an elongated cutter blade movable along the inner side of said comb in shearing engagement therewith, a shaft mounted on said casing and provided with a plurality of spaced apart supports extending radially therefrom, each of said supports having a slot adjacent the end thereof which is remote from said shaft, said cutter blade being loosely disposed in said slots, motor means in said casing for moving said shaft and consequently said blade, spring means for biasing the cutting edge of said cutter blade into shearing engagement with said comb, said cutter blade including a pair of hook-shaped projections extending from the edge thereof opposite said cutting edge, and means on said supports engageable by said hook-shaped projections for releasably locking said cutter blade in said slots.

8. The shaver of claim 7 wherein said last-mentioned means comprises wall portions integral with said supports dividing said slots into two sections and wherein said wall portions are engaged by said hook-shaped projections.

9. A shaver mechanism comprising a casing, an electric motor disposed in said casing, a cutter head disposed along one edge of said casing comprising a comb and a cutter, means for mounting said cutter for movement in shearing engagement with said comb, driving means interconnecting said cutter and said motor, a pair of comb locks pivotally secured to said casing for releasably securing said comb to said casing, and means for releasably securing said comb to one of said comb locks at a position remote from where said one comb lock is pivotally secured to said casing whereby said one comb lock and comb secured thereto pivot as a unit to afford access to said cutter.

10. In an electric shaver comprising a casing, an elec-

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tric motor disposed in said casing, a cutter head disposed along one edge of said casing comprising a comb and a cutter means for mounting said cutter for movement in shearing engagement with said comb, driving means interconnecting said cutter and said motor, a pair of comb locks pivotally secured to said casing for releasably securing said comb to said casing, means for securing said comb to one of said comb locks whereby said one comb lock and comb secured thereto pivot as a unit to afford access to said cutter, and lever means pivoted to said other comb lock for releasing said other comb lock from said comb.

11. The mechanism of claim 9 wherein spring means are provided to bias said one comb lock and comb to a position affording access to said cutter when the other of said comb locks is released from its securing position relative to said comb.

12. The mechanism of claim 9 wherein spring means are provided for securing said comb to said one comb lock.

13. The shaver of claim 3 wherein said spaced apart supports are triangularly shaped and said shaft is disposed at the corresponding ones of the apices of said triangularly shaped supports, said supports having a plurality of spaced angularly disposed slots at said end thereof remote from said shaft, a plurality of elongated springs disposed in different corresponding slots in said supports, and said cutter comprising a plurality of blades loosely disposed on each of said corresponding slots with the cutting edges thereof disposed in spaced parallel relationship.

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