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ELECTRIC SHAVER

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Fig. 1

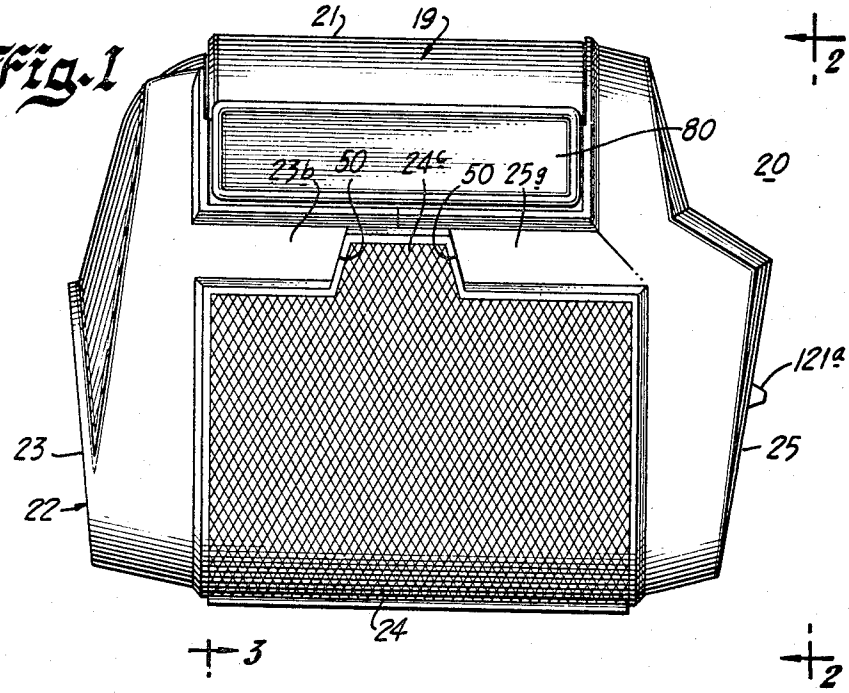


Fig. 2

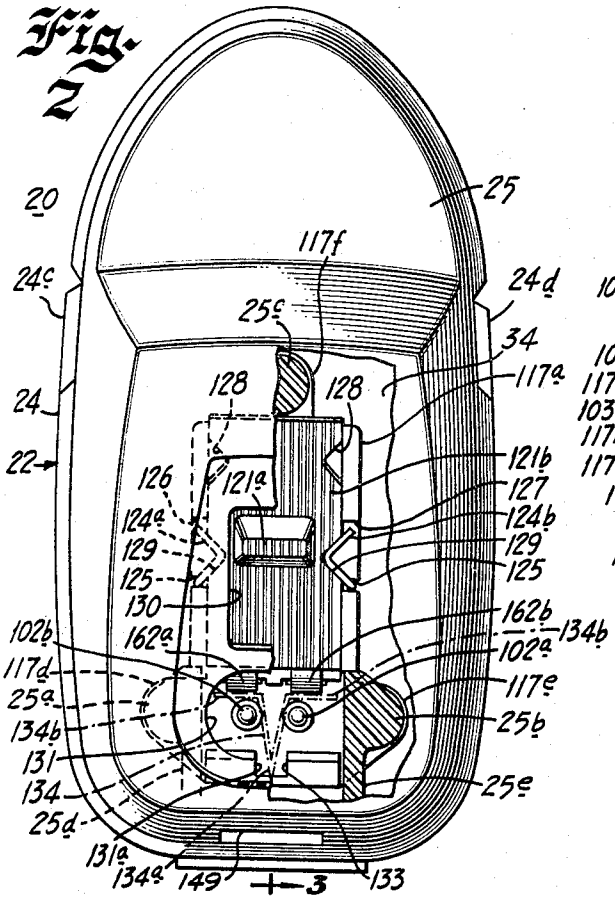
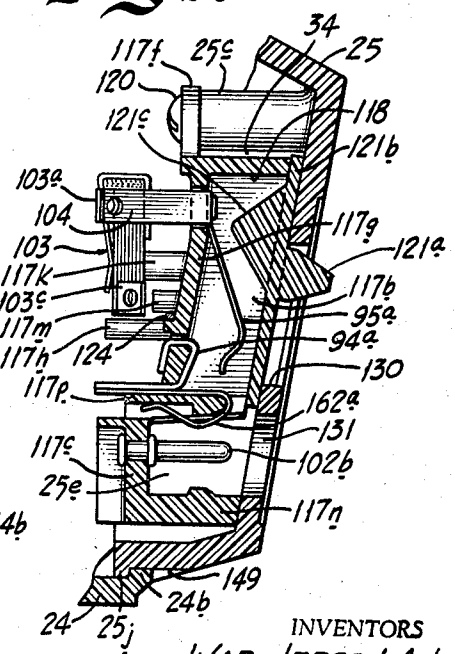


Fig. 10



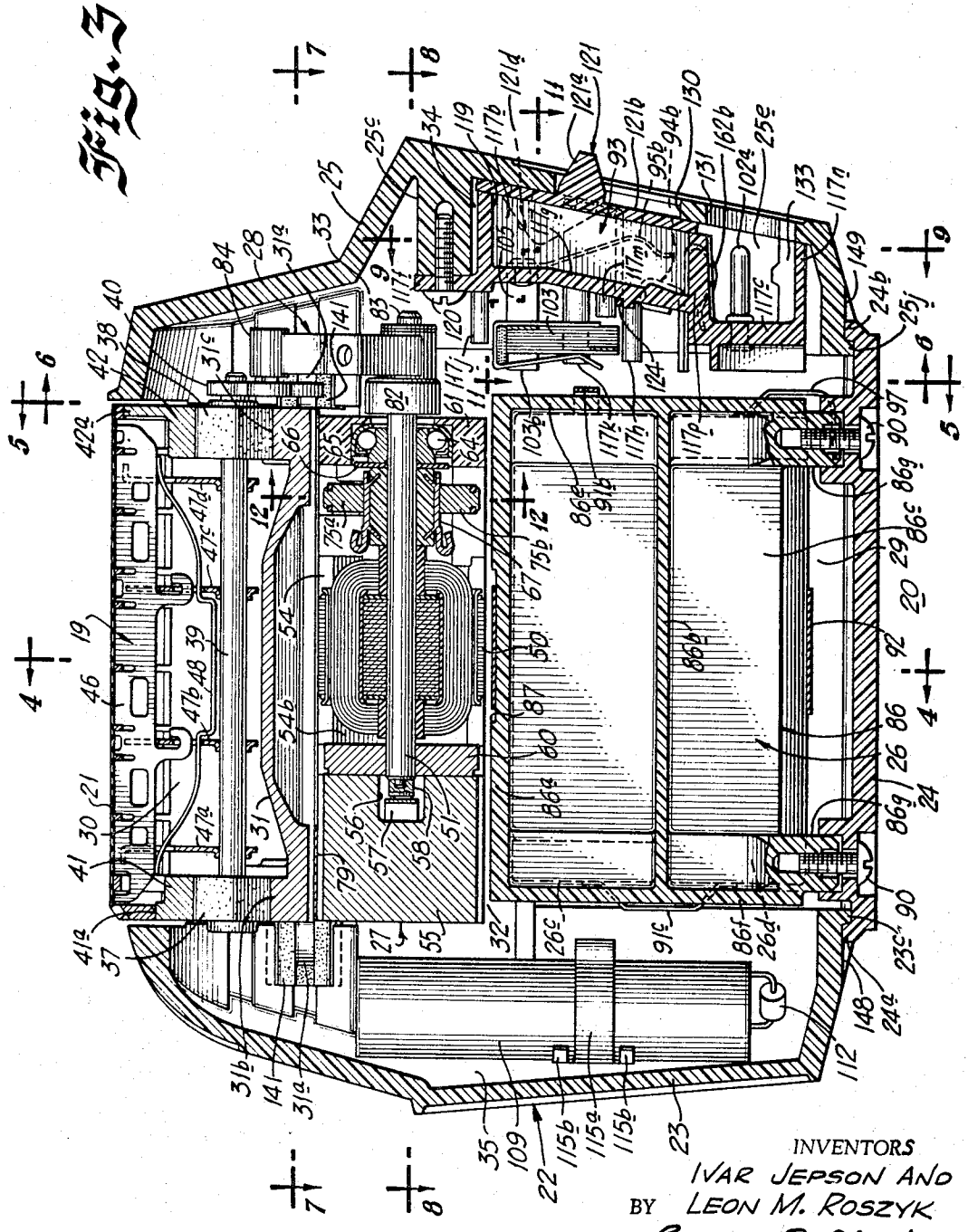
INVENTORS
IVAR JEPSON AND
BY LEON M. ROSZYK
George R. Clark
ATTORNEY

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Fig. 3



INVENTORS
IVAR JEPSON AND
BY LEON M. ROSZYK
George R. Clark
ATTORNEY

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Fig. 4

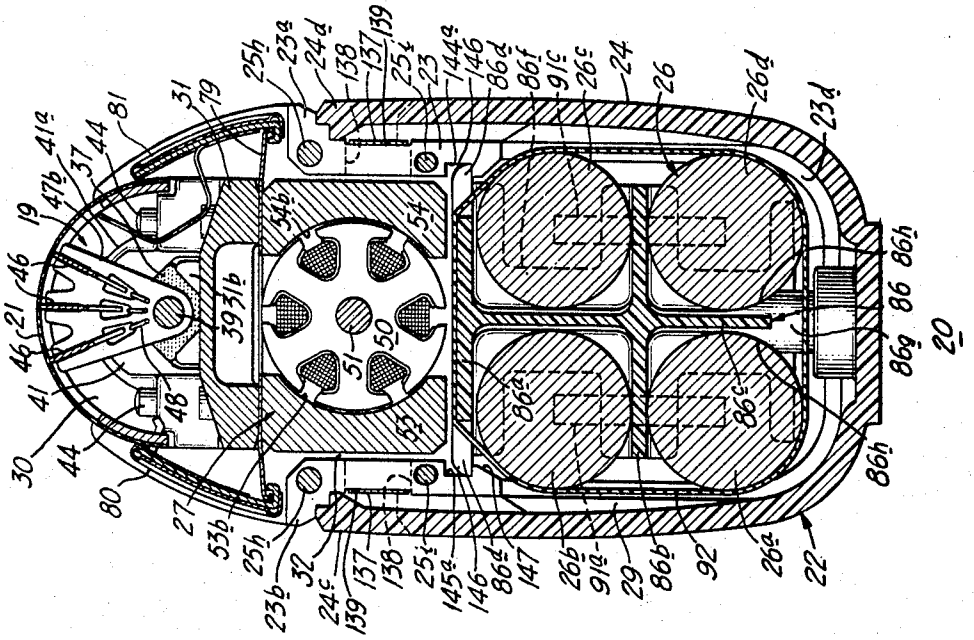
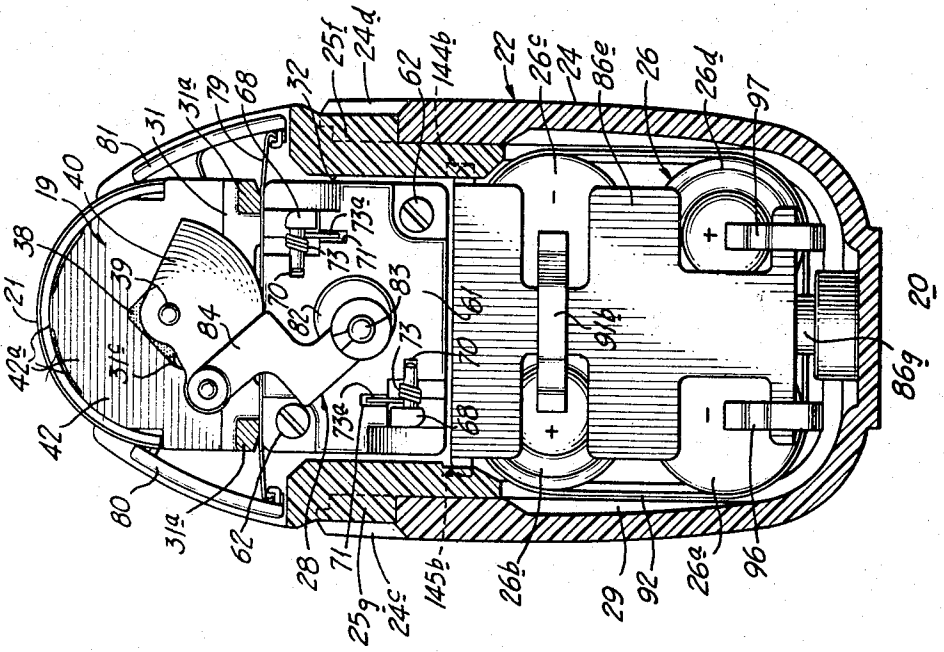


Fig. 5



INVENTORS
IVAR JEPSON AND
BY LEON M. ROSZYK
George R. Clark
ATTORNEY

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Fig. 11

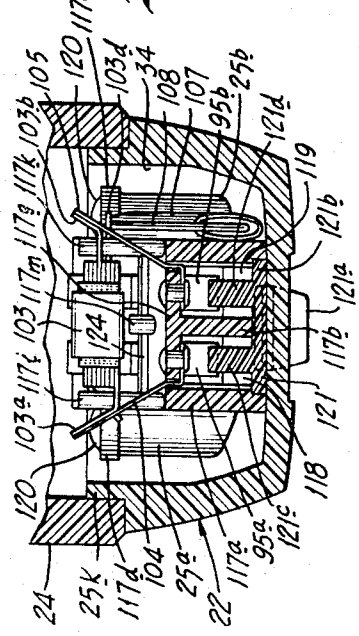


Fig. 9

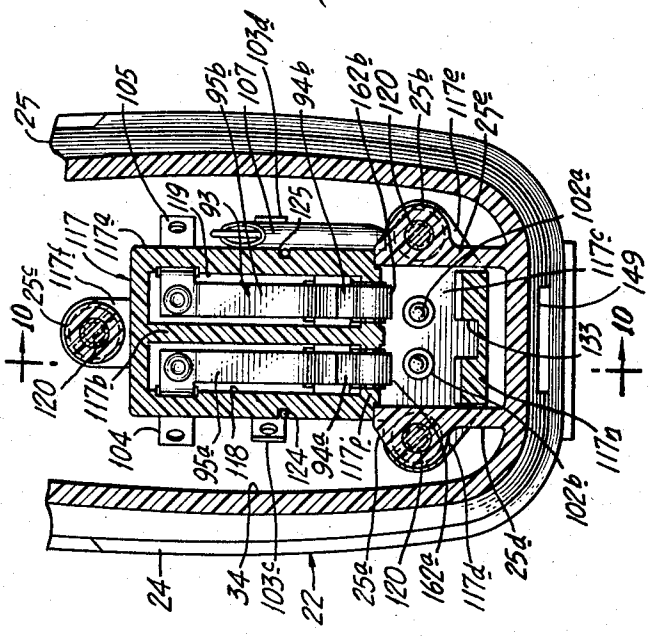
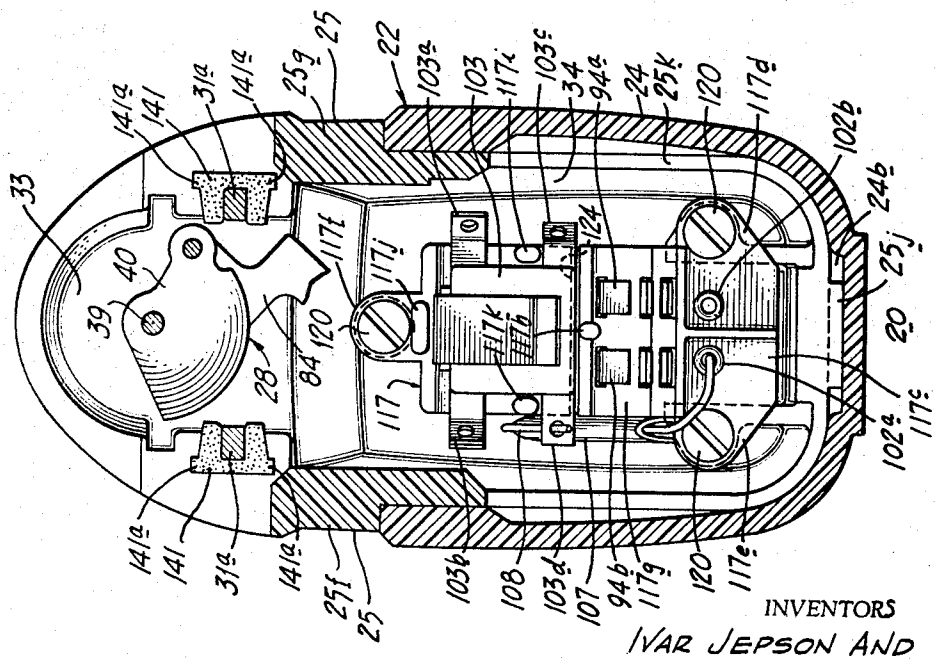


Fig. 6



INVENTORS
IVAR JEPSON AND
BY LEON M. ROSZYK
George R. Clark
ATTORNEY

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Fig. 8

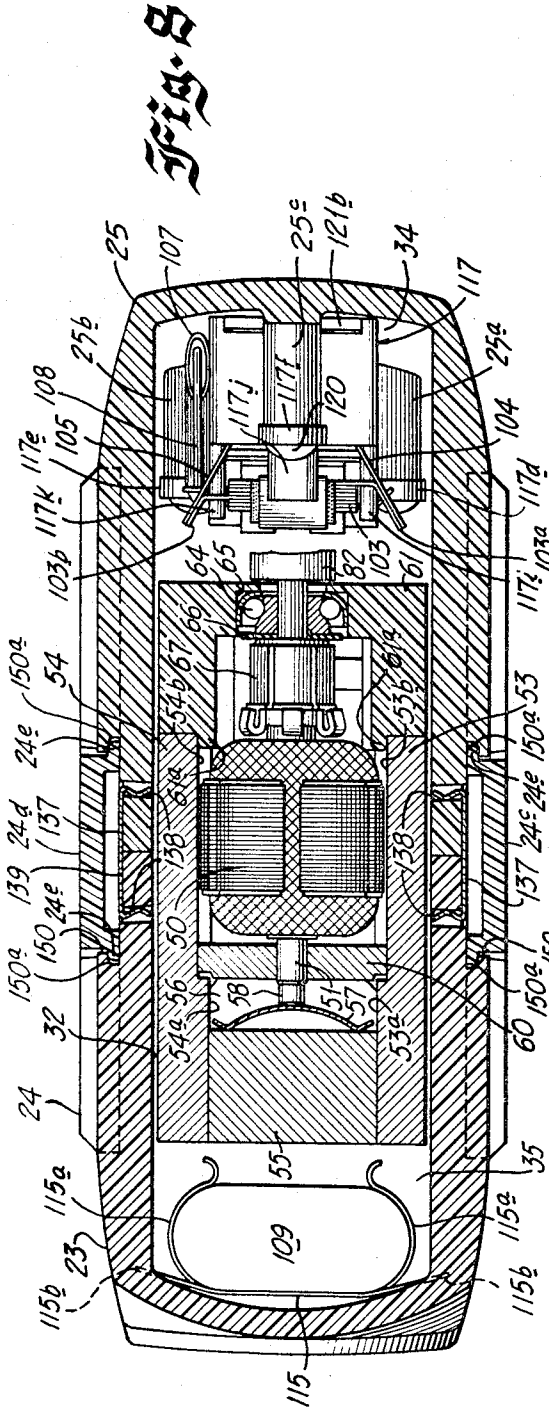
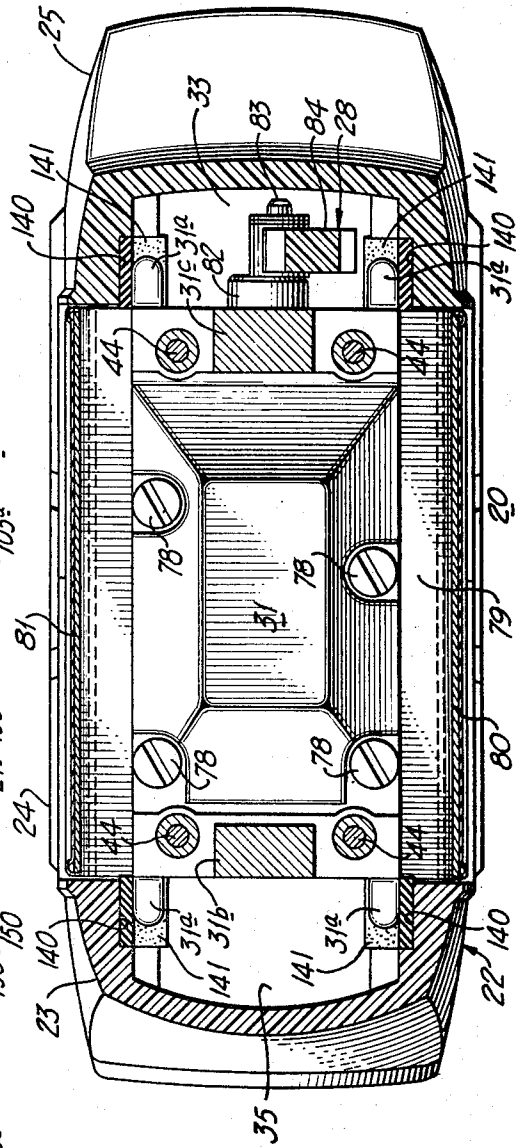


Fig. 7



INVENTORS
IVAR JEPSON AND
BY LEON M. ROSZYK
George R. Clark
ATTORNEY

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Fig. 15

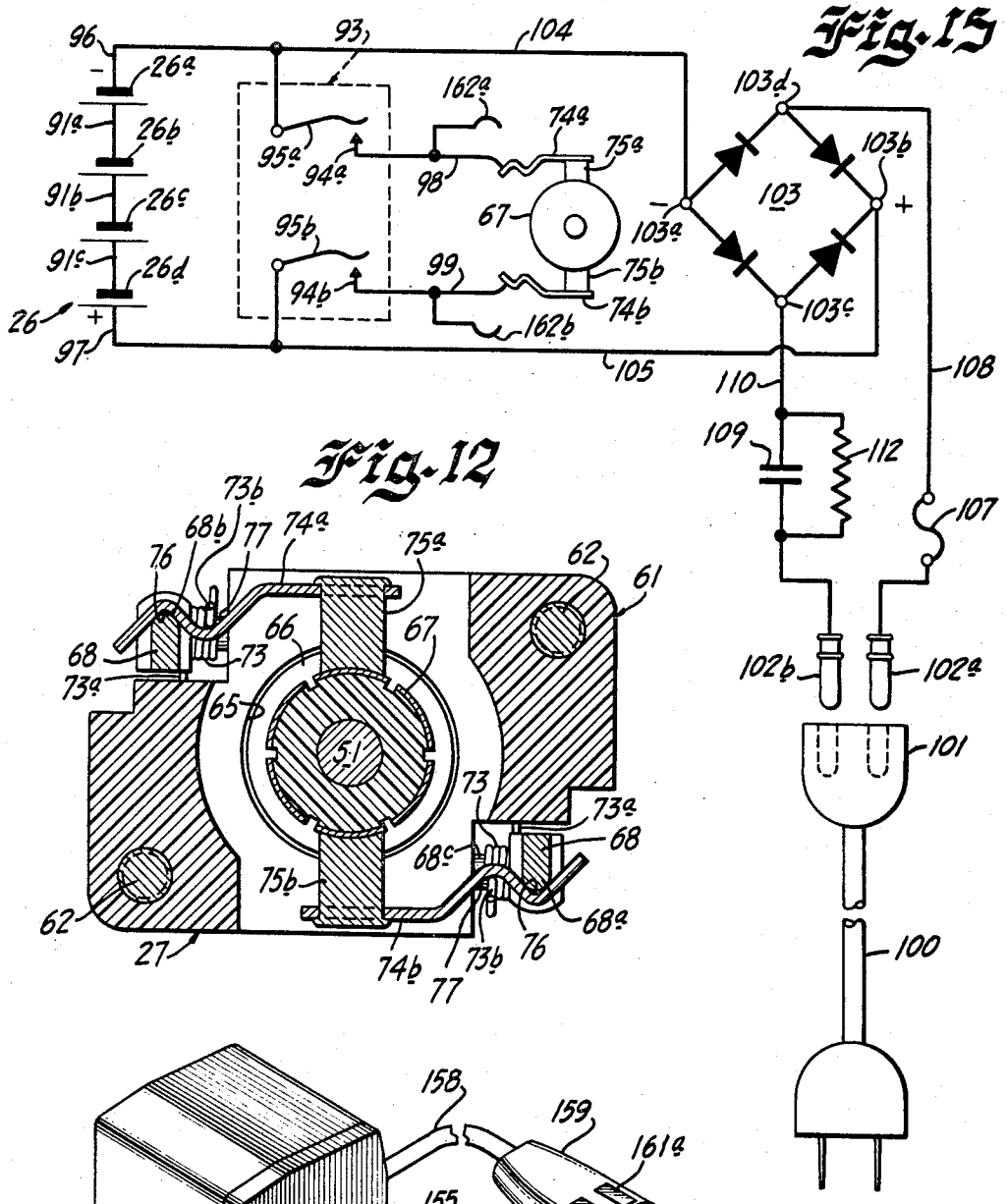


Fig. 12

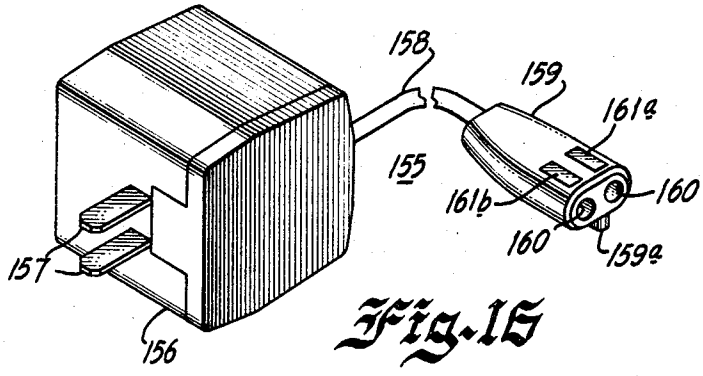


Fig. 16

INVENTORS
IVAR JEPSON AND
BY LEON M. ROSZYK
George R. Clark
ATTORNEY

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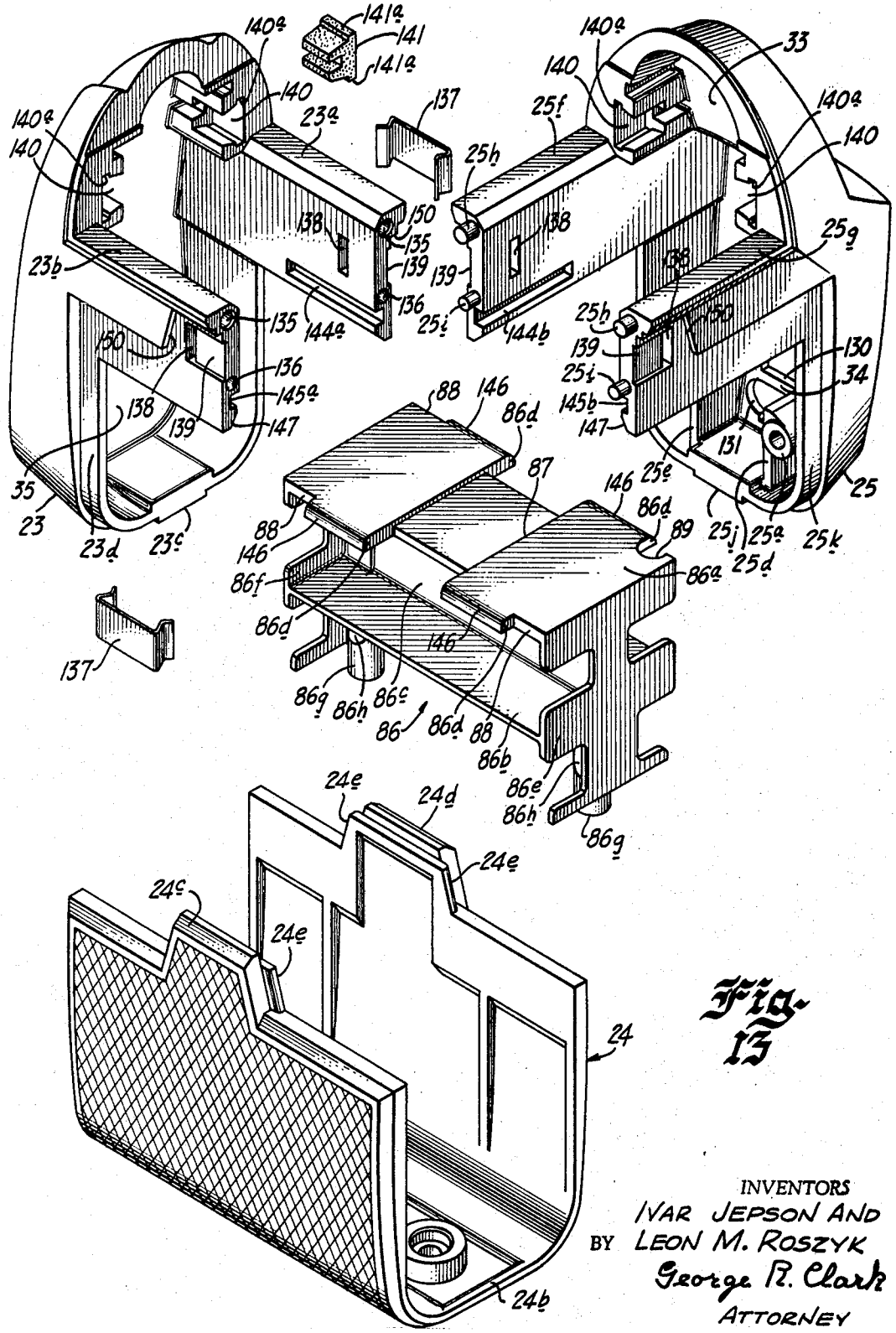


Fig. 13

INVENTORS
IVAR JEPSON AND
BY LEON M. ROSZYK
George R. Clark
ATTORNEY

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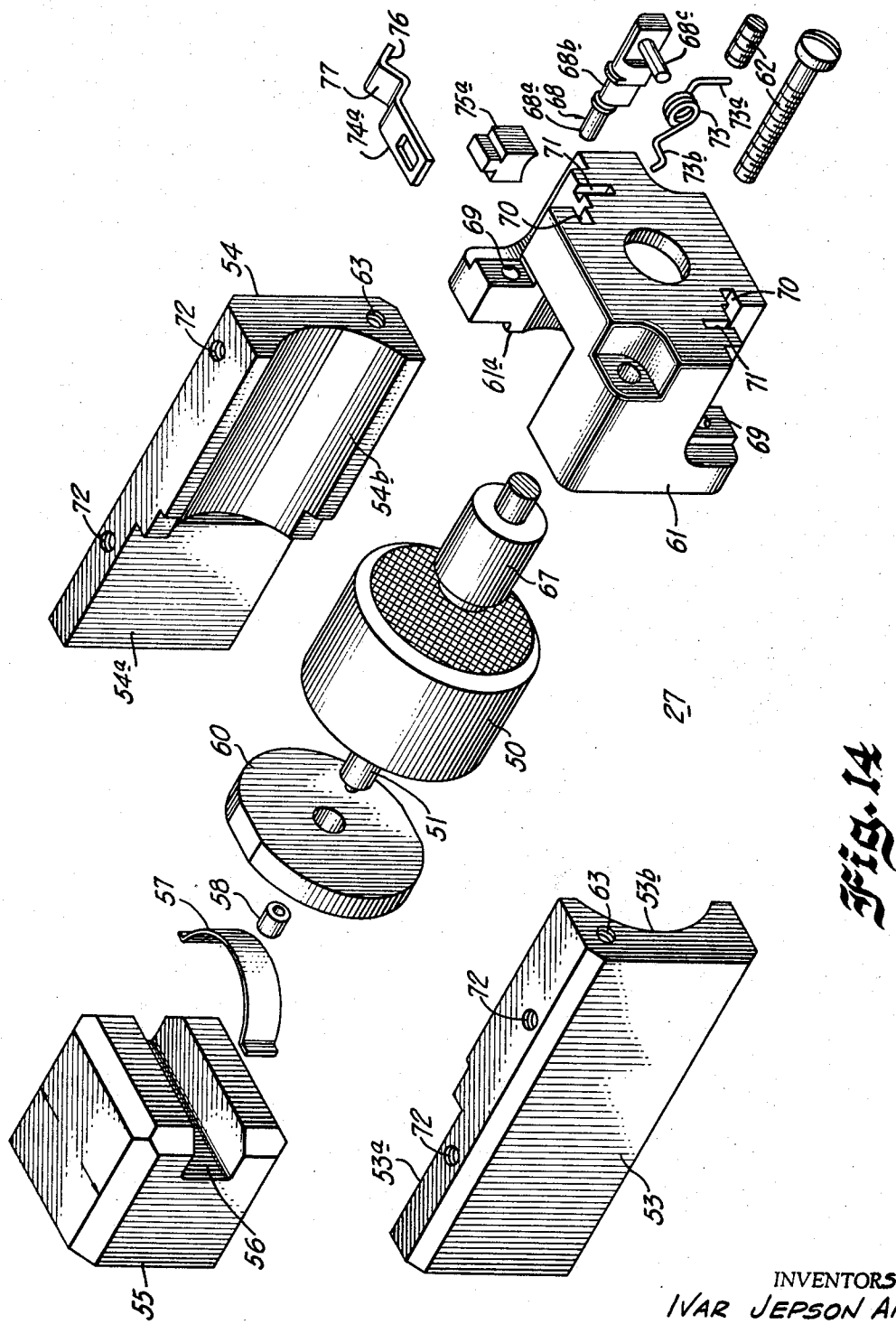


Fig. 14

INVENTORS
IVAR JEPSON AND
BY LEON M. ROSZYK
George R. Clark
ATTORNEY.

United States Patent Office

3,386,023

Patented May 28, 1968

3,386,023

ELECTRIC SHAVER

Ivar Jepson, South Duxbury, Mass., and Leon M. Roszyk, Berwyn, Ill., assignors to Sunbeam Corporation, Chicago, Ill., a corporation of Illinois

Original application July 15, 1963, Ser. No. 295,028, now Patent No. 3,311,763, dated Mar. 28, 1967. Divided and this application Nov. 21, 1966, Ser. No. 595,658

3 Claims. (Cl. 320—2)

ABSTRACT OF THE DISCLOSURE

Rechargeable battery operated shaver with built-in charging means wherein the cutting mechanism and battery unit are spaced apart a minimum distance substantially equal to the diameter of the armature of the motor interposed between them. The terminals which permit the charging unit to be connected to an external source of power are rendered inaccessible by a door member connected to the switch which controls energization of the motor from the battery. Thus the battery cannot be recharged when the shaver motor is energized.

The present application is a division of copending Jepson and Roszyk application Ser. No. 295,028, filed July 15, 1963, now Patent No. 3,311,763 granted March 28, 1967, and assigned to the same assignee as the instant application. It relates to apparatus for removing beards or face hair as well as for removing hair from arms, legs and other portions of the human body, and is generally referred to as an electric dry shaver. More particularly, the present invention relates to a so-called cordless or battery operated electric dry shaver including built-in means for recharging the batteries.

The electric shaver of the present invention is illustrated, by way of example, as embodying a cutting mechanism very similar to that disclosed in copending Jepson and Schuessler application, Ser. No. 109,551, filed May 12, 1961, now Patent 3,196,539, and assigned to the same assignee as the present application. It also embodies features disclosed and claimed in copending Jepson application, Ser. No. 237,239, filed Nov. 13, 1962, now Patent 3,206,850, and also assigned to the same assignee as the instant application.

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 copending applications has proved to be unusually satisfactory for reducing shaving time, while still furnishing a very satisfactory shave. Moreover, the shavers have been designed so that they may be held comfortably and conveniently in the hand of the operator although the appearance design of the shaver of the present invention forms no part of this invention, but is disclosed in copending Peterson application, Ser. No. 74,884, filed May 14, 1963, now Patent Des. 196,911, and also assigned to the same assignee as the instant application.

The type of shaver disclosed in the above-mentioned copending Jepson and Jepson et al. applications is one in which the beard enters the shaving head through a network of small holes or perforations in a curved comb. An oscillating cutter, preferably comprising several blades, travels back and forth across the inside of the curved comb at high speed. Centrifugal force supplemented by a spring force causes the blades to be in shearing engagement with the comb. A suitable electric motor oscillates the cutting mechanism at speeds in excess of nine thousand cycles per minute. It will be understood from the ensuing description that the present invention is not limited to the particular type of shaver disclosed in the above-

mentioned copending applications, but may equally well be used with either the so-called reciprocating shaver or the rotary shaver.

In the above-mentioned copending Jepson and Jepson et al. applications, the powerful electric motor used to actuate the cutting mechanism is of the rotary type and is energized through the conventional power cord from a source of current of a predetermined voltage. This is very satisfactory when the user employes the shaver in his own home or in hotels or the like accommodated with the same type of electric power that he has in his own home. It is a well known fact, for example, that in many of the foreign countries the voltages and frequencies of the power supply vary and the voltage outlets are considerably different so that to use a shaver of the type disclosed in the above-mentioned copending applications, various attachments are necessary so that the shaver can be used universally. It would be desirable to provide a shaver having the same powerful electric motor of the above-mentioned copending applications for driving the cutting mechanism at the same speed, which could be used for relatively long periods of time without being connected to any source of power, so that a traveler may use it all over the world without worrying about whether or not it can be connected to the particular type of electric power outlet available in the various locations.

In recent years, battery operated devices have become relatively popular primarily due to the development of better batteries which were compact, would supply a great amount of energy without recharging and could readily be recharged when desired or necessary. The application of battery power to electric shavers presents a problem since the desirable size of the shaver casing is pretty well established to one that may be comfortably and conveniently held in the hand of the operator and must be very little different in configuration from that disclosed in the above-mentioned copending applications. Moreover, it is desirable to have a unitary structure wherein the batteries and charging unit are all embodied in a single casing. A real problem, therefore, presents itself to accommodate within a small casing a powerful electric motor and the necessary batteries to energize the motor together with means selectively to charge such batteries when desired. Furthermore, the unit must be such that the batteries can readily be replaced all while maintaining the casing of a small size commensurate with that accepted as most desirable today.

In electric shavers of the type described above, the essential elements which take up considerable space are the cutting unit or mechanism, the necessary powerful electric motor, and the batteries for operating the motor. It would be desirable to provide a particular geometry of these elements so that they may be disposed in a casing no greater than the size of the casing employed in the above-mentioned copending applications. In order to provide a motor having the necessary power to operate an electric shaver of the type described above, it is necessary to have an armature of a predetermined diameter and it would be desirable to provide an electric motor in which the maximum dimension thereof in at least one direction is that of the armature. It furthermore would be desirable that an electric motor be provided utilizing a minimum volume of the casing in which it is incorporated.

Accordingly, it is an object of the present invention to provide a new and improved electric shaver of the battery-operated type.

It is another object of the present invention to provide a battery-operated electric shaver in which the cutting mechanism, the electric motor actuating the same, and the batteries for driving the motor are disposed in a casing

of no greater size than that required for electric shavers heretofore driven directly from a source of electric power.

It is a further object of the present invention to provide an improved direct current motor for a battery-operated device.

It is another object of the present invention to provide a new and improved electric shaver having an improved casing whereby there may be housed therein a powerful electric motor which is driven from a plurality of rechargeable batteries, with means included in said casing for recharging said batteries merely upon plugging the unit into a source of alternating electric current.

Still another object of the present invention resides in an improved cordless electric shaver which may be used throughout the world without regard to the power supplies that may be available.

Yet another object of the present invention resides in an improved casing for a battery-operated shaver in which a large access opening is provided to get at the batteries for replacing the same and which casing includes pockets on either side thereof for suitable electrical components, such as a rectifier, a switch, and a current limiting capacitor.

Still a further object of the present invention resides in the provision of a new and improved assembly arrangement for a battery-operated shaver in which the parts are interrelated in a very simple manner to facilitate manufacturing and assembly and still provide a very foolproof construction.

It is another object of the present invention to provide a battery-operated shaver in which the charging means is embodied within the shaver casing and in which means are provided to prevent energization of the motor while the batteries are being recharged.

It is a further object of the present invention to provide a new and improved mounting arrangement of the cutting mechanism and prime mover whereby vibrations will not be transmitted to the shaver casing.

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.

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

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

FIG. 2 is a somewhat enlarged right end view of the shaver of FIG. 1, with certain pertions cut away more clearly to illustrate the present invention, and showing in dotted lines a shipping insert member to prevent the shaver from being energized during shipment thereof;

FIG. 3 is a sectional view taken on line 3—3 of FIG. 2, assuming that FIG. 2 shows the complete structure, but without the shipping insert;

FIG. 4 is a sectional view taken on line 4—4 of FIG. 3, assuming that FIG. 3 shows the complete structure;

FIG. 5 is a sectional view taken on line 5—5 of FIG. 3, again assuming that FIG. 3 shows the complete structure;

FIG. 6 is a sectional view taken on line 6—6 of FIG. 3, again assuming that FIG. 3 shows the complete structure, but with certain portions cut away more clearly to illustrate the present invention;

FIG. 7 is a sectional view taken on line 7—7 of FIG. 3, also assuming that FIG. 3 shows the complete structure;

FIG. 8 is a sectional view taken on line 8—8 of FIG. 3, again assuming that FIG. 3 shows the complete structure;

FIG. 9 is a fragmentary sectional view taken on line 9—9 of FIG. 3, also assuming that FIG. 3 shows the complete structure;

FIG. 10 is a fragmentary view taken substantially on line 10—10 of FIG. 9, assuming that FIG. 9 shows the complete structure;

FIG. 11 is a fragmentary sectional view taken on line 11—11 of FIG. 3, again assuming that FIG. 3 shows the complete structure;

FIG. 12 is a fragmentary enlarged sectional view taken on ine 12—12 of FIG. 3, assuming that FIG. 3 shows the complete structure;

FIG. 13 is an exploded perspective view of the shaver casing and battery and motor supporting elements contained therein;

FIG. 14 is an exploded perspective view of the electric motor embodied in the shaver of FIG. 1;

FIG. 15 is a schematic diagram of the electric circuit embodied in the cordless shaver of the present invention; and

FIG. 16 is a somewhat schematic view of a standby attachment for energizing the shaver of FIG. 1 directly from a conventional alternating current source.

Briefly, the present invention is concerned with an electric dry shaver of the so-called cordless or battery operated type, and although generally applicable to all types of electric shavers has been illustrated as applied to savers of the type disclosed in the above-mentioned copending Jepson and Jepson et al. applications, in which a plurality of oscillating cutting blades cooperate with a curved perforated comb depending upon centrifugal force and spring means for urging the cutting blades into engagement with the comb. Without increasing the size of the casing over that of the above-mentioned copending applications, there is incorporated therein the same cutting mechanism, a powerful electric motor and a plurality of rechargeable batteries capable of producing a large number of shaves without recharging. In addition there is included a control switch and rectifier for recharging the batteries and preventing the shaver from being used while the batteries are being charged. An improved casing construction and improved assembly means are provided whereby all of the shaver parts can readily be manufactured and assembled in a simple manner and yet wherein ready access to the batteries for replacement purposes without disassembly can be accomplished.

Referring now to the drawings, the present invention is illustrated as embodied in an electric dry shaver generally designated by the reference number **20**. Essentially the shaver **20** comprises a cutting assembly or mechanism, generally designated at **19** comprising a plurality of cutters coacting with a comb or cutting surface **21**. The comb and cutter mechanism are associated with a suitable casing generally designated at **22** and comprising casing sections **23**, **24** and **25**. The central section of the casing **22** is substantially enclosed by the section **24** in the form of a wraparound and it defines a battery chamber **29** (FIGS. 3, 4 and 5) for housing a rechargeable battery unit generally designated as **26**.

For driving the cutting assembly or mechanism **19** there is provided a powerful electric motor generally designated at **27**. The cutting mechanism **19**, the motor **27** and the battery unit **26** are disposed in compact superimposed stacked relationship as best shown in FIG. 3 of the drawings. The electric motor **27** is adapted to be connected by suitable driving means generally designated at **28** with the cutting or cutter mechanism **19** in order to cause oscillation of this cutter mechanism at speeds in excess of nine thousand cycles per minute. The casing sections **23** and **25** of casing **22** might be designated as the clipper end casing section and the switch end casing section, respectively, because the casing section **23** is adjacent the clipper end of the shaver, and the casing section **25** effectively houses a control switch.

The shaver casing or housing **22** effectively defines a plurality of chambers therein in addition to the battery chamber **29** described above. In other words between the upper ends of the casing sections **23** and **25** of casing **22** there is provided a cutter chamber **30** for housing

the cutter mechanism **19** (FIGS. 3 and 4). The lower portion of the cutter chamber **30** is defined by a head casting generally designated at **31** (FIGS. 3, 4 and 7) and the upper portion of the cutter chamber **30** is, of course, defined by the curved perforated comb **21**, which is preferably identical with that disclosed in the above-mentioned copending Jepson and Jepson et al. applications. Immediately beneath the head casting **31** and above the battery unit **26** is a motor chamber **32** (FIGS. 3, 4, 5 and 8). The switch end housing section **25** defines at the upper end thereof a drive or mechanism chamber **33** which is defined at the right end of the cutter and motor chambers **30** and **32**, respectively, as viewed in FIG. 3 of the drawings. Beneath the mechanism chamber **33** within the switch end housing or casing section **25** and to the right of the battery chamber **29**, as viewed in FIG. 3 of the drawings, is a switch and rectifier chamber **34**. The clipper end housing section **23** defines a capacitor chamber **35** (FIGS. 3, 8 and 13) which is disposed to the left of the battery and motor chambers **29** and **32**, respectively, as viewed in FIG. 3 of the drawings.

The cutting mechanism generally designated at **19** and the associated driving means **28** form no part of the present invention but are fully disclosed and claimed in the above-mentioned copending Jepson and Jepson et al. applications, so that they will only briefly be described in the instant application. As illustrated, the cutting mechanism **19** comprises the head casting **31** which is preferably in the form of die casting having four lateral projections **31***a*, one from each corner thereof, best shown in FIGS. 3, 5, 6 and 7 of the drawings. As disclosed in the above-mentioned copending Jepson application, the head casting **31** includes at either end thereof a plurality of upwardly directed projections designated as **31***b* and **31***c* (FIGS. 3, 4, 5 and 7) each of which terminates in an upwardly directed V-shaped notch. These V-shaped notches are each adapted to receive therein a cooperating resilient support or block **37** and **38**, respectively, illustrated as substantially identical to those disclosed and claimed in the above-mentioned copending Jepson application. These resilient blocks **37** and **38** are preferably formed of neoprene rubber and serve as energy storage means as well as mounting means for the oscillating portions of cutter mechanism **19**. The resilient block **37** is securely bonded to the clipper end of an oscillating cutter shaft **39**. Similarly the block **38** is securely bonded to the oscillating cutter shaft **39** adjacent the switch end thereof. The end of cutter shaft **39** projecting through the block **38** is connected to a combined counterweight and crank pin **40** which forms a part of the driving means **28** contained in drive chamber **33**.

To clamp the resilient support blocks **37** and **38** into the respective V-shaped notches of the upwardly projecting portions **31***b* and **31***c* of the head casting **31** there are provided a pair of head bearing caps **41** and **42**, respectively. Each of these head bearing caps is preferably formed as a casting and each comprises a cooperating downwardly directed V-shaped notch so that when the cap is secured to casting **31** by fastening means **44**, best shown in FIG. 7 of the drawings, resilient blocks **37** and **38** are securely clamped in position and oscillation of the cutter shaft **39** requires stressing of the resilient blocks **37** and **38** to store and release energy therein. To support the comb **21** in the same manner as disclosed in the above-mentioned copending Jepson application, the clipper end bearing cap **41** is provided with an arcuate projection **41***a* and similarly the crank end bearing cap **42** is provided with an arcuate projection **42***a* upon which cooperating portions of the comb **21** securely rest during the shaving operation when the comb is locked in place for shearing engagement with the coacting cutters.

In order resiliently to support the plurality of cutter blades, each designated as **46**, for oscillation with the cutter shaft **39** the latter is provided with a plurality of upwardly extending supports **47***a*, **47***b*, **47***c* and **47***d* (FIGS. 3 and 4), which may be identical with those disclosed in the above-mentioned copending Jepson and Jepson et al. applications. These supports are of triangular shape and are rigidly secured to the cutter shaft **39**. They are provided with suitable slots (the number of slot corresponding with the number of cutter blades **46**, three being shown in FIG. 4 of the drawings) to receive the cutter blades **46** and suitable blade springs **48** therein in the same manner disclosed in the copending applications referred to above. From the above description it will be appreciated that the head casting **31**, the oscillating cutter shaft **39** with its associated resilient blocks **37** **38**, the bearing caps **41** and **42**, the blade supporting members **47***a*, **47***b*, **47***c*, **47***d*, the blade springs **48**, the cutter blades **46**, the combined counterweight and crank pin **40** and the screws or fastening means **44** for securing the bearing caps **41** and **42** in position provide a subassembly which might be designated the cutter subassembly, which together with the comb **21** defines the cutting mechanism **19** and hereinafter this subassembly will also be referred to by the reference numeral **19** which has been generally appended to the cutting mechanism.

An important feature of the present invention resides in the motor **27**, which since it is battery operated, must be a direct current motor capable of producing the necessary output to oscillate the cutter shaft **39** and blades **46** at the high speed desired. It will be appreciated that to provide the desired power output an electric motor must have an armature of a predetermined diameter and a major limitation in motor size is determined by the size of the armature required. In accordance with the present invention and to provide a minimum vertical dimension for the motor **27**, as viewed in FIG. 3 of the drawings, this dimension is determined substantially by the diameter of the armature of motor **27** designated as **50**. Armature **50** is supported on an armature shaft **51** which is disposed in spaced parallel relationship with the oscillating cutter shaft **39**. Moreover, the shafts **39** and **51** are substantially coextensive as far as the corresponding ends thereof adjacent the driving means or mechanism **28** is concerned.

As best shown in FIGS. 3, 4, 8 and 14 of the drawings, the motor **27** comprises a field structure, including pole pieces **53** and **54** and a permanent magnet **55**. The permanent magnet **55** is illustrated as having a pair of plane opposed surfaces which are soldered to plane surface portions **53***a* and **54***a* of the pole pices **53** and **54**. The permanent magnet **55** is magnetized in the direction of the double ended arrow indicated in FIG. 14 of the drawings so that a magnetic field is provided between the portions of the pole pieces **53** and **54** which extend beyond the permanent magnet **55** and each of which is provided with an arcuate surface **53***b* and **54***b*, respectively, conforming to the exterior configuration of the armature **50** as is well understood by those skilled in the art. It will also be apparent from FIGS. 4 and 14 of the drawings that the pole pieces **53** and **54** are disposed one on each side of the armature **50** so that no portion of the field structure is disposed above or below the armature **50** and hence the diameter of the armature **50** determines the height of the motor chamber **32** (as viewed in FIGS. 3 and 4) and insures a minimum space requirement for this motor as far as the vertical dimension thereof is concerned, which permits the accommodation of a large battery unit **26** within the casing **22**.

To support the magnet end of the armature shaft **51**, the permanent magnet **55**, which is preferably an alnico magnet, is provided with a notch **56** for receiving therein an axial load spring **57** and an end thrust bearing **58**. Additionally, a sintered bronze bearing **60** is provided which is secured to the field structure comprising the pole pieces **53** and **54** and the magnet **55** by a suitable adhesive such as an epoxy resin or the like. To support the other end of the armature shaft **50** there is provided a combined bearing and brush support **61** adapted

to be clamped to the ends of the pole pieces 53 and 54 remote from the magnet 55 by a pair of fastening means such as screws 62, best shown in FIGS. 5, 12 and 14 of the drawings. These screws preferably engage tapped openings 63 (FIG. 14), one in the end of each pole piece 53 54 remote from magnet 55. The bearing support 61 is preferably molded from a suitable plastic and is adapted to support a ball bearing unit 64, as best shown in FIGS. 3 and 8 of the drawings, within a suitable recess 65 defined therein. An opening in this support concentric with recess 65 permits the motor shaft 51 to extend therethrough into the drive chamber 33. Preferably a suitable dust shield 66 is interposed between the ball bearing unit 64 and a commutator 67 suitably secured to the armature shaft 51 in a well understood manner. To insure that armature 50 is mounted concentrically with arcuate surfaces 53*b* and 54*b* the bearing support 61 is provided with opposed arcuate flanges 61*a* (FIGS. 8 and 14) receivable in concentric relationship with surfaces 53*b* and 54*b*.

In accordance with the present invention, the combined bearing and brush support 61 is designed to accommodate a pair of identical spring and brush supports 68, best shown in FIGS. 3, 5, 12 and 14 of the drawings. To this end support 61 is provided with a suitable opening 69 and a pair of angularly disposed notches 70 and 71 for each support 68. Each pair of notches 70 and 71 are disposed at right angles to each other, these notches for the two brush supports 68 being best shown in FIG. 5 of the drawings. Also as shown in FIG. 5 of the drawings, the brush supports 68 are located at diagonally disposed corners of bearing support 61. Each spring and brush support 68 comprises a cylindrical pin portion 68*a* which is adapted to be pressed into the corresponding opening 69 provided therefor. It also includes a pivot portion 68*b* for pivotally supporting an associated brush holder, as described hereinafter. Additionally, it includes an integral pin portion 68*c*, the axis of which is disposed generally at right angles to the axis of portion 68*a*. The pin portion 68*c* is adapted to support the coiled portion of a suitable torsion spring 73. During the assembly operation, the spring and brush supports 68 which are preferably die castings have the portions 68*a* thereof pressed into their associated opening 69 in the bearing support 61 after the associated torsion spring 73 has been suitably mounted on the pin portion 68*c* of each support 68. When the portion 68*a* is fully inserted into its opening 69, the pin 68*c* is received in its corresponding notch 70, whereby the two spring and brush supports 68 are firmly secured to the bearing support 61. The notch 71 is provided to receive the end 73*a* of the torsion spring 73, whereby the other end 73*b* of the torsion spring 73 is capable of applying a biasing force to a suitable brush holder.

As best shown in FIG. 12 of the drawings, a pair of identical brush holders, designated as 74*a* and 74*b*, are provided. Secured to one end of holder 74*a* is brush 75*a* and secured to the corresponding end of holder 74*b* is brush 75*b*. The ends of the brush holders 74*a* and 74*b*, remote from the brushes 75*a* and 75*b*, respectively, are in the form of a sine wave to define adjacent oppositely directed pivot and spring recesses 76 and 77, respectively, as best shown in FIG. 12 of the drawings. The pivot portion 68*b* of each spring and brush support 68 is received within the pivot recess 76 of the associated brush holder 74*a* or 74*b* as the case may be, and the end 73*b* of the associated torsion spring is received in the associated spring recess 77. With this arrangement the springs 73 not only hold the associated brush holders 74*a* and 74*b* in pivotal engagement with pivot portions 68*b* of supports 68, but also bias the associated brushes 75*a* and 75*b* into engagement with the commutator 67 in diametrically opposed relationship, as clearly shown in FIG. 12 of the drawings. In an embodiment built in accordance with the present invention the direct current motor 27 was a five volt motor operating at a speed of between 9300 and 9700 revolutions per minute. Normal load for this motor for the particular application illustrated caused a current flow of the order of one ampere.

In accordance with the present invention the cutting subassembly 19 described above is united with the motor 27 and the drive means 28 into a cutting and power unit subassembly. To this end the pole pieces 53 and 54 are provided with tapped openings 72 (FIG. 14) to receive suitable fastening means 78 (FIG. 7) which extend through the head casting 31 and, consequently, unite the motor 27 and the cutting mechanism 19. In order to support suitable comb locks for securing the comb 21 in cutting position on arcuate supports 41*a* and 42*a* there is preferably provided a comb lock spring 79, best shown in FIGS. 4 and 5, which is interposed between the cutting assembly 19 and the motor 27 and secured in position by the fastening means 78 just described. The comb lock spring 79 is adapted pivotally to support comb locks 80 and 81 which, as will be obvious from the above-mentioned copending applications, are adapted to engage the lower edges of the comb 21 and hold it in cutting position relative to the oscillating cutting blades 46. The driving means 28 converts rotary motion of the armature shaft 51 to oscillating motion of the cutter shaft 39 and to this end the end of the motor shaft 51 adjacent the drive means 28 is provided with a crank 82 including a crank pin 83. The crank pin 83 is connected to one end of a suitable connecting rod 84, the other end of which is connected to the combined crank and counterweight 40 described above.

There has thus been described a cutting and power subassembly comprising a cutting mechanism 19, motor 27 and drive means 28 wherein the dimension in the vertical direction as viewed in FIG. 3 is no greater than the dimension of the cutting mechanism plus the diameter of the armature 50. Moreover, the cutting and power subassembly is such that if a source of direct current were connected to brushes 75*a* and 75*b* of motor 27 the subassembly could perform a shaving operation. The cutting mechanism illustrated is like that disclosed in the above-mentioned copending Jepson and Jepson et al. applications and includes at the clipper end thereof means for clipping sideburns and mustaches. No description thereof is included herewith since it forms no part of the present invention.

As best shown in FIGS. 3, 4, 5 and 13 of the drawings, the rechargeable battery unit 26 comprises a pluarlity of identical rechargeable batteries 26*a*, 26*b*, 26*c* and 26*d*, preferably of the nickel cadmium type, which are assembled into a unit by a suitable molded battery holder or rack 86. The batteries are illustrated as of the type where opposite ends thereof define the battery terminals. In a device built in accordance with the present invention the battery holder 86 comprised a molded plastic rack providing space for the four individual batteries 26*a*, 26*b*, 26*c* and 26*d*. This battery holder or rack 86 as viewed in FIGS. 4 and 13 of the drawings comprises two main horizontally disposed portion 86*a* and 86*b* and a vertical wall portion 86*c*. The portions 86*a* and 86*c* define a T-shaped member while the portion 86*b* defines a pair of shelves secured to either side of the leg of the T intermediate its ends. The portion 86*a* is provided with a centrally disposed recess 87 and the edges of this portion 86*a* on either side of recess 87 provide a plurality of supporting projections 86*d*. The remote ends of these projections 86*d* are cut away to define three substantially identical notches 88 and a fourth special notch 89. As best shown in FIG. 4 of the drawings, batteries 26*b* and 26*c* are disposed above horizontal portion 86*b* while batteries 26*a* and 26*b* are disposed below this portion 86*b*. Moreover, batteries 26*a* and 26*b* are to the left of portion 86*c* and batteries 26*c* and 26*d* are disposed to the right thereof. Thus, the rack 86 insulates the individual batteries from each other. To prevent the batteries from sliding out of the ends of the

rack **86** intgral ends **86***e* and **86***f* are provided of a somewhat double H-shape, portions of which also provide means for insulating the connecting means for connecting the batteries **26***a*, **26***b*, **26***c* and **26***d* in series. The battery holder or rack **86** also includes a pair of depending tubular portions **86***g* at either end thereof adjacent ends **86***e* and **86***f* which are provided with suitable openings to receive self-tapping fastening means **90** such as best shown in FIG. 3 of the drawings. To aid in supporting the lower two batteries **26***a* and **26***d*, the tubular portions **86***g* are each provided with a pair of curved surfaces **86***h* (FIG. 4). To connect the four individual batteries **26***a*, **26***b*, **26***c* and **26***d* in series, conductors **91***a*, **91***b* and **91***c*, best shown in FIGS. 4 and 5 of the drawings, are provided. These interconnections are facilitated by having the positive and negative terminals of alternate batteries disposed at opposite ends of rack or holder **86** as indicated in FIG. 5 of the drawings. The conductors **91***a*, **91***b* and **91***c* are flat uninsulated conductors, the intermediate portions of which are held away from the batteries by portions of rack ends **86***e* and **86***f*, as best shown in FIGS. 4 and 5 of the drawings.

For the purpose of maintaining the individual batteries in the specific places provided therefor by the battery holder **86**, a band of masking tape or similar adhesive generally designated at **92** encircles the rack and the batteries, as best shown in FIG. 4 of the drawings. This supporting band is disposed within the recess **87** thereby effectively taking up no otherwise useable space. It will be understood that the top of portion **86***a* of rack **86** effectively defines the boundary between battery chamber **29** and motor chamber **32**.

Before considering how the above described power and cutting subassembly is supported in the casing **22**, a brief description of the electrical circuit of the electric shaver **20** of the present invention is included with reference to the schematic diagram of FIG. 15 of the drawings where the corresponding parts are designated by the same reference numerals as in the other figures of the drawings. As there illustrated, the commutator **67** and brushes **75***a* and **75***b* and the battery **26** comprising the four separate cells **26***a*, **26***b*, **26***c* and **26***d* connected in series by conductors **91***a*, **91***b* and **91***c* are shown. In order selectively to control the connection of the battery unit **26** to the motor and specifically to the brushes **75***a* and **75***b* thereof, there is provided a switch generally indicated at **93** which comprises a pair of stationary contacts **94***a* and **94***b* and a pair of movable contact members **95***a* and **95***b*, respectively. The movable contact **95***a* is connected by a conductor **96** with the negative terminal of the battery unit **26** while the movable contact **95** is connected by a conductor **97** with the positive terminal of the battery unit **26** (the battery ends of these conductors **96** and **97** are shown in FIG. 5 of the drawings). The negative conductor **96** is also connected through switch contacts **94***a* and **95***a* and a conductor **98** with brush holder **74***a* and brush **75***a*. Likewise, the positive battery lead **97** is connected through the switch contacts **94***b* and **95***b* and a conductor **99** to the other brush holder **74***b* associated with the other brush **75***b*. It will be apparent that when the switch **93** is closed the motor will be energized from the battery unit **26**.

So that the battery unit **26** may selectively be recharged, there is provided a suitable charging circuit which comprises the conventional power cord **100** having a suitable female type plug connector **101** for connection with stationary pin type terminals **102***a* and **102***b* suitably mounted in spaced parallel relationship in the shaver **20**. When it is desired to charge the battery unit **26**, the terminals **102***a* and **102***b* are adapted to make connection with the female type plug connector **101**. As will be described hereinafter, means are provided to prevent the female type plug connector **101** from making electrical connection with the terminals **102***a* and **102***b* when the switch **93** is closed. The charging circuit of the present invention will permit the user to recharge the battery unit **26** from any source of alternating current having a voltage between ninety and two hundred fifty volts. To this end the charging circuit comprises a full wave rectifier unit **103**, having a negative terminal **103***a*, a positive terminal **103***b* and alternating current terminals **103***c* and **103***d*. As illustrated, the negative terminal of the battery unit **26** is connected by a lead **104** with the negative terminal **103***a* of the full wave rectifier **103**. Similarly, the positive terminal of the battery unit **26** is connected by a lead **105** with the positive terminal **103***b* of the full wave rectifier **103**. Also, as illustrated, the terminal pin **102***a* is connected to the alternating current terminal **103***d* of the full wave rectifier **103** through a suitable fuse **107** and a conductor **108**. The other terminal pin **102***b* is connected to the other alternating current terminal **103***c* of the full wave rectifier **103** through current limiting and voltage dropping capacitor **109** and a conductor **110**. Preferably a leakage resistor **112** is connected across the capacitor terminals. In a device built in accordance with the present invention wherein the full wave rectifier **103** was a selenium rectifier capable of producing the desired output to charge the battery unit at approximately five bolts, the capacitor **109** had a capacitance of forty-seven hundredths of a microfarad. The leakage or discharge resistor **112** had a resistance of four hundred seventy thousand ohms.

As best illustrated in FIG. 3 of the drawings, the resistor **112** is connected directly across the terminals of the capacitor **109** and supported thereby. In order to support the capacitor **109** and associated resistor **112** within the capacitor chamber **35** in casing section **23**, there is provided a suitable capacitor supporting clip **115**, which has a clip portion **115***a* clamped around the body of the capacitor and a pair of opposed spring fingers **115***b* of a length to engage the walls of the chamber **35**, as best shown in FIG. 8 of the drawings, thereby firmly to support the capacitor **109** and associated resistor **112** within the chamber **35**.

In accordance with the present invention, and as best shown in FIGS. 2, 3, 6, 8, 9, 10 and 11 of the drawings, the switch **93**, the full wave rectifier **103**, the fuse **107** and the pin terminals **102***a* and **102***b* comprise a subassembly which is capable of being suitably supported within the switch and rectifier chamber **34**. To this end there is provided an insulated switch housing and rectifier support generally designated as **117**. Member **117** is an integrally molded member including a boxlike housing portion **117***a* open on one side and having a central partition **117***b* dividing the housing into two spaced adjacent chambers **118** and **119**. Depending from the end of portion **117***a* is an insulating panel portion **117***c* for supporting in spaced parallel relationship the terminal pins **102***a* and **102***b* described above. To mount the insulated switch housing and rectifier support **117** in shaver casing **22** there are provided laterally projecting ears **117***d*, **117***e*, and **117***f* through which suitable fastening means **120** extend to engage suitable tapped openings in integral projections **25***a*, **25***b* and **25***c*, respectively, of casing section **25** extending into the switch and rectifier chamber **34**. Disposed within the insulated chamber **118** is a portion of stationary switch contact **94***a* and movable switch contact **95***a* of switch **93** which is best shown in FIGS. 9 and 10 of the drawings. Disposed within the insulated chamber **119** is a portion of stationary switch contact **94***b* and movable switch contact **95***b*, best shown in FIGS. 3 and 9 of the drawings. Contacts **95***a* and **95***b* are illustrated as symmetrical resilient contact fingers each having one end thereof secured to a wall portion **117***g* of member **117** within its associated chamber **118** or **119**, and with the other end biased out of contacting engagement with its associated stationary switch contact **94***a* or **94***b*.

In order to support the rectifier **103** with respect to the switch housing and rectifier support **117** the conductors

104 and 105 connecting the rectifier terminals 103*a* and 103*b* to the switch contacts 95*a* and 95*b*, respectively, are rigid conductors suitably secured to member 117 as by extending through the wall 117*g* common to chambers 118 and 119. Preferably also the member 117, and specifically wall 117*g*, is provided with a plurality of spaced integral projecting fingers 117*h*, 117*i*, 117*j* and 117*k*, as shown in FIGS. 3, 6 and 8 of the drawings, for defining a space therebetween for rectifier 103.

For the purpose of activating the movable resilient switch contacts 95*a* and 95*b* of the switch 93 there is provided a combined switch actuating and interlock member 121 including a projecting button or knob portion 121*a* and a rectangular door portion 121*b*. The door portion 121*b* is adapted to be slidably mounted across the open side of boxlike housing portion 117*a* in sliding engagement with the partition 117*b*. At least a portion of the side walls of housing portion 117*a* extend beyond the plane of partition 117*b* to define guides for the edges of door portion 121*b*. On the side of the door portion 121*b* opposite the side from which button or knob 121*a* projects are a pair of spaced somewhat triangular switch actuating projections 121*c* and 121*d* disposed to move within chambers 118 and 119, respectively. In one extreme position of the combined switch actuating and interlock member 121 shown in FIGS. 3 and 10 of the drawings, the projections 121*c* and 121*d* are out of engagement with the movable spring contacts 95*a* and 95*b*, respectively. When the member 121, however, is moved to the other extreme position, the projections 121*c* and 121*d* engage the movable contact members 95*a* and 95*b*, respectively, and move them into contacting engagement with stationary contacts 94*a* and 94*b*, respectively, thereby closing the switch 93 as is readily apparent from the schematic circuit diagram of FIG. 15 of the drawings. In this latter position it should be observed, as best shown in FIGS. 2 and 10 of the drawings, that the lower part of the door portion 121*b* moves in front of the pin terminals 102*a* and 102*b* so that in this position it is impossible to electrically connect plug connector 101 with these pin terminals for charging the battery unit 26.

To selectively latch the member 121 in either of its two positions (the closed position of switch 93 or the position when a source of current may be connected to the charging circuit for the battery unit 26), there is provided a spring detent member 124 of a generally U-shaped configuration, the ends of the legs of the U remote from the bight portion terminating in somewhat V-shaped latching projections 124*a* and 124*b*. This U-shaped detent member 124 surrounds boxlike housing portion 117*a* with the bight portion thereof along wall 117*g* and positioned between finger 117*h* and a similar finger 117*m* (FIGS. 3 and 10). The legs of the U are disposed in notches 125 (FIG. 9) defined in the outside side walls of boxlike housing portion 117*a*. The latching projections 124*a* and 124*b* are disposed in notches 126 and 127 defined in that part of housing portion 117*a* defining guides for door portion 121*b*. Each of the opposed edges of the door portion 121*b* are provided with a pair of equally spaced V-shaped notches 128 and 129 and the latching projections 124*a* and 124*b* and are selectively receivable in either the pairs of notches 128 or 129 thereby selectively to hold the switch actuating and interlock member 121 in the closed or the open position of switch 93.

When the switch and rectifier subassembly is suitably secured within chamber 34 of the housing section 25 of casing 22 by the fastening means 120, the switch actuating and interlocking member 121 is slidably disposed and retained in position between the inside wall defining the chamber 34 and the switch housing and rectifier support 117. The casing section 25 is provided with a pair of spaced openings 130 and 131 leading into chamber 34. The opening 130 is adapted to permit the switch actuating button 121*a* to project therethough for ready actuation thereof from the exterior of casing 22 as best shown in FIGS. 2, 3 and 10 of the drawings. The opening 131 on the other hand is aligned with the terminal pins 102*a* and 102*b* and is of such a size as to permit the ready insertion of the plug connector 101 for electrical connection with the terminal pins 102*a* and 102*b*. When the switch actuating and interlock member 121 is in its lowermost position, which is the closed position of switch 93, the door portion 121*b* extends over the opening 131 and prevents the insertion of the plug connector 101 and hence prevents recharging of the battery unit 26 when the switch 93 is in the closed position. Preferably housing section 25 is provided with integral wall portions 25*d* and 25*e* within chamber 34 on either side of opening 131 effectively to define a plug receptacle for plug connector 101.

In some instances it may be desirable to have a standby power attachment, described hereinafter and disclosed in FIG. 16 of the drawings, whereby the shaver motor 27 may be operated directly from a conventional alternating current source. In this event, a particular orientation of the plug connector of the standby power attachment is necessary. To this end, opening 131 is provided on its lower edge with a notch 131*a* (FIG. 2). Also, a projection 117*n* from the lower end of terminal pin support 117*c* is provided with a corresponding notch 133 coextensive with and aligned with notch 131*a*.

So that the switch 93 cannot be closed to energize motor 27 during shipment of the shaver 20 a shipping insert 134, shown in dashed lines FIG. 2 of the drawings, is employed. This insert 134, preferably formed of cardboard, has a V-shaped portion 134*a* the apex of which is receivable in aligned notches 131*a* an 133. The insert 134 includes flaps 134*b* extending from the top of the V which engage the lower edge of door portion 121*b* and prevent its movement until the insert is removed.

In assembling the housing sections 23 and 25 with the power and cutting subassembly described above, the switch and rectifier subassembly is first mounted within chamber 34 of housing section 25, and similarly the capacitor 109 and the resistor 112 are first suitably supported within chamber 35 of housing section 23. In accordance with the present invention each of the housing sections 23 and 25 in addition to the portions thereof defining the respective chambers described above are provided with a pair of spaced parallel relatively narrow projecting walls which extend from the edges defining the open sides of the chambers contained therein, as best shown in FIG. 13 of the drawings. As illustrated, the casing section 23 is provided with integral spaced parallel projecting wall portions 23*a* and 23*b*. Similarly, the casing section 25 is provided with similar integral spaced parallel projecting wall portions 25*f* and 25*g*. The ends of wall portions 25*f* and 25*g* are each provided with a pair of spaced integral projecting pins 25*h* and 25*i*. Similarly, the ends of projecting wall portions 23*a* and 23*b* are provided with cooperating apertures 135 and 136 to receive the pins 25*h* and 25*i*, respectively. For the purpose of holding the two casing sections 23 and 25 in assembled relationship with the pins 25*h* and 25*i* disposed in the apertures 135 and 136, there are provided a pair of U-shaped clips 137, best shown in FIGS. 8 and 13 of the drawings, which are preferably formed of resilient spring material. The legs of the U-shaped clips are adapted to be received in cooperating slits 138 defined in the projecting wall portions 23*a*, 23*b*, 25*f* and 25*g*. In order that the bight portions of the clips 137, when the legs thereof are inserted in the slits 138, do not project beyond the surface of the projecting wall portions, these wall portions are recessed, as indicated at 139, adjacent openings 138.

For the purpose of supporting the power and cutting subassembly within the casing 22 in a manner so as not to transmit any vibrations to the casing and, furthermore,

in a manner that permits easy assembly, each of the casing sections 23 and 25 is provided with recesses 140 on either side thereof immediately above the projecting wall portions and in the wall defining chambers 35 and 33, respectively. These recesses are adapted to receive therein resilient mounting grommets 141 preferably formed of a suitable butyl rubber or the like. These mounting grommets are of somewhat U-shaped configuration having short retaining flanges 141*a* projecting from each end of the bight portion thereof. The recesses 140 have undercut portions 140*a* to receive these flanges and thus serve to retain the grommets 141 in position. The projecting ears 31*a* on the head casting 31 are receivable between the fingers of the grommets 141, as best shown in FIGS. 6 and 7 of the drawings. During an assembly operation the casing sections 23 and 25 with the grommets 141 suitably mounted therein are brought toward each other so as to cause the supporting ears 31*a* to move into supporting engagement with the grommets 141. When the casing sections are brought together to the position shown in FIG. 8 of the drawings the pins 25*h* and 25*i* are received within apertures 135 and 136 and the clips 137 can be inserted in slits 138 to lock the casing sections 23 and 25 together with the subassembly comprising the motor and cutting mechanism subassembly resiliently supported by these casing sections and with the cutting mechanism disposed above the projecting wall portions 23*a*, 23*b*, 25*f* and 25*g*. When the U-shaped clips 137 are moved into place it will be apparent that a large access opening between the chambers 34 and 35 and below motor chamber 32 is afforded for inserting battery unit 26 and also to permit the electrical connections shown in FIG. 15 of the drawings to be completed. These electrical connections are preferably completed before inserting battery unit 26.

For the purpose of supporting the battery unit 26 the projecting wall portions 23*a* and 25*f* are provided as elongated grooves 144*a* and 144*b*, respectively, along the inside and near the lower edge thereof for receiving the supporting projections 86*d* on one side of the battery rack or holder. Similarly the projecting wall portions 23*b* and 25*g* are provided with grooves 145*a* and 145*b*, respectively, for receiving the supporting projections 86*d* on the other side of rack 86. The grooves 144*a* and 144*b* and the grooves 145*a* and 145*b* in abutting projecting wall portions are aligned to define two continuous grooves 144 and 145, one on each inside wall of casing 22. The battery unit 26, including rack 86, can readily be assembled with casing 22 by inserting the projections 86*d* on one side of rack 86 into the groove 144. Then the battery unit 26 is pivoted about the projections in groove 144 to force the projections 86*d* on the other side of rack 86 into groove 145. To facilitate this operation the top edges of projections 86*d* are rounded as indicated at 146 (FIGS. 4 and 13) and the inside wall of casing 22 directly beneath grooves 145*a* and 145*b* is chamfered, as indicated at 147. The notches 88 and 89 in portion 86*a* of rack 86 provide means whereby the portion 86*a* directly engages the inside walls of casing 22 at the ends of grooves 144 and 145 to provide a more rigid assembly.

To complete the casing 22, the U-shaped wraparound or casing section 24 is moved into position and held there by the fastening means 90 which secure it to the tubular projections 86*g* of rack 86. So that section 24 may aid in locking casing sections 23 and 25 together in assembled relationship the casing section 23 is provided at the lower end with a depending locking projection 23*c* while casing section 25 is provided with a similar projection 25*j*, as best shown in FIGS. 3 and 13 of the drawings. Moreover, the bight portion of the wraparound or U-shaped casing section 24 is provided with cooperating hook-shaped portions 24*a* and 24*b* at each end thereof for engaging the locking projections 23*c* and 25*j*, respectively, as clearly shown in FIG. 3 of the drawings, so that the casing sections 23 and 25 are firmly locked together at the bottom thereof. To facilitate engagement of the hook-shaped portions 24*a* and 24*b* with the cooperating portions on casing sections 23 and 25, these casing sections are provided with recesses 148 and 149 adjacent projections 23*c* and 25*j*, respectively. In order that casing section 24 may be securely supported along the edges thereof, casing sections 23 and 25 below projecting wall portions 23*a*, 23*b*, 25*f* and 25*g* are provided with flanged portions 23*d* and 25*k*, respectively, of reduced thickness, best shown in FIGS. 11 and 13 of the drawings. Moreover, the lower portions of projecting wall portions 23*a*, 23*b*, 25*f* and 25*g* are also provided with portions of reduced thickness to engage the ends of the legs of U-shaped casing section 24 and effectively to define a recess for said casing section. The outside of the bight portion of casing section 24 is preferably flat to provide a flat surface for supporting shaver 20 in an upright position.

In order to interlock the ends of the legs of U-shaped casing section 24 with casing sections 23 and 25, there are provided interlocking projections 24*c* and 24*d* somewhat in the form of a truncated pyramid. Moreover, these projections 24*c* and 24*d* are provided with laterally projecting flanges 24*e* from each side thereof. The casing sections 23 and 25 are provided with cooperating recesses 150 having undercut portions 150*a* for receiving the projections 24*c* and 24*d* and thus the associated flanges 24*e* in the undercut portions 150*a* (FIG. 8). The recesses 150, when the casing sections 23 and 25 are held assembled by U-shaped clips 137, have sloping edges to engage the sloping edges of projections 24*c* and 24*d*. By forcing the projections 24*c* and 24*d* into recesses 150 the casing sections will be forced tightly together and the leg portions of the U-shaped wraparound or casing section 24 will be firmly interlocked with the casing sections in a very simple manner. Additionally, the portions 24*c* and 24*d* overlie clips 137 and hold them in engagement with slits 138. The U-shaped wraparound 24 may be provided with a surface which makes ready gripping thereof possible, as clearly shown in FIG. 13 of the drawings, and may also have a decorative effect to give the shaver 20 a pleasing appearance.

In FIG. 16 of the drawings there is illustrated a standby attachment generally designated as 155 which includes a step down transformer and rectifier unit 156 for converting one hundred ten volt alternating current energy to five volt direct current energy. Conventional terminals 157 permit the unit 156 to be plugged into any conventional outlet. The direct current output of unit 156 is connected by a power cord 158 to a plug connector 159 receivable in the plug receptacle of shaver 20. The plug connector 159 has a pair of openings 160 for receiving terminal pins 102*a* and 102*b* but no electrical conductors are contained in these openings. Supported on one side of connector 159 are contacts 161*a* and 161*b* for making sliding engagement with contacts 162*a* and 162*b* provided in shaver 20. These contacts 162*a* and 162*b* are also illustrated in FIG. 15 of the drawings. As best shown in FIGS. 3 and 10 of the drawings, the contacts 162*a* and 162*b* are electrically connected to stationary contacts 94*a* and 94*b*, respectively, and extend around the lower wall portion 117*p* of boxlike housing 117*a* so as to have spring contacting portions disposed above terminal pins 102*b* and 102*a*, respectively. When plug connector 159 is inserted in the opening 131 the contacts 161*a* and 161*b* engage with contacts 162*a* and 162*b*, respectively, to connect power directly to motor 27 even though switch 93 is open. Connector 159 is provided with a projection 159*a* receivable in aligned notches 131*a* and 133 whereby connector 159 can only be correctly inserted in the plug receptacle of shaver 20.

In view of the detailed description included above, the operation of the electric dry shaver 20 will readily be apparent to those skilled in the art. It will furthermore be apparent that the dry shaver which is battery operated has been disclosed as comprising readily assembled parts,

each of very sturdy construction which will give long and foolproof operation. Moreover, the size of the casing is no greater than that of a very successful electric shaver shown in the above-mentioned co-pending Jepson and Jepson and Schuessler applications. There has been provided an arrangement embodying a very powerful electric motor driven by a battery unit. Additionally a charging unit has been built into the casing **22** so that all the operator has to do to recharge the battery is to plug it into a suitable power source of alternating current having a voltage between ninety and two hundred fifty volts. Moreover, a control switch for turning on the motor is provided with means whereby it is impossible to charge the battery while the motor is connected to the battery.

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. In a battery powered electric shaver, the combination of a casing, a cutting mechanism mounted in said casing, an electric motor in said casing operatively connected to said cutting mechanism, a rechargeable battery unit in said casing, means including an electric switch for energizing said motor from said battery unit, said switch including actuating means accessible outside said casing, a charging circuit in said casing for selectively recharging said battery unit including a pair of terminals, means defining an opening in said casing affording access to said terminals, a door portion connected to said actuating means for closing said opening when said switch is in its closed position, electric contact means directly connected to said motor, said contact means being within said casing and accessible through said opening, and means including a step down transformer and rectifier unit for connecting said contact means to an alternating current source and consequently energizing said motor directly from said source even when said switch is in its open position.

2. A cordless electric shaver comprising a casing, a cutting mechanism supported along one side of said casing, a direct current motor in said casing suspended from said cutting mechanism and drivingly connected to said cutting mechanism, a first chamber in said casing comprising a major portion of the volume of said casing and accessible from the side of said casing opposite said cutting mechanism, a rechargeable battery unit in said chamber, a second chamber in said casing to one side of said battery chamber, a control switch and rectifier disposed in said second chamber, a third chamber in said casing on the opposite side of said first chamber from that of said second chamber, electrical control means disposed in said third chamber, electric circuit means in said casing for electrically connecting said battery unit and motor through said switch, and a charging circuit in said casing for said battery unit including said control means and rectifier.

3. The shaver of claim **2** wherein said electrical control means comprises a capacitor.

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LEE T. HIX, *Primary Examiner.*

WARREN E. RAY, *Examiner.*

S. WEINBERG, *Assistant Examiner.*