

[54] **ELECTRIC SHAVERS**
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 [51] **Int. Cl.**..... **B26b 19/02, B26b 19/20**
 [58] **Field of Search**..... **30/43.91, 43.92,**
30/346.51, 43.9, 222

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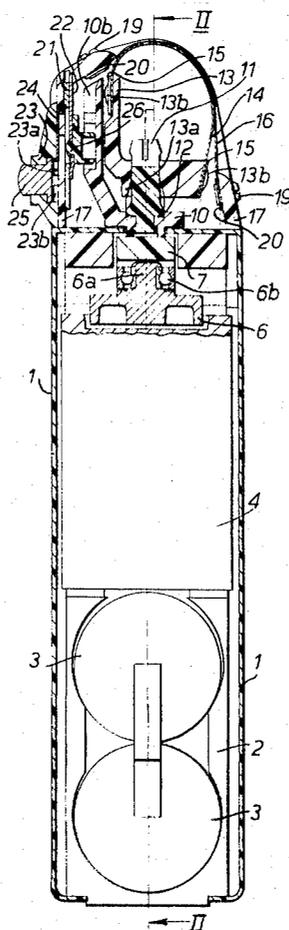
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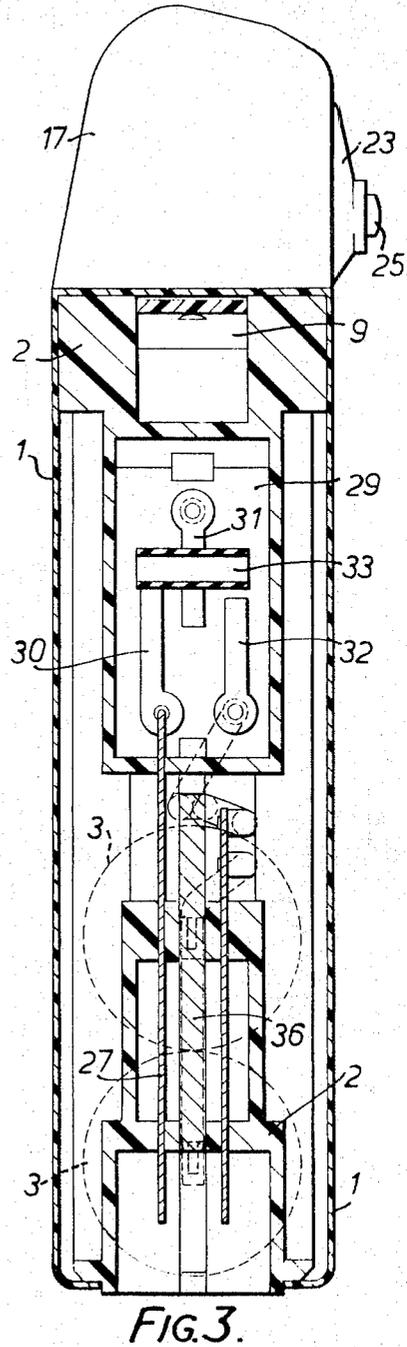
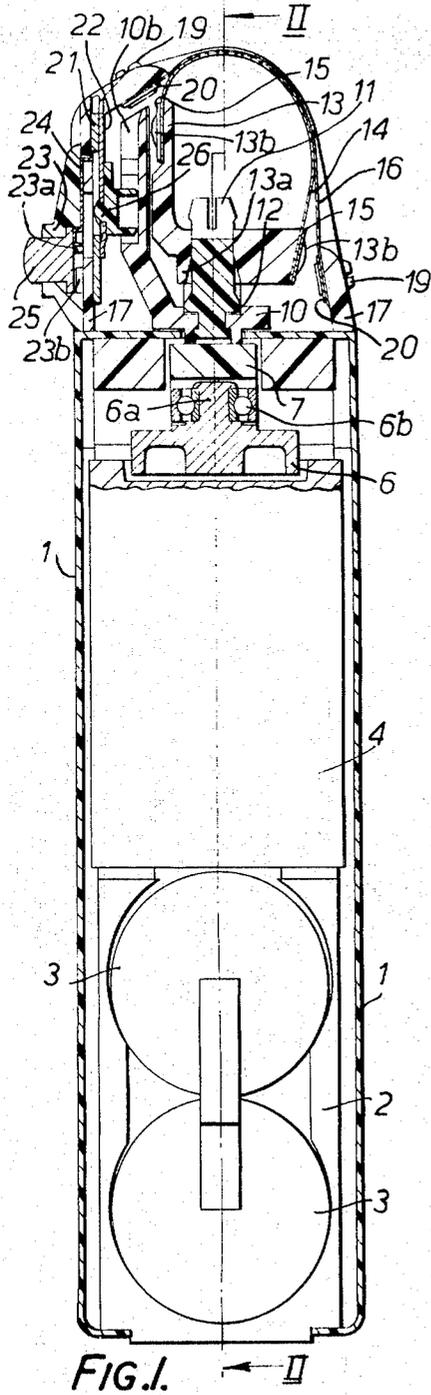
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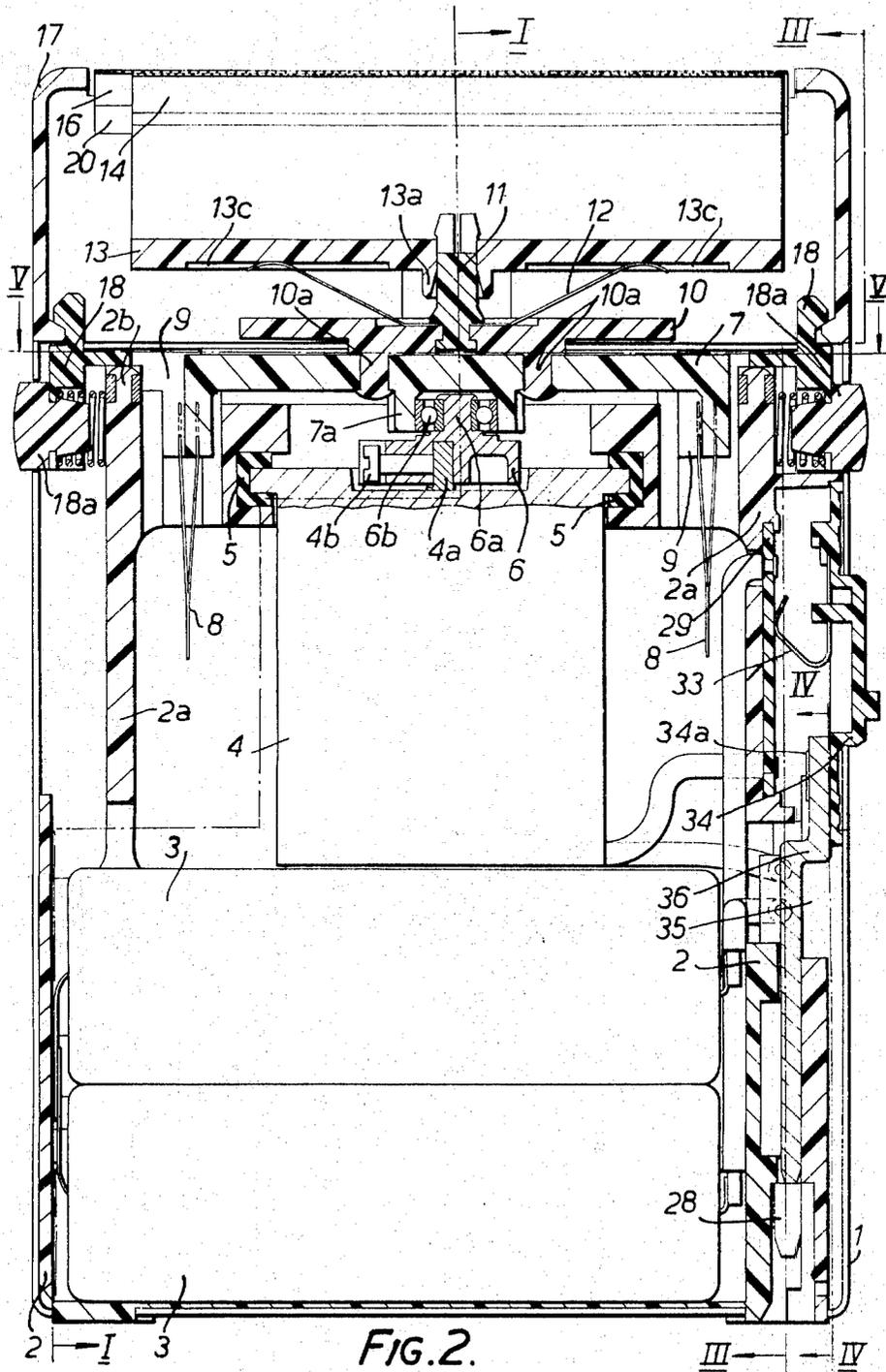
[57] **ABSTRACT**

An electric dry shaver of the cordless type has the motor, battery and other parts supported in an integrally moulded body frame, a sheet metal body casing enclosing the frame and supported parts, with a cutter drive member projecting through the casing and carrying externally thereof a reciprocable cutter which cooperates with a shear plate carried on a head casing detachably secured to the body. The head casing also carries a long hair trimmer. Provision is made for recharging the cells from an external power source and for operating direct from an external source in an emergency, suitable external sources for both purposes being disclosed.

2 Claims, 12 Drawing Figures







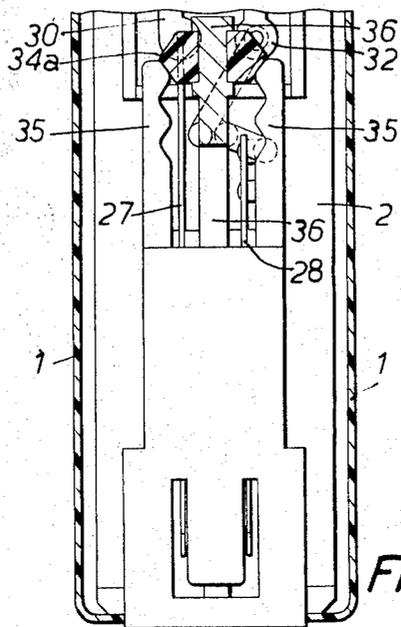


FIG. 4.

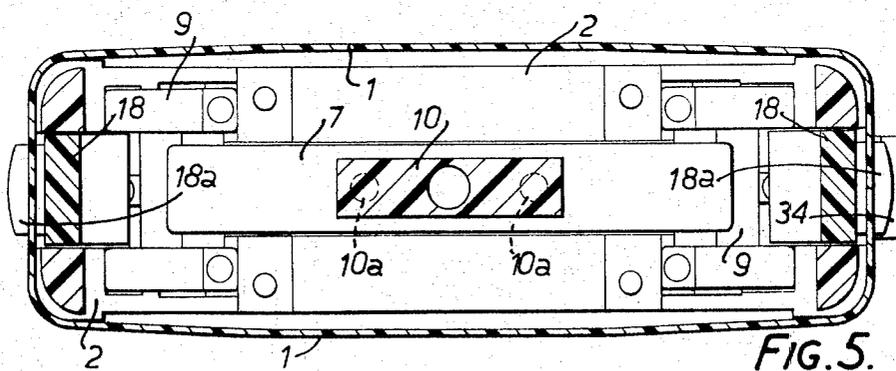


FIG. 5.

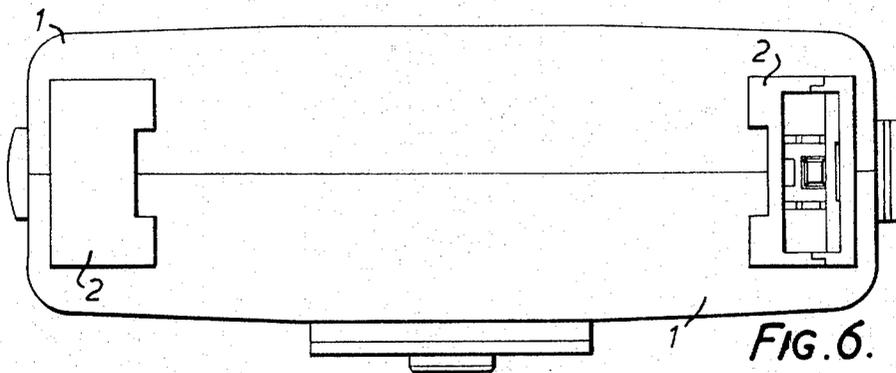
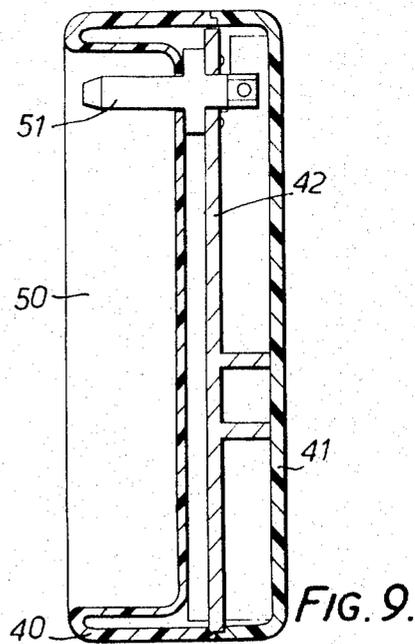
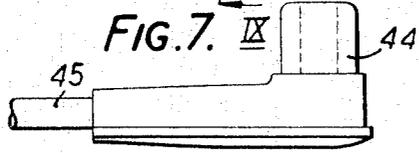
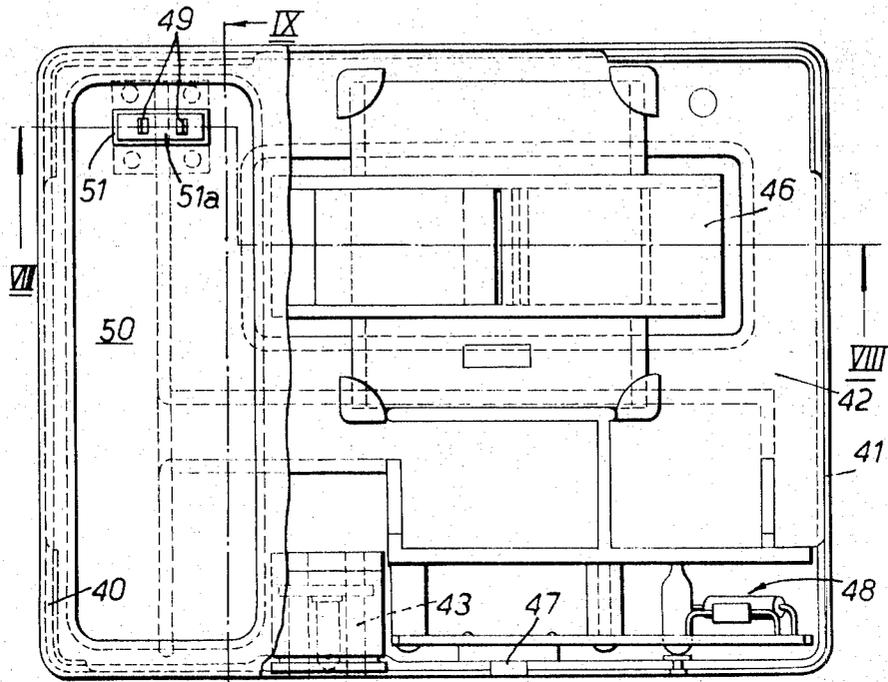


FIG. 6.



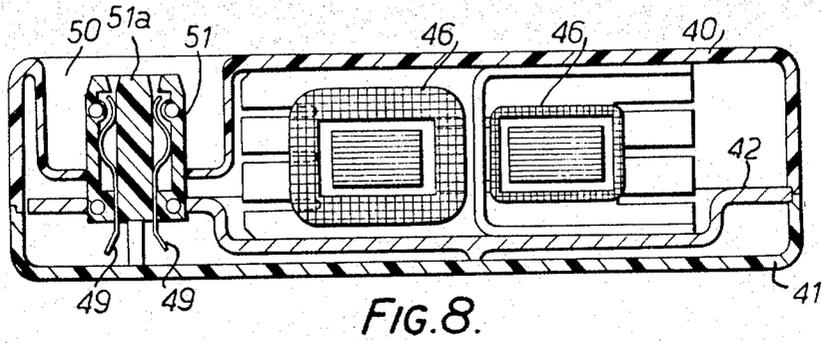


FIG. 8.

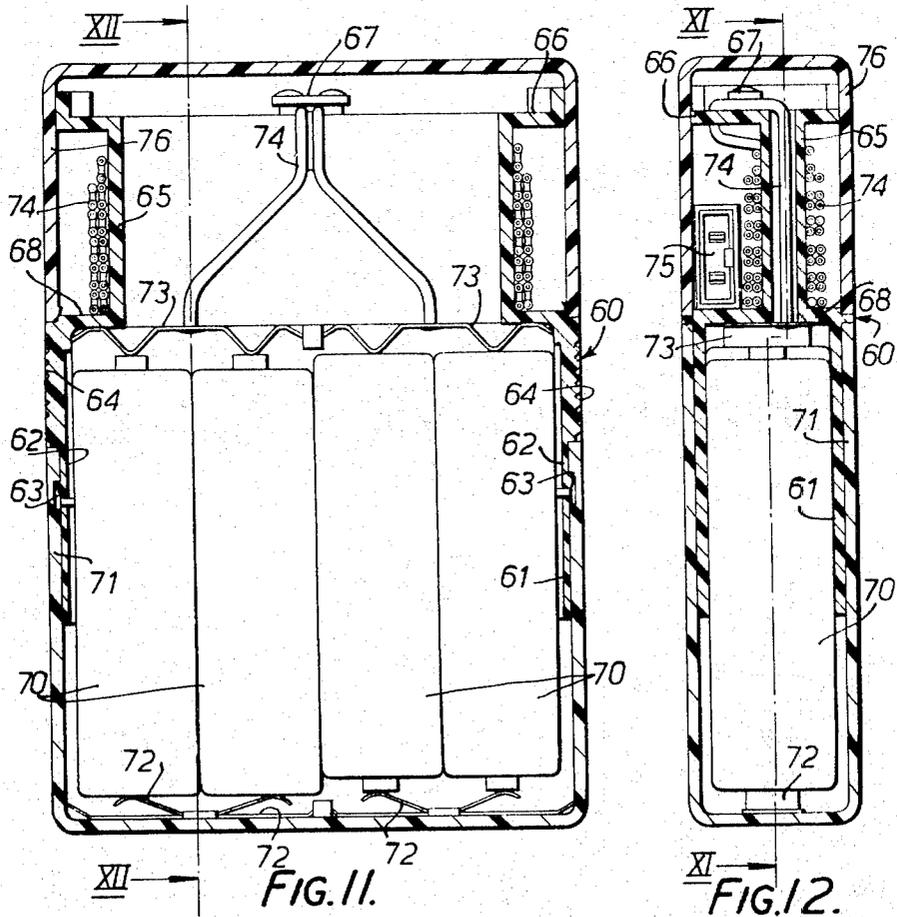


FIG. 11.

FIG. 12.

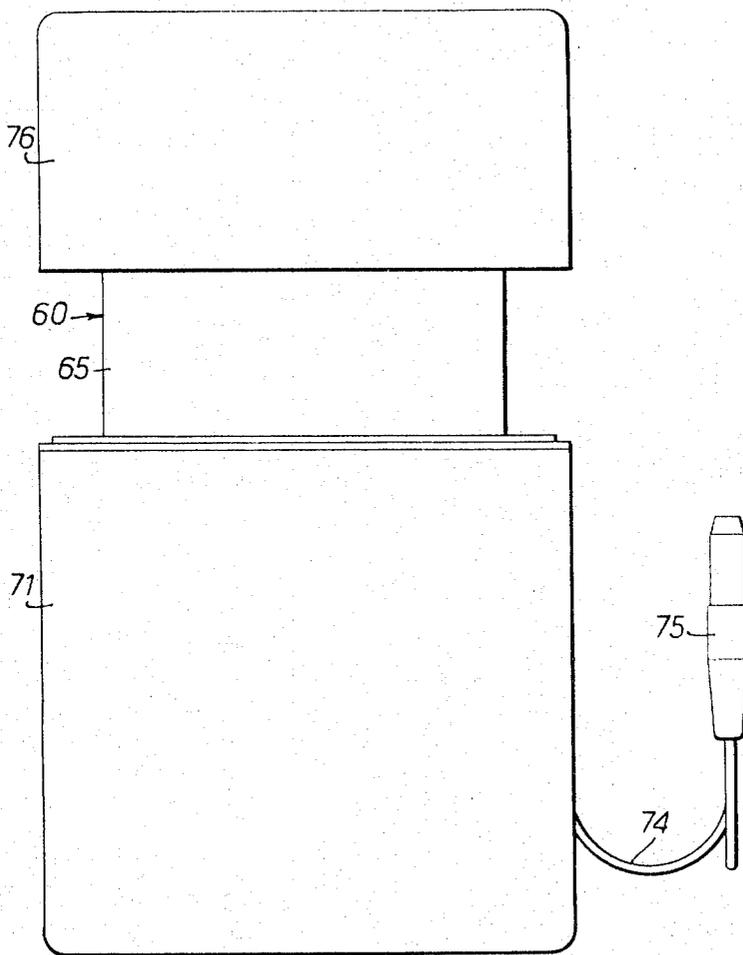


FIG. 10.

ELECTRIC SHAVERS

This invention relates to electrically operated dry shavers and provides numerous improvements in their construction. The invention also provides a charger unit and a dry battery pack for use with such shavers.

The shaver illustrated in the accompanying drawings and further described below is of the "cordless" type, being normally driven by electric cells accommodated within the shaver casing, provision being made for recharging the cells from an external power source during the intervals between use and also for operating direct from an external power source in an emergency.

The electric storage battery and an electric motor operated by the battery are mounted in a frame integrally moulded from plastics material, this frame also supporting in operative connection with the motor a reciprocable cutter drive member; the frame motor and cells are enclosed in a sheet metal casing secured to the frame with the cutter drive member extending through an opening in the casing and carrying externally of the casing a reciprocable cutter; a head casing removably secured to the frame encloses the cutter and carries an apertured shear plate which engages the cutter. Both the shear plate and the reciprocable cutter are constituted by apertured metal foils held in arched form and the construction allows either foil to be removed and replaced very simply, should it become damaged.

The drive member carrying the reciprocable cutter is supported in a fully floating condition by spring blades, so that frictional resistance to movement is minimised and power requirements are small. The drive member and its spring suspension are arranged for manufacture as a self contained sub-assembly which can be located as a unit in the main frame of the shaver. The electric motor which serves to effect reciprocation of the drive member is also constructed as a separate unit and subsequently located in guides provided in the main frame.

The drive member which carries the reciprocating cutter and extends through an opening in the casing within which the electric motor is housed is shaped to overlie the casing adjacent this opening both internally and externally, thereby forming a labyrinth seal hindering access of cut hairs to the interior.

The shaving head, constituted by the two arched foils, has its longitudinal central plane inclined at an angle to one side of the longitudinal central plane of the shaver body. On the opposite side of the latter plane the head casing carries a long hair trimmer, which normally lies retracted within the head casing, but can be moved parallel to the said plane to project through an aperture in the casing, and manually releasable means are provided to lock the trimmer in its projected and retracted positions. Projection and retraction of the trimmer operates automatically to couple its moveable member to and uncouple it from the drive member of the shaver head.

The shaver is provided with a jack socket for connecting the shaver to external sources of electrical power and a three position switch of simple construction allows the motor to be driven from the internal cells, or direct from an external source such as a dry battery pack, or switched off. When the motor is switched off, the cells are connected to the socket terminals so that they can be recharged from an external source such as a mains-operated charger unit. A safety device ensures that the shaver cannot be connected to

the charger unit except when the motor is switched off. In the drawings:

FIG. 1 is a sectional side elevation of a shaver in accordance with the invention, taken on the line I—I of FIG. 2;

FIG. 2 is a sectional front elevation of the shaver, taken on the line II—II of FIG. 1;

FIG. 3 is a part sectional side elevation taken on the line III—III of FIG. 2;

FIG. 4 is a sectional view of the lower part of the shaver, taken on the line IV—IV of FIG. 2;

FIG. 5 is a sectional plane view of the shaver, taken on the line V—V of FIG. 2;

FIG. 6 is an underside view of the shaver;

FIG. 7 is a plan view, partly broken away, of a charger unit for use with the shaver;

FIG. 8 is a section taken on the line VIII—VIII of FIG. 7;

FIG. 9 is a section taken on the line IX—IX of FIG. 7;

FIG. 10 is an elevation of a dry battery pack, shown in this Figure in open condition for use with the shaver;

FIG. 11 is a sectional view, taken on the line XI—XI of FIG. 12 of the battery pack, shown in closed condition; and

FIG. 12 is a section view taken on the line XII—XII of FIG. 11.

The shaver shown in FIGS. 1 to 6 comprises a sheet metal body casing 1, formed in two parts which mate in the plane of FIG. 2, constituting a generally rectangular box enclosing a main frame 2, moulded from a suitable synthetic resin material. The frame 2 is shaped to provide a lower box-like portion, which accommodates two rechargeable electric cells 3, a pair of spaced pillars 2a, which extend upwardly from the box-like portion, and a bridge portion, which extends between the upper ends of the pillars. Between the pillars 2a of the frame there is disposed a rotary electric motor 4, which is resiliently supported and located by engaging a pair of oppositely projecting flanges on the motor in box-like mouldings 5 of elastomeric material and slidably engaging the elastomer covered flanges in channels formed in the frame 2 which frictionally retain them. Secured to the vertical shaft 4a of the motor is a collar 6 formed with an eccentric boss 6a which through the intermediary of ball bearing 6b engages between a pair of flanges 7a depending from a drive bar 7, supported for lateral (left to right in FIG. 2) reciprocating movement, and connected as described below to the moving cutter of the shaver.

Drive bar 7 is supported by a pair of leaf springs 8, each of which is of approximately E shape, having three upwardly projecting tongues, united at their lower ends. The central tongue of each spring is secured to one end of the drive bar 7 while the two outer tongues of each spring are secured to a member 9, which can be engaged from above into a recess formed in the frame 2, a hole in the member taking over an upwardly projecting pin 2b on the frame. The members 7 and 9 are formed by a single injection moulding operation around the ends of the tongues of springs 8 (which are apertured to key the springs to the moulded material in which they are embedded) and this assembly is secured in position in the frame by rivetting over the ends of the pins 2b, as shown.

The drive bar 7 is permanently secured to an upper drive member 10, pins 10a formed integrally with

member 10 being passed through holes in bar 7 and riveted over, as shown. Drive member 10 carries an upwardly projecting split stud 11, which detachably receives the moving cutter assembly described below, and also serves to secure to drive member 10 a leaf spring 12, which serves both to urge the moving cutter assembly upwardly and to prevent that assembly from rotating around the axis of stud 11. It will be observed that the top portion of the body casing 1 engages between the two parts of the cutter drive member constituted by the conjoined members 7 and 10, each of which has a lateral and longitudinal extent substantially exceeding the width and length respectively of the aperture in the casing through which the drive member extends. The parts thus form a labyrinth seal which hinders access of cut hairs into the interior of the casing.

The moving cutter assembly comprises an L-section member 13 of synthetic resin material, having a central apertured boss 13a for engaging stud 11; a thin flexible cutter foil 14, formed with numerous apertures, which is held in arched condition by the engagement of holes formed in its two opposite longitudinal edges with studs 13b formed on the member 13; and a pair of metal strips 15, which are also engaged over the studs 13b and hold the foil 14 in position. The underside of the member 13 is formed with a groove 13c which receives the ends of leaf spring 12, so that the latter prevents rotation of the cutter assembly around stud 11, as stated above, as well as urging the assembly away from the drive members.

The reciprocable cutter foil 14 is urged by the spring 12 into operative engagement with a stationary outer cutter foil or shear plate 16, also formed with numerous apertures. The outer foil 16 is secured in arched condition to a head casing 17, which removably secured to the body of the shaver by a pair of spring mounted catches 18, releasable by pressing in finger pieces 18a. Attachment of foil 16 to the head casing is effected by split studs 19, which are passed outwardly through registering holes in reinforcing strips 20, the foil 16 and the head casing 17. The foil can readily be detached from the head casing (after removal of the latter from the body of the shaver) by pressing inwardly the projecting ends of the studs 19, so that replacement of a damaged foil is a simple operation. Similarly, the complete moving cutter assembly (parts 13, 14 and 15) can be simply pulled off and pushed on to the split stud 11, so that replacement of the inner foil also is a simple operation.

It will be observed that the moving cutter 14 and the co-operating stationary shear plate 16 are not disposed symmetrically about the longitudinal central plane of the shaver body (that is the plane of FIG. 2, indicated by the line II—II in FIG. 1) but are so shaped and disposed that the effective surface of the shaving head constituted by the contacting portions of the foils 14 and 16, has its central plane inclined obliquely to the above-mentioned central plane of the body. This angular disposition of the shaving head is convenient to the user and it allows the disposition alongside the shaving head of a retractible long hair trimmer, now to be described.

The long hair trimmer comprises a stationary shear plate 21, and a reciprocable cutter plate 22, whose upper edges are notched to provide co-operating cutting teeth. The shear plate 21 is disposed against the inner face of a wall of the head casing 17 and is secured

through slots in that wall to a finger piece 23 on the outer side of that wall, the slots allowing the shear plate to be displaced upwardly in its own plane into a position in which the cutting teeth project through an opening provided in the head casing 17. The shear plate is retained in either its retracted position (as shown) or in its protruded position by a leaf spring 24, anchored at its upper end to the head casing and having its lower end engaged in one or other of a pair of recesses, 23a, 23b formed in finger piece 23. Spring 24 can be flexed to permit movement of the shear plate by pressing inwardly a release button 25. The reciprocable cutter plate 22 is held pressed into operative engagement with the inner face of the shear plate 21 by leaf springs (not shown) secured on studs which are secured to the shear plate and pass through longitudinally extending slots in the cutter plate, so that the latter, although captive to the shear plate, is reciprocable relative thereto in a longitudinal direction, that is parallel to the movement of the cutter foil 14 of the shaving head. Fast to the reciprocable cutter plate 22 is a stud 26 which engages between a pair of flanges 10b formed on an upward extension of the drive member 10 for the shaving cutter. (It will be observed that this upward extension of member 10 also serves to support the shaving cutter assembly 13, 14, 15 against any rearward pressure which may be exerted upon it during the action of shaving). When the long hair trimmer is in the retracted position shown, stud 26 lies between parts of the flanges 10b which are far enough apart for the movement of the drive member to be without effect on the cutter plate 22. When the long hair trimmer is moved to its operative protruding position by pressing in release button 25 and sliding upwardly the finger piece 23, stud 26 is brought to lie in a narrow part of the gap between the flanges 10b, so that the cutter plate 22 participates in the reciprocating movement of drive member 10.

Recharging of the cells 3 can be effected by inserting a jack plug connected to a suitable electric power source through an opening in the base of the casing, so as to engage a pair of spring contact blades 27, 28 mounted in the main frame 2. A three-position electric switch is constituted by an insulating plate 29, located in a recess in the frame and carrying three contact strips 30, 31, 32 and by a spring bridging contact 33, carried by a finger piece 34 which projects through a slot in the casing, bridging contact 33 comprising three tongues for engaging the respective strips. Contact strip 30 is connected to jack contact blade 27; contact strip 31 is connected to one cell terminal; contact strip 32 is connected to one terminal of the motor; the other motor terminal is connected to the other cell terminal and to the second jack contact blade 28.

A boss 34a on the inner face of the finger piece is adapted to engage between a pair of resilient arms 35 which are notched so that (as best seen from FIG. 4) they define the three operative switching positions of the finger piece.

With the finger piece 34 in its uppermost position, as shown, the bridging contact engages strips 30 and 31 only, so that the motor is on open circuit and the cells are connected across jack contacts 27, 28, allowing recharging to be effected. When the finger piece is moved to an intermediate position the bridging contact interconnects all three strips, the interconnection of strips 31 and 32 connecting the motor across the cell terminals. When the finger piece is moved to its lowest

position, strips 30 and 32 only are interconnected, so that the cells are on open circuit and the motor is connected to the jack terminals 27, 28. This third position allows the shaver to be operated from an external source, such as a dry battery, should the cells have become exhausted.

Secured to the boss 34a of the switch operating member 34 is a member 36 of insulating material which is secured at its upper end to the slidable switch operating member 34 and extends downwardly between the externally accessible terminal members 27, 28. When the member 34 is in its uppermost position, as shown (conditioning the shaver for connection to the charger unit) the lower end of member 36 lies flush with the top of the recess in which the exposed lower ends of terminals 27, 28 are accommodated. When the operating member 34 is moved downwardly to its second and third positions, the member 36 moves with it so as to project to a greater or lesser extent into the recess.

The charger unit shown in FIGS. 7 to 9 comprises a closed casing formed by upper and lower members 40 and 41, enclosing between them a mounting panel 42. The mounting panel carries a terminal block 43 (accessible through an opening in the casing members) for engagement with a connector 44 on the end of an alternating current mains supply lead 45. Panel 42 also carries a step-down transformer 46, a switch 47 for conditioning the unit to operate on mains supplies of different voltage, rectifier components indicated generally at 48, output terminals 49 to which the unit delivers low voltage rectified current, and the necessary electrical connections between these parts. The electrical components employed and the manner in which they are interconnected are conventional in character and further description is deemed unnecessary.

The upper casing member 40 is shaped to provide a recess 50, shaped and dimensioned to receive the lower part of the shaver of FIGS. 1 to 6, supporting the shaver in upright position. The output terminals 49 of the charger unit are carried in an insulating block 51, which projects through an opening in casing member 40 into the recess 50. When the shaver is applied to the charger unit, terminal block 51 engages in the recess in the shaver in which terminals 27, 28 are located and these terminals contact the terminals 49 of the charger unit. Should the control switch of the shaver be in its second or third position when the shaver is applied to the charger unit, the portion 51a of terminal block 51 will engage member 36 and move the control switch to its first position, appropriate for the charging operation. While the shaver remains engaged with the charger unit, portion 51a blocks movement of member 36, preventing operation of the shaver switch.

The dry battery pack shown in FIGS. 10 to 12 comprises a body member, indicated generally by the reference numeral 60, shaped to provide an open-bottomed box-like portion 61 adapted to receive the upper ends of two pairs of dry cells 70. These cells are enclosed and held in position by a casing member 71 which engages over body portion 61 and is retained to the latter by spring tongues 62 formed in the walls of body portion 61, the barbed lower ends of the tongues engaging at 63 with shoulders formed on the inner surface of two opposite walls of casing 71. These walls of casing 71 are cut away or notched to accommodate the ribbed root portions 64 of tongues 62, pressure on the portions 64 operating to release casing 71 and thus allow replace-

ment of cells 70. Conductor strips 72 secured in casing 71 connect the lower ends of one pair of cells 70 to the lower ends of the other pair of cells (which are reversed in position) and conductor strips 73 secured in body 60 separately connect the upper ends of the two pairs of cells to the two cores of a flexible cable 74.

Cable 74 passes upwardly through a portion 65 of the body which has the form of an open-ended rectangular tube of reduced cross-section relative to the portion 61. At the upper end of this tube portion 65 the body is formed with an outwardly projecting flange 66 carrying a cable clamp 67, which grips cable 74 and prevents any tension on the cable from being applied to its connections to conductor strips 73. The other end of cable 74 carries a connector 75 adapted to engage in the recess in the shaver of FIGS. 1 to 6 in which terminals 27, 28 are located and to connect those terminals to the cores of the cable and thus to the dry cells 70. Connector 75 is of course so shaped that it can be engaged operatively with the shaver even when the shaver control switch is in its third position with member 36 in its fully protruded position.

Fitting slideably over the upper part of the body 60 of the battery pack is a cover 76, which can be lowered into the closed position shown in FIGS. 11 and 12 and raised to the open position shown in FIG. 10, the cover being retained to the body by the engagement of barbs 77 on the cover with the underside of flange 66 of the body. With the cover in open position, as shown in FIG. 10, cable 74 can be wound around the portion 65 of the body between the flange 66 at its upper end and the portion 68 of the body which connects the lower end of portion 65 to portion 61. When the cable is fully wound up, the cover can be closed, as shown in FIGS. 11 and 12, to enclose cable 74 and connector 75. It will be observed from FIG. 12 that the portion 65 of the body is offset to one side of the centre line, so as to facilitate the accommodation within the cover of connector 75.

In a simplified form of the shaver (not illustrated) replaceable primary cells are substituted for the rechargeable secondary cells 3. The casing is provided with a shuttered opening to allow extraction of exhausted cells and the insertion of fresh ones; the terminals 27, 28 are omitted; and the three-position control switch is replaced by a simple on-off switch.

We claim:

1. An electrically operated dry shaver comprising a frame integrally moulded from plastics material, an electric battery located and supported within the frame, an electric motor for operation by the battery also located in and supported by said frame, a cutter drive member mounted for reciprocation by the frame in operative connection with the motor, a sheet metal casing secured to the frame and enclosing the frame, the battery and the motor, the cutter drive member extending through an opening in the casing so as to lie partly inside and partly outside the casing, a cutter secured to the drive member outside the casing, a head casing removably secured to the frame and an apertured shear plate secured to the head casing and engaging the cutter.

2. An electrically operated dry shaver comprising a body having an internal cavity bounded on one side by a wall having an aperture formed therein, an electric motor mounted on the body within the cavity, a cutter drive member extending through said aperture and sup-

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ported from the body for reciprocation in the plane of said wall, means within the cavity operatively connecting the motor to the drive member, a cutter disposed on the outer side of said wall and secured to the drive member, and an apertured shear plate secured to the body and engaging and co-operating with the cutter, wherein the cutter drive member is shaped to provide

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a pair of parallel opposed surfaces extending in closely spaced parallel relation to the inner and outer surfaces respectively of said wall, the lateral and longitudinal extents of said surfaces substantially exceeding the width and length respectively of said aperture.

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