July 16, 1968 YOSHIRO KAWANO ETAL 3,392,443

BATTERY POWERED DRY SHAVER HAVING ROTARY SHAVING HEAD AND RETRACTIBLE TRIMMER

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Fig. 1

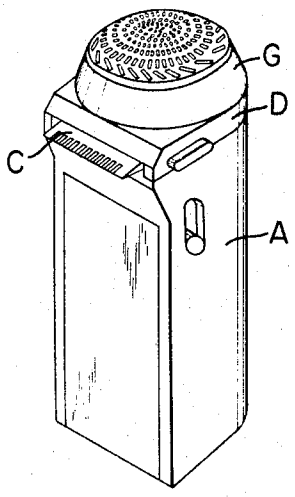


Fig. 2

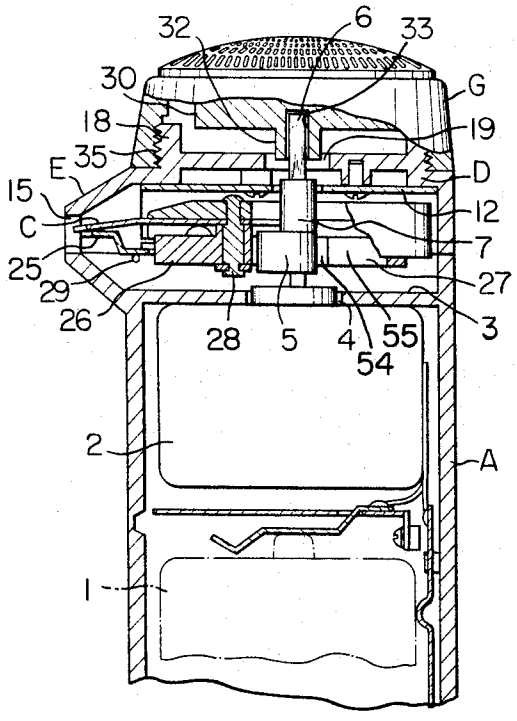
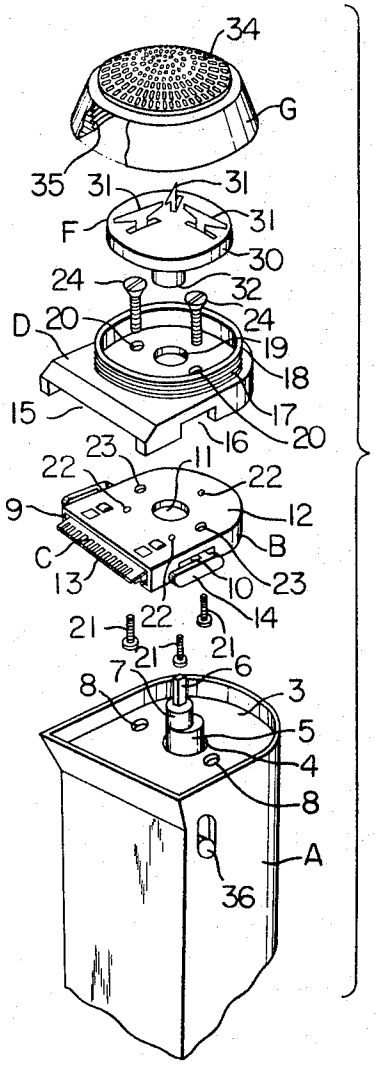


Fig. 3



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Fig. 4

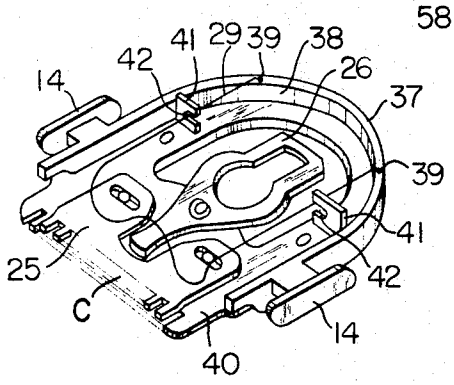


Fig. 5

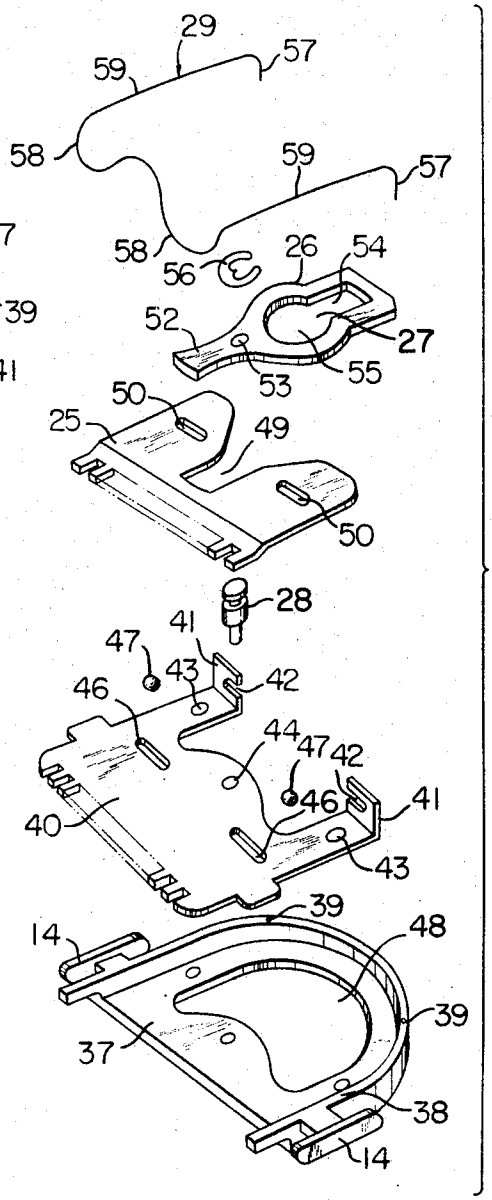


Fig. 6

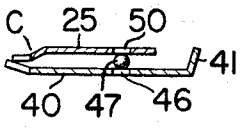


Fig. 7

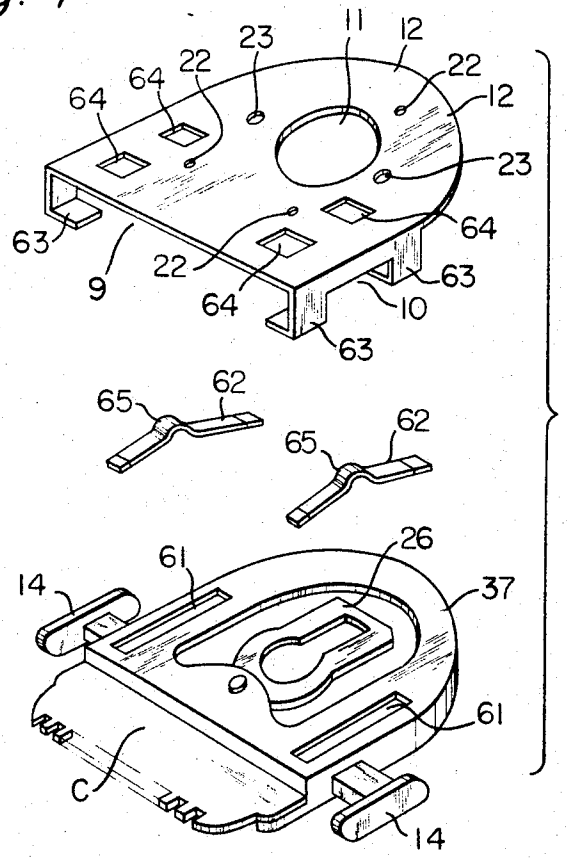

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Fig. 8

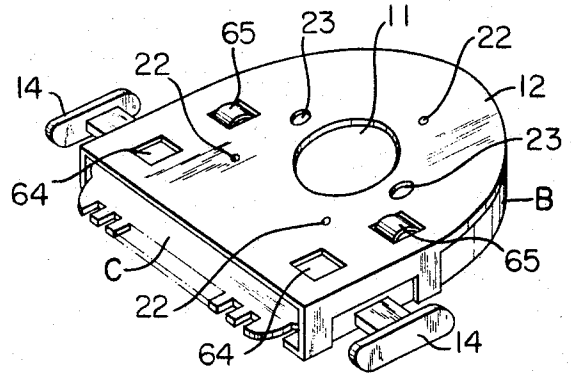

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Fig. 9

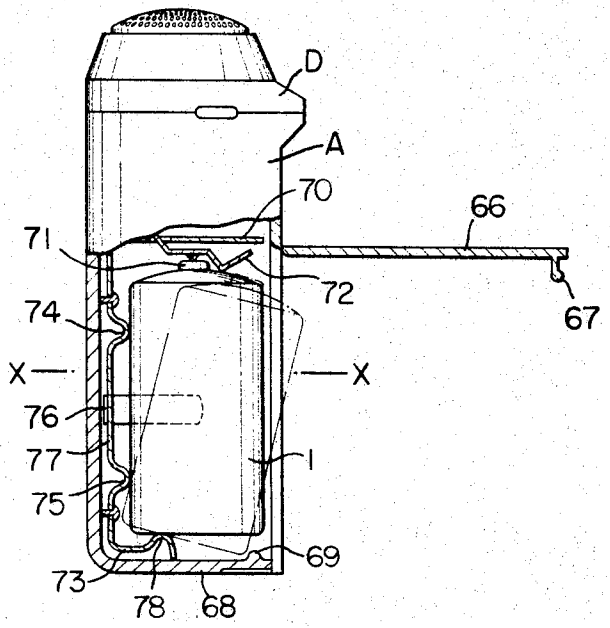
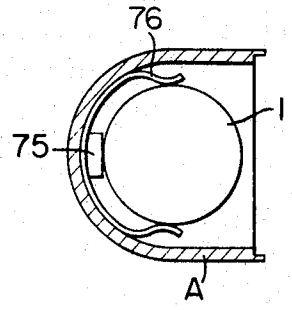


Fig. 10



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3,392,443

BATTERY POWERED DRY SHAVER HAVING ROTARY SHAVING HEAD AND RETRACTIBLE TRIMMER

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Claims priority, application Japan, July 8, 1965, 40/56,025, 40/56,026, 40/56,027, 40/56,028, 40/56,029; July 15, 1965, 40/58,493; Nov. 28, 1965, 40/95,325
6 Claims. (Cl. 30—34.1)

ABSTRACT OF THE DISCLOSURE

A battery powered dry shaver comprises a rotary shaving head located at one end of the shaver housing and a removable trimmer unit beneath the head which projects laterally at one side of the housing. The rotary shaving head and trimmer unit are driven from one and the same rotating shaft of the electric motor, and the trimmer can be retracted into the body of the housing so as not in interfere with use of the rotary shaving head. When retracted, the trimmer is uncoupled from the driving shaft. The shaver can be taken apart for cleaning by unscrewing the shaving head, lifting off the rotary shaving blades from the drive shaft and then removing two screws which secure the trimmer assembly to the case.

This invention relates to improvements in electric dry shavers.

Electric dry shavers of the kind having trimmers of various constructions have been already suggested. They are, for example, R 11 and 12 of RIAM made in Switzerland. However, these types of RIAM have the following defects:

(a) They have a rotary shaving head at one end of a motor shaft and a trimmer at the other end. Therefore, the rotary shaving head and the trimmer not only take relative positions at 180 degrees with each other but also the shavers having such head and trimmer become so large as to be hard to use. It is difficult to normalize the motor in the thrust direction. The force pushing up the inner cutter blade against the outer cutter blade will be varied and the cutting quality will be low.

(b) The outer cutter blade of the trimmer is driven, and comes into direct contact with the skin of users. The trimmer of this kind is, therefore, very dangerous to the user.

(c) The trimmer block is combined in the body of the shaver and can not be assembled alone and therefore assemblability is low.

The present invention is suggested to eliminate the above mentioned defects of the conventional types of the shavers.

In the present invention, the following countermeasures are considered against the above mentioned defects:

(a) The joint of the rotary shaving head and the cam of the trimmer are made to be an integral part. Therefore, the rotary shaving head and the trimmer can be provided on one side of the shaver body and the shaver can be made smaller.

(b) As the inner cutter blade which does not come into direct contact with the skin is driven, there is no danger.

(c) As the trimmer block alone can be assembled, the construction is simple and the assemblability is high.

An object of the present invention is to provide an electric dry shaver which can be simply assembled so that it may be easily taken apart for cleaning.

Another object of the present invention is to provide an electric dry shaver provided with not only a rotary shaving head but also a trimmer, so that the driving of only the rotary shaving head and the simultaneous driving of the rotary shaving head and the trimmer may be made.

A further object of the present invention is to provide an electric dry shaver wherein the trimmer can be retracted into the case so as not to interfere with the use of the rotary shaving head.

A still further object of the present invention is to provide an electric dry shaver wherein the dry cell can be simply and quickly taken out in replacing it.

The present invention shall be explained with reference to the accompanying drawings.

FIG. 1 is a perspective view of an electric dry shaver of the present invention.

FIG. 2 is a vertically sectioned view of an essential part of the shaver as illustrated in FIG. 1.

FIG. 3 is a perspective view of the essential part of FIG. 2 as disassembled.

FIG. 4 is a reverse side perspective view of the trimmer part of the shaver in FIG. 1 with mounting plate removed.

FIG. 5 is a disassembled perspective view of the trimmer part in FIG. 4.

FIG. 6 is a partial sectioned view showing an inner cutter blade and an outer cutter blade as overlapped of the trimmer part in FIG. 4.

FIG. 7 is an upper side perspective view of a trimmer block as disassembled of the trimmer part in FIG. 4.

FIG. 8 is a detailed perspective view of the trimmer block of FIG. 7 as assembled.

FIG. 9 is a detailed vertically sectioned view of a dry cell containing chamber in the case of the shaver in FIG. 1.

FIG. 10 is a sectioned view on line X—X in FIG. 9.

In the drawings, A is a cylindrical case containing such electric source **1** as a dry cell or battery and a motor **2**. A driving shaft **7** having an eccentric cam **5** and a rectangular part is is rotatably projected in a hole **4** made in the substantially central part of the head part **3** of the cylindrical case A. A fitting screw hole **8** is made at each side of the driving shaft **7** on the head part **3**.

B is a trimmer block assembly provided with a window **9** at one end, a groove **10** on each side and a hole **11** in the center of the surface. A trimmer set C is contained in a mounting plate **12** made similarly to the head part **3** of the case A so that the blade face **13** may be located within the window **9**. **14** is a grip. D is a fixing base constituting a readily removable upper part of the case and which is provided with a hollow cut **15** at one end and a hollow cut **16** on each side. A flange part **18** having a screw part **17** on the outer peripheral drum is provided to project on the upper surface of the base D. A hole **19** is made in the center of the flange part **18** and a screw hole **20** is made on each side of the hole **19**. The fixing base D is made similarly to the head part **3** in its shape.

The trimmer block B is overlapped on the lower surface of the fixing base D by fitting the part of the window **9** in the hollow cut **15** and loosely fitting the grips **14** in the respective hollow cuts **16** in the base D and is fixed to the fixing base D with screws **21** through fitting holes **22**. E is a trimmer part formed as mentioned above. This trimmer part E is overlapped on the head part **3** of the case A by fitting and inserting the driving shaft **7** in the holes **11** and **19**. The trimmer block B and the fixing base D are fixed to the case A by screwing the screws **24** fitted and inserted in the screw holes **20** and **23** into fixing screw holes **8**. In such case, the eccentric cam **5** is

passed through an engaging hole 27 of a driving lever 26 for driving the reciprocating inner cutter blade 25 of the trimmer set C and the rectangular part 6 is projected upward through the hole 19 in the fixing base D. 28 is a rotary shaft supporting the driving lever 26 for the inner cutter blade. 29 is a wire spring for pushing up the inner cutter blade.

F is a rotary inner cutter blade body having a plurality of inner cutter blades 31 radially fitted to a base 30 of a T-shaped cross-section. A rectangular fitting hole 33 made in the center of the lower surface of a projecting part 32 is removably fitted on the rectangular part 6 of the driving shaft 7.

G is an outer cutter blade body in the form of a cap having a net blade or dome shaped comb 34. A screw thread 35 on the inner peripheral drum of the peripheral wall of the outer cutter blade body G is screwed on the flange part 18 of the trimmer part E so that the blade faces of inner cutter blades 31 may slide on the lower surface of said net blade 34 and the rotary inner cutter blade body F may be covered with said outer cutter blade body G. 36 is a switch of a motor 2 provided on the side wall of the case A.

The trimmer block B as shown in FIGS. 4 to 8 shall now be explained in detail. 37 is a base molded of plastics and provided with a horseshoe-shaped side wall 38 on the periphery and a grip 14 made integrally on each side of said side wall 38. Further, holes 39 into which the respective ends of the wire spring 29 are to be inserted are made on the upper surface of the side wall 38. An opening 48 is made on the base. 40 is a stationary outer cutter blade or comb provided with cutting edges in the front, on L-shaped bent part 41 on each side in the rear and a cutout part 42 on the inside of each bent part. 43 is a fitting hole to be secured to the base 37 with a screw (not illustrated). 44 is a hole for fitting the rotary shaft 28. 46 is a slot made in parallel with the blade edge of the outer cutter blade. A polished ball 47 is contained in each of two slots 46.

25 is an inner cutter blade provided with cutting edges in the front and a cutout part 49 in the rear. 50 is a slot made in parallel with the blade edge of the inner cutter blade. The inner cutter blade 25 and outer cutter blade 40 are set by mounting said slots 50 on the respective balls 47 placed on the slots 46 in the outer cutter blade 40.

The tip 52 of the driving lever 26 is fitted in the cut out part 49 made in the inner cutter blade 25. 53 is a hole to be fitted on the rotary shaft 28. 54 and 55 of the engaging hole 27 are openings into which the eccentric cam 5 of the driving shaft 7 in FIG. 2 is to come. When the eccentric cam 5 is in the opening 55, the driving lever 26 will not move. When the eccentric cam 5 is in the other opening 54, the driving lever 26 will be moved by the rotation of the eccentric cam 5 and the inner cutter blade 25 will be reciprocated. 56 is a washer to prevent the driving lever 26 from being pulled out when the driving lever 26 is fitted on the rotary shaft 28.

The wire spring 29 is formed in the form of a spectacle frame and is provided with bent parts 57 in the rear and downward curved parts 58 in the front.

Now, in assembling the trimmer part, the outer cutter blade 40 is secured to the base 37, the rotary shaft 28 is then fitted into the hole 44, and hole 53 of the driving lever 26 is fitted on said rotary shaft 28, the washer 56 is fixed to the rotary shaft 28, the tip 52 of the driving lever 26 is then inserted into the cut out part 49 of the inner cutter blade 25, the balls 47 are mounted on the respective slots 46, the slots 50 of the inner cutter blade 25 are mounted on the respective balls, the inner cutter blade 25 is thus overlapped on the outer cutter blade 40, the bent parts 57 of the wire spring 29 are put into the respective holes 39 on the base 37 and the middle parts of both legs 59 of the wire spring are fitted into the cut out parts 42 of the respective L-shaped bent parts 41 of the outer cutter blade 40 so that the upper surface of the inner cutter blade 25 may be pressed with the bent parts 58 of the wire spring 29.

The base 37 of the trimmer set C formed as mentioned above is provided with grooves 61 in which are inserted respective plate springs 62. The mounting plate 12 made of a metal is mounted so as to embrace the trimmer set C from above said plate springs 62 and a leg part 63 made on each side of said mounting plate 12 is bent inward so that the mounting plate 12 may be fitted to the trimmer set C. A pair of windows 64 are made in the mounting plate so as to correspond to each groove 61 in the base plate 37. A plate spring 62 is fitted so that its curved part 65 in the middle may engage with either of the windows 64 of the pair. (See FIG. 8.) Further, the above mentioned mounting plate 12 is fitted to the fixing base D by passing screws through fitting holes 22. Since, as shown in FIG. 2, the fixing base D is secured to the case A, the trimmer set C can advance and retreat within the mounting plate 12.

66 is a cover provided for the window of the cell containing chamber so as to be free to open and close on the case A. 67 is an engaging piece made to project on the inside at the lower end of said cover and to engage with an engaging part 69 formed inside the window of the bottom 68 of the case A.

70 is a positive terminal made of a spring, fixed to the inside of the case and having an engaging piece 72 to engage with the positive pole 71 of the cell 1.

73 is a negative terminal having a resiliency. An electroconductive part 77 to which a holder for embracing the cell is secured between elevated projections 74 and 75 to be in contact with the case of the cell 1 is bent at right angles in the lower part. An elevated projection 78 to be in contact with the bottom of the cell is formed at the tip of the bent part. Said electroconductive part 77 is secured to the case A.

Thus the cell 1 is resiliently held between the positive terminal 70 and the projection 78 of the negative terminal 73. When the cell 1 is to be taken out, if the cover 66 is opened and the cell is pushed at the lower end, the cell will incline around the projection 75 of the negative terminal 73 as a fulcrum as shown with the chain line, will be pushed up on the peripheral drum by the resiliency of the cell holder 76 tending to contract inward and will automatically spring out of the case due to the pressing force of the holder. Therefore, the cell can be simply and quickly taken out without using any tool for taking it out. As the shaver according to the present invention has such structure as explained in the above, when the motor is rotated, only the ordinary shearing by the outer cutter blade body G and inner cutter blade body F will take place. When the trimmer set C is exposed out of the hollow cut 15 with the grips 14 as in FIG. 1, simultaneously with the rotation of the inner cutter blade body F, the driving lever 26 will engage with the eccentric cam 5 and, with the rotation of said eccentric cam, the driving lever 26 will rotate around the rotary shaft 28 as a fulcrum, the inner cutter blade 25 will reciprocate and a trimming operation will be made with trimmer set C.

Thus, in the present invention, as the trimmer block containing the retractable trimmer is overlapped on the head part of the case and the rotary shaving head is further overlapped on its upper part so that the trimmer and the rotary shaving head may be driven by the same driving shaft, there are advantages that an electric dry shaver provided with a trimmer can be simply assembled by overlapping the trimmer mechanism and the rotary shaving head mechanism on the same axis, that the driving of only the rotary shaving head and the simultaneous driving of the rotary shaving head and the trimmer can be made and that, as the trimmer can be retracted into the hollow cut in the base when it is not required, the trimmer will not project out of the case and will not interfere

with the use of the rotary shaving head and the rotary shaving head will be able to be used smoothly.

Thus, in response to the requirement of the trimmer, the trimmer set C can be pulled out of and retracted back into the case. In such case, the trimmer set C will stop in a position in which the curved part **65** of each plate spring fits in either of the windows of the pair and will be able to be fixed in a determined front or rear position in pulling out or retracting the trimmer set C.

Moreover, as is quite evident from the exploded view in FIG. 3, the various operating components of the dry shaver can be assembled and taken apart quite easily without the need of any particular skill or special tools in order to enable the parts, and especially the shaving and trimming cutters to be cleaned. Assuming the shaver to be assembled as shown in FIG. 1, it is taken apart by first unscrewing the topmost cap part G containing the net blade **34** from the threaded flange **18** of part D. This exposes the rotary cutter member F which can then be lifted off the end of drive shaft **6**. Removal of the cutter member F then exposes the heads of the two screws **24** which are then removed simply by means of a screw driver. By removal of screws **24** from their screw holes **8** in the head part **3**, the trimmer assembly consisting of the united parts B, C and D is released and can be lifted off. Thus, with this simple operation, the blades of both the shaving head and trimmer set are both fully exposed for cleaning. If desired, further break-down of the trimmer set to separate the stationary and reciprocating cutter blades can be accomplished easily by releasing the legs of the U-spring **29** from their retaining slots **42** thus enabling the reciprocatable cutter blade **25** to be lifted off from the stationary cutter blade **40**.

While there has been described in connection with the preferred embodiment of this invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and it is aimed, therefore, to cover in the appended claims all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. In an electrical dry shaver, the combination comprising a casing including in a lower part thereof an electric motor and support means for a battery cell, manually operable switch means for connecting said battery to said motor, said motor including a drive shaft extending through an opening in an intermediate transverse wall in said casing and provided with an eccentric cam thereon, a trimmer assembly movably supported within an upper part of said casing, means removably securing said upper part of said casing to said lower part of said casing at said intermediate transverse wall, said trimmer assembly including a base member having mounted thereon a stationary planar comb, a movable planar cutter blade having cutting teeth supported for reciprocating motion across said comb, and an oscillatory lever in driving engagement with said cutter blade for reciprocating said blade, said trimmer assembly including gripping means on the base member thereof projecting outwardly of said upper part of said casing thereby enabling said trimmer assembly to be shifted between a retracted position wherein said trimmer comb and cutter blade are concealed within said upper casing part and an advanced position laterally of said casing part wherein said trimmer comb and cutter blade are exposed for trimming, said oscillatory driving lever for said cutter blade including a slot having narrow portion engageable with said eccentric cam only when said trimmer assembly is shifted to its advanced position thereby to effect oscillation of said driving lever as said cam rotates, and having a wider portion in which said cam rotates free of contact with said driving lever when said trimmer assembly occupies its retracted position, said upper casing part including an opening through which said motor drive shaft projects and a threaded flange portion, a rotary cutter body including a plurality of cutter blades thereon and which is mounted upon the end of said motor drive shaft to be rotated thereby, and a threaded cap member screwed onto said threaded flange of said upper casing part and which includes a circular comb beneath which the cutter blades on said rotary cutter body operate.

2. An electrical dry shaver as defined in claim **1** wherein said means removably securing said upper and lower casing parts together at said intermediate transverse wall is constituted by screw means extending through openings in said upper casing part into said intermediate transverse wall.

3. An electrical dry shaver as defined in claim **1** and which further includes a U-shaped wire spring secured in place on said base member of said trimmer assembly and which exerts a pressure upon said movable cutter blade to maintain said movable cutter blade in surface contact with said planar comb.

4. An electrical dry shaver as defined in claim **3** wherein said U-shaped wire spring is removably secured in place in order to permit said movable cutter blade to be removed for cleaning.

5. An electrical dry shaver as defined in claim **3** and which further includes means for guiding the reciprocating motion of said movable cutter blade of said trimmer assembly, said guiding means including aligned slots in said movable cutter blade and planar comb arranged parallel to the path of reciprocating motion and ball means having a diameter greater than the width of said slots and operating in said slots between said movable cutter blade and planar comb.

6. An electrical dry shaver as defined in claim **1** wherein said support means for said battery cell in said lower part of said case comprises a negative terminal strip secured to a back wall of said case and including a bottom projection in contact with the bottom of the cell, a pair of resilient arms adapted to embrace the body of the cell and upper and lower projections adapted to contact the body of said cell, a resilient positive terminal adapted to contact the positive terminal on said cell, and wherein said case includes a pivotally mounted cover member therefor located opposite said back wall, said cover member when opened permitting said cell to be removed by pushing inward on the lower part thereof at a point below said lower projection thereby causing said cell to pivot about said lower projection such that the upper part of said cell moves in the direction away from said back wall of said case and into the opening exposed by opening of said cover member.

References Cited

UNITED STATES PATENTS

2,574,317	11/1951	Berg	30—34.1
2,917,824	12/1959	Brauss	30—34.1

FOREIGN PATENTS

1,051,161	2/1959	Germany.
353,652	5/1961	Switzerland.

MYRON C. KRUSE, *Primary Examiner.*