Oct. 17, 1939. J. A. HANLEY 2,176,337

ELECTRICALLY DRIVEN HAIR SHEARING MACHINE

Filed Nov. 23, 1935

Fig. 1.

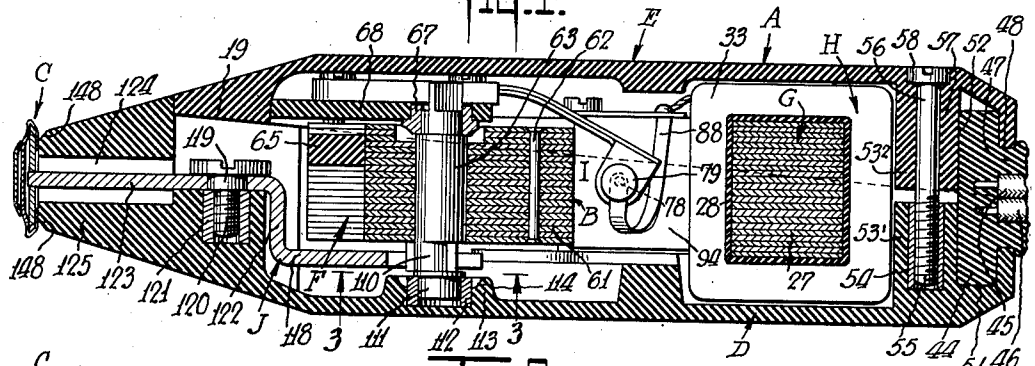


Fig. 2.

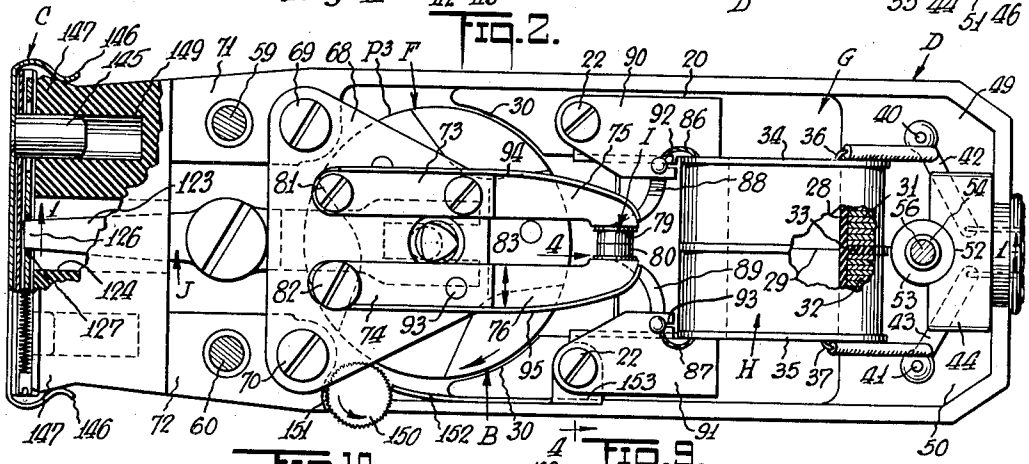


Fig. 10.

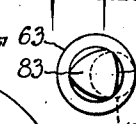


Fig. 3.

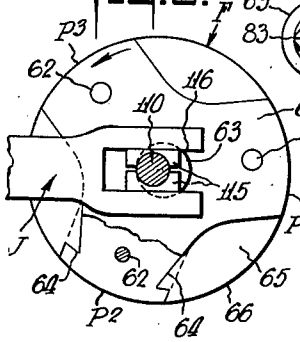


Fig. 4.

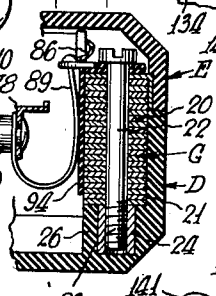


Fig. 9.

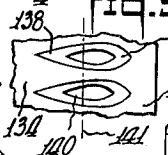


Fig. 5.

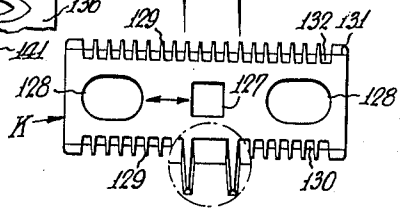


Fig. 6.

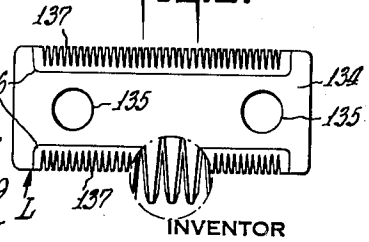


Fig. 7.

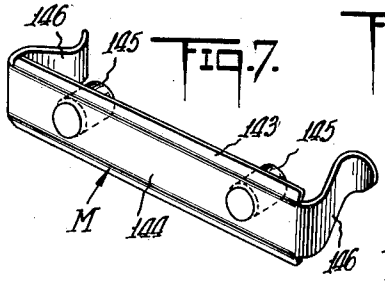
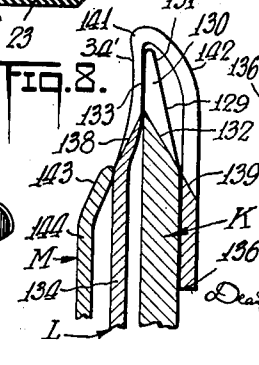


Fig. 8.



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ELECTRICALLY DRIVEN HAIR SHEARING MACHINE

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Application November 23, 1935, Serial No. 51,233

7 Claims. (Cl. 30—43)

The present invention relates to an electrically actuated low-power hair shearing apparatus of the type designed for use primarily as a substitute for a shaving razor, certain features of the present construction being disclosed and generically claimed in my prior Patents No. 2,077,367, granted April 13, 1937, No. 2,078,896, granted April 27, 1937 and No. 2,102,529 granted December 14, 1937, and certain copending applications.

The invention particularly relates to electrically driven shaving devices, in which the actuating electric motor is positioned within the handle structure and in which said electrical motor is provided with an actuating connection to a movable shearing element protected by a cooperating stationary shearing element, which stationary shearing element may be applied to the face of the user or to other parts of the body to remove hair.

An object of the invention is to provide an electrically driven shaving apparatus, rugged, lightweight, compact and inexpensive in construction, involving a minimum number of parts and which may be readily assembled.

Another object is to provide a hair shaver of the general type referred to, having simple, effective and easily mountable bearing means for the rotor, and for the actuating member between said rotor and the shearing assembly.

Another object is to provide a hair shaver of the general type referred to, having a simple, effective and easily mountable and removable means for securing the shearing assembly to one end of the handle structure, without interfering with the shearing elements of said assembly, and without interfering with the proper operative application of said assembly to the parts of the user's body to be shaven.

In the accompanying drawing in which is shown one of the various possible embodiments of the several features of the invention,

Fig. 1 is a longitudinal cross sectional view of the entire device on the line 1—1 of Fig. 2.

Fig. 2 is a top plan view of the apparatus of Fig. 1, with the cover removed, and in fragmentary section, showing the circuit breaker just closed.

Fig. 3 is a fragmentary transverse sectional view upon the line 3—3 of Fig. 1, showing the eccentric connection to the reciprocating lever.

Fig. 4 is a fragmentary transverse sectional view upon the line 4—4 of Fig. 2.

Fig. 5 is a plan view of the reciprocatory shearing plate or blade, with some of the teeth shown on a magnified scale.

Fig. 6 is an inside plan view of the fixed shearing envelope or sheath, with some of the teeth shown on a magnified scale.

Fig. 7 is a perspective view on a somewhat enlarged scale, of the retainer member laid on its side.

Fig. 8 is a fragmentary transverse sectional view on an enlarged scale, of one edge of the shearing assembly, showing the cooperating serrated teeth or edges of the fixed and reciprocatory shearing members.

Fig. 9 is a fragmentary plan view of the envelope cutter of Fig. 6 after it has been slotted but before it is inturned to form an envelope, and

Fig. 10 is a diagrammatic view of the cam and eccentric arrangements indicating their positioning in respect to one another.

Referring now to the drawing the unit as shown in Figs. 1 and 2 consists of a hollow rectangular handle housing or casing A, a motor B enclosed in said housing and a shearing assembly C.

The housing A consists of the base enclosure D and the complementary cover enclosure E both of molded "Bakelite" or similar plastic.

The lower enclosure D carries the mechanism and becomes of increased depth forwardly with its side walls enclosing the motor B and it terminates in a nose 125 carrying the shearing assembly C.

The upper enclosure E correspondingly becomes of decreased depth forwardly, the line of contact between the enclosures D and E being indicated by the line 19.

The motor B consists of the rotor F, the field G and the field coil H. The rotor F actuates the make and break contact arrangement I and also the reciprocating lever J. The lever J is connected to the shearing assembly C.

The shearing assembly as best shown in Figs. 5 to 8 includes the reciprocatory shearing plate or cutter K, a sheath or envelope fixed cutter L and a retainer member M.

The field structure G consists of a plurality of L-shaped laminations superimposed on each other, the legs 20 of which laminations (see Fig. 4) snugly fit against the interior faces 21 of the side walls of the lower casing section D and are held in position by the bolts 22. The lower threaded end 23 of the bolt 22 is screwed into the tapped sleeve 24 molded into the shelf 26 of the molded housing section D. The base elements

27 of the L-shaped legs (see Fig. 2) are tightly fitted inside the insulating non-metallic core 28 (as for example of "Bakelite") of the field coil H. The ends of these base sections 27 contact along the line 29 to form a closed path for the magnetic flux between the pole faces 30 which closely fit and conform to the circular contour of the rotor F.

Upon the core or frame 28 are positioned two coils 31 and 32, separated by the integral fin 33 of the insulating spool 28, and are held in position between the outside fins 34 and 35. The exposed ends of insulated leads 36 and 37 from the coils 31 and 32 are soldered to the binding posts 40 and 41 on the shelves 49 and 50.

Metal strips 42 and 43 (see Fig. 2) lead respectively from the binding posts 40 and 41 and are soldered to the ends of electrical conduits 45 and 46 about which soldered ends is molded the rectangular rubber block 44, through the integral projecting bushing sleeve 47 of which the lengths of insulated conduits 45 and 46 project. The bushing 47 is received in the opening 48 in the rear end of the casing A, one-half of said opening being at each of the two sections D and E thereof. The rubber block 44 fits into a corresponding rectangular recess 51 (see Fig. 1) in the casing.

Block 44 has a longitudinal groove 52 at its rear face to accommodate posts 53′ and 53^2 integral with the respective casing parts. Post 53′ has molded thereinto a tapped sleeve 54 into which is screwed the lower threaded end 55 of bolt 56.

The block 44 is thus anchored against twisting, preventing any turning of the wires in the housing A due to twisting of conduits 45 and 46 and eliminating the possibility of short circuiting. The bolt 56 at the rear of the casing A together with short screws 59 and 60 that extend through the cover and are threaded into tapped sleeves in the shelves 71 and 72 at the front part of the casing hold the two casing sections D and E firmly together.

The rotor F is formed of a plurality of scalloped laminations 61 (see Fig. 3) bolted or riveted together at 62, said laminations 61 forming three poles P′, P^2 and P^3. The laminated stack 61 is tightly fitted upon the shaft 63.

The lower end of the shaft 63 (see Figs. 1 and 3) is provided with the eccentric 110 and the stud 111 which bears in the sleeve 112 molded into the recessed boss 113 integral with the bottom wall of the base enclosure D and fed with lubricant from the peripheral groove 114.

The upper end of the shaft 63 (see Fig. 1) carries the thrust bearing sleeve 67, which sleeve is held in the triangular shaped "Bakelite" plate 68, bolted at 69 and 70 to the shelves 71 and 72 of the casing section D.

To provide a continuous surface on the armature to enable the application of a starting torque thereto a portion of the laminations 61 are provided with the key slots 64 (see Fig. 3), which receive and hold the "Bakelite" or non-magnetic inserts 65, the outer edges 66 of which inserts are continuous with the outer circular edges of the laminations 61.

The triangular plate 68 carries the elongated legs 73 and 74 of the contact breaker I to which legs are attached the ends of the metallic arms 75 and 76. The leg 73 is fixed by the screws 81 to said triangular plate 68 while the leg 74 is mounted on said plate about pivot 82. The pin 93 fixes the leg 74 and arm 76 together and both arms 75 and 76 are provided with stiffening edge flanges 94 and 95 extending along the outside edges of the legs 73 and 74.

To the down turned forward ends 78 of the arms 75 and 76 are connected the contact points 79 and 80 of the contact breaker I. These contacts are connected in circuit by means of flat metal resilient strips 88 and 89 preferably of beryllium copper soldered to the leads 86 and 87 from coils 31 and 32. The insulating folded paper sections 90 and 91, bolted down at their forward end by the screws 22, are slotted at 92 and 93, to receive the rear ends of the strips 88 and 89. The forward ends of the strips 88 and 89 are pinned between the contact points 79 and 80 and the flanges 78 at the rear ends of the arms 75 and 76.

At the upper end of the shaft 63 above the bearing 67, is the triangular cam 83 which is positioned out of contact with the fixed arm 73 and in its rotation causes its apices successively to engage the pivotal arm 74 to press the contact element 80 away from the contact element 79. The curved flats 111 permit resilient return of the contact 80 against the contact 79 by virtue of the resilience of spring 89.

The contact structure I (see Fig. 1) depends into the open space between the armature F and the field structure G, into which space the strips 88 and 89 may radiate heat, by virtue of their good heat conductivity. The strips 88 and 89 extend substantially to the bottom of said space along the inside wall of the laminated pile 20 and are prevented from contacting therewith by the downturned flaps 94 of the insulating paper sections 90, 91. The eccentric 110 is received in the cooperating bearing blocks 115 which slide in the fork 116 of the oscillating lever J.

The lever J is offset to form a pair of substantially parallel arms 118 and 123 extending in opposite directions from an intermediate transverse section 122. The bottom wall of the base enclosure D is formed with an integral step enlargement presenting a riser facing the rear end of the casing A and a ledge or tread extending toward the forward end of said casing and provided with a recess into which is molded a tapped sleeve 121. As indicated in Fig. 1, the lower rear arm 118 of the oscillating lever J is received in the space below the rotor F, and its forward arm 123, is centered with respect to the casing, and passes through the opening 124 in the tapered front 125 of the casing A, and over the ledge formed in said casing. The lever arm 123 is pivoted at 119 upon the stud 120, having a slotted head for receiving a turning tool and screwed into the tapped sleeve 121, and is laterally tapered so that its narrowest end portion 126 (see Fig. 2) will be received in the square opening 127 in the reciprocatory blade K (see Fig. 5).

The blade K of Fig. 5 may be made of stainless steel, of say 0.015″ to 0.020″ in thickness, and is provided with slots 128 and with the serrated edges 130. The edges 130 are cut so as to form a plurality of double spaced V-shaped teeth 129, spaced, for example, 0.040″ to 0.050″ apart and having a front sloping edge 131 (see Fig. 8) of about say 22 degrees and a base slope 132 of substantially greater steepness.

The cooperating sheath or envelope shear plate L (see Fig. 6) preferably formed of say .010″ stock, is provided with the slightly curved base structure 134 provided with the stud holes 135,

with the side bevels 142 and with the inturned sheathing or envelope flanges 136.

The single spaced teeth of the envelope plate L which extend across both the edges of the flanges 136 and the edges of the bevels 142 are preferably cut in the flat sheet of metal stock, preferably by a milling cutter (not shown) say on a one inch radius, as suggested in Fig. 9. Thus, the part of the opening at the left of the bending line 141, where the shearing occurs is considerably smaller than the opening area at the right through which the clippings escape.

By double spacing the serrations 130 or teeth 129 of the reciprocatory blade K, as compared to the serrations 137 of the fixed sheath member L of Fig. 6, sufficient momentum or whip of the blade K in swinging across two teeth of the serrations 137 is obtained, more effectively to cut the hair and to allow the cut hair to leave more readily. The slots have a slightly greater bevel 138 (for example, $\frac{1}{16}$'') toward the base side 134 and a slightly lesser bevel 139 (for example, about $\frac{1}{32}$'') at the flange side 136. The length of the slot 140 may be about $\frac{3}{32}$'' and the slot becomes broader and wider toward the flange 136, the bend line 141 being somewhat closer to the base end of the slot than to the flange end of the slot 140.

The bevels 142 will be spaced somewhat as shown, from the oblique edges of the teeth 129 (see Fig. 8) without binding, by the bent sides 143 of the retainer plate 144, which retain the faces of serrations 137 in shaving contacts with the backs of teeth 130. The plate 134 is ground at 34' at the faces of serrations 137 to bring the shearing surface close to the skin.

To the body 144 of the retainer M (see Fig. 7) are fixed the studs 145 closely fitting the holes 135 in the fixed shearer L and closely fitting the sides of the slots 128 in the reciprocatory shearer K and are lodged in bores 149 in the casing A. The ends of the holder body 144 are provided with the spring fingers 146 of reduced width which latch by their resiliency upon the outwardly bevelled end portions 147 of the casing front, said outwardly sloping portions 147, having a slope preferably of about 5° to 10°, for the purpose of exerting a slight pressure at the shearing surfaces.

The lateral edges of the end of the housing section D are undercut, as indicated at 148 in Fig. 1, to permit readier egress and clearance of the severed stubble or hairs through the adjacent undercut sides of the serrations 129 and 137 of the reciprocatory and fixed cutters K and L.

To start the armature F a milled roller or button 150 is provided which projects out through the recess 151 in the top of the side of the housing section D, as best shown in Fig. 2. The roller 150 may be readily placed in the recess 151 and under the edge of the triangular plate 68 as indicated in Fig. 2, and it is normally pressed outwardly through the recess 151 by the leaf spring 152. The leaf spring 152 extends rearwardly and is provided with a flange 153 held down by the screw 22 upon the laminated pile 20 of the field G. The resilient leaf 152, however, cannot press the roller 150 entirely through the opening which is of somewhat less width than the diameter of the roller 150.

In operation, the electrical conduits 45 and 46 are connected through a suitable double knife or other plug to an electrical socket preferably of the proper voltage of 110 v. to 120 v. generally available in the office or home. No change other than substitution of a suitable winding would be required to adapt the motor for any other voltage, A. C. or D. C., on which it may be desired to use it.

If the contacts 79 and 80 are closed and the poles P', P^2 or P^3 off center, the rotor F may immediately start and rapidly rotate at about 3000 R. P. M. If the rotor will not start, it is only necessary to press the starting button 150 inwardly by the thumb of the hand which grasps the structure A and then rotate the button 150 in the direction indicated by the arrow in Fig. 2 by drawing the thumb toward the rear of the handle casing A. The button 150 will then contact with the pole ends P', P^2 or P^3 and with the segments 165 and cause a rotation of the rotor F and an opening and closing of the contacts 79 and 80, sufficient to set up a pulsating field across the pole faces 30 and initiate rotation of the rotor F which will then continue automatically. The starter roller 150 when released will immediately be thrown out of contact with the rotor by the leaf spring 152.

This rotation of the rotor F, due to the pulsating field between the pole faces 30, will cause rotation of the eccentric 110 effecting an oscillatory movement of the lever J. The lever J through its engagement in the square opening 127 will cause a rapid reciprocation of the blade K and its serrated edges 129 across the serrated edges 137 of the fixed plate L.

To remove the hair from the face or other surface of the body the casing A, held in the hand may be moved across the face and/or other part, similar to a hoe type of razor, with the plate of the blade K at a slight inclination. The hairs to be sheared enter the cutting area 133 in Fig. 8 and after shearing are readily ejected or cleared through the undercut portions of the serrations 129 and 137, past the recessed edges 148 of the housing A. The operation may be stopped by opening the field circuit through the leads 45 and 46.

The cam 83 is preferably so arranged in respect to the eccentric 110, as indicated diagrammatically in Fig. 10, that the power will be applied during a continuous cycle, for about 52°, and off for about the next 68°, the inertia of the rotor F carrying it between successive power impulses resulting upon closure of the contacts 79 and 80.

It has been found most suitable for smooth and efficient operation that the power impulses be symmetrically received at the beginning and end of the reciprocatory stroke in one direction and that the power impulse again be received at the middle of the reverse stroke of the blade K. This effect is attained when the cam 83 and the eccentric 110 are positioned as shown in Fig. 10.

By this arrangement the rotor is given a series of impulses by the stator, two impulses being given on the stroke in one direction of the reciprocatory cutter at the beginning and end of the stroke and the other impulse being given in an intermediate portion of the return stroke.

The positioning and area of the resilient electrical connections 88 and 89 to the contact points 79 and 80 will assure withdrawal of heat and ready radiation thereof from the contact points 78 and 80 and the separated coils 31 and 32 will serve as a condenser to decrease arcing across said contacts 79 and 80 upon separation and also improve the power factor of the circuit in balancing the inductance and choking effect of the coils 31 and 32.

The pivot mounts 112 and 121 being directly in the casing section D will assure a jam founda-

tion for the reciprocating lever J and rotating armature F substantially taking up the strain in the apparatus and assuring a longer life thereof.

By reason of the narrow shearing area 133, as indicated upon Fig. 8, due to the shortness of the shearing teeth 129 of Fig. 5 on the reciprocatory cutter K, the load on the cutting head C is relatively small and sufficient power will be available at all times to prevent clogging or stoppage of the blade and secure a satisfactory shearing action.

It will thus be seen that there is herein described apparatus in which the several features of this invention are embodied, and which apparatus in its action attains the various objects of the invention and is well suited to meet the requirements of practical use.

As many changes could be made in the above construction, and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. An electric shaving implement comprising a handle casing of molded plastic having an integral thickened portion in the interior thereof presenting a ledge, a shearing assembly at one end of said casing, an electric motor in said casing, a lever having a bearing mount on said ledge, and connected near one end to said shearing assembly, and a drive connection between said electric motor and said lever, for oscillating said lever about said bearing mount, to cause vibratory operation of said shearing assembly.

2. An electric shaving implement comprising a handle casing of molded plastic including a hollow base, and a cover, said base having a thickened portion rising from the bottom wall thereof and presenting a riser facing the rear end of said casing, and a ledge or tread extending toward the forward end of said casing, a shearing assembly at the forward end of said casing, an electric motor in said casing including a rotor, a lever doubly bent to form a pair of substantially parallel arms extending in opposite directions from an intermediate transverse section, one of said arms extending over said ledge and having a bearing mount in a recess in said ledge, the forward end of said latter arm being connected to said shearing assembly, said transverse lever section extending along said riser, and the other arm extending between said rotor and a comparatively thin portion of said bottom wall, and an eccentric drive connection between said rotor and said latter arm for oscillating said lever about its bearing mount to cause vibratory operation of said shearing assembly.

3. An electric shaving implement comprising a handle casing of molded plastic including a hollow base, and a cover, said base having a pair of interior recesses in the bottom wall thereof, a shearing assembly at one end of said casing, an electric motor in said casing including a rotor having a bearing in one of said recesses, a lever having a bearing in the other recess and connected near one end to said shearing assembly, and a drive connection between said electric motor and said lever for oscillating said lever about its bearing to cause vibratory operation of said shearing assembly.

4. An electric shaver of the type comprising a handle casing having a shearing plate assembly superposed over the end of said casing, and presenting a shearing edge along one longitudinal side thereof, the combination therewith of removable means for mounting said shearing assembly to said casing end, and comprising a U-shaped clip straddling said assembly with the base intermediate portion of said clip extending longitudinally of said assembly, and spaced transversely inwardly from said shearing edge, leaving said edge exposed along its full length, and with the ends of said clips forming spring fingers flanking the ends of said shearing assembly, and resiliently engaging the respective sides of said casing.

5. An electric shaver comprising a handle casing, a pair of superposed relatively reciprocable shearing plates having co-acting shearing teeth along at least one longitudinal edge thereof, and resilient latch means for detachably securing the shearing plates in position to one end of said casing, and comprising a U-shaped clip straddling said plates, with the base intermediate portion of said clip extending longitudinally of said plates, and spaced transversely inwardly from said shearing edge, leaving said edge exposed along its full length, and with the ends of said clips forming spring fingers, flanking the ends of said shearing plates and having latch engagement with the respective sides of said casing.

6. An electric shaver comprising a handle casing, a pair of superposed relatively reciprocable shearing plates, and resilient latch means for detachably securing the shearing plates in position to one end of said casing, and including a strip superposed on said cutter plates, one or more studs fixed to said strip to form a unit therewith, and removably projecting through corresponding openings in said plates and in the end of said casing, and spring fingers offset from the respective ends of said strip, and having latch engagement with corresponding conformations on the sides of said casing.

7. An electric shaver comprising a handle casing, a pair of superposed relatively reciprocable shearing plates, having co-acting shearing teeth along at least one longitudinal edge thereof, and removable means for detachably securing the shearing plates in position to one end of said casing and comprising a U-shaped clip straddling said plates with the base portion of said clip extending longitudinally of said plates and spaced transversely inwardly from said shearing edge, leaving said edge exposed along its full length, and with the ends of said clip forming outwardly converging spring fingers flanking the ends of said shearing plates, and having a snap engagement with corresponding latch conformations on the respective sides of said casing, and studs fixed to said base portion to form a unit with said clip, and removably projecting through corresponding openings in said plates and in the end of said casing.

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