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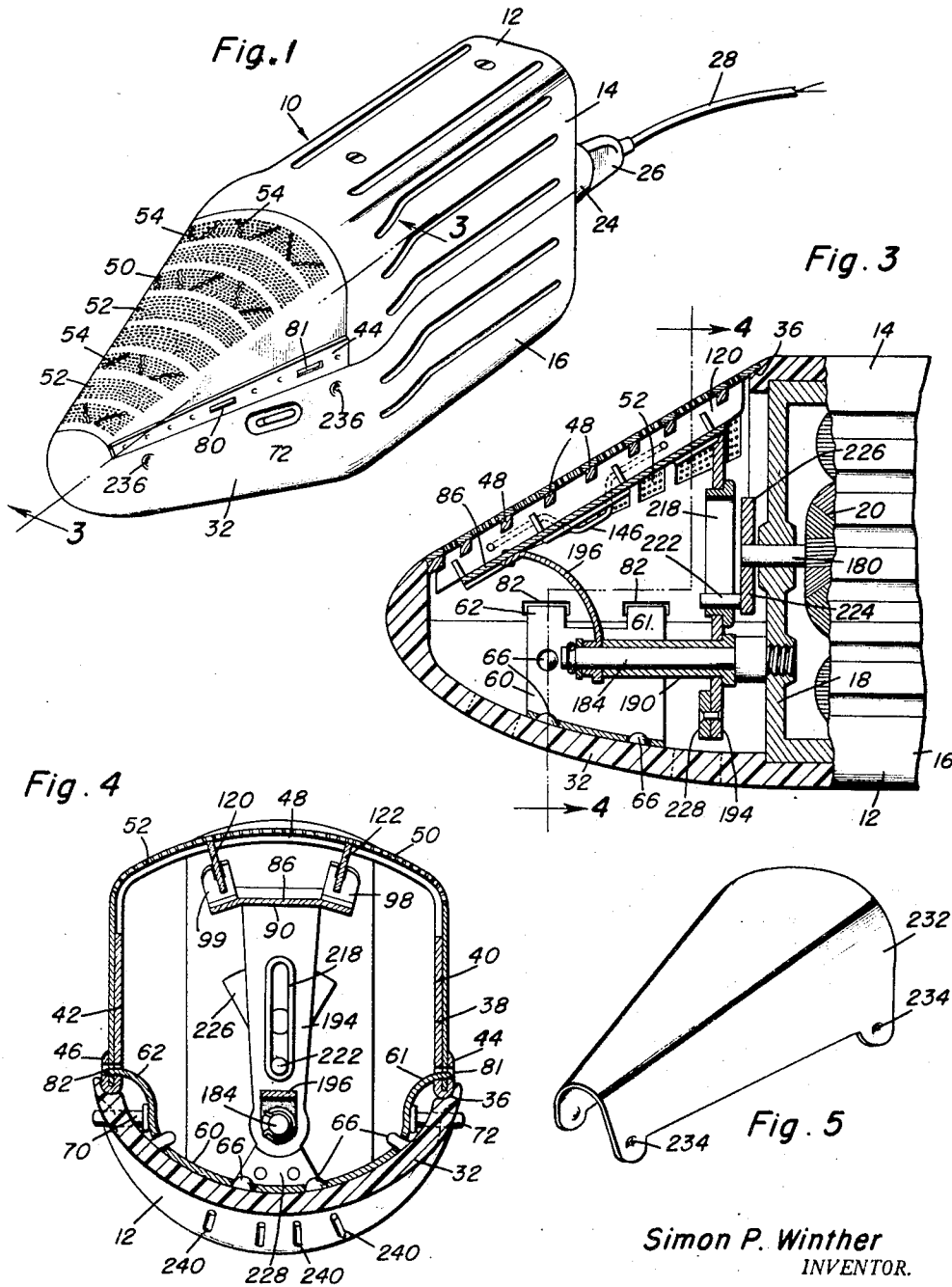
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VIBRATORY ELECTRIC SHAVER

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3 Sheets-Sheet 1



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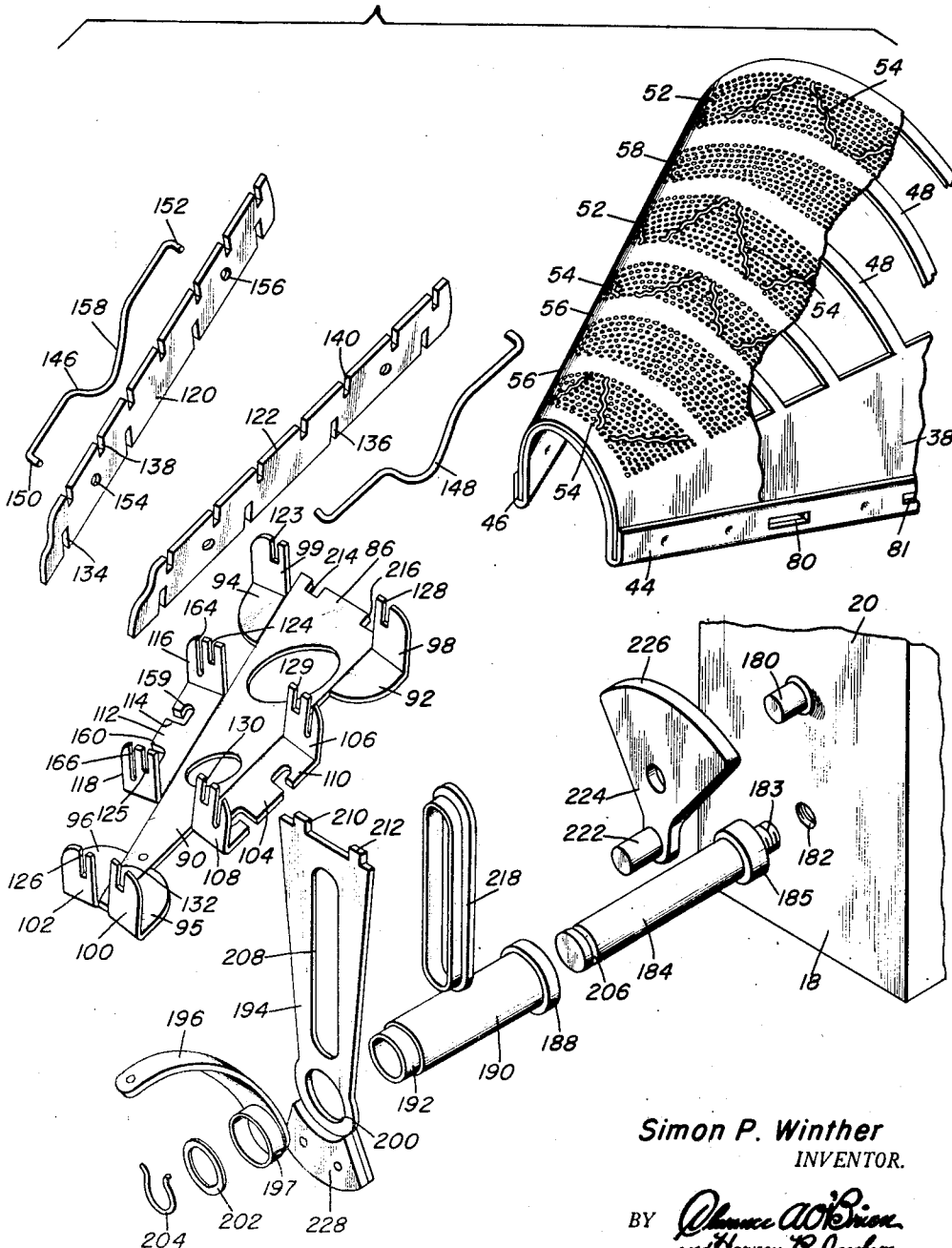
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3 Sheets-Sheet 2

Fig. 2



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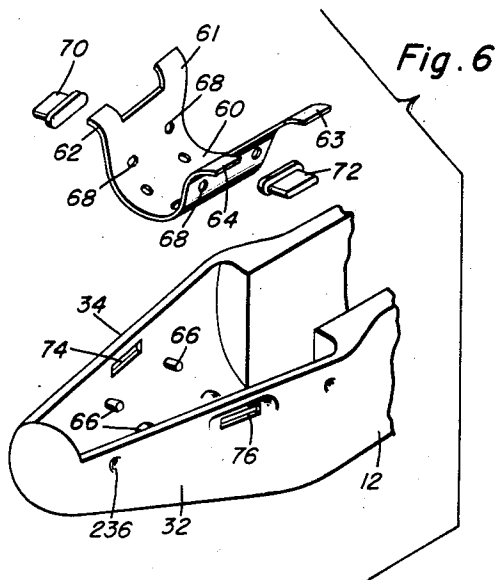
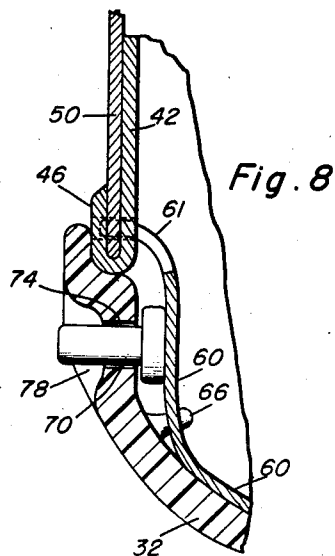
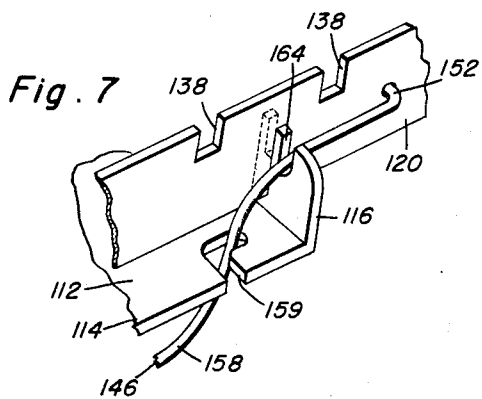
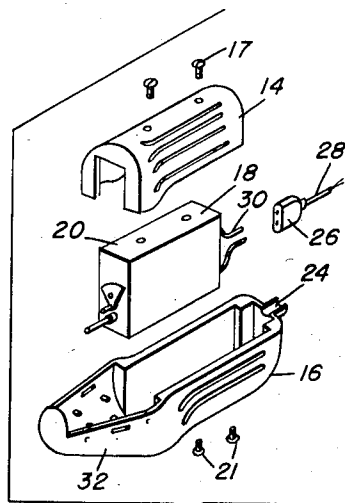
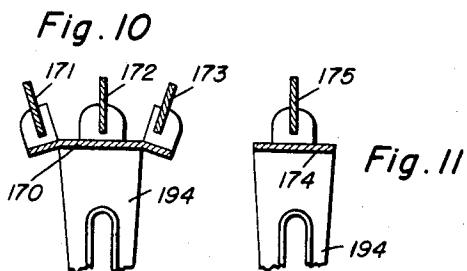
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VIBRATORY ELECTRIC SHAVER

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3 Sheets-Sheet 3



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2,828,539

VIBRATORY ELECTRIC SHAVER

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Application January 13, 1956, Serial No. 558,895

5 Claims. (Cl. 30—43)

This invention relates to improvements in electric shavers and particularly to shavers of the type which have oscillating cutters.

An object of the invention is to provide an electric shaver wherein the moving parts are made as light in weight as possible and still retain the necessary strength and wherein means are provided to eliminate or materially reduce vibration. Excessive vibration in an electric shaver not only results in premature wear but also is responsible for uncomfortable shaving. By reducing vibrations in shavers, therefore, a longer lasting and more comfortably usable shaver results.

A further object of the invention is to provide an electric shaver having an appearance quite similar to my prior Patents 2,700,816 and 2,726,445, but being structurally improved by the utilization of a much simpler design of all parts in the drive chain between the motor and cutter and by improving the cutter and blades which form a part thereof.

A more specific object of the invention is to provide a shaver of the type which has a motor driven, oscillating blade holder, with a one-piece elongated spring that is carried in slots in the holder by locating a portion of the spring intermediate the ends thereof in the slots, and which has its ends disposed in spaced holes formed in the blade, the elasticity of the spring and its shape being such that the blade is pressed lightly against the inner surface of the foraminous wall of the electric shaver.

One of the important features of the invention is the means for attaching the foraminous wall and supporting frame of the foraminous wall to the electric shaver casing, these means being a spring together with buttons arranged to flex the spring from either or both sides thereof; this flexure separating tabs at the ends of the spring from engagement with the foraminous wall and its supporting frame.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

Figure 1 is a perspective view of the electric shaver;

Figure 2 is an exploded perspective view of a part of the shaver and particularly a cutter and drive mechanism for the cutter;

Figure 3 is a longitudinal sectional view of the structure principally shown in Figure 2;

Figure 4 is a transverse sectional view taken on the line 4—4 of Figure 3;

Figure 5 is a perspective view of the cover for the foraminous wall of the shaver;

Figure 6 is an exploded perspective view of the means for attaching the foraminous wall and foraminous wall supporting frame to the shaver casing;

Figure 7 is a fragmentary perspective view showing the attachment of one of the blades to the blade holder;

Figure 8 is an enlarged fragmentary sectional view

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showing the attachment of the foraminous wall to the casing and the means for holding the foraminous wall in place thereon;

Figure 9 is an exploded perspective view of the casing and motor in the casing;

Figure 10 is a fragmentary transverse sectional view showing a slight modification of the cutter wherein there are three blades instead of the two illustrated in Figure 2; and

Figure 11 is a transverse sectional view of a further modification of the cutter utilizing only one blade.

In Figure 9 the general organization of casing 12 for the electric shaver 10 is illustrated. Casing 12 is made of an upper and lower part 14 and 16 respectively, these parts being of a configuration very similar to the casings for the shaver described in my referenced patents. The upper part 14 of casing 12 has apertures in which to accommodate the screws 17, the latter passing into tapped holes in the casing 18 of motor 20. The lower part 16 of the casing has similar apertures to accommodate screws 21, these screws being fastened to the motor casing 18 whereby the casing is held assembled. Socket 24 is located at one end of the casing 12 and it accommodates the plug 26 on the end of an electrical conductor 28. Plug 26 makes contact with the prongs 30, the latter being in electrical conductivity arrangement with the working parts of the motor as is known in the electrical motor art.

The forward end 32 of the casing 12 is tapered, and there is an opening 34 (Figure 6) in this forward end. The opening has a recess 36 extending around it in which frame 38 is disposed. Although it is preferred that the casing 12 be of plastic material, any other material that is suitable for the purpose may be used.

Frame 38 is curved in cross section along the top thereof and has approximately straight sides 40 and 42 (Figure 4), the lower edges of which being returned to form generally U-shaped or rolled edges 44 and 46 which seat in the previously mentioned recess 36. The top of frame 38 consists of a plurality of ribs 48 which extend from sides 40 and 42.

A thin foraminous wall 50 is located on the frame 38 and has the edges thereof fixed within the U-shaped or rolled edges 44 and 46 of frame 38. The foraminous wall has the same shape as the frame. It has a plurality of groups 52 of perforations in which diagonal clipper slots 54 are formed. Bands 56 of imperforate material separate the perforated sections, and these bands are adapted to overlie ribs 48.

When the foraminous wall and frame 38 are placed as a unit over opening 34, they are held in place by a resilient fastener assembly (Figure 6). The fastener assembly consists of a curved spring plate or strip 60 having a pair of tabs 61 and 62 at one end and a pair of tabs 63 and 64 at the opposite end. The cross sectional curvature of the plate 60 is such as to conform to the inner cross sectional curvature of the front tapered part 32 of the casing 12, whereon it is located. It is held in place by a plurality of projections 66 which rise from the inner surface of the tapered part 32 of casing 12 and which pass through apertures 68 in plate 60.

Finger operated buttons 70 and 72 have enlarged ends which bear against spaced portions of the spring 60 near the tabs at the ends thereof. The shanks of the buttons are passed through apertures 74 and 76 in the tapered portion 32 of the casing 12. Each of the apertures 74 and 76 are countersunk as at 78 (Figure 8) to prevent inadvertent actuation of the buttons and also to present a smoother external appearance and touch to the user of the electric shaver. There are two openings 80 and 81 in the U-shaped or rolled edge 44 of frame 38 and foraminous wall 50. Similar openings 82 are formed

in the opposite side of this same assembly. The pairs of tabs 61, 62 and 63, 64 are normally located in these openings in order to hold the frame 38 and foraminous wall 50 assembled on the casing 50. The inherent elasticity of the spring plate 60 retains these tabs in the openings. However, when it is desired to remove the frame 38 together with the foraminous wall 50, it is necessary only to depress one or both of the buttons 70 and 72 and lift the foraminous wall and frame therefrom.

A blade holder 86 is disposed in the tapered portion 32 of casing 12. This blade holder comprises a lightweight flat plate 90 having a pair of lateral projections or extensions 92 and 94 at one end thereof and similar projections 95 and 96 at the opposite end thereof. Upstanding plates 98 and 99 are at the rear edges of the lateral extensions 92 and 94, while upstanding plates 100 and 102 are at the front edges of the lateral extensions 95 and 96. A generally U-shaped support 104 has sides 106 and 108 at right angles to its connecting member 110, the latter extending as a lateral projection of one edge of the main plate 90. An identical U-shaped member 112 is on the opposite edge of the plate 90. It has a connecting member 114 at the ends of which right angular sides 116 and 118 are located.

Blades 120 and 122 are fitted in aligned slots 123, 124, 125 and 126 which are in the U-shaped member 114 and plates 99 and 102 and also in the aligned slots 128, 129, 130 and 132 which are on the corresponding oppositely disposed parts of the blade holder 86. In order that the blades 120 and 122 will be interlocked, they have respectively slots 134 and 136 in their lower edges which interfit over the previously mentioned sets of slots. The upper edges of blades 120 and 122 have sets of slots 138 and slots 140 respectively therein, the latter slots being dimensioned to snugly accommodate the ribs 48 when the blades are operatively disposed in the shaver as shown in Figure 3.

Improved means for yieldingly pressing with a gentle force the blades 120 and 122 against the inner surface of foraminous wall 50 are operatively connected to the blades. These means are identical in construction and consist of spring 146 for the blade 120 and spring 148 for the blade 122. The spring 146 is elongated having approximately right angular ends 150 and 152 which are fitted in apertures 154 and 156 in the blade 120. The intermediate part of the spring 146 has a curvature 158 in it. The curvature of the spring 148 fits beneath the cross member 114 of the U-shaped lateral projection on plate 90 while the end parts thereof fit in keyhole slots 159 and 160. The portions of the spring between the curvature 158 and the right angular ends 150 and 152 seat in the slots 164 and 166 that are formed in the sides 116 and 118. The non-deflected shape of the spring 146 is such that when assembled as described and shown in Figures 3 and 7, a gentle force is applied to the blade 120 tending to press the blade with its cutting edge against the inner surface of foraminous wall 50. The spring 148 is identical in both function and construction to the spring 146. As shown in Figures 10 and 11 blade holder 170 may be substituted for blade holder 86, the blade holder 170 having blades 171, 172 and 173 carried thereby. These blades show that there may be more than two used in the cutter. In addition Figure 11 shows the blade holder 174 that is provided with a single blade 175. This is a further modification where only one blade is utilized, the holders 170 and 174 being altered to the extent necessary to include one or more of the blades.

In Figures 2-4 the drive connection between the shaft 180 of motor 20 and the blade holder 86 is shown. Motor casing 18 has a tapped hole 182 in which the threaded end 183 of spindle 184 is attached. Collar 185 on the inner end of the spindle 184 functions as a thrust bear-

ing for the collar 183 on sleeve 190. This sleeve is fitted over the spindle 184 and has a reduced end 192 on which there is arm 196. Arm 196 has a collar 197 which is pressed on or otherwise fixed to the reduced end 192.

Yoke 194 has an aperture 200 through which the sleeve 190 is passed, coming to bear against collar 183, the yoke 194 being welded, soldered, pressed on or in some way fixed to sleeve 190. Washer 202 is slipped over the end of spindle 184, and clip 204 is fitted in peripheral groove 206 formed at the end of the spindle 184. This clip holds the washer arm 196, and sleeve 190 assembled on the spindle 184.

Arm 196 is riveted or otherwise fixed to the plate 90 of holder 86 near the outer end thereof. Yoke 194 is formed of a lightweight plate having a longitudinal slot 208 extending radially from aperture 200. Lugs 210 and 212 are formed at the outer end of the plate which forms the yoke drive, these lugs being fitted in notches 214 and 216 of plate 90 in order to establish a drive connection between the yoke 194 and plate 90. An insert 218 of hardened material, for example "Teflon" or hardened steel, or chromium plated metal, is pressed into the slot 208. Crank pin 222 at the end of crank arm 224, is disposed in the insert of slot 208. The crank arm 224 is fixed, as by being pressed, onto the shaft 180 of the motor. Counterbalance 226 is on the crank arm 224, and a counterbalance or counterweight 228 is on the yoke 194. By proper selection of the mass of these counterweights 226 and 228, upon actuation of the cutter the vibrations associated with the rapid accelerations of such a structure, are materially reduced.

A cover 232 of a shape similar to the shape of the foraminous wall 50, is adapted to be fitted over the foraminous cover when the shaver is not in use. The cover has indentations 234 therein, these indentations being fitted in similar indentations 236 that are formed in the tapered portion 32 of the casing 12. The inherent resiliency of the cover 232 holds it in place on the casing 12.

Lower ventilation openings 240 are formed in the tapered front portion 32 of the shaver casing 12 so that there will be a free flow of air for the shaver 10. In use, the motor is energized by the customary procedure of plugging in the razor and actuating a switch (not shown). Energization of the motor causes rotation of shaft 180 which is imparted to oscillatory movement of the yoke 194 through the crank pin, crank arm and associated structure. This oscillation is transferred to the cutter 86 by the structure previously described. The springs 146 and 148 hold the cutter blades pressed firstly against the inner surface of the foraminous wall 50 in order that the cutting operations may be successfully performed.

When it is desired to remove the foraminous wall, its support 38 is removed with it. This is accomplished by depressing the buttons 70 and 72, these buttons removing the tabs from the previously described openings in the U-shaped or rolled edges 44 and 46. Then the foraminous support and its frame are removed as a unit. Inspection and cleaning of the interior of the shaver is accomplished in this way.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. In an electric shaver which includes a casing having an opening and a motor located in said casing, a blade holder having a blade and mounted in said casing, a yoke, means including a spindle mounting said yoke for oscillation in said casing, means drivingly connecting said motor to said yoke to oscillate the latter, means driv-

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ingly connecting said yoke to said blade holder so that upon oscillation of said yoke said blade holder is correspondingly oscillated, an arm secured to said blade holder and mounted on said spindle for cooperating with said yoke in supporting said blade holder, a tapered foraminous wall over said opening in said casing, a frame supporting and secured to said wall, means releasably fastening said frame and said wall on said casing, said fastening means including a spring having tabs, said frame having apertures in which said tabs are fitted, and means carried by said casing and operatively connected with said spring for separating said tabs from said apertures so that said frame and said foraminous wall may be separated from said casing.

2. An electric shaver comprising a casing having an opening adjacent to one end thereof, a tapered foraminous wall, a supporting frame having ribs covering said opening, said foraminous wall supported on said ribs and overlying said opening, means releasably fastening said frame and said wall to said casing, a motor disposed in said casing and having a motor shaft, a blade holder, means connected to said shaft and to said blade holder for oscillating said holder, a blade having a cutting edge slidably disposed close to the inner surface of said foraminous wall, means in said blade and said blade holder for supporting said blade on said blade holder, an elongate spring carried by said holder and secured at its ends to spaced parts of said blade for yieldingly basing said blade so that said blade edge is held pressed lightly against said foraminous wall, said holder comprising an essentially flat plate having a pair of lateral projections at one end thereof and a second pair of lateral projections near the opposite end thereof, the projections of said second pair of lateral projections being closer together than the projections of the first mentioned pair of lateral projections, upstanding members on each of said projections and having outwardly opening slots, a second blade, and the first mentioned and said second blades disposed in said slots of said members that are carried by said lateral projections.

3. The electric shaver of claim 2 wherein each blade has a pair of spaced apertures, said elongate spring located in the apertures of one of said blades, a second elongate

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spring in the apertures in the other of said blades, and means connected to said essentially flat plate for securing said springs to said plate intermediate the ends of said springs.

4. The electric shaver of claim 2 wherein said holder oscillating means includes a yoke having lugs at one end thereof, said blade holder including a plate that has notches therein, said lugs fitted in said notches thereby establishing a drive connection between said yoke and said plate, and an arm on said shaft and connected to said plate at a location remote from said notches of said plate for partially supporting said plate.

5. An electric shaver comprising a casing having an opening adjacent to one end thereof, a tapered foraminous wall, a supporting frame having ribs covering said opening, said foraminous wall supported on said ribs, means releasably fastening said frame and said wall to said casing, a motor disposed in said casing and having a motor shaft, a blade holder, means connected to said shaft and said holder for oscillating said holder, a blade having a cutting edge slidably disposed close to the inner surface of said foraminous wall, means in said blade and said blade holder for supporting said blade on said holder, said blade holder comprising a plurality of spaced upstanding plates angularly disposed to the longitudinal axis of said blade holder, a plurality of slots in each blade, the slots being in divergent alignment so that the blades received thereby will diverge from one end of the blade holder to the other to correspond to the other and to correspond to the angle of the tapered foraminous wall.

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