

Oct. 25, 1955

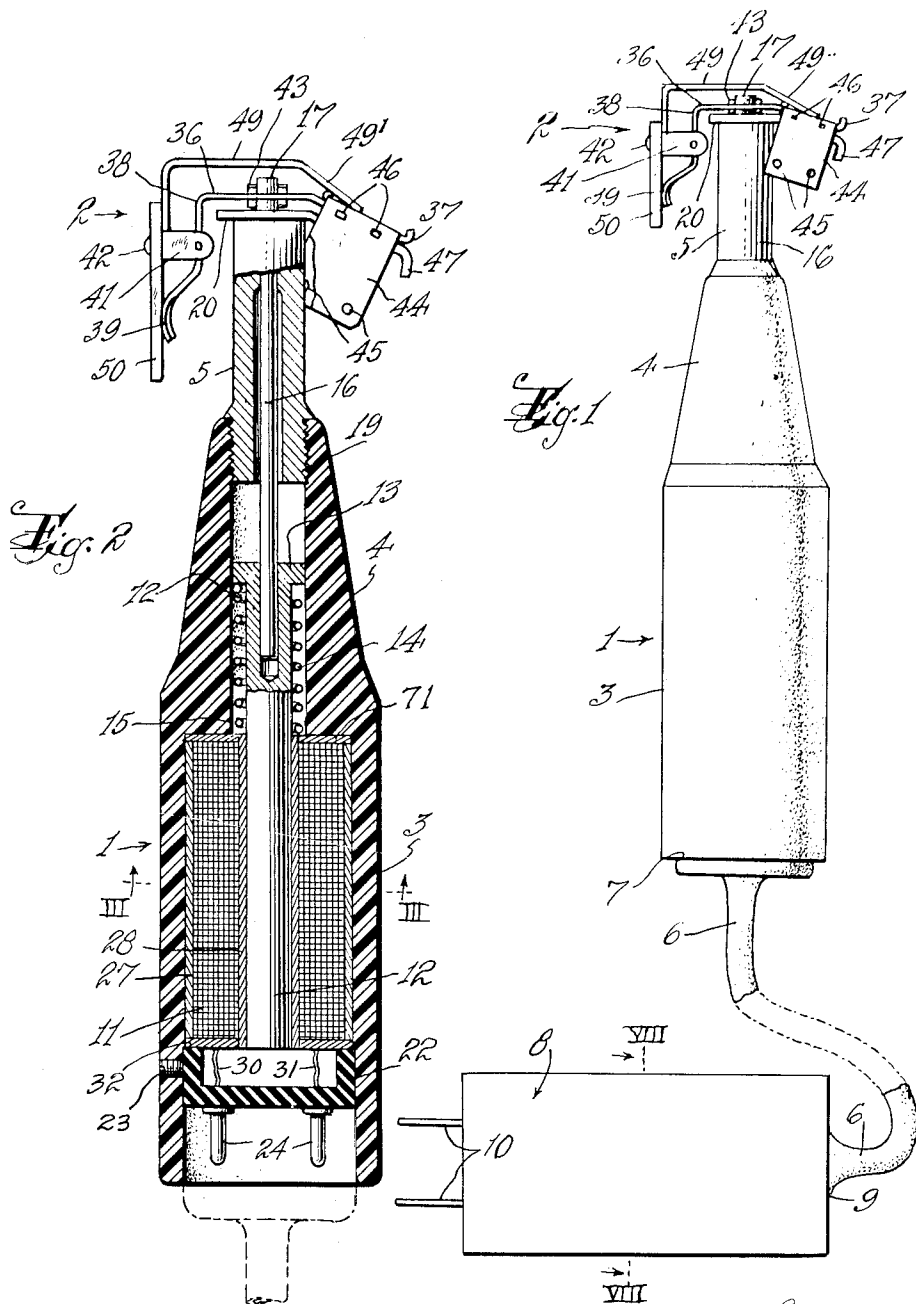
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2,721,382

ELECTRIC SHAVER

Filed Jan. 25, 1955

3 Sheets-Sheet 1



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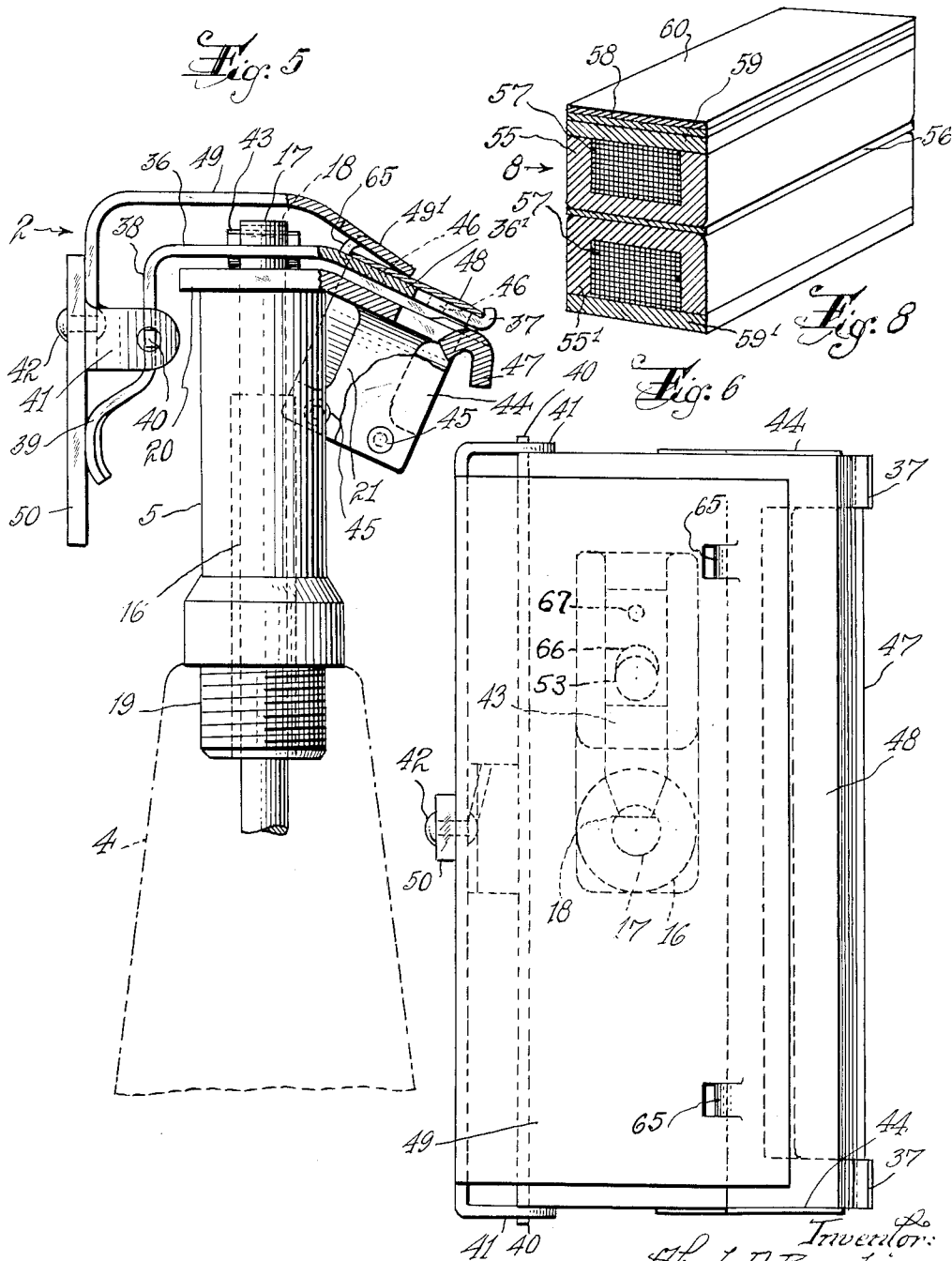
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3 Sheets-Sheet 2



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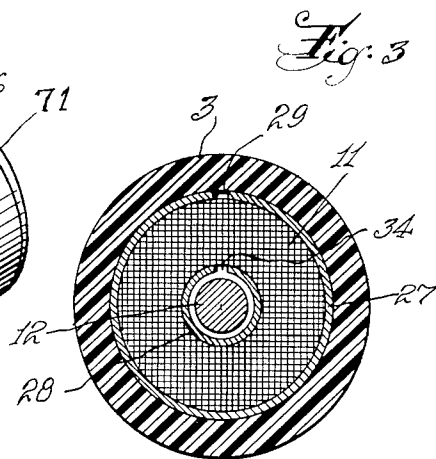
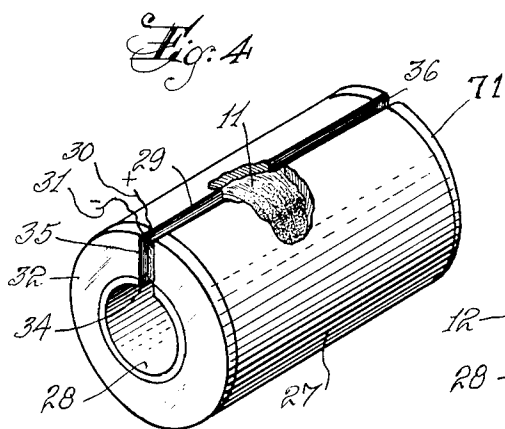
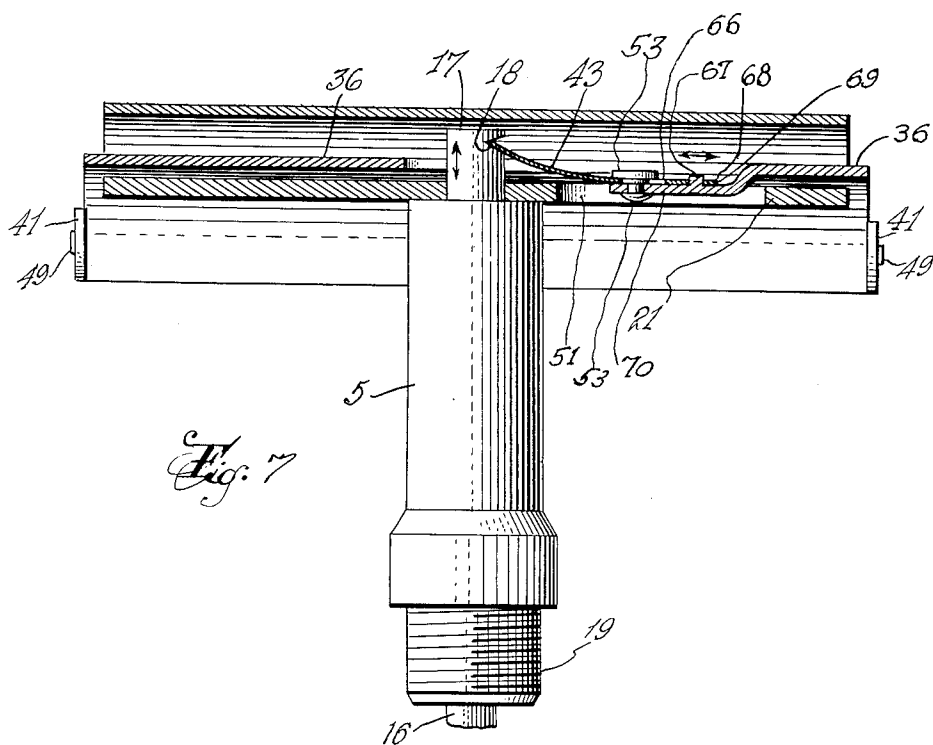
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3 Sheets-Sheet 3



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1

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ELECTRIC SHAVER

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3 Claims. (Cl. 30—45)

This invention relates to electric shavers, and specifically to a shaver having a flat razor blade which is laterally reciprocated by electrical means.

There are a number of shavers on the market which are driven electrically by a small motor and which are devised to cut hair by impact of a rotating or reciprocating shearing element striking against the hair positioned against multiple striking surfaces provided as perforations or slits in a stationary enclosure against the inner surface of which the shearing element rubs. Besides being expensive and fragile, these types of shavers do not give a close shave, which is readily understandable from the fact that the cutting of the hair with such units must necessarily take place some distance away from the skin. Furthermore, the cutting edges of such shavers are quite expensive to replace when they are damaged or when they become dull, and replacement is more often than seldom.

The present invention involves a reasonably priced, electrically driven razor which employs a standard, inexpensive shaving blade that directly contacts the skin and thus provides a close shave. Also, the unit is simple in construction and is rugged enough to withstand dropping impacts without serious damage thereto.

Some electrically driven shavers have been disclosed in the art having reciprocated shaving blades, but they have never appeared on the commercial market for a number of reasons. In the first place, those units having rotating motors have been very bulky and expensive. Those having vertically reciprocating means in the handle for effecting movement of the blade generally employ a coil-armature arrangement in which a make-and-break contact is employed. Since there are a great many make-and-break operations required, even in a limited period of time, it is apparent that such units would soon wear out or get out of order, which has been the case. Also, movement of the blade has been effected by application of the vibrating element directly upon the blade, which is highly ineffective when said blade becomes wet with soap and water. Troubles experienced with prior art shavers of this type also included positioning difficulties with respect to the blade and poor control of blade drift which often takes place when anchoring is not possible or practical.

The shaver of the present invention avoids these difficulties by use of a blade carrier which is moved by the reciprocating element, so that the blade itself need not be directly connected for reciprocation. Also, the blade itself is positioned in driftless and free condition between flexible end supports, thereby eliminating wandering of the blade into ineffective or difficultly reciprocatable status. Furthermore, the coil motivating means is made life-time permanent by use of a rectified transformed A. C. current in the form of half-wave impulses, thereby eliminating entirely the need for make-and-break and similar interrupting devices. The latter is effected by means of a unique plug, connected to the razor by means of a cord, and adapted to be plugged directly into the electrical outlet. Other new and novel features will become apparent from the description which will follow.

2

The invention will be more readily understood by reference to the accompanying drawings in which Figure 1 depicts a side view of a preferred shaver made in accordance with the present invention, including the plug-in transformer-rectifier. A cross-sectional side view of the handle portion of the shaver shown in Figure 1, is illustrated in Figure 2. Figure 3 shows an enlarged cross sectional bottom view of the handle portion of Figure 2 taken along line III—III of that figure. Figure 4 illustrates a perspective view of the coil employed in the handle shown in Figure 2. An enlarged side view of the head of the shaver, partly cut away, is depicted in Figure 5, while Figure 6 is a top view of the shaver head of Figure 5. Figure 7 presents an enlarged portion of the head showing details of the flat spring arrangement (link mechanism) employed for converting the vertical motion into lateral reciprocating motion. Figure 8 depicts a cross-sectional view taken along line VIII—VIII of Figure 1 of the transformer-rectifier plug used for providing the half-wave impulses to the coil of the shaver. Similar numerals refer to similar parts in the various figures.

Referring again to the drawings, numeral 1 represents the handle portion of the shaver while numeral 2 is employed to represent generally the head of said shaver. Bottom portion 3 of the handle is enlarged and is narrowed at top portion 4 so as to join with neck portion 5. Bottom portion 3 and top portion 4 of housing 3 preferably is of plastic, aluminum, or other suitable material, while neck 5 and head 2 are preferably of metal, such as electro-plated steel, brass, stainless steel, or other suitable material. Cord 6 joins the bottom portion of the handle at 7 where it plugs in thereto. The other end of the cord 6 terminates at 9 into transformer-rectifier 8 which is provided with plugs 10 for plugging into an electrical wall outlet or similar electrical feeding means employing available high voltage current, such as 60 cycles, 110 volt, A. C. current.

As shown in Figure 2, handle portion 1 includes hollow body 3 containing annularly-wound coil 11 in the center of which is freely disposed armature 12, a round rod preferably of silicon steel, capable of moving vertically for a distance of roughly $\frac{1}{16}$ ". Rod 12 has widened upper end 13 against which is disposed one end of thrust coil spring 14. The other end of spring 14 rests on top of coil cover plate 71 so that spring 14 tends to maintain rod 12 in upward position when coil 11 is not energized.

Rod 16 fits tightly into the hole in the upper portion of rod 12 and is reduced in diameter, and this reduced-size rod 16 passes through the center opening in neck 5 and projects out of the top thereof with end 17 (of rod 16). The upper end 17 of rod 16 is provided with a side notch or groove 18 for engaging the edge of flat spring 43 (Figure 7) to engage said spring and allow it to flex between it and shoulder rivet 53 for reciprocation of blade carrier 36. Neck 5 screws into body 3 at 19 and terminates at the top with flange 20. Platform shaver frame 21 is merely an extension of flange 20.

Inside the lower part 3 of the hollow body is disposed insulation 22 employed for supporting coil 11 and it is tightly fastened therewithin by means of set screw 23 or by other equivalent means, such as a metal C ring snapped in from below. Attached to insulation 22 are plug pins 24 (connected to the wire leads 30 and 31 of coil 11) and into which cord 6 is inserted for electrical connection therewith.

Details of coil 11 are shown in Figures 3 and 4. It will be observed that coil 11 is wound around centrally disposed brass tube 28, said tube being slotted parallel to the axis of tube at 34. Rod 12 slides within tube 28. Surrounding the exterior of circularly wound coil 11 is slotted silicon steel sheet housing 27, the slot 29 of which is in register with slot 34 in tube 28. Silicon steel end

plates 32 and 71 are joined to housing 27 and are also slotted at 35 and 36, respectively, to join the slots 34 and 29. These slots are provided to minimize eddy currents, whereby coil 11 is made more efficient. Leads 30 and 31 from coil 11 are connected with plug prongs 24 as shown in Figure 2. When half-wave impulses are fed into coil 11, the structure already described causes energization of coil 11 to pull rod 12. Between impulses, spring 14 pulls back rod 12, so that a vertical reciprocation of rod 12 results.

Referring to Figures 5, 6 and 7, blade carrier plate portion 36' is the member which positions and holds flat razor blade 48 in position. Blade carrier plate 36 has no rubbing or frictional contact with frame portion 21, it being positioned approximately 0.020" therefrom and positionally attached at its sides by flat end support springs 44 at 46. Springs 44 are fastened via fastener means 45 to frame 21. These two support springs allow flexible sidewise action of blade carrier plate 36 for a distance of about 0.005" to 0.008".

Flat spring 43, which preferably is about 0.005" thick and about 1/8" wide, has an irregular hole 66 punched out therein, the hole being larger at the rightward portion (in Figure 7) than at the leftward portion, so that the head or top of shoulder rivet 53 may be inserted through the rightward portion of hole 66 and then spring 43 may be pushed rightwardly so that rivet 53 is secured under its head by the leftward portion edges of hole 66 in spring 43. Another smaller hole 68 also is provided in the rightmost portion of spring 43, enabling said latter portion of the spring to be snapped over projection 67 (fitting in hole 68), said projection rising from the depressed portion 70 of blade carrier plate 36. Rivet 53 is locked loosely onto depressed portion 70. The depressed portion 70 and the rivet are disposed within opening 51 cut out of platform shaver frame 21.

Razor blade 48 rests on front portion 36' of blade carrier plate 36 and is held in place by the front portion 49' of cover clamp plate 49. Cover clamp plate 49 is pivotally mounted at 40 on vertically directed blade carrier plate portion 38. This clamp plate may be released and tilted upwardly by turning lock lever 50 which locks against spring portion 39 of carrier plate portion 38, thereby enabling the changing of blades. Cover plate portion 49' may be provided with downwardly directed punched projections 65 to serve as guides for the upper portion of razor blade 48.

As is apparent from Figure 7, blade carrier plate 36 is reciprocated by flat spring 43 which is fastened to blade carrier 36 and extends to notch 18 in end 17 of rod 16. Rod 16 reciprocates vertically, causing flat spring 43 to flex outwardly and thus cause lateral reciprocation of blade carrier plate 36 and razor blade 48 mounted thereon. Blade 48 preferably is a narrow single-edged blade of the Shick Injector type.

Metal neck 5 is the supporting member for frame 21 which is permanently attached thereto. It also contains an internal bearing for reciprocating rod 16. Neck 5 is screwed into handle portion 3 by means of thread 19.

The transformer-rectifier plug 8 (Figure 8) consists of two U-shaped silicon steel plates 55 and 55' insulated from each other by insulation 56 and placed back-to-back. Primary and secondary coils 57 are wound longitudinally over the center of the U's with the required number of turns and gage of wire to transform the usual 110 volts A. C. or other available high voltage to 30 volts or less, as desired. After coils 57 are wound, silicon steel cover plates 59 and 59' are disposed over top and bottom of the assembly. Over top plate 59 is disposed a layer of insulation 58, and thereover is applied selenium rectifier plate 60. Another similar rectifier plate may be placed over plate 59', if desired. The object of the rectifier plate is to convert the low voltage A. C. into half-wave impulses which are transmitted to coil 11 in the shaver for reciprocating rod 16. High voltage A. C. is fed through plugs 10 into the primary portion of windings 57 and both secondary outlets are then connected via plugs 24 to the connections of coil 11. Any number of selenium coated plates (connected with each other in parallel) may be used, depending on the power output desired.

I claim:

1. An electric shaver including a handle portion, a hollow neck attached thereto, and a head portion attached to said neck, comprising a hollow handle, an annular slotted core coil disposed therein, a vertical magnetizable rod disposed within said coil and of length sufficient to project through the neck and beyond said head portion and adapted to be vertically reciprocated by said coil, a flat platform frame fixed to the top of said neck, a flat laterally movable blade holder adapted to hold a flat razor blade and disposed over said frame, engaging means on said blade holder, a flexible linkage connecting the projecting end of said rod with said engaging means and adapted to convert the vertical motion of the rod into lateral reciprocating motion and transmit same to the blade holder, and means connectable with said coil for feeding half-wave impulses thereto.

2. An electric shaver according to claim 1 in which a flat support spring is attached to each side of said platform frame and also attached to each side of said blade holder which straddles therebetween, said springs being adapted to provide positional support to the blade holder, thereby allowing a clearance between the platform frame and blade holder whereby friction is eliminated therebetween.

3. An electric shaver according to claim 1 in which a cover plate is disposed over the blade holder and is adapted to rest on the razor blade thereon, thereby locking said blade in position, said plate being pivotally connected to the back of said blade holder and adapted to swing vertically on said pivot connection.

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