

- [54] RAZOR WITH RECIPROCATING GUARD
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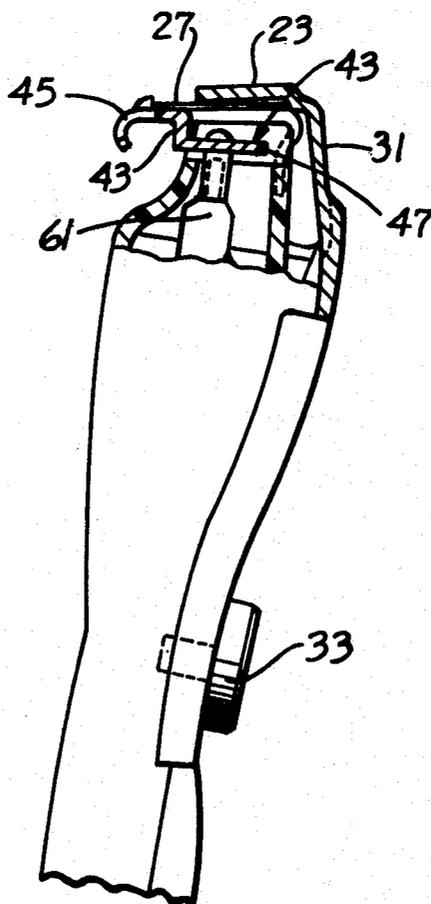
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[57] ABSTRACT

A razor including a body, a blade having a sharp cutting edge fixedly mounted on the body, a guard mounted on the body for movement relative to the body and the blade, and a motor for imparting movement to the guard. The motor includes at least one coil which drives the guard directly or through a tuned reed.

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11 Claims, 9 Drawing Figures



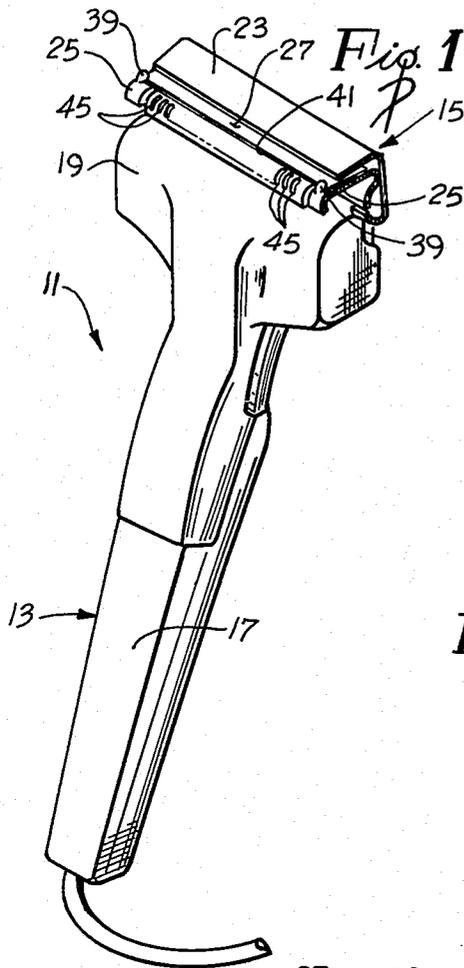


Fig. 2

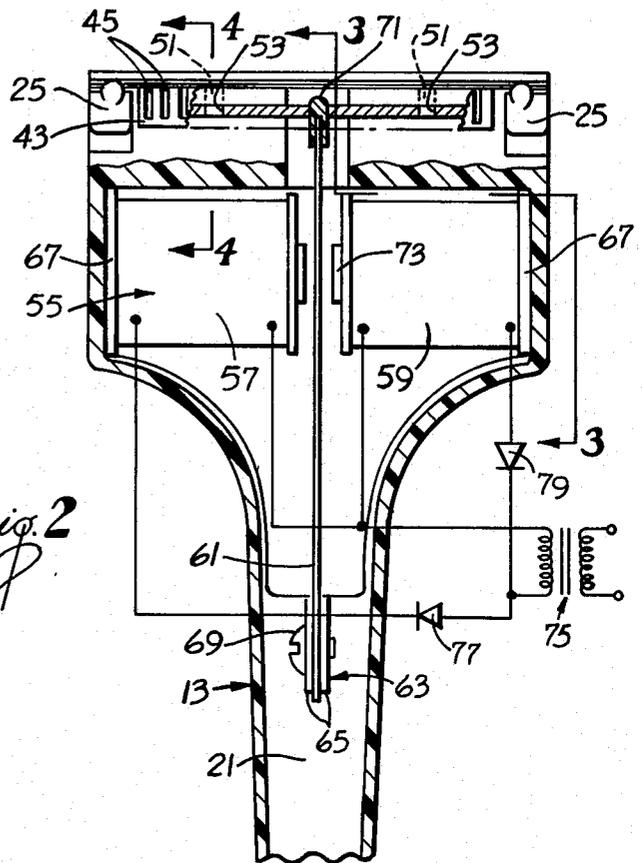


Fig. 3

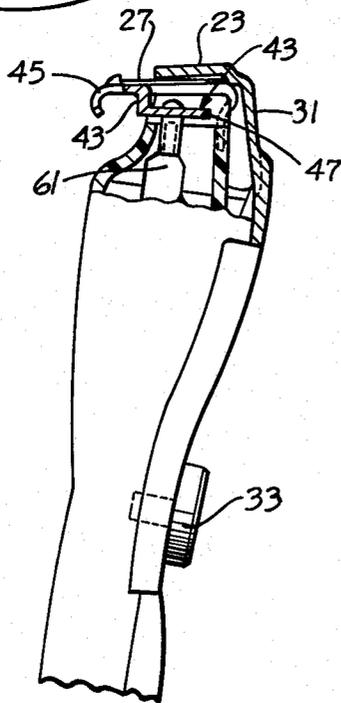
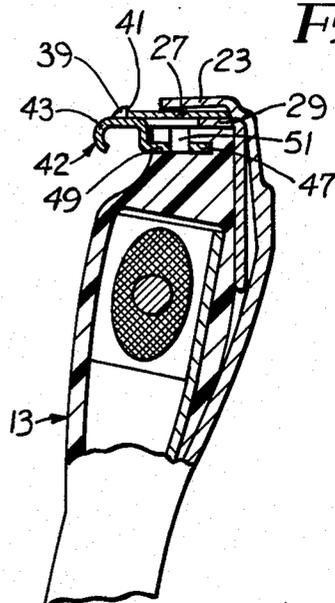


Fig. 4



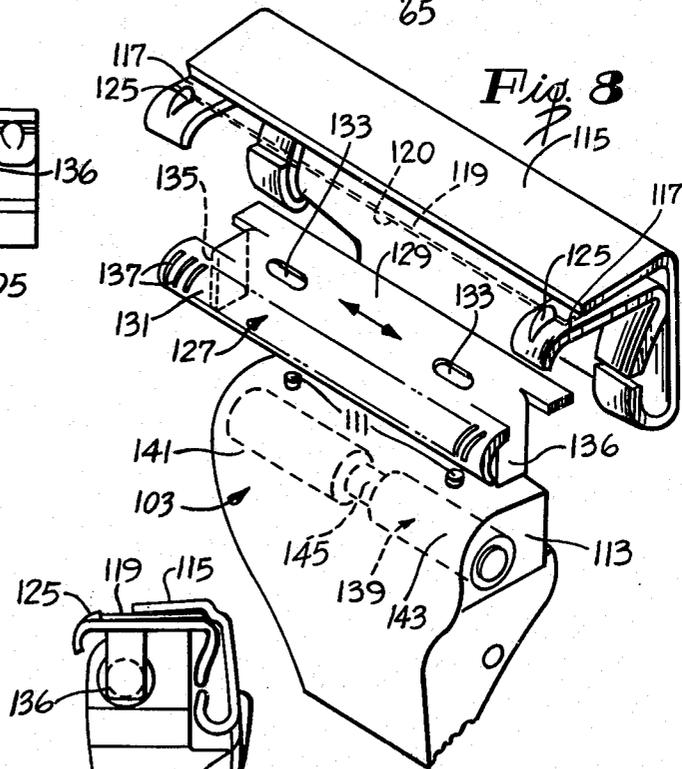
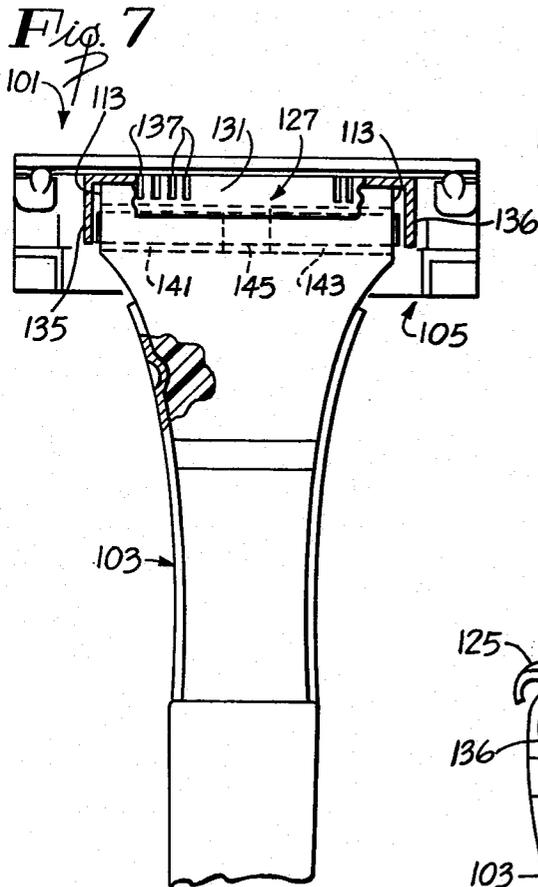
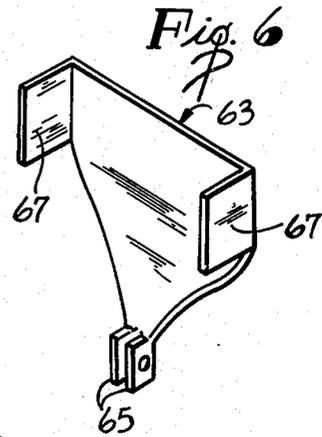
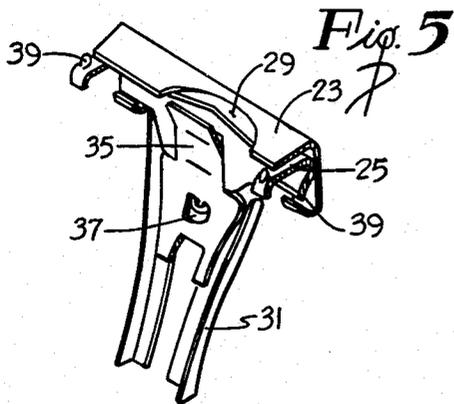
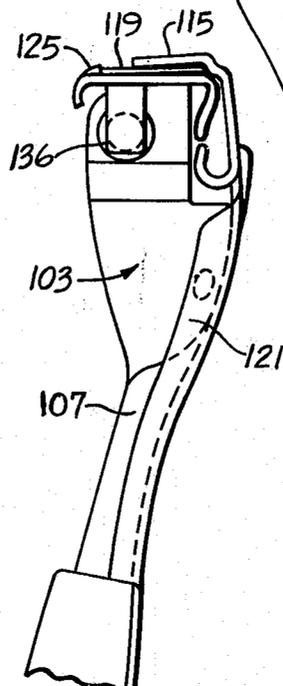


Fig. 9



RAZOR WITH RECIPROCATING GUARD**BACKGROUND OF THE INVENTION**

A conventional razor includes a body adapted to be manually held and means for mounting a blade on the body. The blade mounting means often takes the form of a pair of plates, one of which projects beyond the sharp cutting edge of the blade to form a guard.

In an effort to improve the cutting action of this type of razor, many prior art devices rapidly reciprocate the blade relative to the body or reciprocate the blade and the guard relative to the body. In either event, the blade is reciprocated. Although movement of this type is beneficial from the standpoint of cutting efficiency, it tends to cause injuries as a result of the blade cutting the skin over which the razor is moved.

Another problem with razors of this type relates to the drive mechanisms for reciprocating the blade. Specifically, several prior art razors employ rather cumbersome mechanical drives. This adds to the size, cost, and weight of the razor. In addition, the frequency of oscillation is high and considerable vibration is transmitted to the hand of the user.

SUMMARY OF THE INVENTION

The present invention provides high cutting efficiency and close shaves while eliminating injuries resulting from the reciprocable blade. This is accomplished, in part, by holding the blade stationary with respect to the body of the razor and reciprocating the guard relative to the body and the blade. Because the blade is stationary, it is no more likely to cause injury than a conventional razor. The movement of the guard moves the hairs across the blade to provide a shearing action. This promotes high cutting efficiency and close shaves.

To obtain optimum shearing action, the guard should be reciprocated in a direction parallel to the cutting edge of the blade. In addition the guard should have means such as a plurality of openings for moving the hairs across the cutting edge of the blade.

The razor of this invention advantageously includes a body, at least a portion of which is adapted to be manually grasped to allow manual movement of the razor. The blade is fixedly mounted on the body with the sharp cutting edge exposed. The guard is mounted on the body for movement relative to the body and to the blade. Motor means carried by the body drives the guard.

The razor includes a guard member which includes the guard. The guard and guard member are preferably integral and reciprocate together. The guard extends along the cutting edge of the blade.

The blade can advantageously be held between an upper plate and a pair of clips both of which are fixed to the body. The guard member is positioned intermediate the clips with sufficient clearance between the clips and the guard member to allow the guard member to reciprocate longitudinally of the cutting edge of the blade.

The present invention provides for high frequency reciprocation of the guard without large or cumbersome drives. This is accomplished, in part, by moving the guard electromagnetically. The electromagnetic drive includes coil means.

In one preferred embodiment at least a segment of the guard member is constructed of electromagnetic

material. The coil means is energizable to provide an alternating flux field which cooperates with the magnetic material of the guard member to reciprocate the guard relative to the blade. In this form of the invention, the coil means is carried by an upper end portion of the body and the guard member overlies the upper end portion of the body.

An advantage of this construction is that the body can be completely sealed, and there is no need for any power transmitting element to extend through the body to the guard member.

The guard member can be mounted for reciprocating movement on the body by cooperating pins and slots. The guard member includes tabs at the opposite ends thereof which overlie the opposite ends of the upper portion of the body. The tabs serve as stops for the reciprocatory motion of the guard member and cooperate with the alternating flux field to reciprocate the guard member.

According to another preferred embodiment of the invention, the motor means includes a resiliently deflectable element or segment of magnetic material attached adjacent one end to the body so that the deflectable element can oscillate. The other end of the deflectable element is attached to the guard member. The coil means provides an electromagnetic force for oscillating the deflectable element to reciprocate the guard. The deflectable element is preferably in the form of a tuned reed which resonates at the speed at which the guard is reciprocated. To minimize the transmission of vibration from the motor to the body, a resilient deformable connector member can be provided to join the tuned reed to the guard member. This also provides for quieter operation.

The invention can best be understood by reference to the following description taken in connection with the accompanying illustrative drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of one embodiment of a razor constructed in accordance with the teachings of this invention.

FIG. 2 is an enlarged, fragmentary, longitudinal sectional view of the razor.

FIG. 3 is a sectional view taken generally along line 3—3 of FIG. 2.

FIG. 4 is a fragmentary, sectional view taken generally along lines 4—4 of FIG. 2.

FIG. 5 is a perspective view of a portion of the razor with the blade and guard member removed and portions broken away.

FIG. 6 is a perspective view of a bracket used to mount the deflectable element.

FIG. 7 is a front elevational view partially in section of a second embodiment of razor constructed in accordance with the teachings of this invention.

FIG. 8 is an exploded fragmentary perspective view of the razor.

FIG. 9 is a fragmentary side elevational view of the razor.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 shows a razor 11 constructed in accordance with the teachings of this invention. The razor 11 generally includes a body 13 and a head 15 attached to the upper end of the body. The body 13 includes an elon-

gated handle 17 adapted to be manually grasped and an enlarged upper end portion 19. As shown in FIG. 2, a portion of the body 13 is hollow and defines a chamber 21. The body 13 can advantageously be constructed of a plastic material such as epoxy; however, other materials can be utilized.

The head 15, in the embodiment illustrated, includes an upper plate 23 and a pair of clips 25 for clamping a razor blade 27 therebetween. The blade 27 can be injected beneath the upper plate 23 in a conventional manner by employing a conventional blade ejector. A bottom plate 29 (FIG. 4) supports the blade 27 along the rear edge thereof and integrally interconnects the clips 25. A mounting plate 31 is formed integrally with the upper plate 23 and is attached to the body 13 in any suitable manner such as by a screw 33. The plate 29 is attached by a resilient spring clip 35 to the mounting plate 31, and the clip 35 is attached to the mounting plate 31 by a bent over projection 37 integral with the mounting plate. Integral projections 39 on the clips 25 retain the blade 27 between the clips and the plate 23.

The blade 27 has a sharp cutting edge 41 which is exposed. A guard member 42 underlies the blade 27. Although the construction of the guard member 42 can be varied, in the embodiment illustrated, it is an integral plate-like member. The guard member 42 includes a guard 43 which lies beneath and projects outwardly beyond the cutting edge 41. The guard 43 has a plurality of narrow openings or slots 45, each of which extends from a location slightly inwardly of the cutting edge 41 outwardly toward the outer edge of the guard as shown in FIGS. 1 and 3. In the embodiment illustrated, the slots 45 terminate inwardly of the outer edge of the guard; however, they could extend to the periphery of the guard 43 if desired.

The guard member 42 includes a plate or mounting section 47 which is slidably received within a groove 49 of the body 13. The guard member 42 is mounted for linear reciprocatory movement in the groove 49 by a pair of pins 51 on the body 13 and a pair of cooperating slots 53 (FIG. 2) formed in the mounting section 47. Sufficient clearance is provided between the opposite ends of the guard member 42 and the clips 25 to allow the guard to reciprocate in a direction parallel to the cutting edge 41 of the blade 27.

Thus, the blade 27 is fixedly mounted on the body 13, and the guard member 42 is mounted for reciprocation relative to the blade and the body. Obviously the mounting means for the blade 27 illustrated in the drawings is merely illustrative. Other mounting means which fixedly attach the blade 27 to the body 13 can be employed. Similarly, while the manner illustrated for mounting of the guard member 42 for reciprocation is preferred, the guard member could obviously be mounted for reciprocation in other ways. Thus, the concept of a fixed blade and a reciprocable guard member can be embodied in razors of various different constructions.

The guard member 42 is reciprocated by a motor 55 carried by the body 13 and mounted within the chamber 21. Although the motor 55 could be of various designs, in the embodiment illustrated, it includes coils 57 and 59, a deflectable member in the form of a tuned reed 61, and a mounting bracket 63. The mounting bracket 63 is suitably fixedly attached to the body 13. The mounting bracket 63 is constructed of a magnetic

material and has a pair of mounting lugs 65 at its lower end and a pair of flanges 67 at its upper end.

The tuned reed 61 is mounted at its lower end by a screw 69 or other suitable means on the lugs 65. The reed 61 is an elongated, resiliently, deformable strip or segment constructed of a magnetic material. The upper end of the reed 61 is affixed to a central region of the guard member 42 by a resilient connector 71. The connector 71, in the embodiment illustrated, is constructed of a resiliently, deformable, non-magnetic material such as Neoprene. The connector 71 is in the form of a sheath which receives the upper end of the reed 61 and which in itself is snugly received within a central opening in the mounting section 47 of the guard 42. As shown in FIGS. 2 and 3, the upper end of the reed 61 terminates below the guard 43.

Each of the coils 57 and 59 includes the usual windings and a core 73. The coils 57 and 59 are suitably mounted on the body 13 on opposite sides of the reed 61. The outer faces of the coils 57 and 59 contact the flanges 67, respectively and the interfaces of the coils are disposed closely adjacent the opposite faces of the reed 61.

The coils 57 and 59 are supplied with electrical power by a transformer 75 and diodes 77 and 79. The primary of the transformer 75 is adapted for connection to a standard 110 volt ac outlet. The secondary of the transformer 75 delivers 24 volt power to the coils 57 and 59. The diode 77 allows current flow in only one direction through the coil 55, and the diode 79 allows current flow only in the other direction through the coil 59. Accordingly, the coils 55 and 59 are alternately energized by the current from the transformer 75 and provide an alternating flux field. When the coil 55 is energized, the reed 61 is drawn against the core 73 of that coil, and when the coil 59 is energized, the reed 61 is drawn against the core of this latter coil. Thus, by alternately energizing the coils 57 and 59, the reed 61 is resiliently and rapidly oscillated at a frequency equal to the frequency of the alternating current supplied to the transformer 75. Although frequency adjustment may be made if desired, in the embodiment illustrated, the reed 61 is oscillated at 60 cycles per second. The reed 61 is preferably tuned to resonate at the frequency at which it is driven.

The movement of the reed 61 is transmitted to the guard member 42 by the connector 71. The connector 71 damps vibrations that would be transmitted to the body 13 and allows for less abrupt stopping and starting of the guard member 42. This also makes the razor 11 quieter running.

The guard member 42 and the guard member 43 reciprocate along a path parallel to the cutting edge 41. The slots 45 are adapted to receive hairs of the surface being shaved and move them rapidly back and forth along the cutting edge 41. This materially facilitates the cutting action of the blade 27. Because the blade 27 is stationary relative to the body 13, it is not likely to produce injury.

FIGS. 7-9 show a razor 101 which constitutes a second preferred embodiment of the invention. Except to the extent shown or described the razor 101 is identical to the razor 11. The razor 101 includes a body 103 and a head 105 mounted on the body at the upper end thereof. The body 103 includes a handle 107. The upper end of the body 103 is imperforate and includes a pair of upwardly extending integral pins 111 (FIG. 8).

The upper end of the body 103 has end surfaces 113. In other respects, the body 103 may be substantially identical to the body 13 shown in the embodiment of FIGS. 1-6.

Except for the guard member 127, the head 105 can be identical to the head 15 (FIGS. 1-6). Specifically, the head 105 includes an upper plate 115 and a pair of clips 117 for clampingly receiving a razor blade 119 therebetween. The blade 119 has a cutting edge 120. The upper plate 115 is mounted on the body 103 by a channel shaped mounting bracket 121 which is attached to the body and which is integral with the upper plate 115.

Projections 125 formed on each of the clips 117 hold the blade 119 in position between the clips and the upper plate 115. Thus, the blade 119 is fixedly mounted on the body 103 as described above with reference to FIGS. 1-6.

The head 105 also includes a guard member 127. The guard member 127 includes a plate or mounting section 129 and a guard 131. The mounting section 129 has a pair of slots 133 adapted to receive the pins 111, respectively. The co-operation between the pins 111 and the slots 133 mounts the guard plate 127 for reciprocation along a path parallel to the cutting edge 120 of the blade 119. The guard member 127 also includes a pair of tabs 135 and 136 which extend downwardly from the mounting section 129. The entire guard member 127 or at least the segment thereof forming the tabs 135 and 136 is constructed of a magnetic material.

The guard 131 is identical to the guard 43 (FIGS. 1-6) and includes slots 137. The guard 131 is also oriented relative to the cutting edge 120 in the same manner as described hereinabove with reference to FIGS. 1-6. Accordingly, the entire guard member 127 is reciprocable along a path parallel to the cutting edge 120 and such movement of the guard member is relative to the body 103 and to the blade 119.

The guard member 127 is reciprocated by a motor 139. The motor 139 includes coils 141 and 143 and the guard member 127. The coils 141 and 143 are identical to the coils 57 and 59 except that they include a common core 145. The coils 141 and 143 are carried by and within the upper end portion of the body 103 and are alternately energized in the manner described hereinabove with reference to FIG. 2.

When the coil 141 is energized and the coil 143 is de-energized, the flux produced by the energized coil pulls the tab 135 against the adjacent end of the core 145 as shown in FIG. 7. When the coil 143 is energized and coil 141 is deenergized, the tab 136 is similarly pulled against the adjacent face of the core 145 thereby moving the entire guard member 127 to the left as viewed in FIG. 7. This action can be rapidly repeated in the same manner described above with reference to FIG. 2. Contact of the tabs 135 and 136 against the adjacent ends of the core 145 serves to limit the extent of the reciprocating motion of the guard member 127.

Thus, by alternately energizing and deenergizing the coils 141 and 143, the entire guard member 127 is reciprocated. This causes the guard to move the hairs across the cutting edge 120 to provide improved cutting action. No motion transmitting members are interposed between the coils 141 and 143 and the guard member 127, and accordingly, construction is simplified.

Although exemplary embodiments of the invention have been shown and described, many changes, modifications and substitutions may be made by one having ordinary skill in the art without necessary departure from the spirit and scope of this invention.

I claim:

1. A razor which is usable with a blade having a sharp cutting edge, said razor comprising:

a body, at least a portion of said body being adapted to be manually grasped to allow manual movement of the razor;

means for mounting the blade on the body with the sharp cutting edge exposed and with the blade being fixed against reciprocation relative to said body;

a guard having a plurality of openings therein; means for mounting said guard on said body for reciprocatory movement relative to said body; and motor means for imparting said reciprocatory movement to said guard whereby the guard can move the hair to be cut.

2. A razor as defined in claim 1 wherein said guard is reciprocated along a path which is generally parallel to said cutting edge.

3. A razor as defined in claim 1 wherein said blade mounting means includes a plate fixed to said body and adapted to overlie at least a portion of the blade and a pair of clips fixed to said body and adapted to underlie the opposite end portions of the blade whereby the blade is clamped between said plate and said clips, said razor including a guard member, said guard member including said guard, said guard member lying intermediate said clips with sufficient clearance between said clips and guard member to allow the guard member to reciprocate longitudinally of the cutting edge.

4. A razor as defined in claim 1 wherein said motor means includes a segment of magnetic material drivingly associated with said guard and coil means energizable to provide an alternating flux field which cooperates with said segment to reciprocate said segment and said guard.

5. A razor as defined in claim 4 including a guard member, said guard member including said guard and said segment, said segment being on the exterior of said body.

6. A razor as defined in claim 4 wherein said segment includes a deflectable element of magnetic material, means for attaching said deflectable element adjacent one end thereof to said body whereby said element can oscillate, means for drivingly interrelating said deflectable element adjacent the other end thereof to said guard, said alternating flux field cooperating with said deflectable element to reciprocate said deflectable element and said guard.

7. A razor as defined in claim 6 wherein said means for drivingly interrelating includes a resilient deformable member.

8. A razor as defined in claim 6 wherein said deflectable element is tuned to resonate at substantially the speed at which the guard is reciprocated.

9. A razor which is usable with a blade member having a sharp cutting edge, said razor comprising:

a body, at least a portion of said body being adapted to be manually grasped to allow manual movement of the razor;

first means for mounting the blade member on the body with the sharp cutting edge exposed and with the blade being fixed against reciprocation; a guard member including a guard;

second means for mounting said guard member on said body, said guard member being mounted for reciprocatory movement relative to said body in a direction generally parallel to the cutting edge when the blade is mounted by said first means, said guard being adjacent said cutting edge when the blade is mounted by said first means;

said guard member being constructed at least in part of magnetic material; and

coil means carried by said body and energizable to provide an alternating flux field which cooperates with the magnetic material of said guard member to reciprocate said guard member relative to said body.

10. A razor as defined in claim 9 wherein said body has an upper end portion, said coil means being carried by said upper end portion, said guard member overlying said upper end portion, said guard member having

tabs at the opposite ends thereof which overlie the opposite ends of the upper portion, and said tabs including magnetic material cooperable with said alternating flux field to reciprocate said guard.

11. A combination comprising:

a body, at least a portion of said body being adapted to be manually grasped to allow manual movement of the body;

a blade having a sharp cutting edge;

means for mounting the blade on the body with the sharp cutting edge exposed and with the blade being fixed against reciprocation relative to said body;

a guard having a plurality of openings therein;

means for mounting said guard on said body for reciprocatory movement relative to said body and said blade, said openings being adjacent said cutting edge; and

motor means for imparting said reciprocatory movement to said guard whereby the guard can move the hair to be cut across the cutting edge.

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