

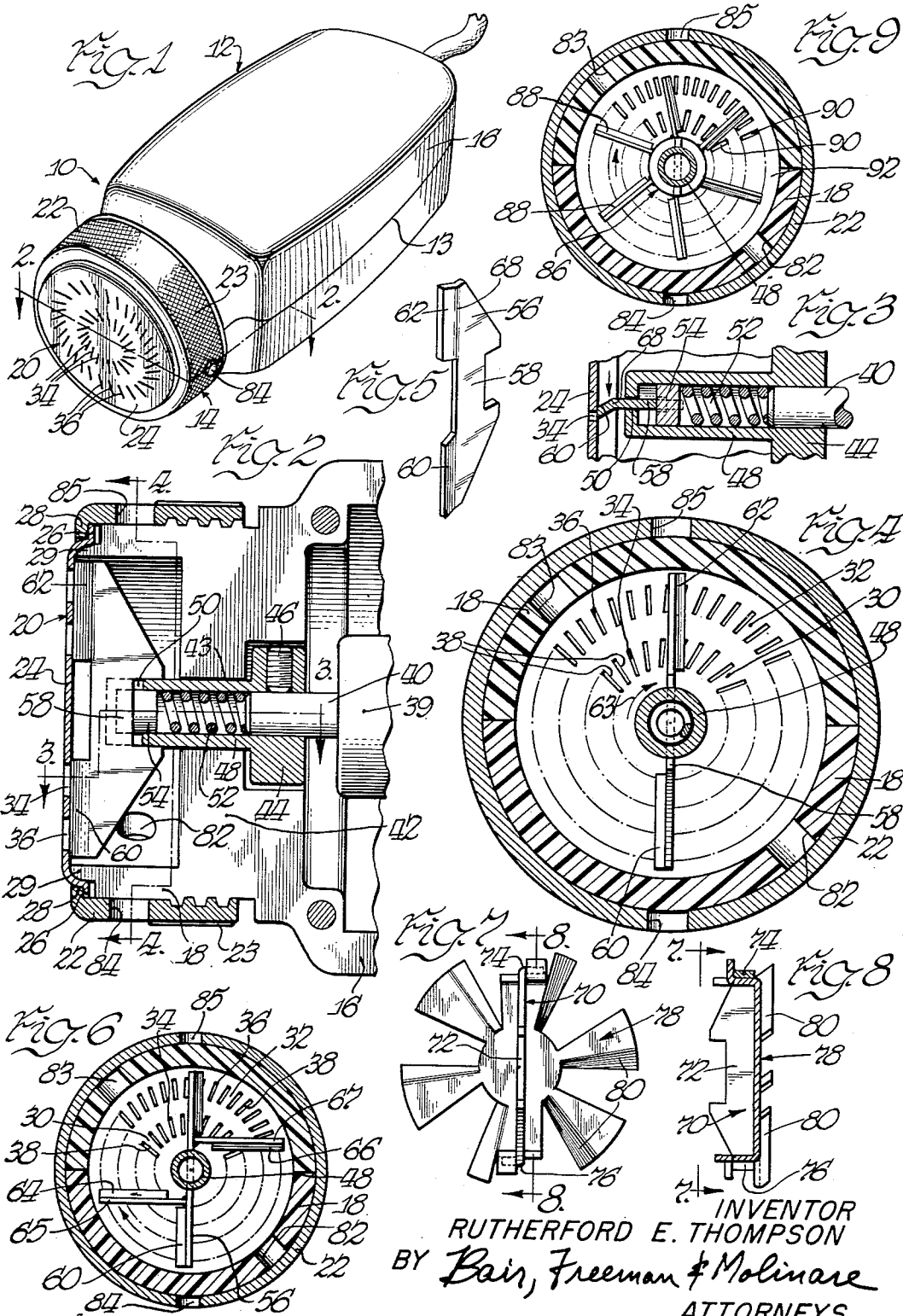
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ELECTRIC RAZOR

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ELECTRIC RAZOR

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This invention relates to a power-operated razor, or dry-shaver, and more particularly to an electric razor, having a rotating cutter.

One object of this invention is to provide a novel and improved razor having a rotating cutter in combination with a flat comb.

Another object of this invention is to provide an electric razor with a novel blade and comb arrangement whereby a shearing action on the whiskers is obtained as distinguished from a chopping action.

A further object of this invention is to provide a rotary-blade type electric razor having a particularly sensitive comb by means of which improved shaves with an electric razor may be obtained.

Still another object of this invention is to provide a rotary-blade type electric razor wherein the interaction between the blade and the comb brings about self-honing of the blade.

Still a further object of this invention is to provide a rotary-blade type electric razor characterized by its novel arrangement of parts and simple means for cleaning thereof.

And still another object of this invention is to provide a highly efficient rotary-blade type electric razor which is characterized by its inexpensiveness and simplicity of construction.

Further objects and advantages of this invention will become apparent as the following description proceeds and the features of novelty which characterize this invention will be pointed out with particularity in the claims annexed to and forming part of this specification.

Figure 1 is a perspective view of the novel power-operated razor;

Figure 2 is an enlarged cross-section view of the head of the razor taken substantially on line 2—2 of Figure 1;

Figure 3 is a fragmentary view taken substantially on line 3—3 of Figure 2;

Figure 4 is a view taken on line 4—4 of Figure 2;

Figure 5 is a perspective view of one form of the cutter for use with the electric razor, particularly the cutter shown in Figures 2 to 4;

Figure 6 is similar to Figure 4 and shows another form of rotary cutter which may be used in the electric razor;

Figure 7 is a plan view of still another form of cutter taken on line 7—7 of Figure 8;

Figure 8 is a view taken on line 8—8 of Figure 7; and

Figure 9 is a view similar to Figures 4 and 6 showing still another combination of rotary cutter and comb which may be used in the electric razor.

Referring now to the drawings, Figure 1 shows a power-operated razor, or dry-shaver, generally indicated at 10 comprising a casing 12 and a shaving head at one end thereof indicated at 14. The casing 12 comprises a motor enclosing portion 16 and an externally threaded tubular portion 18. The casing 12 may be formed in two similar sections which are appropriately joined together as indicated by seam 13.

The shaving head 14 includes a cup-like comb 20 and

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an annular tensioning nut, or cap, 22. The comb 20 has a flat circular face 24 and an outwardly extending flange 26. The tensioning cap 22 slips over comb 20 and is threaded onto the externally tubular portion 18 of the casing. Cap 22 is knurled over a portion 23 thereof to provide for ease in grasping. The tensioning cap 22 has an inwardly extending portion, or flange, 28 which is adapted to engage the comb flange 26 over the entire circumference thereof. The screw-type advance of tensioning cap 22 on the tubular portion 18 of the casing, causes the flange 28 to exert radial tensioning forces on comb face 24 through the medium of engagement of cap flange 28 with comb flange 26.

The extended end of the tubular portion 18 is appropriately shaped to a rounded contour as indicated at 29 and cooperates with the shape of the cup-like comb 20 to provide for uniform radial tensioning of the flat circular face 24, upon the flange 28 engaging and exerting axial forces on the flange 26.

The comb face 24 is provided with apertures through which the whiskers extend when the comb is placed against the face. The apertures may be round, oblong, rectangular or of any appropriate shape and may be disposed in the comb face in any predetermined manner. In the preferred form shown in Figures 1 and 4, the comb face 24 has two annular regions 30 and 32 each provided with a group of rectangular slits 34 and 36. The trailing edge of each slit is the whisker-engaging edge 38 of the slit because it is the edge against which the whisker bears during the whisker-cutting operation. These trailing edges 38 of slits 34 are disposed non-radially of the axis of the circular face 24, and said edges of the group of slits 34 are disposed substantially at the same predetermined angle to radii of said circular comb face 24 which intercept the edges of the group of slits. Such an arrangement provides that as the cutter blade sweeps past said edges of said group of slits, that the blade intercepts the whisker-engaging edges of the slits at substantially the same predetermined angle.

The whisker engaging edges of slits 36 are also disposed non-radially, and may make a different angle with the radii of the circular face 24, or may make the same angle with the radii as the whisker-engaging edges of slits 34. In the form shown at Figure 4, the angle of the whisker-engaging edges of the group of slits 34 and 36 to radii of said comb face 24 is in the order of 10 to 12 degrees. By providing this angle between the cutter blades and the slits in the comb face 24, a shearing action is obtained on the whiskers extending through comb face 24, as contrasted to chopping action on the whiskers obtained by most other dry-shaving razors.

While the slits in the face of the comb are shown disposed in annular regions, the slits may be disposed in any other predetermined geometrical arrangement, such as, for example, spirally with adjacent slits overlapping as to their radially outward extent. It is an important feature of this invention that the whisker-engaging edges of the slits in comb face 24 be disposed non-radially, as above set forth, so that the cutter blades will exert a shearing action on the whiskers extending through the comb slits.

The flat circular face 24 of the comb 20 is preferably made very thin and of a material of very high tensile strength. The range or order of the thickness of said comb face 24 is approximately 0.002 inch thick. The comb face 24 may be hardened or the like and should, preferably be harder than the material in the cutting blades, whereby the movement of the cutting blades relative to the comb causes sharpening or honing of the blades.

When the slits in the comb face 24 are provided substantially over the entire radial extent thereof—as would

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be the case with spirally disposed slits, wherein adjacent slits overlap as to their radial outward extent—then the entire radial extent of the cutting blades will be brought into engagement with honing surfaces, thus causing the entire radial extent of the blade to be honed simultaneously.

Referring now to the interior of the razor, a rotary or vibratory motor, driven by any appropriate power means, is positioned in the motor enclosing portion 16 of the casing. In the preferred form, an electric rotary motor 39 is used which rotates at about 18,000 R. P. M. The motor has a shaft 40 extending therefrom toward comb 20, with the axis of said shaft substantially coinciding with the axis of the comb face 24. Formed integrally with the casing 12 and located between the motor and the comb 20, is a baffle 42 which prevents migration of the cut whiskers into the motor.

The motor shaft 40 has mounted on the extended end thereof a cap 44 which extends through aperture 43 in baffle 42. The cap 44 is secured to the shaft 40 by means of a set screw 46. Mounted on the cap 44 or formed integrally therewith is a hollow tube 48 which serves as an extension of shaft 40. The extended end of tube 48 is slotted at 50 to provide means for receiving therein, in driving relationship, a portion of a rotary cutter. Within tube 48 is a compression spring 52 and a follower 54 adapted to engage the portion of the cutter which is inserted within slot 50. The spring 52, through which the medium of follower 54, serves to resiliently bias the cutter toward the interior surface of comb face 24.

Referring now to the cutter, one form thereof is shown in Figures 2 to 5. This form is a two-bladed cutter and includes an elongated leaf 56 having a central portion 58 which fits into slot 50 of tube 48. The cutter is formed of spring steel, or other appropriate material used for forming razor blades therefrom. Formed on leaf 56 on opposite sides of the central portion 58 and extending substantially radially of the axis of shaft 40 are a pair of cutting blades 60 and 62. The cutting edges of the blades 60 and 62 are properly shaped, sharpened, or honed, and may be either hollow ground or the like as is most desirable. The blades 60 and 62 are bent away from the plane of leaf 56 and extend therefrom in the direction of rotation of the cutter, as is best seen in Figure 4 where arrow 63 indicates the direction of rotation of the cutter.

A second form of cutter is shown in Figure 6. A part of the cutter shown in Figure 6 is identical to the cutter shown in Figures 2-5. In addition, the cutter in Figure 6 further includes auxiliary blades 64 and 66 which are secured to leaf 56 adjacent the junctions between blades 60 and 62 to the central portion 58 of the leaf 56. The auxiliary blades 64 and 66 have leaf-like portions 65 and 67 secured to the leaf 56. The auxiliary blades 64 and 66 extend substantially perpendicular to their adjacent blades 60 and 62.

By bending the blades 60, 62, 64 and 66 away from the leaves 56, 65, and 67, there is provided an arcuate connecting portion 68 (which is best seen in Figure 3) between each said blade and its respective leaf portion. This arcuate connecting portion 68 provides a certain resiliency to the blade mounting, thus further improving the cutting quality of the cutter.

In the third form of the cutter shown in Figures 7 and 8, the cutter includes a flat leaf 70 having a central portion 72 adapted to be inserted within slot 50 of the tube 48. The leaf 70 includes flanges 74 and 76 at the ends of the leaf for securing the leaf 70 to a disc-like member 78. The greater portion of disc-like member 78 lies in a plane perpendicular to the plane of the flat leaf 70. A plurality of cutting blades 80 extend from said disc-like member 78 in the direction in which said disc-like member is to be rotated and at an acute angle from the plane of the disc-like member.

In effect, the disc-like member forms leaf-like spokes

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which lie in a plane perpendicular to the plane of said flat leaf 70 and which extend radially with respect to the axis of shaft 40; and each of these spokes has a blade portion formed thereon and bent therefrom, and extending therefrom in the direction in which said cutter is rotated.

Referring back to Figures 1, 2 and 4, it will be seen that the tubular portion 18 of the casing is provided with opposed apertures 82 and 83 and annular cap 22 is provided with opposed apertures 84 and 85. These apertures may either be aligned when the razor is being used in the shaving operation, or may be adapted to be selectively aligned by rotation of the annular cap 22 with respect to the tubular portion 18. Now when the whiskers are being cut and enter the casing 12 through the comb 20, they are prevented from migrating into the motor by baffle 42. If the apertures in the cap 22 and casing are aligned, the cut whiskers migrate out of the casing through the aligned apertures. If the apertures are misaligned, then by rotating the cap 22 after the shaving operation to align the apertures and then by blowing through the aligned apertures the cut whiskers in the casing may be blown out therefrom.

In the embodiment shown in Figure 9, a cutter 86 is provided having cutting blades 88 which are disposed non-radially with respect to the axis of rotation of the cutter 86. The slits 90 in the comb 92 are so disposed with respect to radii extending from the axis of the comb that the blades 88, when passing the whisker-engaging edges of the comb slits 90, make small acute angles therewith whereby the whiskers extending through the slits 90 are sheared off, rather than being chopped off.

The modified form in Figure 9 differs from the form in Figure 4 in that the blades in Figure 4 extend substantially radially from the axis of rotation of the cutter while in Figure 9 the blades do not extend radially from the axis of rotation of the cutter. However, the basic concept in both forms is the same; namely that of having the cutting edge of the blade sweep past the whisker-engaging edge of the comb slits at an angle whereby the whiskers are subjected to a shearing action as distinguished from a chopping action.

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

What I claim as new, and desire to secure by Letters Patent of the United States, is:

1. An electric razor comprising a casing, a substantially flat circular comb on said casing, said comb having a plurality of slits therein adapted to have whiskers extend therethrough, a blade within said casing mounted to pivot on an axis substantially coinciding with the axis of said circular comb, means for pivoting said blade, resilient means biasing said blade against the inside surface of said comb, whereby said blade is adapted to cut the whiskers extending through the slits in said comb, and means carried by said casing for radially tensioning said comb.

2. An electric razor comprising a casing, a substantially flat circular comb on said casing, said comb having a plurality of slits therein adapted to have whiskers extend therethrough, a cutting blade within said casing mounted to pivot about an axis substantially coinciding with the axis of said circular comb, means for pivoting said blade, resilient means biasing said blade against the inside surface of said comb, whereby said blade is adapted to cut the whiskers extending through the slits in said comb, means carried by said casing for radially tensioning said comb, each said slit in said comb having a whisker-engaging edge against which the whiskers bear during the whisker-cutting operation, said edges of the slits being disposed nonradially of the axis of said circular comb, said whisker-engaging edges of a group of said slits being disposed at substantially the same predetermined angle to

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radii of said circular comb which intersect said edges of said group of slits, whereby said blade passes said edges of said group of slits at substantially the same predetermined angle.

3. An electric razor comprising a casing, a substantially flat circular comb on said casing, said comb having a plurality of slits therein adapted to have whiskers extend therethrough, a cutting blade within said casing mounted to pivot about an axis substantially coinciding with the axis of said circular comb, means for pivoting said blade, resilient means biasing said blade against the inside surface of said comb, whereby said blade is adapted to cut the whiskers extending through the slits in said comb, means carried by said casing for radially tensioning said comb, each said slit in said comb having a whisker-engaging edge against which the whiskers bear during the whisker-cutting operation, said edges of the slits being disposed non-radially of the axis of said circular comb, said whisker-engaging edges of a group of said slits being disposed at substantially the same predetermined angle to radii of said circular comb which intersect said edges of said group of slits, whereby said blade passes said edges of said group of slits at substantially the same predetermined angle, the range of angles of said edges of the slits to radii of said circular comb being in the order of 10°-12°.

4. An electric razor comprising a casing having an exteriorly threaded tubular portion, a cap-like comb having a flat circular face positioned over the open end of said tubular portion and having an outwardly extending flange, an annular cap adapted to be threaded onto said casing and having an inwardly extending portion engaging said flange on the comb for tensioning the flat circular face as the cap is threaded onto the casing, said flat comb having a plurality of slits therein adapted to have whiskers extend therethrough, a rotatable blade within said tubular portion of the casing resiliently biased against the inner side of said comb, and a motor driven rotating shaft operatively associated with said blade.

5. An electric razor comprising a casing having an exteriorly threaded tubular portion, a cap-like comb having a flat circular face positioned over the open end of said tubular portion and having an outwardly extending flange, an annular cap adapted to be threaded onto said casing and having an inwardly extending portion engaging said flange on the comb for tensioning the flat circular face as the cap is threaded onto the casing, said flat comb having a plurality of slits therein adapted to have whiskers extend therethrough, a rotatable blade within said tubular portion of the casing resiliently biased against the inner side of said comb, a motor driven rotating shaft operatively associated with said blade, and a baffle in said tubular portion for preventing migration of the cut whiskers into the remainder of said casing.

6. An electric razor comprising a casing having an exteriorly threaded tubular portion, a cap-like comb having a flat circular face positioned over the open end of said tubular portion and having an outwardly extending flange, an annular cap adapted to be threaded onto said casing and having an inwardly extending portion engaging said flange on the comb for tensioning the flat circular face as the cap is threaded onto the casing, said flat comb having a plurality of slits therein adapted to have whiskers extend therethrough, a rotatable blade within said tubular portion of the casing resiliently biased against the inner side of said comb, a motor driven rotating shaft operatively associated with said blade, and registerable apertures in said tubular portion of the casing and in said cap through which the cut whiskers may migrate from within the casing.

7. An electric razor comprising a casing having an exteriorly threaded tubular portion, a cap-like comb having a flat circular face positioned over the open end of said tubular portion and having an outwardly extending flange, an annular cap adapted to be threaded onto said

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casing and having an inwardly extending portion engaging said flange on the comb for tensioning the flat circular face as the cap is threaded onto the casing, said flat comb having a plurality of slits therein adapted to have whiskers extend therethrough, a rotatable blade within said tubular portion of the casing resiliently biased against the inner side of said comb, and a motor driven rotating shaft operatively associated with said blade, a baffle in said tubular portion for limiting migration of cut whiskers, and registerable apertures in said tubular portion of the casing and in said cap located between the comb and said baffle through which the cut whiskers may be blown to clean said razor.

8. An electric razor comprising a casing having a motor housing portion and a tubular portion, an apertured flat circular comb covering the open end of said tubular portion, a rotating motor in said motor housing portion, a shaft driven by said motor extending concentrically in said tubular portion toward said comb, a blade rotatably driven by said shaft, a spring coaxial of said shaft resiliently biasing the blade against the inner face of said apertured comb, and means carried by said casing for radially tensioning said flat circular comb.

9. A cutter for use with a rotatable drive of a dry-shaving razor comprising an elongated flat leaf having a central portion adapted to be drivingly connected to said rotatable drive, a disc-like member secured to said leaf and lying in a plane substantially perpendicular to the plane of said flat leaf, and a plurality of cutting blades extending from said disc-like member in the direction in which said disc-like member is to be rotated and at an acute angle from the plane of the disc-like member.

10. A cutter for use with a rotatable drive of a dry-shaving razor comprising an elongated flat leaf having a central portion thereof adapted to be drivingly connected to said rotatable drive, a plurality of radially extending sheet-like spokes secured to said leaf and lying in a plane perpendicular to the plane of said flat leaf, each of said spokes having a blade portion formed thereon and bent therefrom and extending therefrom in the direction in which said member is to be rotated, and displaced axially outwardly from the plane of said spokes.

11. An electric razor comprising a casing, a substantially flat circular comb on said casing, said comb having a plurality of slits therein adapted to have whiskers extend therethrough, a cutting blade within said casing mounted to pivot about an axis substantially coinciding with the axis of said circular comb, means for pivoting said blade so that the blade sweeps over the inside surface of said comb, whereby said blade is adapted to cut the whiskers extending through the slits in the comb, each said slit in said comb having a whisker-engaging edge against which the whiskers bear during the whisker-cutting operation, said edges of the slits and said blade being so disposed relative to radii extending from the axis of said comb that said blade makes an angle with the whisker-engaging edge of each slit as the blade sweeps past said slit edge, whereby the whiskers extending through said slits are sheared off by the blade, and means carried by said casing for radially tensioning said comb.

12. A cutter for use with a rotatable drive of a dry-shaving razor comprising an elongated flat leaf having a central portion adapted to be drivingly connected to said rotatable drive, a disc-like member lying in a plane substantially perpendicular to the plane of said flat leaf, flanges bent from said flat leaf at the ends thereof, flanges bent from said disc-like member and interlocking with the flanges bent from said leaf to secure said disc-like member to said leaf, and a plurality of cutting blades extending from said disc-like member in a direction from which said disc-like member is to be rotated and at an acute angle from the plane of the disc-like member.

13. An electric razor comprising a casing, a substantially flat circular comb on said casing, said comb having a

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plurality of slits therein adapted to have whiskers extend therethrough, a cutter within said casing mounted to pivot on an axis substantially coinciding with the axis of said circular comb, said cutter including a plurality of cutting blades adapted to engage the inside surface of the comb at an acute angle to the plane of said comb, means for pivoting said cutter, resilient means biasing said cutter against the inside surface of said comb, whereby the blades of said cutter are adapted to cut the whiskers extending through the slits in said comb, and means carried by said casing for radially tensioning said comb.

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