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ELECTRIC SHAVER

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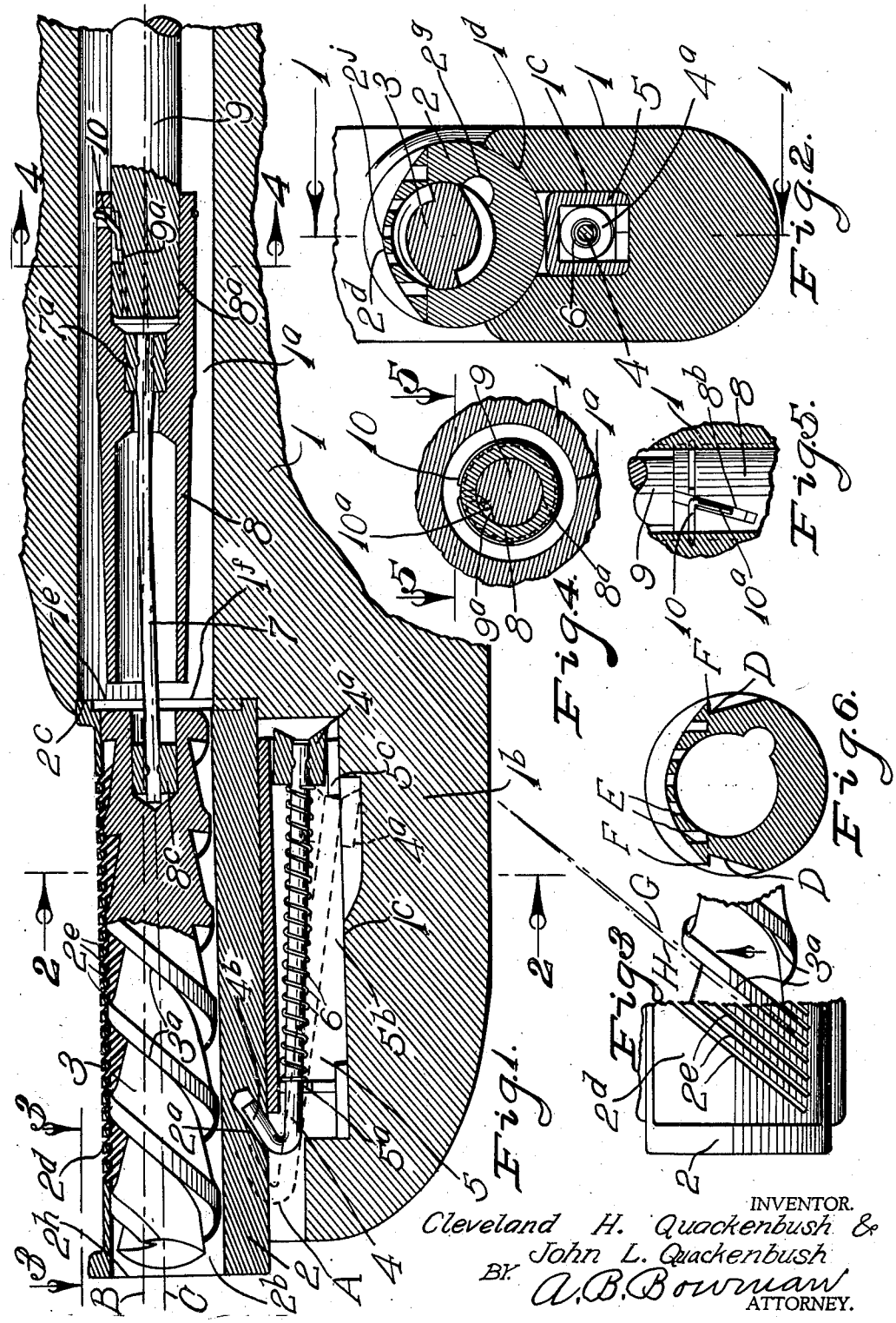


Fig. 1.

Fig. 2.

Fig. 3

Fig. 4.

Fig. 5.

Fig. 6.

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ELECTRIC SHAVER

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10 Claims. (Cl. 30—43)

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Our invention relates to an electric shaver and the objects of our invention are:

First, to provide a shaver of this class in which the rotary cutter member is held in co-extensive spring tension contiguous revoluble relation with the inner cutting side of the cutter and casing member thereof while in operation;

Second, to provide a shaver of this class which is arranged to automatically and forcefully expel the cut hair therefrom while in operation;

Third, to provide a shaver of this class in which the entire shaver head mechanism is readily manually removable and replaceable therewith;

Fourth, to provide a shaver of this class in which the rotary driving means provides resilient and tensional support for the rotary cutter member in its engaged relation with the internal side of the cutting face of the cutter and casing member of our electric shaver;

Fifth, to provide a shaver of this class in which the helical form of the rotary cutter member when revolving provides a directional turbulence in a grooved portion of the cutter and casing member for forcefully expelling cut hair from our shaver;

Sixth, to provide a shaver of this class in which a latch means is arranged to automatically hold the shaver head mechanism in spring tensional engaged relation with the handle member and also in proper angular aligned relation with the motor drive shaft;

Seventh, to provide a shaver of this class in which the rotary drive wire in connection with the rotary cutter member is positioned in angular flexed axial relation with the motor drive shaft providing constant revoluble lateral thrust of the rotary cutter member relatively with the inner cutting surface of the cutter and casing member;

Eighth, to provide a shaver of this class in which the latch means in engagement with the shaver head mechanism is readily releasable for removing the shaver head mechanism and is arranged to remain in certain position for receiving the shaver head mechanism when replacing the same in its relation with the handle member and the motor drive shaft;

Ninth, to provide a shaver of this class in which the shaver head mechanism is provided with connecting means arranged to engage the motor drive shaft whereby the rotary cutter member is arranged for revoluble operation by the motor drive shaft when connected therewith in any radially engaged position;

Tenth, to provide a shaver of this class in which the direction of the slots of the cutting

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portion of the cutter and casing member is arranged in diverging angular relation with the helical cutting portions of the motor and cutter member whereby the cooperative angular relation between said slots and said helical cutting portions is arranged to wedge or force hairs into the apex between the edges of said slots and said helical cutting portions when frictionally engaged thereby with certain directional rotation of said rotary cutter member;

Eleventh, to provide a shaver of this class in which the outer arcuate side of the slotted cutting side wall of the cutter and casing member is concentric with the inner side wall thereof substantially fifty thousandths of an inch on both sides of the middle of said slotted cutting side wall providing a uniform thickness of said slotted cutting side wall extending substantially one-tenth of an inch in the arcuate side thereof;

Twelfth, to provide a shaver of this class in which the angular connected relation of the drive shaft engaging spring with the motor drive shaft provides a tendency of the drive shaft when revolving to urge the drive shaft engaging spring inwardly together with its connecting mechanism, whereby the rotary cutter member in connection with said drive shaft engaging spring, is held inwardly within the cutter and casing member during revoluble operation.

With these and other objects in view as will appear hereinafter, our invention consists of certain novel features of construction, combination and arrangement of parts and portions, as will be hereinafter described in detail and particularly set forth in the appended claims, reference being had to the accompanying drawings and to the characters of reference thereon which form a part of this application in which:

Figure 1 is an enlarged fragmentary sectional view of our electric shaver taken from the line 1—1 of Fig. 2 showing parts and portions in elevation to facilitate the illustration and also showing by dash lines varying positions of parts thereof; Fig. 2 is a fragmentary transverse sectional view taken from the line 2—2 of Fig. 1; Fig. 3 is a fragmentary top or plan view taken from the line 3—3 of Fig. 1; Fig. 4 is a fragmentary transverse sectional view taken from the line 4—4 of Fig. 1; Fig. 5 is a fragmentary sectional view taken from the line 5—5 of Fig. 4 and Fig. 6 is a sectional view taken on the same plane as that shown in Fig. 2 showing a modified form of a part of our electric shaver.

The shaver handle member 1, cutter and casing

member 2, rotary cutter member 3, connecting latch member 4, latch member casing 5, latch spring 6, rotary drive wire 7, drive wire casing 8, motor drive shaft 9 and the drive shaft engaging spring 10 constitute the principal parts of our electric shaver.

The shaver handle member 1 is arranged to rigidly support a conventional electric motor, not shown, from which extends a motor drive shaft 9, as shown best in Fig. 1 of the drawings. The shaver handle member 1 is provided with a substantially circular bore 1*a* in which the motor drive shaft 9 is revolubly positioned. The offset portion 1*b* of this shaver handle 1 is provided with a recess 1*c* in which is positioned the latch member casing 5, as shown best in Figs. 1 and 2 of the drawings.

This latch member casing 5 is substantially rectangular in cross section and is provided with an opening 5*a* in its one end in which is reciprocally mounted the latch member 4, as shown best in Fig. 1 of the drawings.

This latch member 4 is arranged to be held in the dash line position A when the collar 4*a* is positioned in the opening 5*b* in the bottom of the latch member casing 5 and in engagement with the end of the opening 5*c*, it being noted that this latch member 4 is held in the solid line position, as shown in Fig. 1 of the drawings by means of the latch member spring 6, which is mounted on the latch member 4 and is arranged to engage the latch member casing 5 around the opening 5*a* thereof, as shown best in Fig. 1 of the drawings. The latch member 4 is also provided with an upwardly and inwardly extending angularly directed hook portion 4*b* which is arranged to engage an angularly positioned hole 2*a* in the lower side of the cutter and casing member 2, all as shown best in Fig. 1 of the drawings.

The lower side of the cutter and casing member 2 is arranged to be positioned in a conforming rest portion 1*d*, as shown best in Fig. 2 of the drawings. This rest portion 1*d* provides a rest for the casing 2 that lies at a slight angle with respect thereto the motor drive shaft 9, as indicated by the center lines B and C as shown best in Fig. 1 of the drawings, the center line B being the center line of the motor drive shaft 9 and the center line C being the center line of the rotary cutter member 3 and the internal bore 2*b* of the cutter and casing member 2. It will be noted that the spring tensional engaged relation of the latch member 4 with the cutter and casing member 2 holds the lower side of the cutter and casing member 2 in the rest 1*d* of the shaver handle member 1 and also holds the end portion 2*c* of the cutter and casing member 2 securely against the shaver handle member 1 adjacent the open end 1*e* of the bore 1*a* thereof. The cutter and casing member 2 is provided with a relatively thin side wall portion 2*d* in which are positioned angularly disposed slots 2*e*, as shown best in Figs. 1 and 3 of the drawings. The outer side of said relatively thin side wall portion 2*d*, as shown in Fig. 2 of the drawings is concentric with the inner side thereof for substantially fifty-thousandths of an inch on both sides of the middle portion 2*j* providing a relatively wide portion of said relatively thin portion 2*d* which is adapted for very close shaving.

The rotary cutter member 3 is provided with helically positioned cutter portions 3*a* which are arranged to be held in close relation with the slotted portions 2*e* in the cutter and casing member 2 for cutting hairs which are positioned in the slotted portions 2*e* when shaving with our electric shaver.

The direction of the rotary cutter member 3 is indicated by the arrow in Fig. 3 of the drawings. It will be here noted that the helical angle of the cutter portions 3*a* of the rotary cutter member 3 is in diverging angular relation with the direction of the slots 2*e*, the angular disposition thereof being substantially 2° as indicated by the broken lines G and H in Fig. 3. Hairs positioned in the slots 2*e* are engaged by the revolving cutter portions 3*a* and said hairs are wedged or forced toward the apex of said diverging angle formed by the angular relation of said slots 2*e* and said cutter portions 3*a*. Thus the hairs are very neatly cut off without noticeable pulling thereof. Rigidly connected in one end of the rotary cutter members 3 is the rotary drive wire 7. This rotary drive wire 7 is preferably made of spring steel and provides resilient lateral thrust for holding the rotary cutter member 3 in coextensive revoluble engaged relation with the interior of the cutter and casing member 2 adjacent the slotted portion 2*d* thereof.

The drive wire casing 8 is substantially cylindrical in form and is provided with a hollow bore 8*a* which is arranged to conform with the outer side of the motor drive shaft 9. This drive wire casing 8 in the engaged relation with the motor drive shaft 9 is arranged to revolve with the motor drive shaft 9 in concentric relation therewith. The opposite end of the rotary drive wire 7 from the rotary cutter member 3 is rigidly connected with the drive wire casing 8 by means of the pressed bushing member 7*a*. The rotary drive wire 7 is secured to the rotary cutter members 3 in a similar manner by means of the bushing 8*c*, which is positioned in one end of the rotary cutter member 3.

It will be here noted that the axis of the motor drive shaft 9 and the axis of the rotary cutter member 3 are angularly disposed to each other, as indicated by their respective center lines B and C, as shown best in Fig. 1 of the drawings. The rotary drive wire 7 in its connected relation with the rotary cutter member 3 and the drive wire casing 8, is in flexed axial relation between said rotary cutter member 3 and said motor drive shaft 9 providing resilient lateral thrust of the rotary cutter member 3 in relation with the slotted portion 2*d* in the relatively thin portion 2*d* of the cutter and casing member 2. In the particular structure disclosed, we have arranged the bore 2*b* of the cutter and casing member 2 at an angle of substantially five degrees with the axis fixed of the motor drive shaft 9 whereby the rotary drive wire 7 in its interconnected relation with the motor drive shaft 9 and the rotary cutter member 3 is sprung to compensate for the angular relation between said rotary cutter member 3 and said motor drive shaft 9.

The drive shaft engaging spring 10 is arranged in substantially circumferential position around one end of the drive wire casing 8 and this drive shaft engaging spring 10 is provided with an angularly and inwardly extending portion 10*a* which extends through a slotted portion 8*b* in the drive wire casing 8, as shown best in Figs. 1 and 5 of the drawings. This angularly and inwardly extending portion 10*a* is arranged to engage an angularly related slot 9*a* in the motor drive shaft 9, as shown best in Fig. 4 of the drawings.

The operation of our electric shaver is substantially as follows: When the motor drive shaft 9 is revolving in a normal counter-clockwise direc-

tion, as shown best by the arrow in Fig. 2 of the drawings, the inwardly extending portion 10*a* of the drive shaft engaging spring 10 engages the slotted portion 9*a* of the motor drive shaft 9 causing the drive wire casing 8 to revolve in a like direction in axial alignment with said motor drive shaft 9. The flexible rotary drive wire 7 in its rigidly connected relation with the rotary cutter member 3 and the drive wire casing 8 revolves in a sprung condition angularly revolving the rotary cutter member 3 in the bore 2*b* of the cutter and casing member 2. When the portion 2*d* of the cutter and casing member 2 is placed in contiguous relation with the skin of a person's face, the whiskers extending through the slotted portion 2*b* are cut off by means of the helical cutting edges 3*a* of the rotary cutter member 3.

It will be noted that the helical form of this rotary cutter member 3 provides a directional turbulence in the groove portion 2*g* which causes the hairs cut off by the helical cutting portions 3*a* to be forced outwardly through the open end 2*h* of the cutter and casing member 2 through said groove portion 2*g*.

When it is desired to remove the shaver head mechanism from the shaver handle member 1, the cutter and casing member 2 is pulled outwardly carrying with it the latch member 4. When the latch member 4 in its connected relation with the cutter and casing member 2 is pulled out to the dash line position A, the bushing 4*a* engages the portion 5*c* of the latch member casing 5, and holds the latch member 4 in said dash line position A, as shown best in Fig. 1 of the drawings. When the latch member 4 is in the dash line position A, the cutter and casing member 2 may be shifted inwardly a slight distance, then may be removed from the shaver handle member 1 together with the rotary drive wire 7 and the drive wire casing 8. When the shaver head mechanism is inserted in the position, as shown in Fig. 1 of the drawings, the drive shaft engaging spring may be so positioned that the angularly and inwardly extending portion 10*a* is out of engagement with the slotted portion 9*a* of the motor drive shaft 9. However, when the motor drive shaft 9 revolves in its normal direction, the end portion 10*a* of this drive shaft engaging spring 10 snaps into position in the angularly disposed slotted portion 9*a* of the motor drive shaft 9 whereby the drive wire casing 8 is locked into secure relation with the motor drive shaft 9 for conforming revolution therewith.

The angularly connected relation of the drive shaft engaging spring 10 with the motor drive shaft 9 when revolving, causes a tendency of the drive shaft engaging spring 10 to shift inwardly in the slot 9*a* carrying with it the shaver mechanism operatively connected therewith. The rotary cutter member 3, in connection with the drive shaft engaging spring 10 is urged longitudinally within the cutter and casing member toward the handle member 1 when in operation.

The latch member 4 in its angularly connected relation with the cutter and casing member 2 is actuated by means of the latch spring 6 so that the cutter and casing member 2 is held in secure engaged relation with the rest portion 1*d* of the shaver handle member 1 and the shoulder portion 1*f* adjacent the open end 1*e* of the bore 1*a* in the handle member 1. The tension of the latch spring 6 in its relation with the latch member casing 5 tends to force the latch member 4 into the solid line position when the angularly extending end portion 4*b* of the latch member 4 engages the conforming hole 2*a* of the cutter and casing member 2 whereby the latch member 4 is automatically shifted out of the dash line position A and into the solid line position, as shown best in Fig. 1 of the drawings when replacing the shaver head mechanism relatively with the shaver handle member 1.

In Fig. 6 is disclosed a modified form of the cutter and casing member 2 of our electric shaver. This modified form, as shown in Fig. 6 of the drawings, is substantially the same construction as shown in Fig. 2 of the drawings except that the modified form is provided with undercut portions D at opposite sides of the slotted portion E providing comb-like extending portions F for combing the hair extending from a person's skin inwardly into the slots E which are substantially the same as the slots 2*e* of the cutter and casing member 2, as shown best in Fig. 3 of the drawings.

Though we have shown and described a particular construction, combination and arrangement of parts and portions and a certain modification, we do not wish to be limited to this particular construction, combination and arrangement, nor to the modification, but desire to include in the scope of our invention the construction, combination and arrangement and the modification substantially as set forth in the appended claims.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. In an electric shaver of the class described, the combination of a motor drive shaft, a single piece cutter and casing member having a bore therein and having a cutting portion with slots therein communicating with said bore, said bore of said cutter and casing member being in slightly angular position relative to the axis of said motor drive shaft, a rotary cutter member revolubly positioned in said bore, a normally straight resilient rotor drive wire the cross section of which is at right angles to the rotating axis thereof throughout its entire length in slightly flexed and angular interconnected relation with said rotary cutter member and said motor drive shaft, said cutter and casing member provided with a longitudinal scavenging groove portion communicating with the inner side of the bore thereof.

2. In an electric shaver of the class described, the combination of a motor drive shaft, a single piece cutter and casing member having a bore therein and having a cutting portion with slots therein communicating with said bore, said bore of said cutter and casing member being in slightly angular position relative to the axis of said motor drive shaft, a rotary cutter member revolubly positioned in said bore, and a normally straight resilient rotor drive wire the cross section of which is at right angles to the rotating axis thereof throughout its entire length in slightly flexed condition interconnecting said rotary cutter member and said drive shaft.

3. In an electric shaver of the class described, the combination of a motor drive shaft provided with an angularly disposed slot in the side thereof at its extending end, a drive shaft engaging spring in said slot, a rotary cutter member, a sleeve supporting said drive shaft engaging spring, and resilient means interconnecting said sleeve and said rotary cutter member.

4. In an electric shaver of the class described, the combination of a hollow casing member provided with a slotted cutting side, a rigid spiral

rotary cutter member revolubly mounted therein, a motor drive shaft slightly angularly positioned relative to the axis of said rotary cutter member, and a normally straight spring wire drive member secured in a flexed condition to said drive shaft at one end, and to said rotary cutter at its other end at an intermediate point along the axis of said cutter, to provide equal pressure between said cutter and said casing member for the full length of said cutter.

5. In an electric shaver of the class described, the combination of a hollow casing member provided with a slotted cutting side, a rigid spiral rotary cutter member revolubly mounted therein, a motor drive shaft slightly angularly positioned relative to the axis of said rotary cutter member and a normally straight spring wire drive member secured in flexed condition to said motor drive shaft at one end and to said rotary cutter at its other end at an intermediate point along the axis of said cutter, to provide equal pressure between said cutter and said casing member for the full length of said cutter, whereby said cutter and said casing member are held in revoluble coextensive engaged relation at the inner side of said cutter and casing member at the slotted cutting side, by the lateral inherent spring of said spring wire drive member.

6. In an electric shaver of the class described, the combination of a hollow cutter and casing member provided with a slotted cutting side, a rigid spiral rotary cutter member revolubly mounted therein, a motor drive shaft slightly angularly positioned relative to the axis of said rotary cutter member, a normally straight spring wire drive member secured in flexed condition to said motor drive shaft at one end and to said rotary cutter at its other end at an intermediate point along the axis of said cutter, to provide equal pressure between said cutter and said casing member, for the full length of said cutter, whereby said cutter and said casing member are held in revoluble coextensive engaged relation to the inner side of said cutter and casing member at the slotted cutting side, by the lateral inherent spring of said spring wire drive member, and a casing secured at one end around said motor drive shaft and around said spring wire drive member and forming a connection between said motor drive shaft and said spring wire drive member.

7. In an electric shaver of the class described, the combination of a hollow cutter and casing member provided with a slotted cutting side, a rigid spiral rotary cutter member revolubly mounted therein, a motor drive shaft slightly angularly positioned relatively with the axis of said rotary cutter member, a normally straight spring wire drive member secured in flexed condition to said motor drive shaft at one end and to said rotary cutter at its other end at an intermediate point along the axis of said cutter, to provide equal pressure between said cutter and said casing member for the full length of said cutter, whereby said cutter and said casing member are held in revoluble coextensive engaged relation to the inner side of said cutter and casing member at the slotted cutting side, by the lateral inherent spring of said spring wire drive member, a casing secured at one end around said motor drive shaft and around said spring wire drive member, and forming a connection between said motor drive shaft and said spring wire drive member, and a drive shaft engaging spring secured to said spring wire casing and arranged to engage said motor drive shaft.

8. In an electric shaver of the class described, the combination of a hollow cutter and casing member provided with a slotted cutting side, a rigid spiral rotary cutter member revolubly mounted therein, a motor drive shaft slightly angularly positioned relative to the axis of said rotary cutter member, a normally straight spring wire drive member secured in flexed condition to said motor drive shaft at one end and to said cutter at its other end at an intermediate point along the axis of said cutter to provide equal pressure between said cutter and said casing member for the full length of said cutter, whereby said cutter and said member are held in revoluble coextensive engaged relation to the inner side of said cutter and casing member at the slotted cutting side, by the lateral inherent spring of said spring wire drive member, a casing secured at one end around said motor drive shaft and around said spring wire drive member and forming a connection between said motor drive shaft and said spring wire drive member, a drive shaft engaging spring secured to said spring wire casing and arranged to engage said motor drive shaft, and a handle member in revoluble disconnectable relation with said hollow cutter and casing member and resilient latch means connected with said handle member arranged to resiliently hold said cutter and casing member in certain position relatively with said handle member.

9. An electric shaver of the class described consisting of a single piece hollow casing member provided with a slotted cutting side, a rigid spiral rotary cutter member revolubly mounted therein, a motor drive shaft slightly angularly positioned relatively with the axis of said rotary cutter member and a normally straight spring wire drive member the cross section of which is at right angles to the rotating axis thereof throughout its entire length secured to said motor drive shaft at its one end in laterally flexed position and its other end secured to said rigid rotary cutter member at one end thereof.

10. An electric shaver of the class described consisting of a single piece hollow casing member provided with a slotted cutting side, a rigid spiral rotary cutter member revolubly mounted therein, a motor drive shaft slightly angularly positioned relatively with the axis of said rotary cutter member and a normally straight spring wire drive member secured to said motor drive shaft at its one end in laterally flexed position and secured at its other end to said rigid rotary cutter member, said spring wire drive member extending into said rotary cutter member and secured thereto at an intermediate point along its axis to provide predetermined equal pressure the full length of said rotary cutter member with said single piece hollow cutter and casing member.

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