July 27, 1965 A. J. FOLEY ETAL 3,196,541

SHAVING APPARATUS

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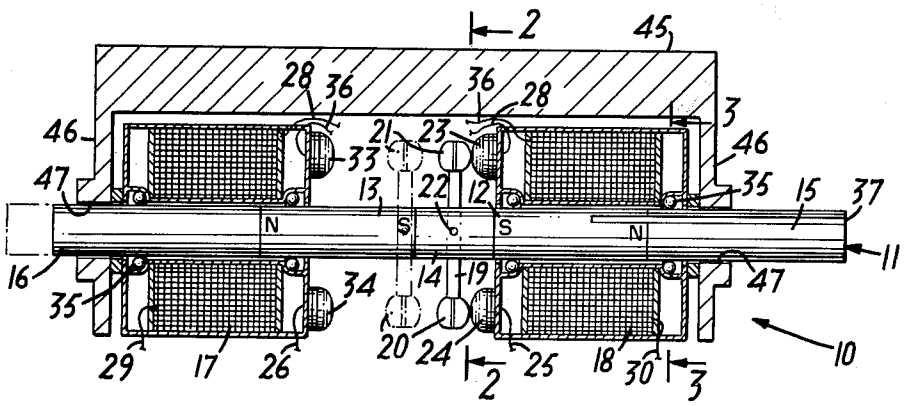


FIG. 1

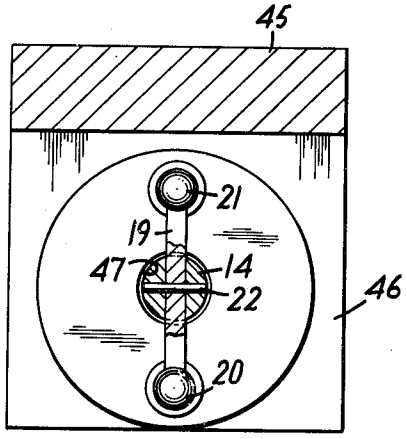


FIG. 2

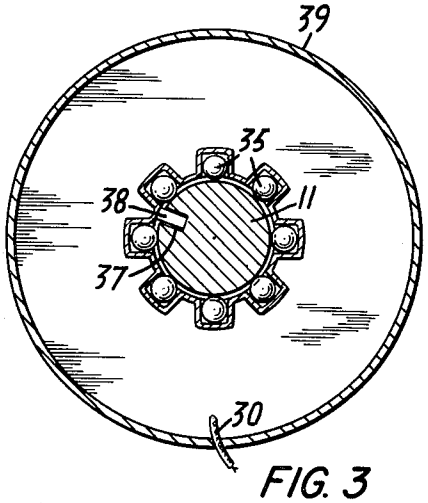


FIG. 3

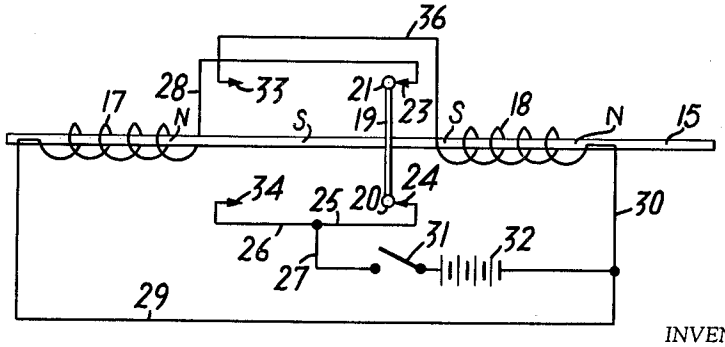


FIG. 4

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SHAVING APPARATUS

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FIG. 5

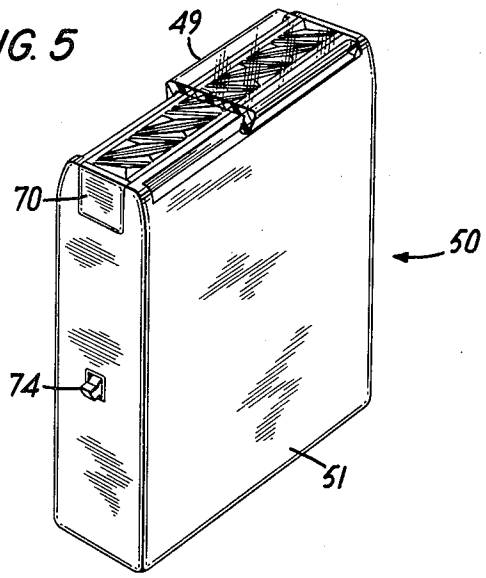
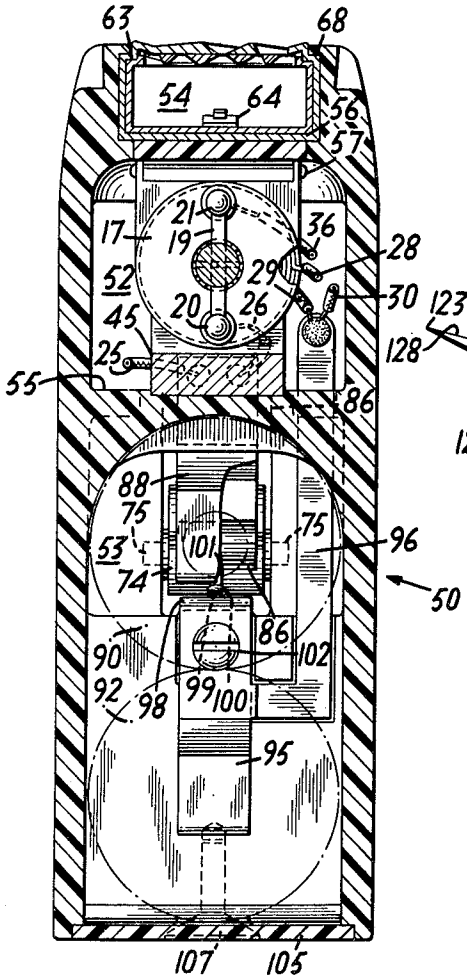


FIG. 8



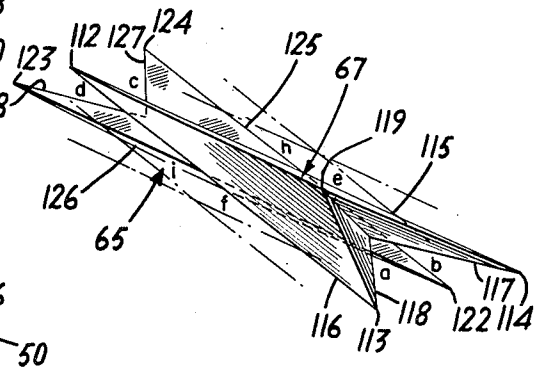


FIG. 9

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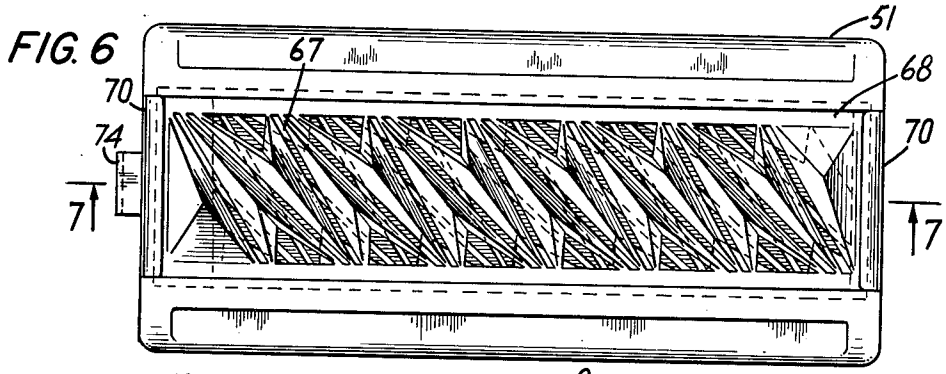
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FIG. 6



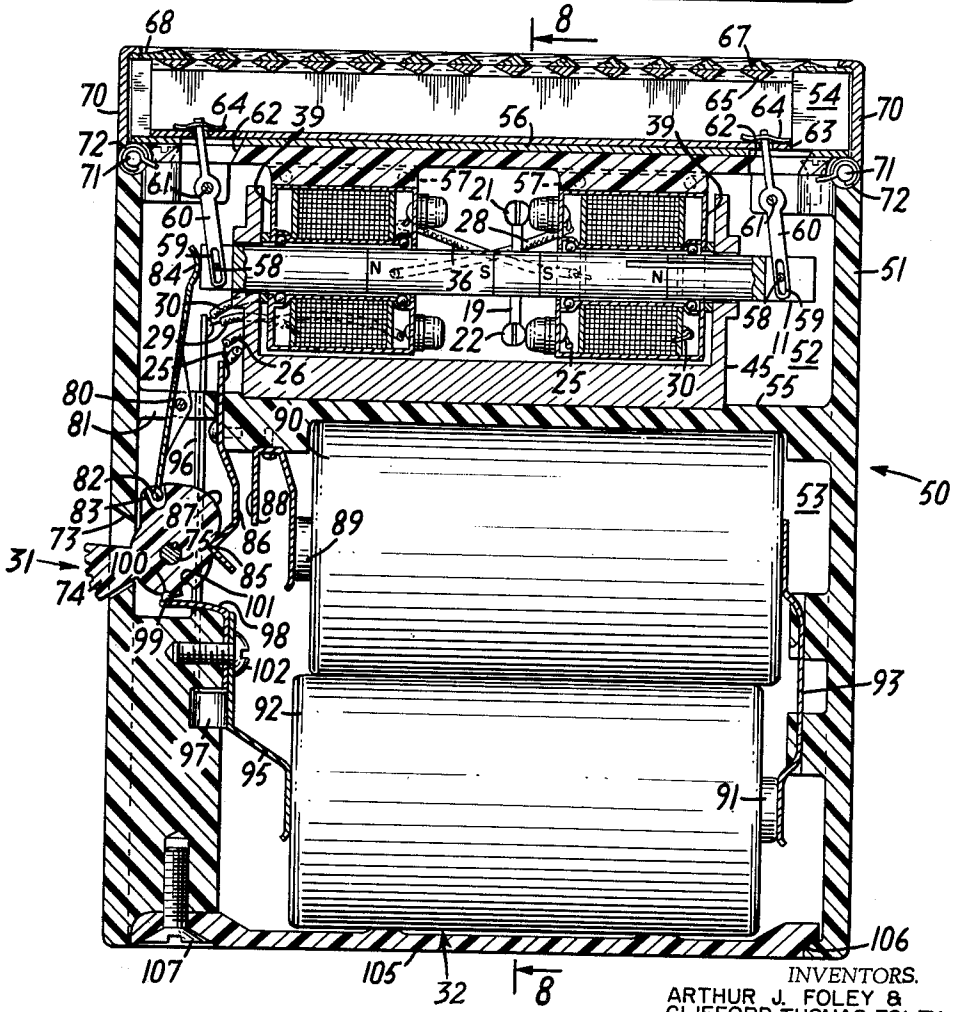


FIG. 7

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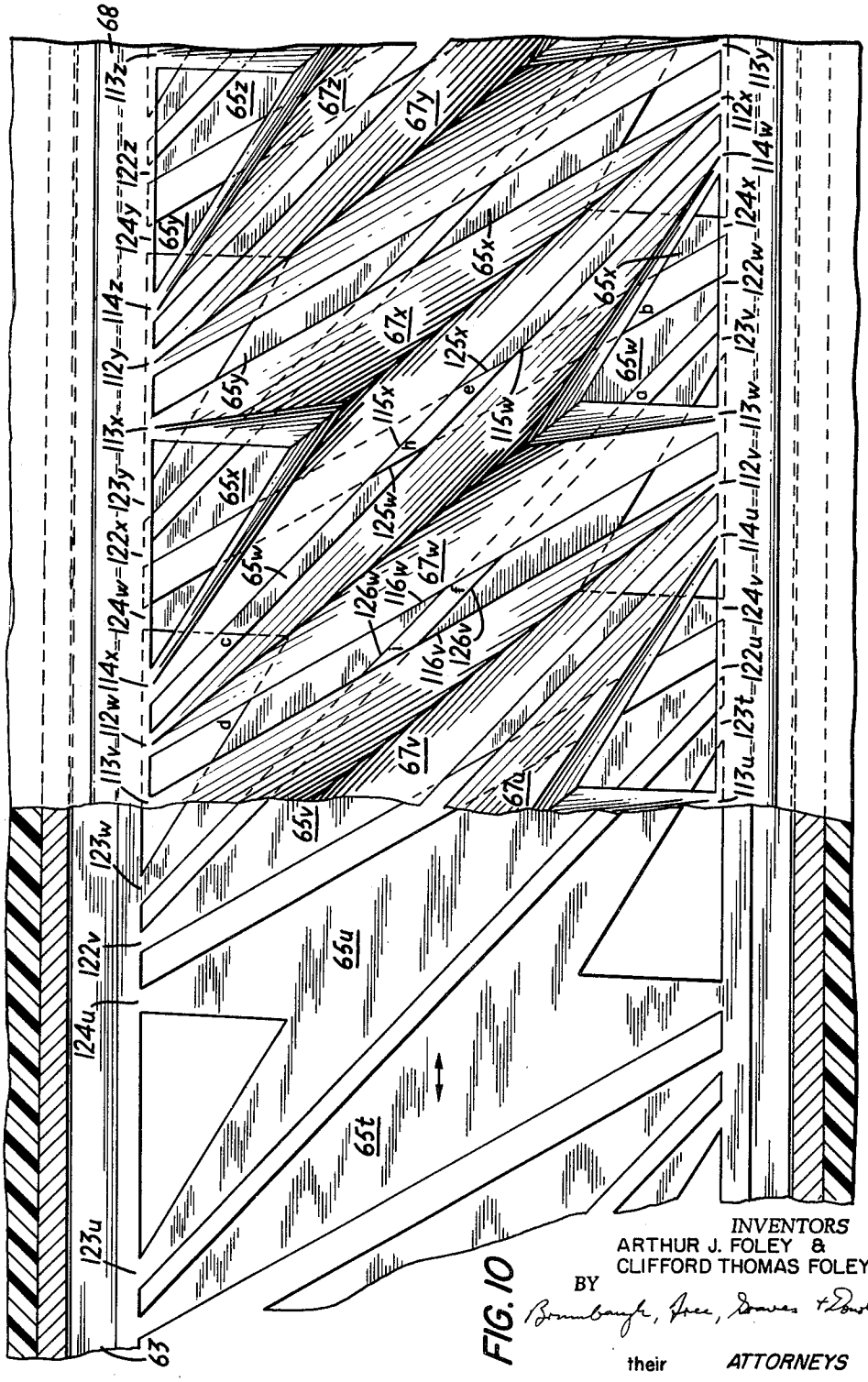


FIG. 10

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United States Patent Office 3,196,541 Patented July 27, 1965

3,196,541

SHAVING APPARATUS

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Filed Dec. 27, 1962, Ser. No. 247,692
4 Claims. (Cl. 30—43.6)

This invention relates in general to an electric motor and, more particularly, to a battery-energized apparatus which produces a reciprocating motion along a linear path.

The invention also discloses a particular use for this battery-powered reciprocating device in the form of a handy pocket electric shaver. The invention further encompasses a unique blade formation and arrangement which provides for a great increase in the number of cutting surfaces over similar devices heretofore available.

In general the electric motor disclosed herein is composed of a pair of spaced solenoids positioned coaxially around a movable magnetically responsive bar. The two spaced terminal ends of a first circuit joining the first solenoid with a battery are placed adjacent the second solenoid near the surface facing the first solenoid. Similarly, the two spaced terminal ends of a second circuit connecting the second solenoid with the battery are placed adjacent the first solenoid near the surface facing the second solenoid. A contact arm is mounted about the central section of the bar, between the solenoids, and is fastened so as to move reciprocally with the bar. Thus when the bar is displaced a specific distance toward the second solenoid, the contact arm bridges the first circuit terminals energizing the first solenoid and developing a magnetic field which draws the bar toward the first solenoid. As the bar starts its movement away from the second solenoid, the first circuit is once again opened and the first solenoid de-energized. The inertia of the bar, however, continues to carry it forward until the centrally disposed contact arm engages the two terminals of the second circuit adjacent the first solenoid. At this point the second solenoid is energized and the bar responds to its magnetic field moving in its direction. This movement toward the second solenoid breaks the second circuit but not before the bar attains a momentum sufficient to carry it to the terminals of the first circuit. In this manner a continual reciprocating linear motion is produced which may be applied and used in any number of devices.

One such application of this electric motor is disclosed herein and consists of a pocket, battery-operated, electric shaver which reciprocally moves a plurality of specially designed blades adjacent a second set of mating blades. One blade from each set combines to form a pair of blades which cooperate with each other and with adjacent pairs of blades to produce for the first time a plurality of acute cutting angles along the length of each blade.

Each blade whether movable or not is generally triangular in shape having a deep notch in its base. The two blades forming a particular pair are placed in an inverted position so that the apex of one blade crosses the notch in the base of its mating blade. In this manner at least four acute cutting angules are formed. Furthermore, when two rows of alternately inverted blades are positioned adjacent to each other, a plurality of inverted pairs, as described above, are formed. In this arrangement each blade in one of the sets closes three acute cutting angles as the blades are moved in one direction and closes three separate cutting angles as the blades move in the opposite direction.

With this device it is now possible to shave a particular surface area in a very efficient manner, using short quick strokes with a finely honed blade. The speed of the shaving operation is greatly increased by the fact that three acute cutting angles are closing at the same time whereas in older devices only one cutting angle is closing at any particular moment.

It is an important advantage of this blade arrangement that the two cutting edges which meet when severing the strands of material placed therebetween, are crossing in a scissoring action and gradually closing the acute angle which they make with each other. In some prior shavers the two cutting edges meet head-on, severing the hair caught therebetween on impact. Over a period of time, the resistance of especially coarse hair severed in this manner tends to dull the cutting edges of these opposed blades. In the arrangement herein disclosed, the hair engaged by the cutting edges is free to yield in one direction thereby allowing the hair to be severed gradually as the cutting edges slide into its cross section. Thus due to this scissoring action the impact between the hair and the blades disclosed herein is greatly reduced and the blades will maintain their sharpness over a longer period of time.

Other objects and a fuller understanding of the invention may be had by referring to the following description and claims taken in conjunction with the accompanying drawing, in which:

FIGURE 1 shows a cross sectional view of the electric motor portion of this invention without its battery source;

FIGURE 2 shows a cross sectional end view taken along lines 2—2 in FIGURE 1;

FIGURE 3 shows a cross sectional end view taken along lines 3—3 of FIGURE 1;

FIGURE 4 shows a circuit diagram of the electric motor;

FIGURE 5 shows an isometric view of the pocket shaver disclosed in this invention;

FIGURE 6 shows a top view of the pocket shaver;

FIGURE 7 shows a cross sectional elevation of the pocket shaver;

FIGURE 8 shows a cross sectional end view of the pocket shaver taken along line 8—8 of FIGURE 7;

FIGURE 9 shows a detailed isometric view of the pair of blades disclosed in this invention; and

FIGURE 10 shows a cut-away detailed top view of two sets of blades mounted in cutting relationship.

With reference to the drawing the electric motor, as shown in FIG. 1, is indicated generally by the reference character 10 and is composd of a bar 11 which has two permanently magnetized sections 12 and 13 surrounded by non-magnetized sections 14, 15 and 16. Left solenoid 17 and right solenoid 18 are spaced from each other and positioned coaxially around the bar 11 in such a manner that the bar is allowed to pass freely through the center of the coils. The magnetized portions 12 and 13 are spaced from each other by a distance which is less than the distance between the spaced solenoids 17 and 18. As a result when magnetized portion 12 is positioned within right solenoid 18, the magnetized portion 13 is displaced toward the area between the coils as shown in FIG. 1. The reverse is also true, for when magnetized portion 13 is positioned within left solenoid 17, the right magnetized portion 12 is displaced toward the area between both of the coils.

The central non-magnetized portion 14 of bar 11 rigidly supports contact arm 19, the arm being held firmly in place by cross pin 22 as shown in FIG. 2. The contact arm 19 is a solid piece of conductive material having contact point 21 at its upper extremity and contact point 20 at its lower extremity. When the bar 11 is in its extreme right position the contact arm 19 joins the two terminals 23 and 24 which are located adjacent the right solenoid

18 in the area between the two solenoids. These terminals form a simple electrical loop which includes the left solenoid 17 and a battery 32 as shown in FIG. 4. Specifically terminal 23 is connected to solenoid 17 by electrical lead 28 while the other end of the solenoid 17 is joined to the negative end of battery 32 by lead 29. When the switch 31 is closed and the contact arm 19 bridges the terminals 23 and 24, current passes from the positive end of the battery 32 through electrical leads 27 and 25 to terminal 24 and the remainder of the circuit.

Thus, with the contact arm 19 in its extreme right position, the current flows through solenoids 17 drawing magnetically responsive section 13 of bar 11 toward the center of solenoid 17. This immediately causes an interruption in the circuit as contact arm 19 starts to move toward the left away from terminals 23 and 24. Although solenoid 17 is only momentarily energized, a sufficient momentum is nevertheless given to bar 11 to carry it leftwardly into bridging engagement across terminals 33 and 34 which are located adjacent solenoid 17 and which face the area between the two coils.

When the contact arm 19 reaches its leftmost position it closes a second loop circuit through which battery 32 energizes the right solenoid 18. In this circuit the current flows from the positive terminal of battery 32, through closed switch 31 and electrical leads 27 and 26, to the terminal 34. With contact arm 19 bridging terminals 34 and 33, the current passes therethrough to electrical lead 36, the solenoid 18, and to electrical lead 30 which is connected to the negative end of the battery 32. In this manner the right solenoid 18 is energized momentarily and, in turn, draws magnetically responsive section 12 of bar 11 to a position toward the right. With the entire bar 11 moving away from terminals 33 and 34, the circuit energizing the right solenoid 18 is immediately broken. As above, however, the momentum of the bar 11 carries it to its extreme right position adjacent contact points 23 and 24 and the cycle begins anew.

A housing 39 surrounds and supports each of the solenoids 17 and 18. Within each housing adjacent the center of the coil are at least two sets of ball bearings 35 which greatly reduce friction and allow the relatively free linear motion of bar 11 through the coils. A keyway or groove 37 is cut into the surface of bar 11 as shown in FIGS. 1 and 3. A guiding projection 38 which is attached firmly to the housing 39 moves within the keyway 37 as the bar 11 continuously shuttles back and forth through repeated cycles. The guide 38 assures the non-rotation of the bar 11 and thus gaurantees that the contact arm 19 will remain in one position, aligned with the terminals 23 and 24 and the terminals 33 and 34.

A flux bar 45 having end flanges 46 with apertures 47 surrounds both coils as shown in FIGS. 1 and 2. The apertures 47 permit the free movement of bar 11 through the flux bar, while the end flanges 46 act as flux plates and tend to concentrate the magnetic flux, thereby increasing the force acting on and moving the bar 11.

The electric motor discussed above has been incorporated in a pocket shaver shown in FIG. 5 which may be easily handled and carried, due to its small, convenient size and which contains its own energy source thereby permitting its use at any location. The shaver itself is shown in FIGS. 5, 6, 7 and 8 and is indicated generally by the character reference 50. The entire unit has a cover 49 and is contained within box shaped housing 51 which is divided into three compartments by the inner supporting walls 55 and 56. The middle compartment 52 contains the motor section while the lower compartment 53 comprises the battery or energy section and the upper compartment 54 encompasses the blade section.

The housings 39 surrounding solenoids 17 and 18 are fastened below removable inner supporting wall 56 at points 57. The entire electric motor, as described, occupies compartment 52 and is placed therein prior to the fastening of removable inner supporting wall 56 in position. Actuating arms 60 pass through apertures 62 in

inner supporting wall 56 and are pivoted therein at points 61. The arms 60 link pins 58 protruding from the extreme end portions 15 and 16 of bar 11 with a movable blade frame 63 in upper compartment 54. These pins 58 slide within slots 59 in the lower portion of actuating arms 60 while the upper portion of the actuating arms pass through aperture 62 and are movably attached to blade frame 63 by spring clamps 64. The arrangement is such that when the bar 11 is displaced to the right, the blade frame 63 is displaced to the left, as shown in FIG. 7. Similarly, when the bar 11 moves to the left, the blade frame travels to the right within the blade or upper compartment 54.

Lower blades 65 are positioned on the upper surface of movable blade frame 63 with their sharpened edges being adjacent the sharpened edges of the upper stationary blades 67. These upper stationary blades 67 are fastened firmly to stationary blade frame 68 which, as shown in FIG. 8, surrounds movable frame 63, and is itself locked to the upper part of housing 51.

The two ends of the blade or upper compartment 54 are provided with pivotable wall sections 70 which allow access to the upper compartment 54 from either end. The walls 70 are held in a closed position by springs 72 although either or both of these walls may be pivoted about points 71 and opened when it is necessary to clean upper compartment 54.

The lower compartment 53 contains the switching elements 31 and a battery power source 32 for energizing the electric motor. Specifically the control switch 74 protrudes through aperture 73 in the side of housing 51. The switch 74 pivots around axis 75 and is connected to cam surface 87. As shown in FIG. 7, the switch 74 is in the "Off" position and recess 83 on the upper part of cam surface 87 forces the lower end 82 of pivoting bar 80 to the extreme left. The pivoting bar 80 passes through aperture 81 in wall 55 and has an upper end 84 which forces bar 11 to its extreme right position bridging terminals 23 and 24. When switch 74 is moved upwardly recess 83 in cam surface 87 moves to the right carrying lower end 82 of bar 80 with it. This moves upper end 84 of the bar to the left freeing bar 11. This arrangement assures that the contact arm 19 bridges the terminals 23 and 24 when the linkages composing main switch 31 are thrown on and the electric motor energized. Unless the contact arm 19 crosses either terminals 23 and 24 or terminals 33 and 34 it would not be possible to start the electric motor.

In addition the cam surface 87 has a notch 85 which receives suspended resilient contact element 86. When the switch 74 is in the "Off" position as shown in FIG. 7, the suspended bar 86 is separated from the suspended contact bar 88. However, when the switch is moved to its upper position the protruding portion of the cam surface 87 moves bar 86 into contact with contact bar 88, thus effecting the closure of switch 31 as shown in the circuit diagram in FIG. 4.

The battery source 32 is composed of two standard batteries 90 and 92, shown positioned in lower compartment 53 and connected in series by contact bar 93. The positive terminal 89 of battery 90 engages contact bar 88 while the negative terminal of battery 92 contacts bar 95 which has projecting piece 97 engaging electrical lead bar 96. The contact bar 88, and elements 93 and 95 are, of course, flexible and are positioned so as to easily receive and to maintain continuous contact with the batteries 90 and 92.

The fastener 102 locks bar 95 and switch positioning bar 98 in position against housing 51. A nob 99 located on the end of positioning bar 98 is designed to engage either one of two recesses 100 and 101 which are formed in the lower portion surface of cam 87. Thus, when the switch 74 is in the "Off" position nob 99 will occupy groove 100 and when switch 74 is in the "On" position nob 99 will occupy groove 101. This arrangement prevents the switch from occupying an intermediate position and assures that

the switch will be either completely "On" or completely "Off" at any particular time.

A lower plate **105** closes the battery compartment **53** and is held in place by flange **106** and fastener **107**. This plate **105** may be easily removed when it is necessary to change the batteries **90** or **92**.

The electrical circuit shown in the pocket shaver is the same as the circuit schematically drawn in FIG. 4. When one loop of the circuit is energized and the contact arm **19** bridges terminals **23** and **24**, conventional current flows from positive terminal **89** of battery **90** through suspended contact bars **88** and **86** and through electrical lead **25** to terminal **24**. The contact arm **19** shunts the current across to terminal **23** from which it passes through electrical lead **28** to solenoid **17**. From the base of solenoid **17** it passes through electrical lead **30**, through bars **96** and **95** to the negative terminal of battery **92**. The current, of course, flows from the positive terminal **91** of battery **92** to the negative terminal of battery **90** via bar **93**.

The circuit remains energized as long as the contact arm **19** is in its right hand position. As soon as bar **11** begins its movement toward the left the circuit is de-energized. This is true even though switch **74** remains "On" and continues to force bar **86** into direct contact with bar **88**.

When contact arm **19** reaches its leftmost position a second loop of the circuit is energized and current flows from positive terminal **89** of battery **90** through contact bars **88** and **86** and through electrical lead **26** to terminal **34**. Bar **19** shunts current to terminal **33** where it flows through electrical lead **36** to solenoid **18**. The current then proceeds from the end of solenoid **18** through electrical lead **30** and bars **96** and **95** to the negative terminal of battery **92**, thereby completing the second electrical circuit and energizing the right solenoid **18**. Thus, as long as the electrical switch **74** remains in the "On" position the bar **11** will continue to move reciprocally back and forth within compartment **52** and the actuating arms **60** will continue to transmit this motion to the lower blade or upper holder **63** in the blade compartment **54**.

The upper stationary blades **67** and the lower blades **65** are arranged so as to present a plurality of acute cutting angles with each cross sweep of the lower blades. As shown in detail in FIGS. 9 and 10, each blade is shaped in the form generally of a slanted triangle having a notched base formed by either cutting edges **117** and **118** or cutting edges **127** and **128**. Both the row of upper stationary blades and the row of lower blades are arranged so that the apex of one blade is surrounded on each side by one of the base points of one of the neighboring blades.

As shown in FIG. 10, lower blades **65***t*, **65***v*, **65***x* and **65***z* have their apex points attached along one side of lower blade frame **63**, spaced by base points **123***u* and **124***u* of blade **65***u*, by base points **123***w* and **124***w* of blade **65***w* and by base points **123***y* and **124***y* of blade **65***y* respectively. The other ends of the blades are attached to the opposite side of frame **63** in a similar manner with, for example, the apex points **122***u* of blade **65***u* and **122***w* of blade **65***w* spaced by the base points **124***v* and **123***v*.

The upper blades are likewise inverted with respect to their neighboring blades; the apex **112***w* of blade **67***w* attaching to upper blade frame **68** at a point falling between the base point **113***v* of blade **67***v* and base point **114***x* of blade **67***x*. Similarly the apex **112***x* of blade **67***x* is disposed between base points **114***w* and **113***y*.

The additional reference characters in FIG. 10 show the same blade sequence for connecting the other upper blades to frame **68** and the other lower blades to movable frame **63**.

Furthermore, the upper and lower blades are arranged so that the apex of one bisects the notch formed in the base of the other. For example, in FIG. 9, the apex **112** of the upper stationary blade **67** bisects the notch formed in the base of lower blade **65**, falling generally between

the lower base points **123** and **124**. Similarly the apex **122** of the lower blade **65** bisects the notch formed in the base of the upper stationary blade **67** and falls generally between the points **113** and **114** of the base of upper stationary blade **67**.

When lower blade **65** is moving to the right across upper stationary **67** as shown in FIG. 9, cutting edge **116** of upper stationary blade **67** and **128** of blade **65** form an acute cutting angle (*d*). Similarly, cutting edge **125** of lower blade **65** and cutting edge **117** of upper stationary blade **67** form an acute cutting angle (*b*). In addition to the above, as shown in FIG. 10, cutting edge **116***w* forms an acute cutting angle (*f*) with cutting edge **126***v* of lower blade **65***v* to the left of the lower blade **65***w*. Similarly, edge **125***w* of lower blade **65***w* makes an acute cutting angle (*h*) with the edge **11***x* of the upper blade **67***x* to the right of the upper blade **67***w*.

As shown clearly in FIG. 9, when the lower blades are sweeping to the left, cutting edge **127** of lower blade **65** makes an acute cutting angle (*c*) with cutting edge **115** of upper stationary blade **67**. Similarly, cutting edge **118** of upper blade **67** makes an acute cutting angle (*a*) with cutting edge **126** of lower blade **65**. In addition to the above, as shown in FIG. 10, the cutting edge **126***w* of lower blade **65***w* makes an acute cutting angle (*i*) with cutting edge **116***v* of the upper blade **67***v* to the left of the upper blade **67***w*. At the same time cutting edge **115***w* of upper blade **67***w* makes an acute angle (*e*) with the cutting edge **125***x* of the lower blade **65***x* to the right of the lower blade **65***w*. Thus, with each sweep of the lower cutting blades to the left, acute cutting angles (*c*), (*a*), (*i*) and (*e*) are closed in a scissoring manner which will sever any hair caught therebetween. Similarly, when the lower cutting blades move to the right, acute cutting angles (*b*), (*d*), (*f*) and (*h*) close on the hair protruding therebetween.

The upper blades, as shown in FIG. 9 have a pinnacle point **119** above their cutting surfaces. In each blade four smooth surfaces proceed from point **119** to the four cutting edges of each blade. Thus in blade **67** the upper surface is formed of a plane extending from point **119** to cutting edge **115**, another plane extending from point **119** to cutting edge **117**, a third plane from point **119** to cutting edge **118**, and finally a fourth plane from point **119** to cutting edge **116**. Formed in this particular manner the upper blade **67** provides a guard which protects the face of the user from injury by preventing portions of the skin from protruding between the cutting edges of the blades.

As has been explained above, it is this scissoring arrangement and cooperation between the blades **65** and **67** which provides a much smoother sliding method for severing hair than the present direct impact methods, where cutting edges meet each other at one instant along the entire edge of the cutting plane.

Many uses for the electric motor other than in combination with the pocket shaver are envisioned. For example, the electric motor may be used as the power source in vibration units. Also small portable hand saws, grinding equipment, and other tools which use a reciprocating linear motion represent areas wherein the electric motor may also be applied.

On the other hand, the individual design of the shaving blades are not to be limited to use in combination with the battery energized motor. These blades may have wide use in standard A.C. operated electric shavers or in many other devices where a plurality of scissor-type cutting edges are needed.

Although the invention has been described with a certain degree of particularity, it is understood that the present disclosure has been made only by way of example and that numerous changes in the details of construction and the combination and arangement of parts may be resorted to without departing from the spirit and scope of the invention as hereinafter claimed.

We claim:

1. A cutting apparatus comprising

a first triangular shaped blade having an apex, a notched base and four cutting edges,

a second triangular shaped blade having an apex, a notched base and four cutting edges, said first and second blades positioned with their cutting edges adjacent and with the apex of said first blade intersecting the notch in the base of said second blade and the apex of said second blade intersecting the notch in the base of said first blade thereby forming four acute cutting angles, and

means for moving said blades across each other while maintaining the cutting edges of said first and second blades in adjacent relationship.

2. A cutting apparatus as defined in claim 1 wherein said first notched triangular blade is slanted with respect to its base and said second notched triangular blade is slanted with respect to its base, the notch of said first blade being intersected by the apex of said second blade and the notch of said second blade being intersected by the apex of said first blade.

3. A cutting apparatus comprising

a plurality of first triangular shaped blades wherein each blade has an apex, a notched base and four cutting edges and is fixed in an inverted position adjacent the sides of neighboring blades whereby the apex of one blade is placed adjacent the base of its neighboring blade and with at least one cutting edge of each blade in a spaced adjacent relationship with each of its neighboring blades,

a second plurality of triangular shaped blades wherein each blade has an apex, a notched base and four cutting edges and is fixed in an inverted position adjacent the sides of neighboring blades whereby the apex of one blade is placed adjacent the base of its neighboring blade and with at least one cutting edge of each blade in a spaced adjacent relationship with one cutting edge of each of the neighboring blades, each of said second plurality of blades positioned with its cutting edges adjacent the cutting edges of one of said first blades with the apex of each of said first blades intersecting the notch in one of the bases of said second blades and the apex of each of said second blades intersecting the notch in one of the bases of said first blades, and

means for moving said blades across each other while maintaining the cutting edges of said first blades and said second blades in adjacent relationship whereby each of said plurality of first blades closes three acute cutting angles as it moves in one direction and closes three different acute cutting angles as it moves in another direction across the cutting edges of said plurality of second blades.

4. A cutting apparatus comprising

a first triangular shaped blade having an apex, a notched base and four cutting edges, each of said edges lying in a single plane which defines one surface of the blade and away from which four separate plane surfaces rise, one from each cutting edge, towards a single point,

a second triangular shaped blade having an apex, a notched base and four cutting edges, each of said edges lying in a single plane which defines one surface of the blade and away from which four separate plane surfaces rise, one from each cutting edge, toward a single point,

said first and second blades positioned with their cutting edges adjacent and with the apex of said first blade intersecting the notch in the base of said second blade and the apex of said second blade intersecting the notch in the base of said first blade thereby forming four acute cutting angles, and

means for moving said blades across each other while maintaining the cutting edges of said first and second blades in adjacent relationship.

References Cited by the Examiner

UNITED STATES PATENTS

1,120,414	12/14	Schoolfield et al.	310—35
1,205,576	11/16	Stearns et al.	30—43.92
1,421,350	6/22	Powell	310—35
1,568,210	1/26	Colstad	310—34
1,668,278	5/28	Langdon	310—23
1,851,850	3/32	Lamar	310—35
2,121,895	6/38	Toward et al.	310—35
2,164,425	7/39	Rand	30—43.1
2,201,349	5/40	Scruggs	30—41.6
2,253,737	8/41	Testi	30—43.1
2,272,123	2/42	Te Pas et al.	30—43.2
2,273,685	2/42	Berg	30—43.92
2,281,434	4/42	Gur Arye	30—43.92
2,558,459	6/51	Podner	56—296 X
2,601,720	7/52	Carissimi	30—43.92
2,617,951	11/52	Jeffrey	310—35
2,636,267	4/53	Wittcomb	30—355
2,749,453	6/56	Cassell et al.	317—171 X
2,930,119	3/60	Kleinman	30—43.92
3,002,276	10/61	Kobler	30—354 X

FOREIGN PATENTS

154,140	11/20	Great Britain.

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