June 17, 1958 A. LUSSIER 2,838,836

RECIPROCATING ELECTRIC SHAVER HAVING MULTIPLE SHEARING SURFACES ON OUTER AND INNER CUTTERS

Filed Feb. 16, 1954 2 Sheets-Sheet 1

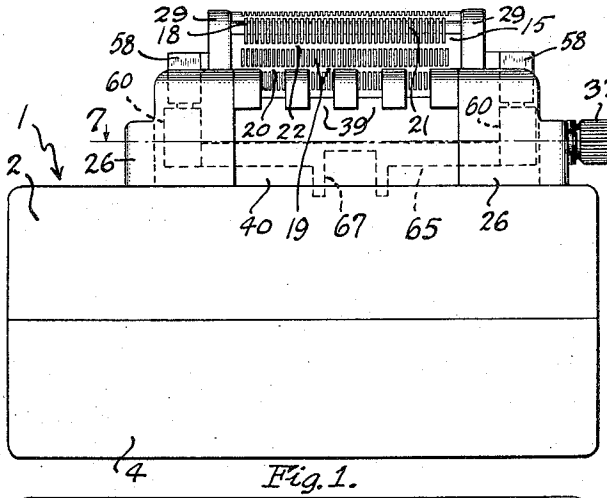


Fig. 1.

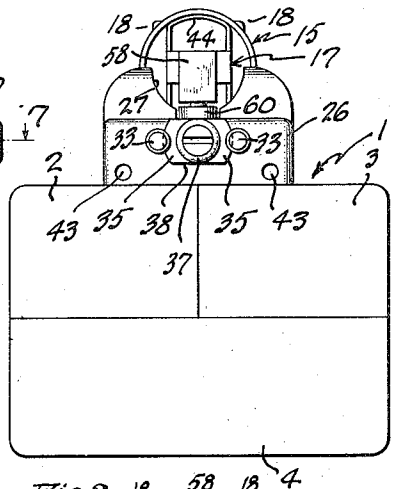


Fig. 2.

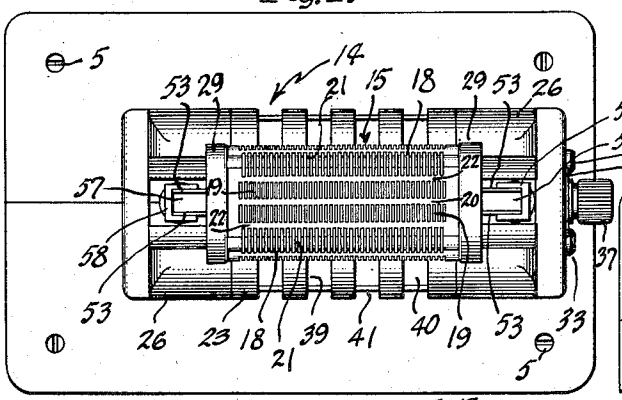


Fig. 3.

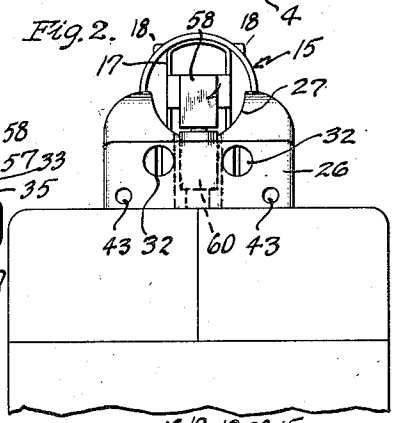


Fig. 4.

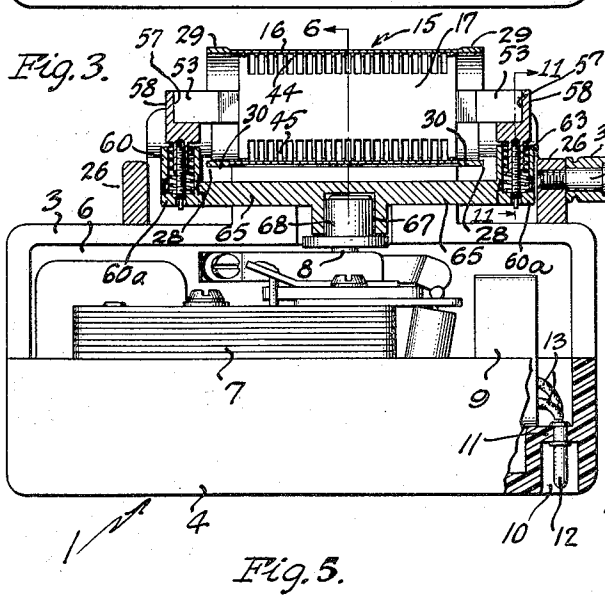


Fig. 5.

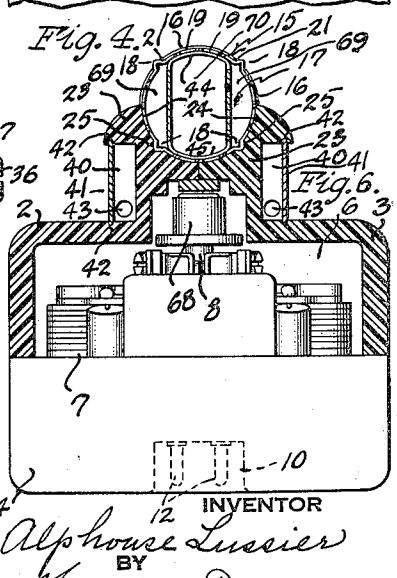


Fig. 6.

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RECIPROCATING ELECTRIC SHAVER HAVING MULTIPLE SHEARING SURFACES ON OUTER AND INNER CUTTERS

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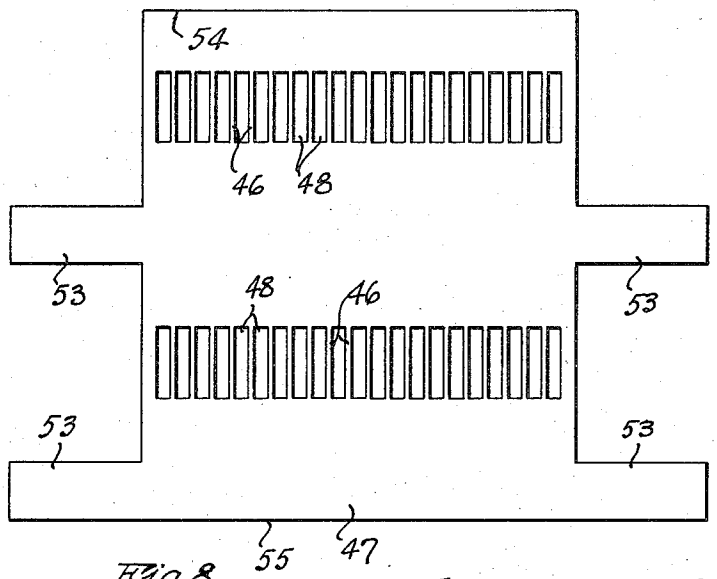


Fig. 8.

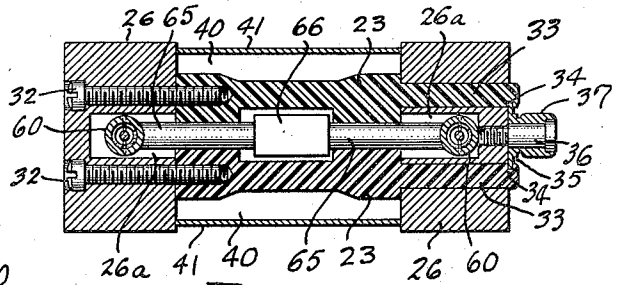


Fig. 7.

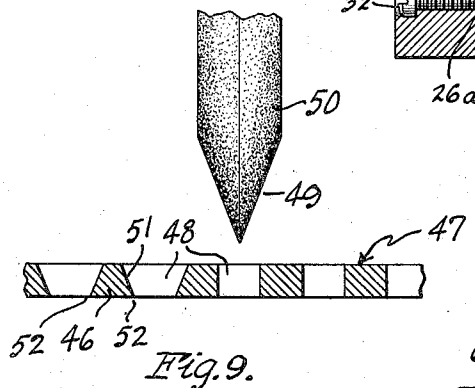


Fig. 9.

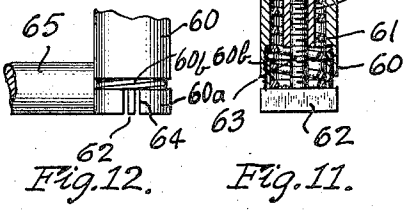


Fig. 12.

Fig. 11.

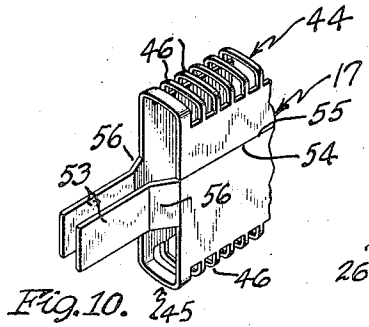


Fig. 10.

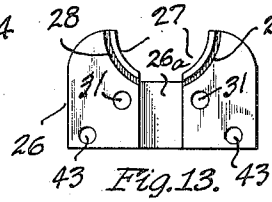


Fig. 13.

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United States Patent Office 2,838,836 Patented June 17, 1958

2,838,836

RECIPROCATING ELECTRIC SHAVER HAVING MULTIPLE SHEARING SURFACES ON OUTER AND INNER CUTTERS

Alphonse Lussier, Waterbury, Conn.

Application February 16, 1954, Serial No. 410,559

15 Claims. (Cl. 30—41)

This invention relates to an electric shaver, particularly of the type in which there is a stationary outer skin-engaging cutter and guide, and an inner reciprocable movable cutter on the inner side of the outer cutter having cutting edges cooperating with those of the outer cutter to provide a shearing action for cutting the hairs.

It is an object of the invention to provide an improved means for mounting the outer cutter and securing it in place whereby it may be easily removed and replaced, for turning to expose different sides for use, and for periodical cleaning.

It is also an object to provide an improved means of providing the necessary pressure between the inner and the outer cutter, and to provide means whereby there is a controlled or adjustable skin-line shaving action for light or heavy whiskers, with means whereby the pressure may be easily reduced or increased to exactly satisfy the person according to the type of skin he may have; that is, to provide a structure whereby the shaver may be set for light pressure of the cutter for use by a man with a light beard, so as to prevent irritation to a delicate or tender skin, which would be caused by heavy pressure, and also whereby the pressure may be increased or a relatively heavy pressure used for cutters for men with heavy beards.

A further object is to provide improved means for mounting the inner cutter and uniformly maintaining the pressure desired.

It is a still further object to provide a shaver of this type with an inner cutter provided with bifacial or double shaving sides which are easily interchangeable so that in effect a new cutter may be secured by merely reversing this inner cutter.

Still another object is to provide an improved and simplified construction for the inner cutter, and another object is to provide a shaver with large spaces and air passages for holding accumulated shavings and prevent clogging of the shaver.

With the foregoing and other objects in view, I have devised the construction illustrated in the accompanying drawings forming a part of this specification. It is, however, to be understood the invention is not limited to the specific details of construction and arrangement shown, but may embody various changes and modifications within the scope of the invention.

In these drawings:

Fig. 1 is a side elevational view of this improved shaver:

Fig. 2 is an end view looking from the right of Fig. 1;

Fig. 3 is a top plan view;

Fig. 4 is an end view looking from the left of Fig. 1;

Fig. 5 is a longitudinal section;

Fig. 6 is a transverse section substantially on the plane of line **6** in Fig. 5;

Fig. 7 is a longitudinal section substantially on line **7—7** of Fig. 1;

Fig. 8 is a plan view of a blank which may be blanked

out from a piece of sheet metal for forming the inner cutter;

Fig. 9 is a partial section and partial elevation illustrating the improved method of grinding the shearing or cutting edges on the inner cutter;

Fig. 10 is a perspective view of one end portion of the inner cutter in its operative form;

Fig. 11 is a detail section of a means of mounting the inner cutter, taken substantially on line **11—11** of Fig. 5;

Fig. 12 is a side view looking from the left of Fig. 11; and

Fig. 13 is an inner side view of the supporting members for the opposite ends of the outer cutter.

This improved shaver is of the palm-size type in which the body or housing enclosing the motor, and on which the cutter head is mounted, is of a size to fit snugly in the palm of the hand for greater comfort and more effective handling during the shaving operation, the cutter head being mounted on the top side of this body. In the construction and arrangement shown, the body or housing **1** comprises three sections **2**, **3** and **4** preferably of suitable molded plastic material, section **4** being the lower section and the sections **2** and **3** being mounted side by side on top of the lower section **4** and secured thereto by any suitable means, such, for example, as the screws **5**. These sections provide a hollow housing or body with an enclosed chamber **6** in which is mounted the operating electric motor **7**, which may be of any of the standard types of motors used for this device operating a rotary shaft **8**. A condenser usually required for this type of motor is mounted in the chamber **6** at one end thereof, as shown at **9**, and the lower section **4** of the housing may be molded with a recess **10** opening either through the bottom or one side thereof providing a supporting cross wall **11** for the pin contacts **12** to be inserted in the female plug-in connector (not shown) connected by conductor wires to the usual means for plugging into any standard outlet of a house wiring system, with suitable electrical conductors **13** connecting these contact pins to the condenser and the motor in the usual manner.

The cutter head **14**, as previously indicated, is mounted on the top of the housing or body **1**, and part of it is made of plastic material integral with the sections **2** and **3** of the housing, this housing also forming the hand grip for holding the device while in use. The cutter head comprises an outer cylindrical cutter and guide **15** of thin tempered steel, having perforated or slotted surfaces **16** for entrance of hairs during the shaving operation, and providing sharp cutting or shearing edges on the inner surface of the outer cutter cooperating with the cutting or shearing edges on the outer surface of the inner or movable cutter **17** to secure the shearing and shaving effect. The outer cylindrical cutter **15** is of reduced thickness to bring the cutting edges close to the surface of the skin to secure a close shaving action. It is provided with outwardly extending hollow longitudinal V-shaped ribs **18**, there being four of these ribs spaced equally about the periphery, or that is, ninety degrees apart, and between each pair of these ribs the cylindrical or curved surface **16** of this cutter is provided with rows of perforations, which as shown in the present case are transversely arranged elongated slots **19**. In the arrangement shown, between each pair of ribs **18** there are two rows of these perforations or slots **19** separated by a narrow imperforate strip **20** (Fig. 2). The V-shaped ribs **18** are also provided with transversely extending slots **21**, which, as shown in Fig. 6, are extended from each side of the rib into the adjacent cylindrical portion **16** of the cutter forming in effect a comb, and are separated at their ends from the rows of perforations or slots **19** by an imperforate strip **22** (Fig.2) similar

to the strip 20. These imperforate strips add strength and stiffness to the surface of the cutter to assist in maintaining its proper shape under the pressure of the skin during the shaving operation.

This outer cutter is mounted in a saddle comprising extensions 23 projecting above and molded in one piece with the sections 2 and 3 of the housing, as shown in Fig. 6, and these two sections of the saddle comprise a curved seat 24 in which the lower portion, preferably substantially one-half, of the outer cylindrical cutter is seated leaving substantially the upper half exposed. The curved surface 24 is provided with longitudinal channels 25 in which the longitudinal ribs 18 may seat, and thus provide a simple and effective means for locating and holding the outer cutter in proper angular position. It also so holds the cutter that any one of the four cylindrical or transversely curved portions 16 may be located at the outer exposed side of the cutter to provide the skin-engaging surface for the shaving operation. This form of cutter therefore in effect provides four different stationary or face-engaging cutters or shaving surfaces, any one of which may be used after one or more of the others become dull.

This cylindrical outer cutter is retained seated in its supporting saddle by end blocks 26 at its opposite ends. As shown in Fig. 13, the top edge of this block is concavely curved, as shown at 27, and just inwardly of this curve the inner surface of the block is provided with circular grooves 28 to receive the edges of the somewhat thickened, and therefore strengthened, end portion 29 of the cutter 15, as shown in Fig. 5, the lower walls of the groove 28 being extended inwardly, as indicated at 30, forming a seat on which the lower sides of these portions 29 rest. These two end blocks 26 are of a width to overlap the opposite ends of the saddle portions 23 of the housing and are secured thereto. Both blocks are provided with longitudinal openings 31 for the securing means, the left hand block being secured to the saddle portions 23 by the long screws 32, as shown in Fig. 7. Quickly releasable means is provided for securing the opposite block at the right hand end. This comprises a pair of studs 33 molded on the ends of the saddle portions 23 and pass through the openings 31 in this block, as shown in Fig. 7. They are of a length to project a short distance beyond the outer side of the block, and these projections are each provided with a notch or groove 34 on their opposed inner sides to receive the outer edges of flanges 35, Figs. 2 and 7, of a suitable catch mounted for turning movements on a stud 36 threaded into the outer side of the block 26, and having a knurled hand knob 37 whereby it may be rotated on this stud to shift the flanges 35 to and from a position seating in the recesses 34, the opposite sides of this catch being flattened as indicated at 38, so that when this catch is turned at right angles to the position of Fig. 2, the flanges 35 are free of the recesses 34. When they are in this position the block 26 is released and may be shifted outwardly a short distance, or wholly removed if desired, to release this end of the outer cutter 15. However, it is not necessary to entirely remove this block in order to permit removal of the cutter. It is merely necessary to move this right hand block 26 outwardly a sufficient distance to release the end of the cutter 15 and a sufficient additional distance to permit this cutter to be shifted to the right as viewed in Fig. 5 to release its opposite end from the corresponding grooves 28 in the block 26 at the opposite end of the cutter. Then the cutter may be easily lifted from the saddle for turning, to bring a new curved surface 16 to the outer side, for replacing with a new cutter, or for cleaning or any other purpose. It may be as easily and quickly replaced or remounted in the saddle by merely placing it on the curved surfaces 24, sliding it to the left a short distance to insert its left hand end edge in the groove 28 in the left hand block 26, and then the right hand block 26 may be shifted inwardly or to the left to seat the right hand end of the cylinder in the grooves 28 in this block. Then the catch may be turned to shift its flanges 35 to seat their edges in the groove 34 in the studs 33, as shown in Figs. 2 and 7.

The molded saddle portions 23 include longitudinally spaced notches 39 in their outer edge portions leading from the outer cutter to recesses or chambers 40 formed in the opposite outer sides of these extensions for passage of shavings from the cutters into these chambers or receptacles during the shaving operation. The outer sides of these chambers or shavings receptacles are closed by thin slidable gate members 41 which may be mounted to slide longitudinally at their opposite edges in grooves or channels 42 formed at the upper and lower sides of these chambers. They will be retained in this position by the two blocks 26 at their opposite ends, but on removal of either block 26 these members 41 may be slid out of position to expose the chambers 40 for cleaning and removal of any accumulation of shavings there may be in them. For ordinary cleaning or removal of these accumulations of shavings, however, each of the end blocks 26 is provided with an opening 43 leading to these chambers at the lower sides thereof through which a small round brush may be passed for cleaning out any accumulation of shavings which may be in these chambers.

The inner movable cutter 17 is of improved and simplified construction, and is supported in an improved mounting which will maintain proper pressure uniformly between this cutter and the inner surface of the outer cutter 15 to secure proper and uniform shaving action, and also provide means whereby the pressure between the cutters may be easily and quickly adjusted to suit users having different types of beards or skins of different degrees of tenderness. That is, the pressure of the inner cutter on the outer cutter may be easily adjusted and varied according to different conditions for most effective operation and least irritation under all conditions.

This inner cutter is mounted for longitudinal sliding and reciprocating movement within the outer cutter 15, and it is provided with bifacial or dual cutting surfaces 44 and 45 arranged on diametrically opposite sides of the cutter. These could either be identical or could be different for different shaving effects. They each comprise a series of transversely curved blades 46 spaced longitudinally of the cutter and longitudinally curved, or that is, curved in a direction transversely of the cutter, and accurately ground on the arc of a circle of slightly larger diameter than the diameter of the inner surface of the outer cutter 15 so as to always maintain a pressure between the inner cutter and the outer cutter, and thus always effect a shearing action between them. This slightly larger diameter of the inner cutter does not interfere with the insertion of this cutter into the outer cutter, because in performing this operation all that is necessary is to press laterally inward somewhat on the opposite sides of the outer cutter, which will cause it to become elongated somewhat in the vertical plane sufficient to permit easy insertion of the inner cutter, after which release of the outer cutter will cause it by its resilient action to tend to return to its true circular or cylindrical form, thus providing pressure between the opposite curved surfaces of the inner cutter and the outer cutter. However, additional means is provided for increasing the pressure between the inner cutter and the outer exposed skin-engaging section 16 of the outer cutter, as will presently be described.

As shown more clearly in Figs. 8 and 10, the inner cutter is formed from sheet steel of proper thickness. It is stamped in the form as shown in Fig. 8, with a body portion 47 of proper width and length, and two rows of longitudinally spaced slots 48 forming transverse bars between them for the cutter teeth 46. There are also provided on each of the opposite ends of the blank rectangular extensions 53. Then the opposite side edges

of these slots are ground on one side (the side which is to be at the inner side of the finished cutter) with the V-shaped or tapered edges 49 of a suitable grinding wheel 50, providing tapered sides 51 for the slots, leaving sharp cutting or shearing edges 52 on the opposite sides of each slot and therefore on the opposite side edges of each tooth or blade 46. The blank is then folded to a substantially rectangular cross section, as shown more specifically in Fig. 10, but also as indicated in Figs. 2, 4 and 6, with the blades or bars 46 on the diametrically opposite narrower top and bottom edges of the cutter and extending transversely thereof. These blades are also longitudinally curved, or that is, curved in a direction transversely of the cutter, and accurately ground after the cutter is properly hardened and tempered, so that their outer surfaces form parts of a cylinder of a slightly larger diameter than the inner diameter of the outer cylindrical cutter 15, as previously indicated. The blank is also folded in a direction so that the sharp round cutting edges 52 are on the outer curved sides of these blades or bars and thus are located against the inner surface of the outer cutter 15 and cooperate with the inner edges of the perforations or slots 19 in this cutter for the shearing operation. The cutter 17 is preferably of a width, as shown in Fig. 6, to extend laterally beyond the imperforate strips 22 of the outer cutter to substantially the adjacent edges of the ribs 18 and therefore so as to overlap the slotted cylindrical portion between these ribs and the imperforate strips 22 (that is, the outer end portions of the transverse slots in the ribs 18) to thus provide a wide shaving surface. This also provides relatively long shearing blades 46 on the inner cutter with a good wide bearing surface on the inner side of the outer cutter to reduce wear on the cutters.

When forming the inner cutter to substantially rectangular shape, the opposite free edges 54 and 55 are so arranged as to abut on one side of the cutter, as shown in Fig. 10, and they therefore support each other against lateral or inward crushing pressures. When folded to this position the extension 53 on the opposite ends of the blank project longitudinally from the opposite ends of the cutter and side by side as shown in Fig. 10. They are offset or bent inwardly, as shown at 56, so that their free portions are spaced apart less than the width or thickness of the body of the cutter, so as to seat in sockets 57 in supporting members 58 for mounting this inner cutter. These members 58 are upright socket members with the rectangular socket 57 opening through the top and one side, and each has an internally threaded extension or stem 59 (Fig. 11) telescoping within a supporting member 60 surrounded by a coil spring 61 pressing at its opposite ends against the under side of the head portion 58 and the head of a vertically adjustable plug 60*a* threaded into the lower end of portion 60, as shown at 60*b*. There is a transverse bar 62 on a threaded stem 63 threaded into the extension 59. Bar 62 is located in a transverse notch 64 in the lower end of the plug 60*a* which acts as a guide for this cross bar 62 and prevents turning of this bar and the screw 63 relative to plug 60*a*. There are two of these upright cylindrical members 60, one at each of the opposite ends of the operating shaft 65, provided at its center with a block or enlarged portion 66 provided in its under side with a transverse recess or socket 67 to receive the eccentrically located roller or cam member 68 on the motor shaft 8. Thus the rotation of this shaft will longitudinally reciprocate the shaft 65 mounted in opposed bearings in the inner abutting surfaces of the saddle extensions 23, and through the end members 58 will operate the inner movable cutter 17 with a longitudinal back and forth oscillating movement. The members 60 are in the upright channels or recesses 26*a* in the inner sides of the end blocks 26, while the members 58 are in the recesses 27. The inner cutter is mounted in these members 58 by merely inserting the extensions 53 in the sockets 57 in these members.

It will also be seen that when in this position the springs 61 will tend to lift the supporting socket members 58 and press the upper edge or row of cutter blades 46 of the inner cutter against the inner surface of the top or skin-engaging section 16 of the outer cutter 15. These springs will hold the inner cutter against the inner surface of the outer cutter with a uniform pressure for indefinite operation, it being very important in this type of shaving apparatus that the proper pressure be applied from the inner cutter to the outer cutter to secure the proper shearing action. Experience has shown that close line shaves can be secured only by squeezing or pressing the inner cutter against the inside perforated surface of the outer cutter as close as possible and under constant pressure. The greater the squeeze pressure the closer the shave. The structure and arrangement of this device definitely accomplishes this all-important action. However, in the present case, by adjusting the plug 60*a* up or down by relative turning movement between these members and the member 60, the tension of these springs may be readily adjusted and made either lighter or heavier as desired when pressing the inner movable cutter against the outer cutter and therefore vary and control this pressure, depending on the shaving conditions and also depending on the tenderness of the skin of the user. That is, lighter pressures may be used for lighter beards and more tender skins, while heavier pressures may be employed for heavier beards. The upright rectangular extensions 53 for the inner cutter form a rigid support for the cutter and also hold it rigidly in the upright proper shaving position, as indicated in Fig. 6. They also provide a support for this inner cutter whereby it may be easily and quickly reversed to bring either set of cutting teeth 44 or 45 into the shaving position at the inner surface of the upper outer skin-engaging portion 16 of the outer cutter 15. This type of cutter therefore provides a bifacial cutter, or that is, provides two or double shaving sides for the inner cutter which, when one set of blades becomes dull, may be easily and quickly turned or reversed to bring another or sharp set of blades to the shaving position, thus greatly increasing the useful life of the cutter. As the greater pressure for the shaving operation is between the outer or upper set of blades on the inner movable cutter, there is very little wear on the inner or lower set of blades and they are maintained in the sharpened condition. It will also be seen from Fig. 6 that large spaces or air passages 69 and 70 are provided within the cutters, preventing accumulation of the shavings and therefore preventing clogging of the cutters. The shavings are also readily carried to the receptacles 40, as previously described, from which they may be readily removed, as previously indicated.

It will be seen from the above that this provides a simple and effective electric shaver comprising a minimum number of parts, that both the outer and inner cutters have a plurality of shaving sections or sections which may be readily shifted to the shaving position, thus greatly prolonging the useful life of the shaver and permitting the user to quickly put the shaver in condition for most effective operation, and that the proper pressure may be provided at all times between the inner cutter and the outer cutter for the most favorable and effective shaving operation; still further, that both cutters may be easily and quickly removed from their mountings and the cutter head for renewal or cleaning purposes and as readily remounted. The combs formed by the long transverse slots in the longitudinal ribs 18 guide the long hairs into shearing position in front of the blades on the inner cutter, the bends in the comb bars or teeth caused by the ribs also acting as guides or means to lift up hairs bent or lying over the skin surface so they pass readily into the slots.

Also the pressure of the inner movable cutter against the outer stationary cutter may be varied and controlled by using lighter or heavier springs 61.

Having thus set forth the nature of my invention, I claim:

1. An electric shaver comprising a cutter head including an outer hollow stationary cutter having a perforated transversely curved section to engage the surface of the skin, a longitudinally reciprocable hollow cutter within the stationary cutter comprising laterally spaced side walls connected at each of their opposite edges by a series of longitudinally spaced transversely curved cutting blades with the two series separated and integrally connected by the side walls, one of said series located at the inner surface of said perforated section of the stationary cutter to cooperate therewith for a shearing action, mounting means for the inner cutter comprising a support provided with means adapted to removably support the cutter with either series of cutting blades located at the inner surface of the perforated section for cooperation therewith for the shaving operation, and driving means for longitudinally reciprocating the inner cutter.

2. An electric shaver comprising a cutter head including an outer hollow stationary cutter having diametrically opposite transversely curved perforated sections, mounting means for said cutter comprising a support provided with means adapted to removably support the cutter with either section exposed to engage the surface of the skin, a longitudinally reciprocable hollow inner cutter within the outer cutter comprising laterally spaced parallel unslotted side walls integrally connected at each of their opposite edges by a series of longitudinally spaced transverse curved cutting blades, mounting means for the inner cutter adapted to removably support it with either series located at the inner surface of the exposed section to cooperate therewith for the shaving operation, and driving means for longitudinally reciprocating the inner cutter.

3. An electric shaver comprising a cutter head including an outer hollow cylindrical stationary cutter provided with four peripherally spaced longitudinally extending outwardly projecting ribs dividing its surface into four transversely curved sections which are perforated to provide shearing edges on the inner surfaces of said sections, mounting means for said cutter including means for removably positioning it with any one of said perforated sections exposed for contact with the surface of the skin and including means cooperating with said ribs for positioning the cutter with any one of said sections in the exposed position, a hollow inner cutter within the outer cutter comprising laterally spaced side walls connected at their opposite edges by a series of longitudinally spaced transverse curved cutting blades, mounting means for the inner cutter including means adapted to removably support this cutter with either series of blades held against the inner surface of the exposed section of the outer cutter for cooperation therewith for the shaving operation, and driving means for longitudinally reciprocating the inner cutter.

4. An electric shaver comprising a cutter head including an outer hollow stationary cutter having a perforated cylindrical section exposed for contact with the surface of the skin, a hollow inner cutter of oblong cross section having a pair of diametrically opposite series of longitudinally spaced curved cutting blades connected by integral spaced unslotted side walls and adapted for contact with the inner surface of the perforated section to cooperate therewith for the shaving operation, mounting means for the inner cutter including a support provided with means adapted to removably support this cutter with either series of blades held against the inner surface of the perforated section, and driving means for longitudinally reciprocating the inner cutter.

5. An electric shaver comprising a cutter head including an outer stationary hollow cylindrical perforated cutter, a longitudinally reciprocable hollow cutter within the stationary cutter comprising laterally spaced side walls connected at each of their opposite edges by a series of longitudinally spaced cutting blades comprising two series of these blades separated and integrally connected by the side walls, said blades curved transversely of the cutter on arcs of a circle of somewhat larger diameter than the internal diameter of the outer cutter, said outer cutter of thin flexible metal and capable of being vertically elongated by pressure inwardly on its opposite sides to permit insertion of the inner cutter into the outer cutter with the cutter blades of the inner cutter engaging the inner surface of the outer cutter on diametrically opposite sides thereof, and driving means for longitudinally reciprocating the inner cutter for the blades to cooperate with the perforated surface of the outer cutter for the shaving operation.

6. An electric shaver comprising a cutter head including an outer hollow cylindrical stationary cutter provided with four peripherally spaced longitudinally extending outwardly projecting ribs dividing its surface into four transversely curved sections which are perforated to provide shearing edges on the inner surfaces of said sections, said ribs provided with a series of transverse slots extending at their opposite ends into the adjacent curved sections, mounting means for said cutter comprising a support provided with means adapted to removably support the cutter with any one of said perforated sections exposed for contact with the surface of the skin, a hollow cutter within the outer cutter of oblong cross section having a pair of diametrically opposite series of longitudinally spaced curved cutter blades separated by integral spaced side walls, mounting means for the inner cutter including means adapted to removably support it with either series of blades held against the inner surface of the exposed perforated section to cooperate therewith for the shaving operation, and driving means for longitudinally reciprocating the inner cutter.

7. An electric shaver comprising a cutter head including an outer hollow stationary cutter provided with laterally spaced longitudinally extending outwardly projecting tapered ribs with a transversely curved section between them which is perforated to provide shearing edges at the inner surfaces of said section, said ribs provided with a series of transverse slots extending into the adjacent curved section, means mounting the cutter with said perforated section exposed for contact with the surface of the skin, a hollow inner cutter of oblong cross section having a pair of diametrically opposite series of longitudinally spaced curved cutting blades separated by integral spaced side walls and each adapted for contact with the inner surface of the perforated section to cooperate therewith for the shaving operation, mounting means for the inner cutter comprising a support including means adapted to removably support this cutter with either series of blades held against the inner surface of the perforated section, and driving means for longitudinally reciprocating the inner cutter.

8. An electric shaver comprising a cutter head including a hollow stationary cutter having a perforated cylindrical section to engage the surface of the skin, a hollow reciprocable cutter within the outer cutter comprising two series of longitudinally spaced transversely extending curved cutter blades connected and separated by integral spaced side walls and each series adapted to engage the inner surface of the perforated section to cooperate therewith for the shaving operation, said two series of cutter blades located on diametrically opposite sides of the inner cutter, mounting means for the inner cutter including a support provided with resilient means adapted to removably support this cutter with either series of blades held against the perforated section, and driving means for reciprocating the inner cutter.

9. An electric shaver comprising a cutter head including a hollow stationary cutter having a perforated cylindrical section to engage the surface of the skin, a hollow reciprocable cutter within the outer cutter comprising sheet metal formed into an oblong cross section with

spaced side walls and a series of integral longitudinally spaced transverse curved cutter blades at each of the opposite edges thereof and each series adapted to engage the inner surface of the perforated section, a longitudinally reciprocable shaft, upright supporting means connecting the shaft with the opposite ends of the inner cutter for operating it and each including resilient means pressing the inner cutter against the outer cutter, and means for connecting the shaft with an operating motor to reciprocate the inner cutter.

10. An electric shaver comprising a cutter head including a hollow stationary cutter having a perforated cylindrical section to engage the surface of the skin, a hollow reciprocable cutter within the outer cutter comprising sheet metal formed into an oblong cross section with spaced side walls and a series of integral longitudinally spaced transverse curved cutter blades at each of the opposite edges thereof and each series adapted to engage the inner surface of the perforated section, projections extending from the opposite ends of the inner cutter, a longitudinally reciprocable shaft, upright supporting means on the shaft provided with sockets in which said projections are seated to removably support and operate the inner cutter with either series of cutter blades engaging the outer cutter, said supporting means including resilient means pressing the inner cutter against the outer cutter, and means for connecting the shaft to an operating motor to reciprocate the inner cutter.

11. An electric shaver comprising a cutter head including a hollow stationary cutter having a perforated cylindrical section to engage the surface of the skin, a hollow reciprocable cutter within the outer cutter comprising sheet metal formed into an oblong cross section with spaced side walls and a series of integral longitudinally spaced transverse curved cutter blades at each of the opposite edges thereof and each series adapted to engage the inner surface of the perforated section, supporting extensions projecting from the opposite ends of the inner cutter, a longitudinally reciprocable shaft, upright supports at the opposite ends of the shaft each comprising connected relatively movable members one of which is provided with a socket, said extensions on the inner cutter removably seated in said sockets and adapted to support and operate the cutter with either series of cutter blades in engagement with the inner side of the perforated section of the stationary cutter, spring means in the supports tending to shift the socketed members to press the inner cutter against the outer cutter, and means for connecting the shaft to a motor to reciprocate the inner cutter.

12. An electric shaver comprising a cutter head including a hollow stationary cutter having a perforated cylindrical section to engage the surface of the skin, a hollow reciprocable cutter within the outer cutter comprising laterally spaced side walls integrally connecting two series of longitudinally spaced transversely extending curved cutter blades and each series adapted to engage the inner surface of the perforated section to cooperate therewith for the shaving operation, said two series of cutter blades located on diametrically opposite sides of the inner cutter, a reciprocable shaft, supporting means detachably connecting the shaft to the opposite ends of the inner cutter for operating it and adapted to support this cutter with either series of cutter blades in engagement with the outer cutter, each supporting means including spring means pressing the inner cutter against the outer cutter, and means for operating the shaft to reciprocate the inner cutter.

13. An electric shaver according to claim 12 in which the supporting means for the opposite ends of the inner cutter include means whereby the tension of the springs may be adjusted to control the pressure of the inner cutter against the outer cutter and it may be varied to suit different operating conditions.

14. An electric shaver comprising a cutter head including a hollow cylindrical stationary cutter having perforated side walls to engage the surface of the skin, a housing of oblong shape to provide a hand grip and having a chamber for an operating motor, extensions on one side of the housing having curved surfaces providing a seat in which the outer cutter is mounted and including means cooperating with the ends of the cutter to retain it in the seats, a reciprocable shaft mounted in bearings in said extensions, a hollow reciprocable inner cutter within the outer cutter provided with a series of longitudinally spaced transversely extending curved cutter blades engaging the inner surface of the outer cutter to cooperate therewith for the shaving operation, supporting means connecting the shaft to the outer ends of the inner cutter and including spring means pressing the inner cutter against the outer cutter, and means for connecting the shaft to a motor in the housing for operating it.

15. An electric shaver comprising a cutter head including a hollow cylindrical stationary cutter having perforated side walls to engage the surface of the skin, a housing of oblong shape to provide a hand grip and having a chamber for an operating motor, said housing comprising a pair of connected sections of plastic material providing the upper side thereof and including side by side integral extensions having curved surfaces providing a seat in which the outer cutter is mounted, the outer lateral sides of said extensions provided with recesses, walls closing the outer sides of the recesses to provide receptacles for shavings and said extensions having passages leading from the cutter to said receptacles, removably mounted blocks secured on the housing sections at the opposite ends of the extensions and including means retaining the cutter in said seat, a hollow reciprocable cutter within the outer cutter including cutter blades at the inner side of said perforated section to cooperate therewith for the shaving operation, driving means for reciprocating the inner cutter, and said end blocks provided with openings in alignment with the ends of said receptacles for passage of a cleaning brush to remove the shavings from said receptacles.

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