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J. T. SCULLY

2,400,027

SHAVING MACHINE

Filed July 29, 1941

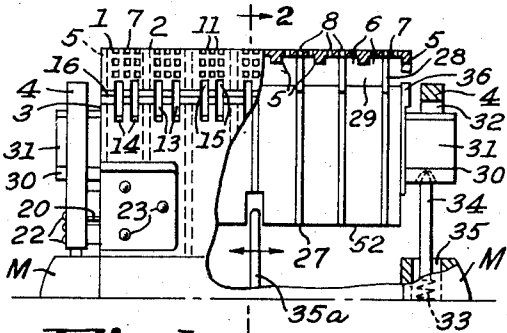


Fig. 1

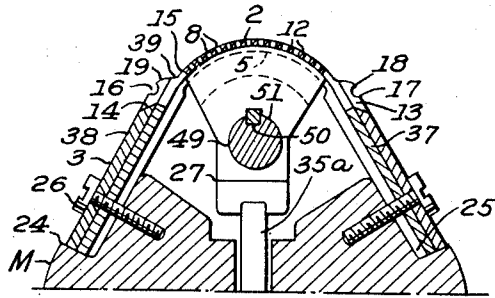


Fig. 2

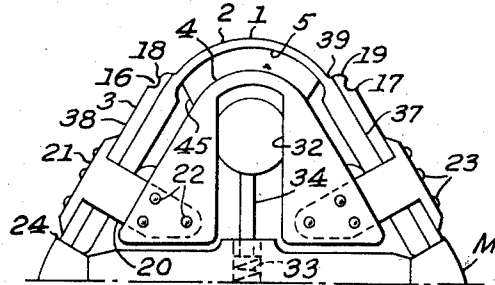
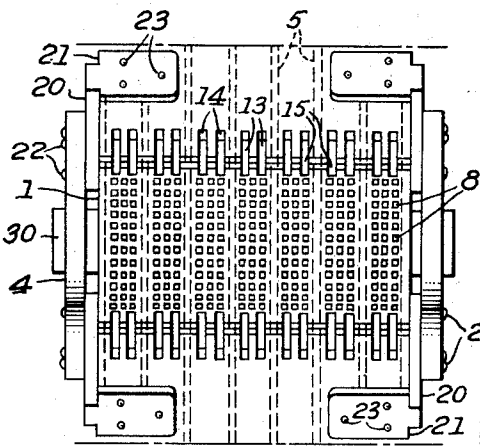


Fig. 3

Fig. 4

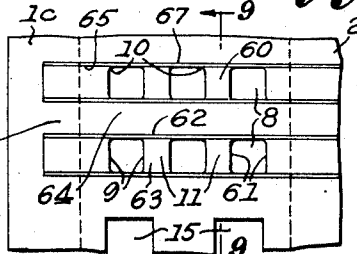
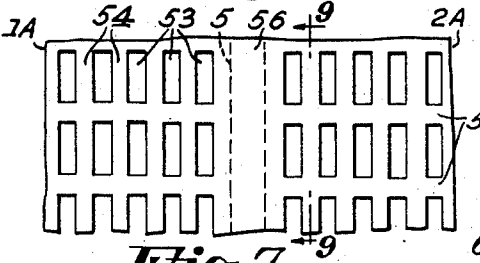


Fig. 5

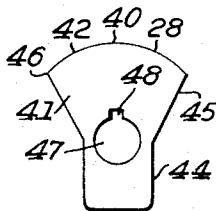


Fig. 6

Fig. 7

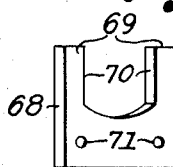
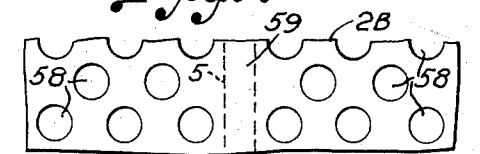


Fig. 8

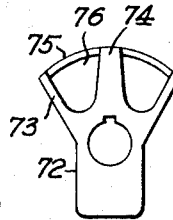


Fig. 9

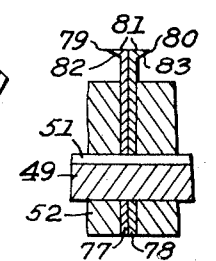


Fig. 10

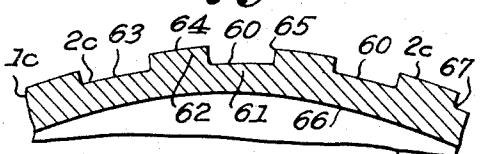


Fig. 11

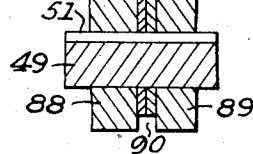


Fig. 12

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SHAVING MACHINE

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Application July 29, 1941, Serial No. 404,536

23 Claims. (Cl. 30—43)

This invention relates to shaving machines of the kind usually employed to cut hair without the use of shaving preparations, such machines being commonly referred to as dry shavers.

The invention relates more particularly to shaving machines employing co-operating shearing members and the subject matter of the invention is related to the matter of my co-pending application issued as Patent No. 2,286,443, June 16, 1942.

A principal object of the invention is to provide a shaving machine of generally improved efficiency, the parts of which are easily, cheaply, and accurately manufactured.

A further principal object is to provide a shaving machine having improved means for receiving and cutting both long and short hairs.

Another principal object is to provide a generally improved outer shear member.

An important object is to provide improved means for seating and supporting the outer shear member on the casing or handle of the machine.

A further object is to provide an outer shear member capable of being handled by the user with minimum risk of danger to the member during displacement and replacement on the casing-handle for cleaning and other purposes.

A further object is to provide an improved outer shear member having a curved skin-engaging portion in which the hair-receiving openings and the shearing edges are relatively close to the longitudinal ends of the curved skin-engaging portions.

A further object is to provide an arcuate outer shear member having improved means for disturbing and guiding long hairs into openings.

A further object is to provide an outer shear member having improved means for disturbing short hairs and increasing the opportunity for short hairs to enter openings.

A further object is to provide an outer shear member having means on its inner side to conduct heat from the cutter-engaging portion and in which the conducting means are provided with increased heat-radiating surface.

A further object is to provide a re-enforced outer shear member easily flexed to arcuate form in manufacture.

A further object is to provide in the outer surface of the skin-engaging portion of an outer shear member a series of channels through the bottoms of each of which a plurality of closely spaced hair-receiving openings are provided and in which the channels are spaced by skin-engaging bars.

A further object is to provide a movable inner cutter member with means for supporting oppositely disposed projecting blade portions.

A further object is to provide an inner cutter member with flexible cutting end portions held under tension by the co-operating outer shear member.

A further object is to provide a skin-engaging outer shear member having hair-receiving openings in an arcuately curved portion and improved means for combing and guiding hair into the openings.

A further object is to provide a skin-engaging outer shear member having an arcuate hair-receiving zone and projecting comb teeth at a leading side that is easily and simply manufactured as well as efficient in receiving hair.

A still further object is to provide in an outer shear member having an arcuate hair-receiving zone a longitudinal series of elongated hair-receiving openings and comb bars, and projecting hair-engaging ends intermediate the ends of the comb bars.

Other objects will hereinafter be apparent from consideration of the description taken in connection with the attached drawing.

The invention resides substantially in the construction, combination, arrangement and relative location of parts as will be described in connection with the drawing.

I wish it to be understood that any or all of the parts may be made of any suitable material or materials and that some or all of the parts or portions of the parts may be made of a metal such as steel, or other metals, or an alloy or alloys thereof; that some or all of the parts, or portions thereof may be formed of metal having any desirable and suitable composition of ingredients and that such metal may be mechanically worked and/or heat treated and cooled according to the best practice in the art at any time prevailing; that some of the parts, or portions thereof, may be made of rigid or flexible metal; and that such material or metal may be provided with such qualities and degrees of hardness, ductility, strength and corrosion resistance as may be deemed best suited and practicable.

In the embodiment shown for illustration the outer shear member is provided with an arcuate portion, to engage the skin, and in the arcuate portion are hair-receiving openings and shearing edges, and the co-operating inner cutter member is provided with cutting edges which co-operate with the shearing edges in the outer shear member to cut hair. The inner cutter member as

herein shown is a reciprocatory member which is moved back and forth in the direction of its axis, and while this is in the present invention the preferred path of cutter travel and preferred manner of cutter movement, it will be apparent from the description that certain features of the invention, more particularly in the outer shear member, are adaptable for use with an inner cutter member which is moved continuously in one direction, for example a rotary cutter member, or with an inner cutter member which is rocked or oscillated, examples of which have been shown in the above referred to patent.

Referring to the drawing:

Figure 1 is a side elevation partly broken away and with parts in section of the invention.

Figure 2 is a vertical section taken on line 2-2 of Fig. 1.

Figure 3 is an end view of Fig. 1.

Figure 4 is a top plan view of the shearing head of Fig. 1.

Figure 5 is a fragmentary view of the outer shear member showing in enlarged form a portion of the hair-receiving zone of Figures 1 and 4.

Figure 6 is a side elevation of a cutting bar or blade element of the inner cutter member.

Figure 7 is a fragmentary plan view of a modification in the outer shear member as shown in Figs. 1-4 and in which a portion of the modified hair-receiving zone is shown enlarged.

Figure 8 is a fragmentary plan view of a further modification in the hair-receiving zone of the outer shear member and in which a portion of the zone is shown enlarged.

Figure 9 is an enlarged fragmentary view in section of a modification in the contour of the outer side, or skin-engaging side, of the outer shear member.

Figure 10 is a view in perspective of a modified means for guiding the reciprocatory movement of the inner cutter member.

Figure 11 is a side elevation of a modified form of cutting bar or blade element in the inner cutter member.

Figure 12 is a fragmentary view in cross-section showing a further modification in the cutting means of the inner cutter member.

Figure 12 is a fragmentary view in cross-section showing a still further modification in the cutting means of the inner cutter member and more particularly a modification of the cutting means shown in Fig. 12.

Referring again to the drawing and particularly to Figures 1-6 inclusive, the reference character M denotes the upper portion of a casing, usually made of molded material such as "Bakelite" or other similar material, and which is the basic support for the shearing or cutting head, is the housing for the electric means of actuating the inner cutter member and, also serves the purpose of a handle for the device, such combined handle and housing being well known in the art. Removably supported on this casing is an outer shear member generally denoted by the reference numeral 1, and which includes a middle portion 2 which is relatively thin and of arcuate form and from opposite longitudinal sides of which depend relatively thick, rigid or substantially so, side portions 3 extending in straight and spaced planes, and which straight side portions are connected and braced to rigid transverse members 4 at opposite ends, or marginal ends, of the hood-like structure. On the inner side of the arcuate middle portion and preferably, though not necessarily, integral with

the arcuate portion are curved re-enforcing ribs or projections 5 extending transversely and which are suitably spaced longitudinally on the inner side of the member to provide a series of transverse internal channels 6 paralleling the planes of the ribs. The ribs may be formed by milling or planing out the channels in normally curved or flat material, and, as shown here, are preferably formed as the result of a rolling operation from flat, thin steel, or an alloy of steel, and with the further result that the ribs and channels extend from the arcuate portion in opposite directions on the inner sides the straight side portions 3. In some instances the straight side portions may be strengthened, or the planes of their inner sides made flat or smooth for comfortable handling or to facilitate cleaning by securing a plate, slotted or channelled to receive the projecting rib portions, by soldering or bolting, or any other suitable means, to the inner side of each of the straight side portions. The ribs strengthen the arcuate portion against inward flexing or distortion generally and are spaced close together enough to prevent or substantially prevent, localized flexing or distortion from ordinary skin or inner cutter pressure, and preferably, although not necessarily, the arcuate longitudinal sides of the ribs are widened adjacent the inner surface of the thin arcuate portion. This result can be accomplished by beveling the ends of the ribs or the ends of milling cutters. The ribs at opposite longitudinal ends of the member may be wider than the intermediate ribs, but preferably they are of the same, or substantially the same, width and height. Formed in each bridging channel wall 7 are a plurality of longitudinally and transversely spaced hair-receiving openings 8 provided in panels spaced by transverse webs of solid material radially outwardly of the planes of the ribs. These hair-receiving openings are large enough to accommodate a hair and are small, of uniform size and closely grouped in each panel. As shown here the hair-receiving openings in each panel are aligned in transverse and longitudinal rows, the area of hair-receiving zone being deemed sufficient together with the closeness of the rows to each other to provide adequate coverage on the skin by each panel during manipulation of the head on the skin by the average user. However, the openings in each panel can, if desired, be arranged so that the openings in alternate rows are in longitudinally spaced planes relative to the other rows. The perforated channel walls 7 are extremely thin in cross-sectional thickness in their shear-cutting portions and in some instances the ribs are provided with means to increase the radiation of heat conducted by the ribs from the panels, heat generated by the engagement of the inner cutter member with the inner surface of the panels, means such as serrations in the form of cross-slots, no notches, which increase the area of surface of the ribs. In some instances the height of the ribs from the inner surface of the perforated portions of the panels is of graduated height lengthwise of the ribs, and may with advantage progressively increase in height in opposite directions outwardly from the region of their middle portion, being thinnest in the central region of the arcuate portion. The hair-receiving openings may have any suitable shape and relative dimensions known in the art, for example they may be in the form of circles or circular holes. As herein shown the hair-re-

ceiving openings denoted by the reference numeral 8 are in the form of what I refer to as modified square openings, each being defined by four sides of equal length, or substantially equal length, of metal, opposite shearing sides of which are indicated by the reference numeral 9, and which four sides of metal join with each other, short of what would otherwise be rectangular corners, at obtuse angles, being joined by relatively very short portions or sides 10 diagonally joining the ends of the longer sides, and preferably, although not necessarily, the ends of the relatively long sides and the ends of the relatively short sides merge with each other on a curve. These modified square hair-receiving openings are defined at their inner ends by edges at the inner side of the arcuate portion, and these edges are adapted to co-operate with an edge or edges on an inner cutter member to cut hair, and the openings are longitudinally spaced by transverse shear bars 11, and are transversely spaced by longitudinal bars which are referred to as connecting bars 12. As will be apparent the shear bars are portions of transversely extending webs of metal, while the connecting bars are portions of longitudinally extending webs of metal. Laterally on the outer shear member and on opposite sides thereof are formed longitudinally spaced transverse hair-receiving openings in the form of slots 13 which are elongated and wider than the modified square openings, and are adapted to receive long hair as well as short hair. The elongated slots extend from the thin arcuate portion into the relatively thick side portions and are preferably bevelled at their lower ends as indicated at 14. The upper portions 15 of the slots are arcuate and are defined at their inner sides by shearing edges. The comb bars longitudinally spaced by elongated slots are provided with grooves 16 deep and wide enough to receive the cross-sectional thickness of a hair, and on opposite sides of and at the outer ends of the grooves the comb bars are provided with hair-guiding and deflecting edges 17 and 18 which are sufficiently blunt to provide only a mild scraping effect on the user's skin, and which are located intermediate the ends of the comb bars. The upper ends of the straight portions of the comb bars terminate in preferably upwardly rounded shoulders 19 which project outwardly of the outer surface of the arcuate middle portion and project high enough relatively thereto to preferably prevent the user's skin from being bulged into the arcuate portions of the elongated slots. At opposite longitudinal ends of the hollow portion formed by the hood-like structure of the outer shear member the transverse members 4, which hold the relatively thick side portions permanently in fixed planes serve also as end walls of the member being curved at their upper ends to parallel, or to substantially parallel, on a shorter radius, the plane of the arcuate middle portion.

The transverse portions 4 which serve as the end walls are secured to the relatively thick straight side portions 3 preferably permanently, the various parts or portions constituting one complete unit. Any suitable means may be employed to unite or connect the opposite straight side portions, and for this purpose the transverse end portions are provided with substantially oppositely disposed rigid or relatively rigid arms 20 which can be integral with the transverse member or preferably made of separate and different material. The arms have projecting

rigid or relatively rigid portions 21 which extend longitudinally against the relatively thick straight side portions 3, and are fixedly clamped to the transverse end portions and on the inner sides thereof by any suitable means such as bolts, or, more preferably, by rivets 22. The projecting portions 21 of the arms are similarly fixedly secured against the external sides of the relatively thick straight side portions by suitable means such as solder, bolts, or, more preferably by rivets 23. Preferably, also, the arms are against the longitudinal ends of the side portions, 3. The outer shear member is demountably supported as a unit by the casing handle M which is provided with longitudinal ledges 24 on opposite sides of the casing and which ledges are open at their opposite ends as well as at their outer sides. These ledges are preferably of the same lengths as the lengths of the bottoms of the straight side portions of the outer shear member to facilitate accurate seating of the latter and being open at their outer sides and ends can readily and thoroughly be wiped clear of dust, cut hair, or any substance which might interfere with the accurate seating of the outer shear member, and, for this purpose, are provided with plane surfaces. Projecting upwardly of these ledges and provided on the casing and extending longitudinally on opposite sides thereof paralleling the planes of the inner sides of the straight side portions of the outer shear member are walls 25 preferably having plane surfaces against which the inner sides of the side portions of the outer shear member snugly fit securing the outer member against lateral translatory movement. These walls extend preferably the full length of the ledges so that their longitudinal ends engage or are flush with the arm portions 20 of the transverse end walls, and at their upper marginal end portions are inclined as by bevelling from their lower end portions and with the edges rounded off, inclined toward their upper ends in a direction away from the planes of the inner sides of the arm portions of the transverse end walls, and in their longitudinal end portions in the region opposite the rivets 22 are suitably shortened or recessed to provide adequate clearance for the ends of the rivets. The engagement or flush fit of the outer shear member with the ends of the side walls of the casing provides a snug fit which preferably fixes the outer shear member against longitudinal movement. In some instances the fit of the outer shear member to the casing may be a forced fit, and, also, the sides 25 of the casing walls and the end portions confronting or abutting the arm portions 20 may be faced with hard metal. At their inner sides at their bottoms, for example at the free ends of the ribs, the straight side portions of the outer shear member are bevelled or rounded off to prevent damage, such as burring, to the side walls 25 during mounting or demounting, and, to facilitate cleaning, the ledges and side walls preferably meet at an obtuse angle or are joined by a rounded surface. At the longitudinal ends of the casing head portion and as will be clear on reference (see Fig. 3), transverse ledges are also provided which project longitudinally at the ends of the upper portion of the casing walls and which ledges are each transversely divided by a relatively raised portion of the casing, the raised portion being a continuation of the bottom wall of a longitudinally extending channel in the upper end of the casing. These transverse ledges

are between the planes of the longitudinal ledges 24 to provide the open ends of the latter and are below the transverse end walls of the outer shear member, and are preferably spaced below the transverse end walls of the member. It will be clear that the transverse end walls may be adapted to be seated on these ledges, but I prefer to space them therefrom not only to reduce the amount of surface which should be generally kept clean, but, also, to provide entrances for a forcing tool such as a lever. To further hold the outer member to the casing and in operative position thereon, screws 26 are preferably provided in removable engagement with the relatively thick side portion of the outer shear member and with opposite sides of the casing. It will be apparent that in order to eliminate the risk of dropping and damaging the outer shear member as a result of its removal or displacement from its operative position on the casing handle for cleaning or any other purpose, I may substitute for the screw or screws on one side other means of joining the outer shear member removably or displaceably to the casing: For example, in one embodiment I provide a movable joint or joints on one longitudinal side by connecting the outer member on one of its relatively thick side portions to one longitudinal side of the casing by means of a hinge or a pair of hinges longitudinally spaced, and on which the outer member may be swung into or out of operative position; the removable screw or screws on the opposite side serving to lock or unlock the outer member. The hinge or hinges are preferably secured to the relatively thick straight side portion of the outer shear member by any suitable means such as screws, but preferably by rivets, the securing means preferably engaging the side portions between the planes of the ribs and the hinge or hinges may be connected to any suitable portions of the side of the outer member, for example, they may be connected to that portion of the member lying in a plane between the planes of the projecting portions 21 of the arms 20 or they may be connected to these projecting portions. To the casing the hinges may be secured by any suitable means and are preferably secured thereto by relatively long screw bolts received in holes, the inner ends of which connect with recesses in which are fitted nuts held against turning by the side walls of the recesses on the casing. Split washers, twisted and of resilient metal, are provided in the recesses with the nuts at the inner ends of the bolt holes. By these means the hinge or hinges are removable from the casing for renewal of an outer shear member and securely hold the hinges to the casing, the turning of the screw bolts in the nut forcing the nuts toward the inner ends of the bolt holes with the washer under tension, so that risk of the bolts becoming loosened by vibration is minimized. Preferably, the width of the ledges 24 is such that their outer side longitudinal ends are flush with the outer longitudinal ends of the bottoms of the straight side portions of the outer shear member and on the hinged side the surface of the marginal portion of the casing immediately below the outer longitudinal side end of the ledge on the hinged side is flat and extends in a plane continuous with, or approximately so, the plane of the outer surface of the straight side portion of the outer shear member.

The co-operating movable inner cutter member which is designated generally by the reference numeral 27 is an elongated member pro-

vided on its upper portion with longitudinally spaced, transversely extending cutter bars 28 and transverse hair-receiving and rib-receiving slots 29. The projecting cutter bars have flat sides and their upper ends are arcuate, conforming in curvature to the inner surface of the arcuate portion of the outer shear member, and, transversely of their curvature the upper ends of the cutter bars are provided with flat surfaces adapted to travel against the inner surface of the arcuate portion of the outer shear member. At opposed sides of the flat surfaces are cutting edges formed by the meeting of the flat surfaces with the flat sides, which cutting edges are adapted to co-operate with the shearing edges in the outer member to cut hair, and at opposite longitudinal ends of the inner member are provided projecting portions 30 opposite sides of each of which have flat guiding surfaces 31 which serve to guide the movements of the member in the fixed guide bearings 32 which in this instance are provided in the end walls or transverse portion of the outer shear member, but which may be provided in the casing if desired. The inner cutter member is urged against the inner surface of the arcuate portion of the outer shear member with the transversely flat surface of the arcuate upper ends of the cutter bars in slidable engagement with the inner surface of the arcuate portion of the outer shear member, and may be so urged by any suitable means known in the art, for example by compression springs 33 and plungers 34 in wells 35, the inner cutting member resting at its opposite marginal ends on the free ends of the plungers. The inner cutter is axially reciprocated by means well known in the art by an electrically actuated bar or lever 35a, which is usually oscillatable and operated by the motor which is not shown. The hair-receiving slots 29 in the inner cutter member which space the cutter bars are, as will be noted, considerably wider, preferably very considerably wider, than the width of the ribs in the outer member; likewise, the cutter bars of the inner member are considerably narrower than the channels 6 of the outer shear member; ample room is thereby provided for the reciprocatory movements of the inner member. In axially reciprocated cutters "overthrow" is common, and to prevent the cutter bars from striking the ribs as a result of "overthrow" means are provided to limit the travel of the cutter opposite the longitudinal ends thereof; the transverse end wall portions 4 of the outer shear member are adapted for this purpose, the upper portion thereof co-operating with marginal end portions on the cutter which project longitudinally of each of the end cutter bars, and, to minimize noise and shock, there is provided on the confronting face of these co-operating portions, for example on the cutter, suitable cushioning means which are compressible and of a relatively soft material which is resilient to a suitable degree and in the general form of washers 36. During the reciprocatory movements of the cutter its cutting edges cooperate with the shearing edges on the outer member at the inner ends of the modified square openings 8 of the outer shear member to cut the hair which is received in the openings as the cutter travels back and forth with the transversely flat surfaces of the arcuate ends of the cutter bars against the inner surface of the arcuate portion of the outer shear member. The longitudinally spaced arcuate cutter bars engage only the ar-

uate portion of the outer shear member, and the transversely extending cutting edges on the cutter bars cooperate with the shearing edges of the outer member at the inner sides of the small perforations and with the shearing edges at the inner sides of the upper ends of the arcuate portions of the elongated slots; below the cutting edges the inner cutter is narrowed inwardly and downwardly, as shown, to provide, together with the outwardly and downwardly diverging straight side portions of the outer shear member, opportunity for relatively long hair to enter the straight portions of the elongated slots of the outer member in a more or less erect position without hindrance by the inner cutter; the straight ends of the cutter bars at the sides of the cutter are inclined to the straight portions of the comb bars of the outer shear member at an angle wide enough to prevent a hair being caught and pulled between their respective outer and inner surfaces, and merge at their upper ends with the arcuate surfaces of the cutting bars at preferably sharp corners.

In a preferred embodiment the outer shear member is constructed from metal sheet or narrow band which on one side has been channelled to provide the spaced ribs, as by milling or rolling, but preferably by rolling, and the perforating, tempering and lapping operations are performed while the metal is in a flat plane. The metal is flexible. In some instances the height of the middle portion of the ribs from the bottoms of the channels is reduced by milling or grinding. On the opposite side of the sheet or band and laterally of a transversely extending middle portion of suitable width, there are secured on the portions 37 generally rectangular plates 38 of any suitable rigid or relatively rigid material fitting flush at three ends with three ends of the sheet or band. The plates are preferably of metal and are soldered, or otherwise secured as by rivets to the position 37 serving to stiffen the portions of the band or sheet to which they are joined. At one marginal end of each plate comb bars have been formed by slotting and transversely thereof grooves have been formed and in securing the plates with the aforesaid ends flush, the slots of the plates are in registration with elongated slots in the band or sheet and provide the hair-receiving slots 13 heretofore described. Between the projecting shoulders 19 of the stiffening plates the thickness of the middle portion of the band or sheet is reduced by grinding to provide a shearing zone, or zones, in which the metal is of extreme thinness; this operation results in the formation of shoulders 39 which are substantially continuous with the shoulders 19, and may be considered as such, and decreasing the thickness of the middle portion relative to the side portions 37. The rigid arms 20 are secured, the rigid projecting portions 21 being riveted and the opposite ends being free. The member is then bent on a form having a cylindrical surface on the same length of radius as the arcuate upper end of the cutter bars of the inner cutter member, and having channels adapted to receive the ribs, and which also has flat side surfaces, also channelled to receive the intermediate ribs, the opposite ends of the form having recessed portions to receive the end ribs and projecting portions to guide the arms 20 and prevent relative longitudinal movement between the relatively rigid and thick side portions. The free end portions of the arms are then riveted to the rigid transverse member 4 completing the outer shear member as a unit with

the middle portion flexed to and fixed in arcuate form and permanently under tension. The unit is easily handled for seating and unseating purposes—and is protected against being distorted or damaged during handling. The metal in the arcuate middle portion provides a relatively firm shearing zone, the ribs reinforcing the arcuate zone and being under tension strengthening the portion as a whole against inward flexing from pressure on the skin and against outward flexing from the pressure of the cutter; the transverse webs overhanging the planes of the ribs are sufficiently firm and being relatively close together longitudinally relieve the metal bridging thereto from any relatively wide area of skin pressure, and the shear edges at the sides of the individual openings are sufficiently firm as not to be distorted in the direction of movement of the cutter during the shear-cutting actions.

The inner cutter 27 may be made in any suitable manner known in the art. As shown herein the cutter bars 28 and their arcuate upper ends and flat surfaces are provided on metal cutting elements 40 having flat bodies 41. At their ends opposite the opposed cutting edges 42 on each element, they are provided with flat bottoms 43 on which the cutter rests when it is removed from its operating position for cleaning or other non-operating purposes, and, extending vertically, flat ended opposite portions 44, preferably parallel, are provided to facilitate the assembly of the parts and their accurate alignments and to provide portions by which the parts may be conveniently held while being secured at opposite longitudinal ends of the assembly. At the upper ends of these portions 44, and diverging therefrom upwardly in the direction of the cutting ends of the elements are flat ended portions 45 which merge with the opposite ends 46 of the arcuate upper ends on obtuse angles. Holes 47 having slots 48 are provided in the flat bodies of the elements to receive a shaft 49 having a longitudinal key 51. The shaft may be of any suitable shape in cross-section and may be solid or hollow, for example, tubular. The cutting elements are longitudinally spaced, and preferably laterally supported, by spacing elements 52 which preferably have the same general shape as the cutting elements and terminate a suitable distance below the cutting edges of the cutting elements to provide the hair-receiving slots in the cutter member of uniform depth, or substantially uniform depth, and, as will be clear, the depth of these hair-receiving slots is fixed by the distance which the cutter bar portions project from the upper ends of the spacing elements, and the distance which the cutter bar portions project is usually, although not necessarily, determined by the thickness of the projecting portions, this distance usually being for instances where the projecting portions are of uniform, or substantially uniform, thickness in cross-section for the major part of their height, not greater than five times their thickness and preferably not greater than four times the thickness of these portions for the purpose of providing projecting cutting portions which are relatively rigid against lateral distortion during the shear-cutting actions. It will be clear, then, that the projecting cutter bar portions may be extremely thin to provide a minimum of friction and a maximum relative width of slot. At opposite longitudinal ends of the cutter assembly to preshorten its length the end spacing elements are usually of narrower width than the intermediate spacing elements, and the cutting and spacing elements are usually held in

assembled formation by end elements as shown. Between the outer faces of the end spacing elements and the inner faces of the end elements cushioning material in the form of washers are provided to limit cutter throw and noise. The cushioning material is relatively soft and elastic, and may be of fibre or rubber, portions of which are compressed against the end spacing elements by the end elements.

In Figure 7 there is shown a modification of the outer shear member and in which the member 1A has an arcuate middle portion 2A which is provided with a plurality of longitudinally and transversely spaced short narrow hair-receiving slots instead of the modified square hair-receiving openings, being in other respects the same as the outer shear member 1. These short narrow slots 53 extend lengthwise in the general direction of the ribs and are longitudinally spaced by transverse shear bars 54 on the inner sides of which are shear edges 55. The short slots are arranged in groups and the groups are longitudinally spaced by transverse webs 56 radially outwardly of and overhanging the planes of the ribs, and in each group the slots are transversely spaced by longitudinal webs 57 which connect with the shear bars and also the transverse webs.

In Figure 8 there is illustrated another modification of the outer shear member and in which the member 1B has an arcuate middle portion 2B which is provided with a plurality of longitudinally spaced and transversely spaced small hair-receiving openings 58 which are closely grouped in transverse panels longitudinally spaced by transverse webs 59 radially outwardly of and overhanging the planes of the ribs. The openings are in the shape of circular holes, a shape well known in the art, instead of the modified square hair-receiving openings, and the openings in each panel are arranged so that the openings in transversely alternate rows are longitudinally spaced from the openings in the intervening rows. Circular edges define the openings at their inner ends. In other respects the outer shear member 1B is the same as the outer shear member 1.

The arrangement of the small hair-receivings of the modification shown in Fig. 8 may be applied if desired to the grouping of the short slats shown in Fig. 7 or to the grouping of the modified square hair-receiving openings shown in Figures 1 and 4. To increase the opportunity for short hair to enter the small perforations, particularly short hair inclined to the direction in which the user may move the device, the outer skin-engaging surface of the outer shear member may be roughened in the area of the small perforations.

As illustrated in Figure 9 this roughening of the skin-engaging outer side is made by forming, as by cutting, in the outer member 1C and in its arcuate middle portion 2C preferably before it is bent to arcuate form, a plurality of narrow channels 60 which in a broad sense are formed by reducing the thickness of the shear bars with edges of which the cutter edges co-operate to cut hair and reducing the thickness of the bars relative to the thickness of the connecting bars. As shown here these channels extend longitudinally on the arcuate middle portion continuously from one longitudinal marginal end of the arcuate portion to the opposite longitudinal marginal end. The channels are transversely spaced by the connecting bars. The shear bars 61 are preferably superlatively thin in cross-section and the connecting bars 62 are extremely thin in cross-section. From the planes of the outer surfaces 63

of the shear bars the distance to the planes of the outer surfaces 64 of the connecting bars is very short, but is great enough to provide projections suitable to disturb a hair or hairs from their normal positions; and to facilitate the disturbing of hair the projecting connecting bars are provided, by the manner in which the channels are formed, with edges 65 which are preferably substantially sharp, the extreme shallowness of the channels will prevent the edges of the bars from cutting or scratching the skin of the user when the outer shear member is moved on the skin of the user in the preferred directions, which are transverse to the longitudinal axes of the channels and bars, the outer surface of the member serving as a guard for the successive edges 65 of the bars, in a somewhat similar manner as does the guard in the commonly known safety razor for the extremely and acutely sharp edge of the razor blade used in the common safety razor; in some instances the narrowness of the channels will serve to protect the skin; and in its arcuate form the curvature of the outer surface will increase the effectiveness of the outer surface as a guard. These edges extend longitudinally for the lengths of the channels together with the connecting bars providing longitudinally extending projecting webs of metal whose projecting portions are spaced transversely by the channels, and these webs connect with or bridge to the longitudinally spaced transverse webs radially outwardly of the ribs 5 on the inner or cutter-engaging side 66 of the arcuate portion. The corners 67 where the outer sides of the shear bars join or merge with the projecting connecting bars may have any convenient shape. The projecting webs serve to engage the free ends of inclined hairs, or the side of hairs, and to tauten the skin tending to erect the hairs, being most effective in accomplishing these results when the free ends of the hairs lie in a direction opposed to or angular to the direction of movement of the device. In other respects the outer shear member 1C is the same as the outer member 1 and the modification shown in Fig. 9 is a sectional view of the modification as applied to the member 1 and taken along the plane of the line 9-9 of Figure 5. The construction as shown in Fig. 9 and with slots instead of the modified square hair-receiving openings can, of course, be applied to the structure shown in Fig. 7 and can be easily understood by viewing Fig. 9 as a sectional view of that modified structure on the plane of the line 9-9. The structure shown in Fig. 8 may be modified also in a similar manner. It will be noted that superlative thinness in cross-section of the shear bars may be attained to a degree sufficient to prevent lateral distortion of the shear bars and that this degree of thinness may be barely sufficient to prevent such permanent distortion, irrespective of the relationship between the widths and the lengths of the shear bars, and that the width of the shear bars may be so proportioned to their length that wear may destroy the shear bars in commercial use without risk of injury to the user, the connecting bars or webs preventing damage to the skin by the cutting during the destruction.

In Figure 10 there is shown a modified form of guide bearing for the inner cutter member and in which flat bodied, generally U-shaped elements 68 are positioned longitudinally spaced. Spaced projecting arm portions have inner side faces 70 confronting a hollow portion adapted to receive the opposite marginal longitudinal ends

of the inner cutter. These guide bearings are preferably accurately positioned on the casing-handle and removably secured thereto by screws entering the holes 71 which are aligned with screw-receiving holes in the casing, the guide bearings thereby renewable with the inner cutter member and more particularly with the end elements of the inner cutter assembly. Such guide bearings may be used instead of, or, supplementary to, the guide bearings in the transverse end wall or member.

In Figure 11 there is shown a modified form of inner cutter bar, and in which flat bodied elements 72 of relatively thin cross-sectional thickness and having in appearance the same general outline of the elements previously described have had portions of metal removed providing holes transversely between oppositely disposed end bar portions 73 and a centrally disposed bar portion 74; the bars support and at their upper ends merge with arcuate rim-like portions on opposite sides of which are arcuate cutting edges 75 merging with the ends of the bars and extending from end to end of the cutting element. The holes serve in the manufacture of the elements to facilitate cutting opposite inclined sides 76 of the rim-like portions so as to provide these portions with sharp cutting edges formed by the meeting at relatively small acute angles of the oppositely inclined sides 76 with the lateral ends of the upper face of the elements; opposite sides of the marginal upper ends of the bars may be hollow ground to provide sharp portions of the cutting edges if desired. The elements are assembled in the same manner and relation as has previously been described to provide the inner cutter member, and the member is reciprocated as previously described.

In Figure 12 there is illustrated an inner cutter in which the cutter bars are provided in the form of cutting elements 77 and 78 which are positioned side to side or back to back and held in such relation by the spacing elements. On laterally and oppositely projecting portions of the respective elements are provided arcuately extending cutting edges 79 and 80 which are formed at the meeting of the transverse ends of the flat outer or upper ends 81 with the acutely and oppositely inclined sides 82 and 83 of the laterally projecting portions of the respective elements. The acutely inclined sides are inclined to the outer surface 81 at a relatively small acute angle and the distance of lateral projection of these portions is very short. As a result the cutting edges are very sharp and firm. By substituting such pairs of elements for the individual elements previously described the cutter member is constructed, guided and reciprocated as previously described, and, usually, in this modified form the ends of the cutting edges preferably terminate in rounded corners.

In Figure 13, a further modification in construction of the inner cutter member is shown and in which the cutter bars are of flexible material and generally Y-shaped in cross-section, and usually formed by positioning side to side, or back to back a pair of elements having outwardly projecting marginal end portions, the marginal end portions forming an arcuate groove *a*. At the outer arcuate sides of the cutter elements are acute cutter edges 84 and 86 and at the inner sides are cutter edges 85 and 87 which are sharp, having grooves, as shown, as the result of grinding, preferably hollow grinding, the inner sides of the marginal end portions. The elements are

held in position by spacing elements 88 and 89 which preferably serve also as clamps, although it will be understood that the cutter elements may be joined together as a unit by solder or other means before positioning on the shaft. In this assembly the spacing elements are provided with shoulders 91 and 92 which support the marginal ends of the cutter bars or blades on their outer sides and act to limit the flexing of the cutter bars in the direction of the axis of the cutter. At the upper ends of the spacing elements arcuately extending recesses 93 and 94 are provided to receive hair, with a minimum tendency to bend long hair. Between the edges 84 and 85 and 86 and 87 of the respective members, the end surfaces are flat and, of course, extend arcuately; at their ends the edges are preferably rounded rather than pointed; and the projecting portions of the elements as viewed from the top looking down in the groove preferably flare outwardly at their ends to the cutting edges or to the region of the cutting edges so that the length of the projecting or bent portions is greater at the top than at the bottom of the groove. To facilitate sharpening the elements, more particularly grinding and lapping their ends which travel against the inner surface of the outer shear member any suitable means may be employed, but preferably, an arcuate bar wedge shaped in section to conform to the groove *a* is connected at each end to corresponding ends of another bar seated in the groove 90 by coil springs under tension which cause the arcuate bar in the groove *a* to force the marginal ends of the cutter elements against the shoulders of the spacing elements, that is the groove *a* is widened and the marginal ends are under tension. After sharpening the bars and springs are removed and the marginal ends spring towards each other narrowing the groove. In positioning the cutter in operative position the outer shear member flexes the marginal ends of the cutter and the outer ends of the cutter elements conform to or parallel the plane of the inner surface of the outer member with the marginal ends of the cutter elements bearing against the inner surface of the outer member. As shown here the marginal end portions are in the position in which they bear against the inner surface of the outer member. They may be maintained in this position during operation and wear by the springs 33 urging the cutter as a whole in the direction of the outer member, as previously described; or in some instances the inner cutter may be supported in fixed bearings and the springs 33 dispensed with and intimate contact between the co-operating shear cutting members be effected by the inherent resilience of the cutter elements of the inner cutter member.

It will be understood from the foregoing that, preferably, the channels in the outer member are narrow enough to prevent the skin from flexing the outer member out of its arcuate plane in the shearing zone under ordinary shaving pressure, but I wish it to be further understood that I may employ channels of any suitable width relative to the thinness or strength of the shearing zone of the outer member, and that in instances where the channels are relatively wide and the shearing zone relatively weak suitable provision is made for the cutter edges to pass the edges of the outer member during operation, for example by inclining the cutter edges in the direction of cutter movement, or by curving the edges, or suitable portions thereof, of the outer member, and I wish it to be further understood that in commercial

practice changes in arrangement and construction and proportions of parts may be made without departing from the spirit and scope of the invention.

Therefore, what I claim is:

1. A shaving machine including a casing-handle, an outer shear member supported on the casing-handle and having an extremely thin portion flexed to arcuate form, spaced ribs projecting rearwardly from the inner face of said member and reinforcing the arcuate portion on its inner side, panels of small hair-receiving openings of relatively narrow width provided in the arcuate portion between the planes of the ribs, relatively thick and rigid straight side portions depending from opposite longitudinal sides of the arcuate portion, relatively wide elongated hair-receiving openings longitudinally spaced at the upper marginal ends of the relatively thick portions and registering with portions of elongated hair-receiving openings extending from the thin arcuate portion of the member, projecting comb teeth provided on bars spacing the elongated openings of the relatively thick side portions, said comb teeth projecting outwardly of the plane of the upper ends of said bars, and a co-operating inner cutter provided with edges to co-operate with edges at the inner ends of the relatively small and the relatively large hair-receiving openings, and means to actuate the inner cutter.

2. A shaving machine as claimed in claim 1, and with said straight side portions depending in planes diverging downwardly, and projecting hair-engaging ends provided on the comb teeth below the uppermost ends of said teeth.

3. In a dry shaving head, the combination of an outer member having a curved shearing portion of relatively thin material and straight side portions tangential thereto and of relatively thick material, shearing elements in said outer member at the inner sides of spaced relatively small perforations in said shearing portion thereof, combined combing and shearing bars spaced in said outer member by slots extending from said relatively thin curved shearing portion into said relatively thick and tangential portions thereof, said slots being individually of greater width than the individual width of said perforations, an inner movable member having a curved shearing portion engaging only said shearing portion of said outer member, and shearing elements in said inner movable member spaced by slots extending transversely of said shearing portion thereof and disposed beneath said perforations and the curved portions of said slots of said outer member.

4. In a dry shaving head, the combination of an outer member having a curved shearing portion of relatively thin material and straight side portions tangential thereto and of relatively thick material, shearing elements in said outer member at the inner sides of spaced relatively small perforations in said shearing portion thereof, combined combing and shearing bars spaced in said outer member by slots extending from said relatively thin shearing portion into said relatively thick and tangential portions thereof, a longitudinally reciprocable inner member having a curved shearing portion engaging only said shearing portion of said outer member, shearing elements in said inner movable member spaced by slots extending transversely of said shearing portion thereof and disposed beneath said perforations and the curved portions of said slots of said outer member, and fixed bearing means in said

outer member for guiding said reciprocable inner member longitudinally.

5. In an outer shear member, a shearing portion, extremely shallow longitudinal channels formed in said outer member in the outer face of said shearing portion thereof, external ribs extending longitudinally transversely spacing said longitudinal channels, longitudinally spaced, small, hair-receiving perforations formed through the bottom wall of each of said longitudinal channels in planes transversely between said external ribs, hair-engaging edges extending longitudinally on said external ribs, and shearing elements on said shearing portion at the inner ends of said hair-receiving perforations.

6. In a shaving machine, the combination of a movably mounted inner cutter, oppositely and outwardly projecting, spaced, resilient cutting portions on said inner cutter, a cutter edge on each of said cutting portions, a perforated cooperating outer shear member, and means supporting said inner cutter with said resilient cutting portions thereof engaging said outer shear member and forced under tension thereby.

7. In a shaving machine, the combination of a movably mounted inner cutter member, oppositely and outwardly projecting, spaced, resilient cutting portions on said inner cutter, a cutter edge on each of said cutting portions, means supporting one side of said spaced cutting portions, a perforated cooperating outer shear member engaging the cutter edge-carrying ends of said inner cutter member, and means urging said inner cutter member as a whole in the direction of the cutter ends engaging surface of said outer shear member and forcing said resilient cutting portions on said inner cutter under tension against said outer shear member.

8. For a shaving machine, an outer shear member provided with an arcuate shearing portion and straight side portions depending from opposite sides thereof, spaced perforations formed in said shearing portion and providing an arcuate hair-receiving zone, spaced ribs projecting rearwardly from the inner face of said member and reinforcing said shearing portion intermediate the ends of said hair-receiving zone and reinforcing said straight side portions of said outer shear member, and rigid means projecting from and connecting said straight side portions at opposite longitudinal ends thereof.

9. For a shaving machine, an outer shear member provided with an extremely thin shearing portion flexed to arcuate form and straight side portions depending from said shearing portion thereof, spaced perforations formed in said shearing portion and providing an arcuate hair-receiving zone, spaced ribs flexed to arcuate form projecting rearwardly from the inner face of said shearing portion and reinforcing said shearing portion intermediate the ends of said hair-receiving zone, straight portions on said spaced ribs reinforcing said straight side portions of said outer shear member, and longitudinally spaced members carried on said outer shear member at opposite longitudinal ends of said straight side portions thereof rigidly and transversely connecting said straight side portions and fixing the shape of said outer shear member.

10. A shaving machine including a casing-handle, an outer shear member supported on the casing-handle and having an extremely thin portion flexed to arcuate form and relatively thick and rigid straight side portions depending in downwardly diverging planes from said portion

flexed to arcuate form, spaced ribs projecting rearwardly from the inner face of said outer member and reinforcing the arcuate portion on its inner side, extremely shallow narrow longitudinal channels formed in said outer member in the outer face of said arcuate portion thereof, narrow external ribs extending longitudinally continuous with and transversely spacing said longitudinal channels, longitudinally spaced, small hair-receiving perforations formed through the bottom wall of each of said longitudinal channels in planes transversely between said external ribs and between the planes of said ribs reinforcing said arcuate portion on its inner side, hair-engaging edges on opposite sides of said external ribs laterally defining the tops of said channels, relatively wide elongated hair-receiving openings longitudinally spaced at the upper marginal ends of said relatively thick straight side portions and registering with portions of elongated hair-receiving openings extending from the thin arcuate portion of said outer shear member into said thick straight side portions thereof, protuberantly projecting comb teeth provided on transverse bars spacing said elongated openings of said relatively thick side portions, shearing elements on said outer shear member at the inner sides of said small perforations and at the inner sides of the upper portions of said elongated hair-receiving openings, a movably mounted cooperating inner cutter having an arcuate cutting portion engaging said arcuate portion of said outer shear member, transverse cutter bars longitudinally spaced in said inner cutter by relatively wide rib-receiving and hair-receiving slots, arcuate cutter edges on said cutter bars, and means to actuate the inner cutter.

11. In a dry shaving head, the combination of an outer member having a thin shearing portion of sheet metal flexed to arcuate form and relatively thicker straight side portions tangential to said shearing portion thereof, shearing elements formed in said outer member by closely grouped small perforations in a relatively central area of said shearing portion thereof, shearing bars formed in said shearing portion by spaced slots extending transversely in said outer member in longitudinal rows on transversely opposite sides of said central area thereof, said slots being longer and wider than said small perforations, said central area of said outer member including shearing elements formed in said shearing portion by small openings located relatively close to the lateral ends thereof, said straight side portions of said outer member having their inner ends, adjacent said shearing portion, protuberantly projecting high enough relatively to the outer surface of said shearing portion to guard the skin of the user by lifting the skin substantially tangentially to the arcuate portion at the inner ends of said slots, an inner movable member having a curved shearing portion engaging said shearing portion of said outer member, arcuate shearing elements in said inner movable member spaced by spaced slots extending transversely of said shearing portion thereof and disposed rearwardly opposite to said shearing portion of said outer member, and skin-guarding means in said outer member depending rearwardly from the lateral ends of said shearing portion and rearwardly of the shearing edges of said inner movable member.

12. In a dry shaving head, the combination of an outer member having a thin shearing portion of sheet metal flexed to arcuate form and rela-

tively thicker straight side portions tangential to said shearing portion thereof, shearing elements formed in said outer member by closely grouped small perforations in a relatively central area of said shearing portion thereof, shearing bars formed in said shearing portion by spaced slots extending transversely in said outer member in longitudinal rows on transversely opposite sides of said central area thereof, said central area of said outer member including shearing elements formed in said shearing portion by small openings located relatively close to the lateral ends thereof, said straight side portions having on their inner ends comb teeth in planes offset from the planes of said slots with the free ends of said teeth facing in the direction of curvature of said outer member and said teeth having their outer ends high enough relatively to the outer surface of said shearing portion to guard the skin of the user by lifting the skin substantially tangential to the arcuate portion at the inner ends of said slots, an inner movable member having a curved shearing portion engaging said shearing portion of said outer member, arcuate shearing elements in said inner movable member spaced by spaced slots extending transversely of said shearing portion thereof and disposed rearwardly opposite to said shearing portion of said outer member, and skin-guarding means in said outer member depending rearwardly from the lateral ends of said shearing portion and located rearwardly of the lateral edges of said inner movable member.

13. In a dry shaving head, the combination of an outer member having a cylindrical segment shearing portion of thin sheet metal and relatively thicker rearwardly flaring straight side portions tangential thereto, said straight side portions having inner ends protuberantly projecting relatively to the plane of the outer surface of said shearing portion, shearing elements formed in said outer member by spaced perforations in said shearing portion thereof, combing and shearing bars formed in said outer member by spacing slots extending from said shearing portion into said tangential portions thereof, a longitudinally reciprocable inner member having an arcuate shearing portion engaging said shearing portion of said outer member and having straight side portions meeting said arcuate shearing portion of said inner member, and shearing elements in said inner member spaced by slots extending transversely of said shearing portion thereof, said slots of said inner member having their transversely opposite ends open at said straight side portions of said inner member, and said inner member being disposed with said arcuate and said straight side portions thereof respectively opposite said segment and said straight side portions of said outer member.

14. In a dry shaving head, the combination of an outer member having a cylindrical segment shearing portion of thin sheet metal and relatively thicker rearwardly flaring straight side portions tangential thereto, shearing elements formed in said outer member by spaced perforations in a relatively central area of said shearing portion thereof, said perforations being individually of narrow width in the direction perpendicular to the direction of curvature of said shearing portion, combing and shearing bars spaced in said outer member by spaced slots extending from said shearing portion into said tangential portions thereof, said slots being individually of relatively greater width than said per-

forations in the corresponding direction, and said straight side portions having their inner ends protuberantly projecting upwardly relatively to the arcuate plane of the outer surface of said segment for lifting the skin of the user relatively to the adjacent portions of said segment, a longitudinally reciprocable inner member having an arcuate shearing portion engaging said shearing portion of said outer member and having straight side portions meeting said arcuate portion of said inner member, and shearing elements in said inner member spaced by slots extending transversely of said shearing portion thereof, said slots of said inner member having their transversely opposite ends open at said straight side portions of said inner member, and said inner member being disposed with said arcuate and said straight side portions thereof respectively opposite said segment and said straight side portions of said outer member.

15. In a dry shaving head, the combination of an outer member having a cylindrical segment shearing portion of thin sheet metal and relatively thicker rearwardly flaring straight side portions tangential thereto, shearing elements formed in said outer member by spaced perforations in a relatively central area of said shearing portion thereof, said perforations being individually of narrow width in the direction perpendicular to the direction of curvature of said shearing portion, combing and shearing bars spaced in said outer member by spaced slots extending from said shearing portion into said tangential portions thereof, said slots being individually of relatively greater width than said perforations in the corresponding direction, and said straight side portions having on their inner ends comb teeth protuberantly projecting upwardly relatively to the arcuate plane of the outer surface of said segment for lifting the skin of the user relatively to the adjacent portions of said segment, combing edges on said straight side portions intermediate the ends of said bars and extending transversely to the axes of said bars, a longitudinally reciprocable inner member having an arcuate shearing portion engaging said shearing portion of said outer member and having straight side portions meeting said arcuate portion of said inner member, and arcuate shearing bars in said inner member spaced by slots extending transversely of said shearing portion thereof, said slots of said inner member having their transversely opposite ends open at said straight side portions of said inner member, and said inner member being disposed with said arcuate and said straight side portions thereof respectively opposite said segment and said straight side portions of said outer member.

16. In a dry shaving head, the combination of an outer member having a cylindrical segment shearing portion of thin sheet metal as its only shearing portion and relatively thicker rearwardly depending side portions, said side portions having their inner ends projecting laterally upwardly of the arcuate plane of said segment and forming together with the curvature of said segment longitudinal grooves at the lateral sides thereof over which the skin of the user may bridge, shearing elements formed in said outer member by spaced perforations in a relatively central area of said shearing portion thereof, combing and shearing bars spaced in said outer member by spaced slots extending transversely from said shearing portion at the lateral sides of the area of small perforations into said side portions

of said outer member, a longitudinally reciprocable inner member having an arcuate shearing portion engaging said shearing portion of said outer member, and shearing bars in said inner member spaced by slots extending transversely of said shearing portion thereof and disposed rearwardly of said slots and said perforations of said outer member.

17. In a dry shaving head, the combination of an outer member having a cylindrical segment shearing portion of thin sheet metal as its only shearing portion and relatively thicker rearwardly depending side portions, said side portions having comb teeth at their inner ends and having the free ends of said teeth projecting laterally upwardly of the arcuate plane of said segment and forming together with the curvature of said segment longitudinal grooves at the lateral sides thereof over which the skin of the user may bridge, shearing elements formed in said outer member by spaced perforations in a relatively central area of said shearing portion thereof, said central area of said outer member including shearing elements formed in said shearing portion by small openings located relatively close to the longitudinal arcuate ends thereof, shearing bars spaced in said outer member in said shearing portion thereof by spaced slots extending transversely from the lateral sides of said central area and laterally and rearwardly of said free ends of said comb teeth, an inner movable member having an arcuate shearing portion engaging said shearing portion of said outer member, arcuate shearing bars in said inner movable member spaced by spaced slots extending transversely of said shearing portion thereof and disposed rearwardly opposite to said shearing portion of said outer member, and skin-guarding means in said outer member depending rearwardly on the longitudinal arcuate ends of said shearing portion thereof and depending externally of the longitudinal ends of said shearing portion of said inner member and rearwardly of the shearing edges thereof.

18. In a dry shaving head, the combination of an outer member having a cylindrical segment shearing portion of thin sheet metal and relatively thicker rearwardly depending straight side portions, extremely shallow longitudinal channels formed in said outer member in a relatively central area of the outer face of said shearing portion thereof, longitudinally extending narrow external ribs in said outer member in said central area of said outer face thereof transversely spacing said channels, shearing elements formed in said outer member by longitudinally spaced, small perforations formed through the bottom wall of each of said channels in planes transversely between the planes of said external ribs, hair-engaging edges longitudinally extending on said ribs and laterally defining the tops of said channels, combing and shearing bars spaced in said outer member on transversely opposite sides of the area of said external ribs by spaced slots extending transversely from said shearing portion of said outer member into said straight side portions thereof, an inner movable member having an arcuate shearing portion engaging said shearing portion of said outer member, and arcuate shearing bars in said inner movable member spaced by slots extending transversely of said shearing portion thereof and disposed rearwardly opposite to said shearing portion of said outer member.

19. In a dry shaving head, the combination of

an outer member having a cylindrical segment shearing portion of thin sheet metal and relatively thicker rearwardly flaring straight side portions, shearing elements formed in said outer member by spaced small perforations in said shearing portion thereof, combing and shearing bars spaced in said outer member by spaced slots extending transversely from said shearing portion into said straight side portions thereof, said combing and shearing bars having intermediate their ends protuberantly projecting shoulders transversely spacing longitudinal inner and outer external grooves in said outer member, said inner external grooves of said member being formed by the laterally upward projection of said shoulders relative to the arcuate plane of the outer surfaces of the inner portions of said combing and shearing bars, and said outer external grooves being defined at opposite longitudinally extending outer ends by inner and outer edges transverse to the axes of said bars, the inner of said edges being on said protuberantly projecting shoulders and being combing edges, and the outer of said edges projecting laterally of said combing edges, a movable inner member having a shearing portion concentrically arcuate with the inner face of said shearing portion of said outer member, and arcuate shearing elements in said inner member spaced by slots extending transversely of said shearing portion thereof and disposed rearwardly opposite to said shearing portion of said outer member.

20. In a dry shaving head, the combination of an outer member having a cylindrical segment shearing portion of thin sheet metal and relatively thicker rearwardly flaring straight side portions, extremely shallow longitudinal channels formed in said outer member in a relatively central area of the outer face of said shearing portion thereof, longitudinally extending narrow external ribs in said outer member in said central area of said outer face thereof transversely spacing said channels, shearing elements formed in said outer member by spaced small perforations formed through the bottom wall of each of said channels in planes transversely between the planes of said external ribs, said small perforations being relatively closely spaced longitudinally, hair-engaging edges longitudinally extending on said ribs and laterally defining the tops of said channels, combing and shearing bars, spaced relatively more widely longitudinally than said shearing elements, spaced in said outer member on transversely opposite sides of the area of external ribs by slots extending transversely from said shearing portion of said outer member into said straight side portions thereof, said slots being relatively more widely spaced longitudinally than said small perforations, said combing and shearing bars having intermediate their ends protuberantly projecting shoulders transversely spacing longitudinal inner and outer external grooves in said outer member, said inner external grooves of said member being formed by the laterally upward projection of said shoulders relative to the arcuate plane of the outer surfaces of the inner portions of said combing and shearing bars, and said outer external grooves being defined at opposite longitudinally extending outer ends by inner and outer edges transverse to the axes of said bars, the inner of said edges being on said protuberantly projecting shoulders and being combing edges, and the outer of said edges projecting laterally of said combing edges, a longitudinally reciprocable inner member having a

shearing portion concentrically arcuate with and engaging the inner face of said shearing portion of said outer member, and arcuate shearing elements in said inner member spaced by slots, extending transversely of said shearing portion thereof and disposed rearwardly opposite to said shearing portion of said outer member.

21. In a dry shaving head, the combination of an outer member having a cylindrical segment shearing portion of thin sheet metal and relatively thicker rearwardly flaring straight side portions, extremely shallow longitudinal channels formed in said outer in a relatively central area of the outer face of said shearing portion thereof, longitudinally extending narrow external ribs in said outer member in said central area of said outer face thereof transversely spacing said channels, shearing elements formed in said outer member by spaced small perforations formed through the bottom wall of each of said channels in planes transversely between the planes of said external ribs, said small perforations being relatively closely spaced longitudinally and said central area of said outer member including shearing elements formed in said shearing portion by small openings located relatively close to the longitudinal arcuate ends of said member, hair-engaging edges longitudinally extending on said ribs and laterally defining the tops of said channels, combing and shearing bars, spaced relatively more widely longitudinally than said shearing elements, spaced in said outer member on transversely opposite sides of the area of external ribs by slots extending transversely from said shearing portion of said outer member into said straight side portions thereof, said slots being relatively more widely spaced longitudinally than said small perforations, said combing and shearing bars having intermediate their ends protuberantly projecting shoulders transversely spacing longitudinal inner and outer external grooves in said outer member, said inner external grooves of said member being formed by the laterally upward projection of said shoulders relative to the arcuate plane of the outer surfaces of the inner portions of said combing and shearing bars, and said outer external grooves being defined at opposite longitudinally extending outer ends by inner and outer edges transverse to the axes of said bars, the inner of said edges being on said protuberantly projecting shoulders and being combing edges, and the outer of said edges projecting laterally of said combing edges, a longitudinally reciprocable inner member having an arcuate shearing portion concentrically curved with and engaging the inner surface of said shearing portion of said outer member, arcuate shearing elements in said reciprocable inner member spaced by spaced slots extending transversely of said shearing portion thereof and disposed rearwardly opposite to said shearing portion of said outer member, means for guiding said reciprocable inner member longitudinally, and skin-guarding means in said outer member depending rearwardly on the longitudinal arcuate ends of said cylindrical segment shearing portion thereof and depending externally of the longitudinal ends of said shearing portion of said reciprocable inner member and rearwardly of the shearing edges thereof.

22. In a dry shaving head, the combination of an outer member having a shearing portion of thin sheet metal fixedly flexed in cylindrical segmental form and relatively thicker and rigid rearwardly flaring straight side portions, longitudinally spaced transverse internal ribs in said outer

member extending from said straight side portions thereof and arcuately reinforcing on its inner face and projecting rearwardly from said shearing portion thereof, shearing elements formed in said outer member by a plurality of small perforations in a relatively central longitudinal area of said shearing portion thereof in planes lateral of the planes of said internal ribs, combing and shearing bars longitudinally spaced in said outer member by spaced slots extending transversely in said outer member from transversely opposite sides of said shearing portion thereof into said straight side portions thereof and in planes lateral of the planes of said internal ribs, said central longitudinal area of said outer member including shearing elements formed in said shearing portion by small transversely spaced perforations located relatively close to the longitudinal arcuate ends of said outer member, a longitudinally reciprocable inner member having a shearing portion concentrically arcuate with and engaging the inner face of said shearing portion of said outer member, arcuate shearing elements in said inner member relatively widely spaced by spaced slots extending transversely of said shearing portion thereof and disposed rearwardly opposite to said shearing portion of said outer member and receiving said internal ribs of said outer member, and skin-guarding means in said outer member depending rearwardly on the longitudinal arcuate ends of said shearing portion thereof and depending externally of the longitudinal ends of said shearing portion of said reciprocable inner member and rearwardly of the shearing edges thereof.

23. In a dry shaving head, the combination of an outer member having a cylindrical segment shearing portion of thin sheet metal and relatively thicker and rigid rearwardly flaring straight side portions, extremely shallow narrow longitudinal channels formed in said outer member in a relatively central longitudinal area of the outer face of said shearing portion thereof, longitudinally extending narrow external ribs in said outer member in said central area of said outer face thereof transversely spacing said channels, hair-engaging edges longitudinally extending on opposite sides of said ribs and laterally defining the tops of said channels, longitudinally spaced transverse internal ribs in said outer member extending from said straight side portions thereof

and arcuately reinforcing on its inner face and projecting rearwardly from said shearing portion thereof, shearing elements formed in said outer member by spaced small perforations formed through the bottom wall of each of said channels in planes transversely between the planes of said external ribs and longitudinally lateral of the transverse planes of said internal ribs, combing and shearing bars longitudinally spaced in said outer member by spaced slots extending transversely in said outer member from transversely opposite sides of said shearing portion thereof into said straight side portions thereof and in planes longitudinally lateral of the planes of said internal ribs, comb teeth in said straight side portions of said outer member constituting the outer faces of outer portions of said combing and shearing bars and having shoulder-like ends adjacent to the transverse ends of said segment shearing portion and projecting laterally upwardly relatively to the arcuate plane of the outer surface of the inner portions of said bars, combing edges in said comb teeth transversely defining the longitudinally extending outer ends of the inner sides of narrow longitudinal grooves in the outer faces thereof, edges projecting laterally of said combing edges at the transversely opposite sides of said grooves in said comb teeth, said segment shearing portion of said outer member including shearing elements formed therein by small transversely spaced perforations located relatively close to the longitudinal arcuate ends of said outer member, a longitudinally reciprocable inner member having a shearing portion concentrically arcuate with and engaging the inner face of said shearing portion of said outer member, arcuate shearing elements in said inner member relatively widely spaced by spaced slots extending transversely of said shearing portion thereof and disposed rearwardly opposite to said shearing portion of said outer member and receiving said internal ribs of said outer member, means for guiding said reciprocable inner member longitudinally, and skin-guarding means in said outer member depending rearwardly on the longitudinal arcuate ends of said segment shearing portion thereof and depending externally of the longitudinal ends of said shearing portion of said reciprocable inner member and rearwardly of the shearing edges thereof.

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