April 20, 1943. L. C. CARISSIMI 2,317,177

DRY SHAVER

Filed Aug. 3, 1940 2 Sheets-Sheet 1

Fig. 1.

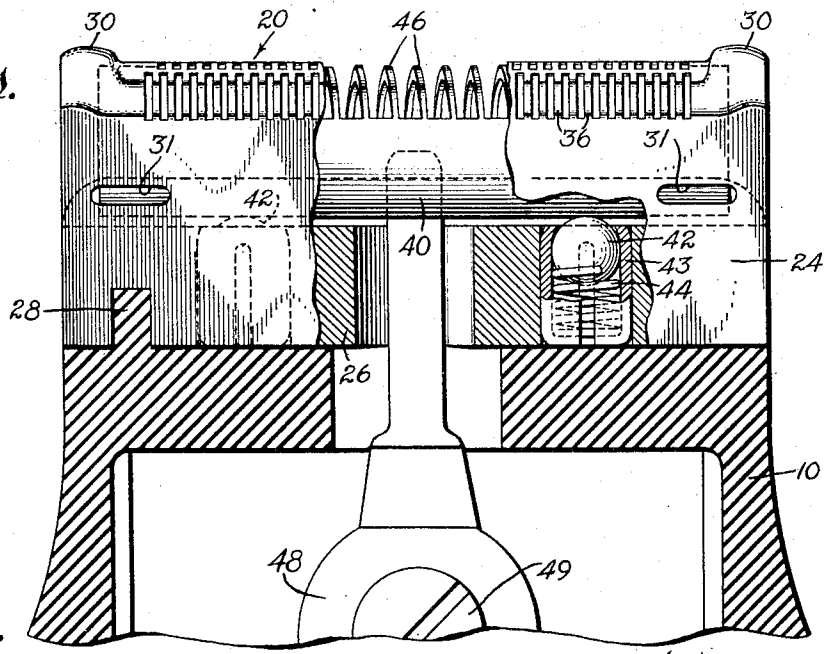

Fig. 2.

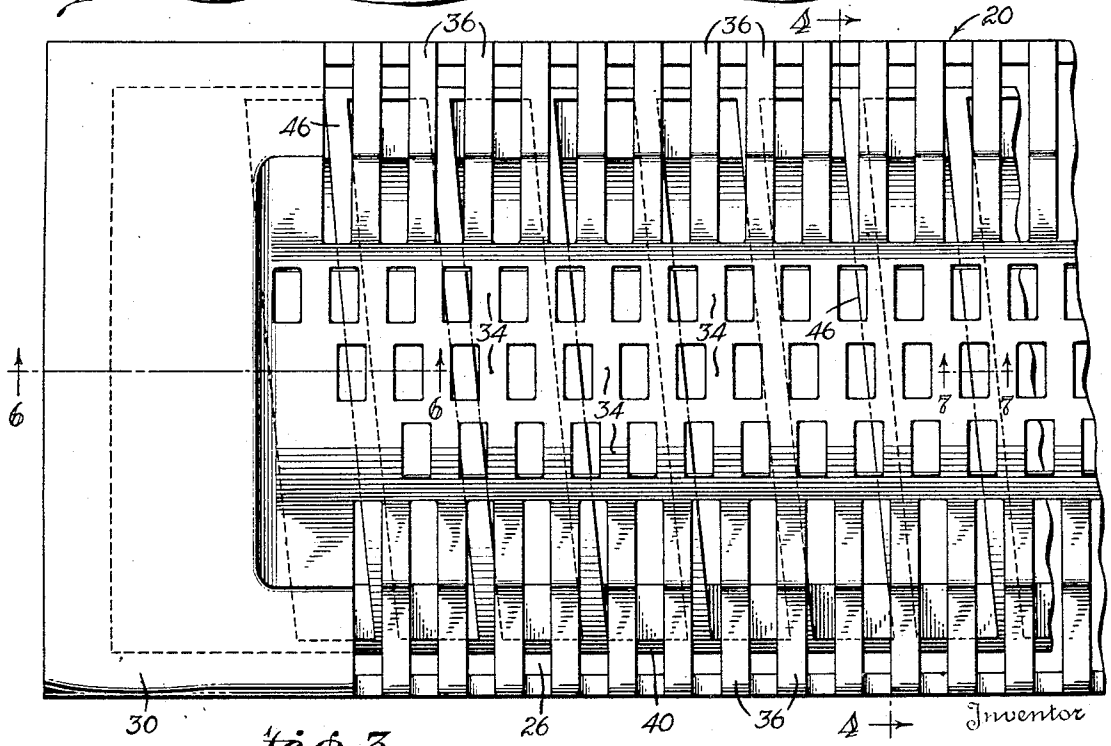

Fig. 3.

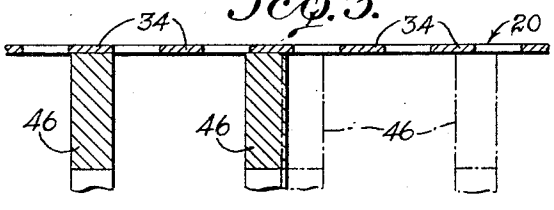

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Fig. 4.

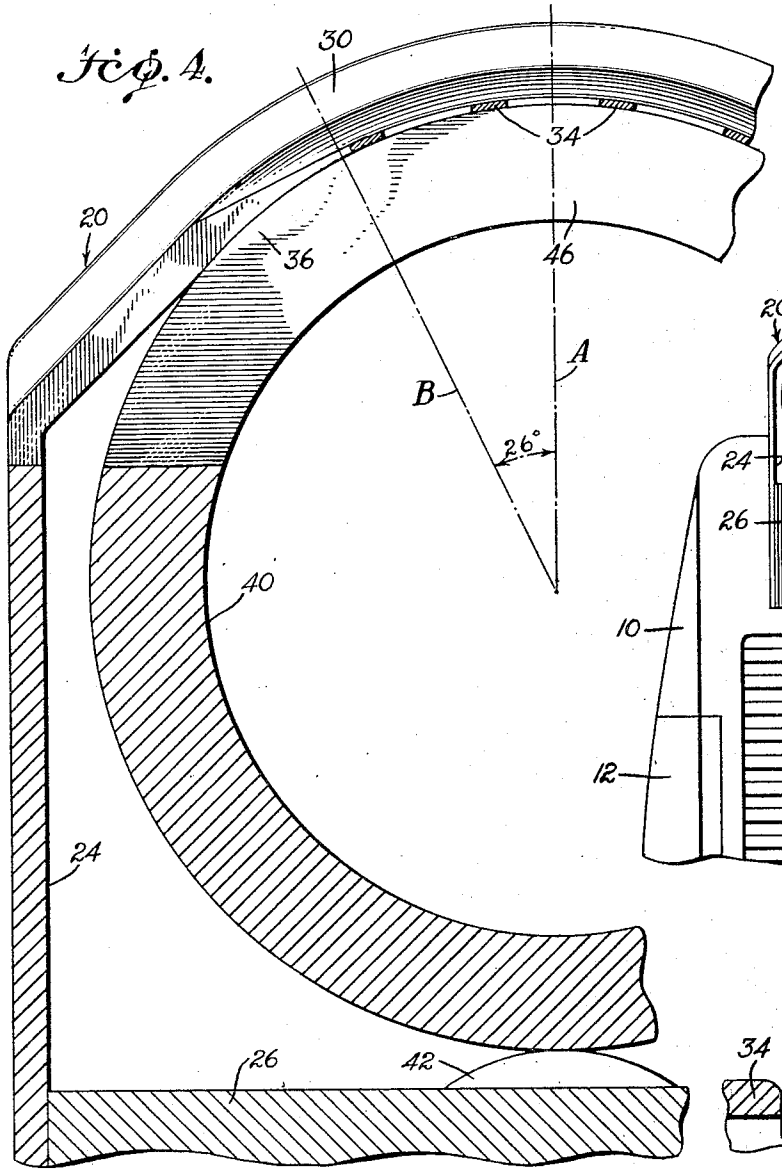


Fig. 5.

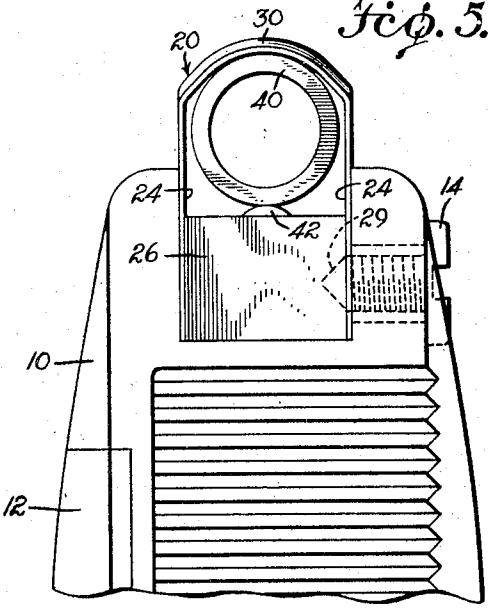


Fig. 7.

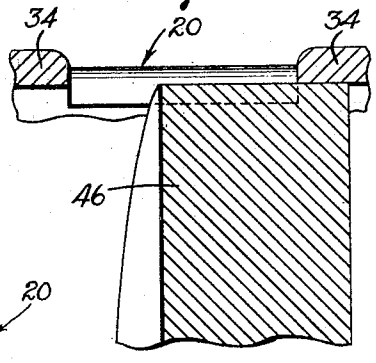
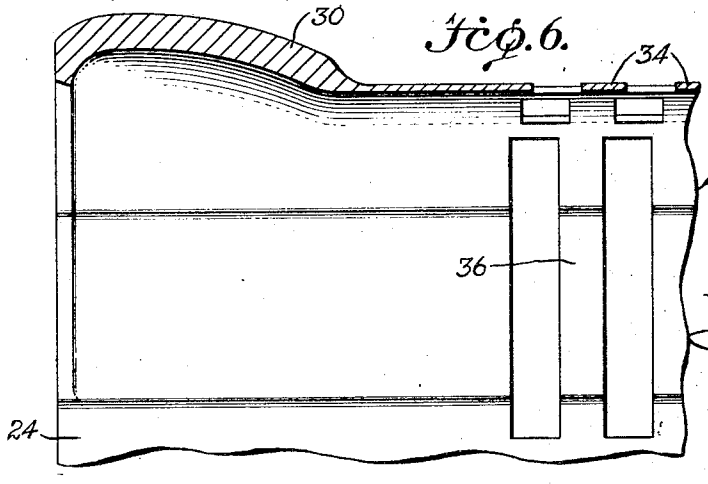


Fig. 6.



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UNITED STATES PATENT OFFICE

2,317,177

DRY SHAVER

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Application August 3, 1940, Serial No. 350,327

20 Claims. (Cl. 30—43)

This invention relates to electric dry shavers, and more particularly to improvements in the shaving head thereof.

The invention comprehends an improved shaver head construction that will facilitate more economical manufacture; provide improved precision in the fitting of the parts to increase efficiency in shaving and reduce skin irritation; provide sharper cutting edges on the outer and inner cutters by punching the apertures in the sheet metal in forming the cutter bars; provide for less irritation to the skin through rounding the outer edges of the cutter bars on the outer cutter; provide a substantially rigid outer cutter by forming it from sheet metal shaped into partially cylindrical form providing for the reduction in thickness of the shaving area to two thousandths of an inch for closer shaving; provide end corrugations cooperating to retain the sheet metal outer cutter in substantial U-shaped form and form a smooth raised surface to reduce skin irritation and cooperate with the partial cylindrical shaving area; provide an aperture structure and cutter bar size for obtaining greater length cutting edges for more rapid shaving; and provide an inner cutter having cutter bars arranged in an irrational relation to the outer cutter bars to produce progressive cutting with inclined cutting edges on the inner cutter bars; and longitudinally offset cutter bars in successive rows on the outer cutter, together with other features hereinafter described.

In the drawings:

Fig. 1 is an enlarged, sectional view of a portion of an electric dry shaver equipped with a shaving head constructed in accordance with the present invention, the view showing certain parts broken away.

Fig. 2 is a further enlarged plan view of a portion of the shaving head shown in Fig. 1.

Fig. 3 is a diagrammatic sectional view on a still further enlarged scale illustrating the extent of operating movement of the inner shearing member with relation to the outer shearing member.

Fig. 4 is a fragmentary, transverse sectional view taken on line 4—4 of Fig. 2, the view being on the same enlarged scale as Fig. 3.

Fig. 5 is a fragmentary, end elevational view of the electric dry shaver shown in Fig. 1, the view being on the same enlarged scale as Fig. 1.

Fig. 6 is a fragmentary, longitudinal sectional view taken on line 6—6 of Fig. 2, the view being on the same enlarged scale as Figs. 3 and 4.

Fig. 7 is another fragmentary, longitudinal sectional view on a still further enlarged scale, the view being taken on line 7—7 of Fig. 2.

The electric dry shaving device to which the present invention has been applied comprises a molded housing 10 as shown in Figs. 1 and 5, which housing incloses an electric motor which is accessible through a removable cover plate 12. A channel of substantially square cross section is provided at the upper end of the housing 10, and this channel receives the shaving head of the present invention which is retained therein by a holding screw 14 as will be later described.

The dry shaving head of the present invention includes an outer stationary member which has been designated as a whole by the reference numeral 20. This outer member is preferably formed from flat sheet metal stock of a suitable spring steel material, and it has been found preferable to stamp or otherwise form perforations of a particular arrangement which will later be described in the central portion of this flat sheet steel stock before it is formed into the shape shown in the drawings. These perforating and bending operations are performed before the member 20 is subjected to the final heat treating operation to provide the proper degree of hardness.

In Figs. 4 and 6, the present shaving head has been shown on a greatly enlarged scale of about twenty-five to one. Referring to Fig. 4, it may be seen that the central portion of the outer member 20 is bent on an arc to form a cylindrical segment extending approximately 26 degrees each side of the vertical center line A of the shaving head. The adjacent portions of the outer member 20 are straight and extend tangentially from the cylindrical segment formed by the curved central portion. The end portions of the sheet steel outer member 20 are then bent downwardly with respect to the adjacent tangential portions to form spaced parallel sides 24. The lower end portions of the sides 24 are spot-welded to the sides of a metal base member 26.

Referring to Fig. 1, a transverse slot is provided in the lower surface of the base member 26 and in the sides 24, and this slot receives a web 28 extending across the channel in the housing 10. This slot and web 28 prevent longitudinal shifting of the shaving head relative to the housing and insures that the head is always placed on the housing in the same position relative thereto. An indentation 29 is provided in one of the sides 24 and in the base

member 26 and this indentation receives the inner end of the screw 14 to removably secure the head in position in the channel of the housing 10.

Inasmuch as the outer member 20 of the present head is bent from flat sheet steel into the shape shown, there are stresses set up by this bending operation in the sheet steel material. In order to relieve these stresses and to strengthen the upper portion of the outer member 20 against deformation from its illustrated shape, reinforcing beads or raised corrugations 30 are formed in the end portions thereof. Each of these corrugations 30 extends between the sides 24 and is curved in cross section to slope inwardly as shown in Fig. 6. In order to facilitate the pressing of the corrugations 30 in the end portions of the outer member 20, slots 31 are provided in each of the sides 24. These slots 31 serve to relieve the stresses set up in the sides 24 by the pressing of the raised corrugations 30.

The cylindrical segment and the adjacent tangential portions of the outer member 20 are provided with combing and shearing elements formed by perforations made in the sheet steel material before it is bent to shape as previously pointed out. The shearing action of the present shaving head is obtained almost entirely by the centrally disposed cylindrical segment, while the combing action is obtained by the adjacent tangential portions. Thus, the shearing elements provided in the cylindrical segment comprise relatively short shearing bars 34 which are formed by spaced rectangular perforations. The adjacent tangential portions are accordingly provided with relatively long combing and shearing bars 36 formed by spaced slots which extend a short distance into the cylindrical segment.

The particular arrangement of the bars 34 and 36 is shown in Fig. 2, wherein it may be seen that bars 34 are arranged in three parallel rows in the cylindrical segment, and that the bars 34 are all equally spaced and are all formed by equally spaced rectangular perforations. The size of these bars 34 and 36 and the size of the perforations forming the bars has been carefully selected to obtain the maximum shaving efficiency without irritating the skin and yet retain sufficient mechanical strength in the shearing portion of the outer member 20. For example, it has been found that satisfactory results are obtained when the shearing bars 34 are thirteen thousandths of an inch wide and are formed by perforations or rectangular holes which are fourteen thousandths of an inch wide and twenty-seven thousandths of an inch long. It has likewise been found that the combing and shearing bars 36 may also be thirteen thousandths of an inch wide and formed by slots which are fourteen thousandths of an inch wide and one hundred thirty-nine thousandths of an inch long. Furthermore, it has been found that maximum shaving efficiency is obtained without unduly sacrificing the mechanical strength of the cylindrical segment if the spacing of about ten thousandths of an inch is provided between the three rows of rectangular perforations as well as between the side rows of rectangular perforations and the side rows of slots.

In the present arrangement of the shearing elements in the outer member 20, the side edges of the shearing bars 34 as well as the side edges of the combing and shearing bars 36, are all disposed at right angles to the longitudinal axis of the shaving head. However, it will be noted that the shearing bars 34 in each of the longitudinal rows and the combing and shearing bars 36 in each of the longitudinal rows are not in relative transverse alignment to the corresponding bars in the other rows, but are disposed in a slightly offset relation. In the specific arrangement shown in Fig. 2, the bars 34 and 36 in each of the rows are offset longitudinally about thirty-two ten-thousandths of an inch with relation to the corresponding bars in the adjacent rows. With this particular arrangement, the corresponding parts of the bars 34 align transversely of the shaving head at an approximate angle of five degrees with relation to the alignment of the side edges of the bars 34 and 36 which are at right angles to the axis of the head.

This particular arrangement of the bars 34 and 36 is formed by perforating the material of the outer member 20 before it is formed into its illustrated shape as previously pointed out, and after the outer member 20 is formed into the shape shown it is preferably heat treated to provide the proper degree of hardness. The sheet steel material of which the outer member 20 is formed may have a thickness of about ten thousandths of an inch, and after this material is perforated and formed into its illustrated shape, the central portion thereof comprising the cylindrical segment is ground to a reduced thickness in order to provide for closer shaving.

With the present arrangement of the bars 34 and 36 formed by the particular illustrated pattern of perforations, it has been found that the cylindrical segment of the outer member 20 may be ground to a thickness of about two thousandths of an inch or about one-fifth the thickness of the remaining portion of the outer member 20. This grinding operation is performed throughout the portion of the cylindrical segment disposed between the two end corrugations 30 so that the outer surface of this portion of the cylindrical segment is concentric with the inner surface thereof. This grind on the cylindrical segment of the outer member 20 is preferably tapered off into the adjacent tangential outer surface portions, perpendicular to line B, Fig. 4, indicating the approximate point of tangency to the outer portion of the cylindrical segment.

The perforation of the outer member 20 forms the cutter bars 34 and 36 with the edges thereof substantially at right angles to the surface, and with both the inner and outer corners of these bars presenting sharp right angular shearing edges. These sharp shearing edges are, of course, desirable and necessary at the inner corners of the bars 34 and 36 for proper shearing of the hairs, but these sharp corners are undesirable at the outer surface of the bars 34 and 36 as irritation is caused by the scraping action produced thereby on the surface of the skin. Accordingly, these outer corners at the edges of the bars 34 and 36 are slightly rounded or curved outwardly in accordance with the present invention in order to reduce the irritation caused by moving the shaving head over the surface of the skin.

It has been found that the outer corners of the bars 34 and 36 may be thus rounded sufficiently to reduce this irritation by performing a buffing operation on the outer surface of the outer member 20 after the cylindrical segment

thereof has been ground to its reduced thickness. It will be understood that the outer corners of these shearing bars are only slightly rounded and although the results of this buffing operation are not easily perceived without magnification, the results are nevertheless very noticeable in use. In order to more clearly illustrate the results of this buffing operation, a small portion of the present shaving head has been shown on a greatly enlarged scale of about one hundred twenty to one in Fig. 7. With this extent of enlargement, it is easily seen that the outer corners of the shearing bars **34** are definitely rounded or curved outwardly, while the inner corners of these bars are square and sharp.

An inner member **40** is provided in the present shaving head for longitudinal reciprocating movement within the outer member **20**. This inner member **40** is of suitable steel shaped into a hollow cylinder with the outer surface thereof curved on a radius which is substantially equal to the radius of the inner surface of the cylindrical segment of the outer member **20**. This outer surface of the inner member **40** is held in effective shearing engagement with the inner surface of the cylindrical segment of the outer member **20** by spring pressed steel balls **42**. Each of the balls **42** is carried by a companion cup-shaped carrier **43** as shown in Fig. 1, and each of the carriers **43** is frictionally retained in an opening in the base member **26**. An expansion spring **44** is provided in each of the carriers **43** to act upwardly on the companion ball **42** to press the outwardly extending end thereof into engagement with the inner shearing member **40**.

The inner member **40** is provided with shearing elements which have a particular size and arrangement to coact most effectively with the arrangement of the shearing bars **34** and **36** of the outer member **20**. These cutting elements are in the form of transverse shearing bars **46** arranged in an equally spaced relation and formed by equally spaced slots cut transversely through the inner member **40**. These slots are so cut in the inner member **40** that the bars **46** are inclined at an angle of five degrees with respect to a line at right angles to the longitudinal axis of the head. This angle of inclination of the bars **46** corresponds to and is in the same direction as the angle of offset of the bars **34** and **36** of the outer member **20**.

With this relative arrangement of the shearing bars **46** of the inner member and the shearing bars **34** of the outer member, it will be clear that as the inner member **40** is moved longitudinally, each of the bars **46** coacts simultaneously with a transverse row of the bars **34**. However, the edges of the bars **34** are disposed at right angles to the longitudinal axis of the head while the edges of the bars **46** are inclined with relation thereto, and accordingly the edge of each of the bars **46** will coact progressively along the length of the bars **34** and **36**.

In the present shaving head, the slots forming the spacing between the shearing bars **46** of the inner member are considerably wider than the slots forming the spaces between the shearing bars **34** of the outer member. This relatively wide spacing between the bars of the inner member reduces the possibility of clogging the inner cutter by the sheared ends of hairs and other particles which may collect therein.

In accordance with the present invention, the spacing between shearing bars **46** of the inner member is so proportioned to the spacing between shearing bars **34** of the outer member that progressive shearing action is obtained throughout a substantial portion of the length of the head. In the specific form shown, shearing bars **46** are one hundred eighteen ten-thousandths of an inch wide and the slots separating these bars are thirty-eight thousandths of an inch wide. Thus, as may be seen in Fig. 2, six inner bars **46** occupy about the same linear distance in the head as eleven outer bars **34** and **36**. This section of the head shown in Fig. 2, which includes six inner shearing bars **46** and eleven outer shearing bars **34** and **36**, is duplicated about three times throughout the length of the head. The ratio of the number of bars throughout a given linear distance on the inner member to the number of bars throughout the same linear distance on the outer member is as .027 to .0498, and is maintained throughout the length of the present shaving head.

The inner member **40** in the present shaver is operated by motor driven lever **48** which is pivotally mounted at **49** to housing **10**. An arm on lever **48** extends outwardly through an opening in housing **10** and an aligned opening in base member **26**, and the projecting end of this arm enters a slot (not shown) in the central portion of inner member **40**. This motor driving mechanism is so arranged that a reciprocating movement is imparted to the inner member of an extent represented in Fig. 3. It will be noted in Fig. 3 that inner bars **46** are spaced slightly less than double the spacing of outer bars **34**, and that the operating movement of bars **46** causes each of these bars to pass beneath at least two of the outer bars **34**. The operating movement of inner member **40** in the particular form shown is approximately sixty thousandths of an inch in each direction.

The above arrangement of shearing bars on the inner and outer members results in progressive shearing action during the operating movement of the inner member throughout each of the sections of the head, wherein each section includes approximately six of the inner shearing bars **46** and eleven of the outer bars **34** and **36**. In other words, one inner shearing bar **46** will first be moved past one outer shearing bar **34** to progressively coact therewith throughout the length of the bar, and then the next adjacent inner bar **46** will coact in the same manner with the second adjacent outer bar **34**, and so on until six inner bars **46** coact progressively with a corresponding number of outer bars **34**, whereupon the next shearing action will occur between the first inner bar of the section and the second outer bar and so on. In this manner, due to the irrational ratio of .027 to .0498 between the inner and outer cutter bars, no two inner bars **46** has cutting operation with an outer bar **34** simultaneously in exactly the same manner.

This progressive cutting action obviously evenly distributes the load on the motor driving mechanism throughout the entire stroke of the inner shearing member. This even distribution of the load enables the shaver to operate smoother and with an even and higher speed. This also reduces the tendency for the motor to stall or its operating speed to be materially reduced when the shaving head is operated over a beard of thick and coarse hairs.

In providing the above progressive action between the inner and outer shearing members, it will be clear that the number of bars on the outer member should be close to some multiple

of the number of bars on the inner member, but should not be exactly a multiple thereof. Although it is not essential, it may be preferable that some irrational ratio exists between the number of bars **46** and the number of bars **34** and **36**. In the present instance, the irrational ratio of .027 to .0498 has been selected to obtain the progressive cutting operation described, but it is to be understood that any similar ratio could be selected and substantially the same results could be obtained.

Referring to Figs. 4 and 5, it will be noted that the outer surface of inner shearing member **40**, which includes shearing bars **46**, contacts outer member **20** throughout only the inner surface of the cylindrical segment thereof. This arrangement reduces the friction of operation of inner member **40** and concentrates the pressure between the inner and outer members to this cylindrical segment area where practically all the actual shearing of the hair takes place. This arrangement also permits combing bars **36** to effectively guide the longer hairs into cutting position, and inasmuch as inner bars **46** do not contact and are spaced from the inside surface of the outer ends of combing bars **36**, the skin will not be irritated as it tends to crease or fold into the slots between the outer ends of these bars.

An improved shaving head for electric dry shavers has thus been provided wherein a very efficient shaving action is obtained with a minimum amount of irritation to the skin. The particular arrangement of the staggered or offset shearing bars **34** on the outer member greatly increases the efficiency of the present shaving head inasmuch as the rectangular perforations which form these bars produce a shearing edge thereon having an effective length which is greater than the round or oval shaped perforations ordinarily provided. Furthermore, these rectangular perforations have a sufficient transverse length to permit hairs to be closely cut and yet the length of these perforations does not permit the skin to be creased or folded therein to an extent causing irritation by action of the inner shearing bars thereon. A further important feature of this construction which prevents irritation to the skin is the provision of rounded outer corners on shearing bars **34** and **36**. This feature greatly reduces the irritating scraping action which ordinarily results from moving the sharp outer edges of the shearing bars over the skin. Irritation is also reduced by corrugations **30** providing rounded ends on the head and by the projection of the outer surfaces beyond the outer surfaces of bars **34** and **36**.

Although the majority of the shearing action occurs in the cylindrical segment of the outer shearing member, it will be clear that all of this shearing is not confined to bars **34** but the inner ends of combing and shearing bars **36** also have an effective shearing cooperation with inner shearing bars **46**. Bars **36** are tapered in thickness. Adjacent their inner ends where they extend into the cylindrical segment they are approximately two-thousands of an inch thick. Progressing outwardly they increase in thickness as shown in Fig. 4 throughout the straight portion tangent to the outer surface of the cylindrical segment until the major thickness of the sheet metal used in making the head is reached. This varying thickness of bars **36** facilitates the lifting and guiding of long hairs into the slots between bars **36** for cutting. The cylindrical segment although only two-thousandths of an inch thick has substantial strength obtained by reason of its cylindrical form. The offsetting of bars **34** and **36** aids in obtaining greater strength in the outer member.

The speed and smoothness of operation of the present shaving head has also been materially improved by the relative arrangement of the inner and outer shearing bars to afford a progressive shearing action throughout the operating movement of the inner shearing member. In the particular form shown, the spacing between the shearing bars on the inner member has been made considerably greater than the spacing between the shearing bars on the outer member in order to permit free passage of the sheared ends of the hair into the bore of the inner member, and the proportion of this spacing of the inner shearing bars to the spacing of the outer shearing bars has been so selected that evenly progressive shearing cooperation is obtained. Improved shaving operation is obtained by having the inner cutter travel a sufficient distance for each of the inner cutter bars **46** to traverse at least two outer cutter bars **34** since the cutting speed and number of cutting operations is materially increased.

The sheet metal used in making the outer shaver member has the grain running lengthwise in the sheet, so that when it is stamped to form the apertures and cutter bars, the punching operation will cause the under face of the strip forming the inner surface of the outer shaver member to have substantially sharp cutting edges. The forming of the punched sheet metal strip into the substantial U-shape as shown in the drawings obtains an outer cutter structure with the partially cylindrical thin shaving section, held in shape by the thicker corrugated ends, wherein the corrugations retain the sheet metal in shape and cooperate with the shaving section to reduce irritation of the skin at the ends of the shaver head and by the projection of the corrugations beyond the outer surface of the head therebetween.

It will be further noted that the inner cutter made according to the invention has an outside surface in substantially true cylindrical form. The inner cutter only engages the outer cutter member in said cylindrical segment and with its cylindrical form having an intimate bearing in the outer cutter member that effectively insures efficient cutting cooperation between all of the cutter bars of both the inner and outer cutter members.

It will also be noted that the perforations in the outer cutter member extend in radial relation in the completed outer cutter member due to the perforations being formed when the sheet metal strip is in a flat condition.

The corrugations, it will be noted, are formed so that the inner surfaces are positioned outwardly beyond the inner surface of the cylindrical segment so as not to interfere with the reciprocation of the inner cutter and its intimate contact with said inner surface.

The invention claimed is:

1. In a dry shaving head, the combination of an outer member having a curved shearing portion of less thickness than the adjacent portions thereof, a plurality of substantially straight shearing elements extending transversely of said portion formed by rows of rectangular perforations in the shearing portion of said outer mem-

ber, the perforations in each row being offset longitudinally with relation to the perforations in the other rows, a plurality of combing and shearing bars formed by rows of slots extending from said shearing portion into the adjacent side portions of said outer member, the slots in each row being offset longitudinally with relation to the perforations in the shearing portion, an inner member having a curved shearing portion, a plurality of shearing elements formed by spaced slots extending across the shearing portion of said inner member at an angle corresponding to the longitudinal offset of the perforations in one row relative to the perforations of the other rows in said outer member, and means acting on said inner member to hold said shearing elements thereof in effective shearing engagement with the shearing elements of said outer member.

2. In a dry shaving head, the combination of an outer member having a shearing portion of less thickness than the adjacent portions thereof, a plurality of shearing elements formed by rows of rectangular perforations in the shearing portion of said outer member, the perforations in each row being offset longitudinally with relation to the perforations in the other rows, a plurality of combing and shearing bars formed by rows of slots extending from said shearing portion into the adjacent side portions of said outer member, an inner member having a shearing portion, a plurality of shearing elements formed by spaced slots extending across the shearing portion of said inner member at an angle corresponding to the longitudinal offset of the perforations in one row relative to the perforations of the other rows in said outer member, and means acting on said inner member to hold said shearing elements thereof in effective shearing engagement with the shearing elements of said outer member.

3. In a dry shaving head, the combination of an outer member having a shearing portion of less thickness than the adjacent portions thereof, a plurality of shearing elements formed by rows of rectangular perforations in the shearing portion of said outer member, the perforations in each row being offset longitudinally with relation to the perforations in the other rows, an inner member having a shearing portion, a plurality of shearing elements formed by spaced slots extending across the shearing portion of said inner member at an angle corresponding to the longitudinal offset of the perforations in one row relative to the perforations of the other rows in said outer member, and means acting on said inner member to hold said shearing elements thereof in effective shearing engagement with the shearing elements of said outer member.

4. In a drying shaving head, the combination of an outer shearing member, shearing elements thereon formed by rows of rectangular perforations having the longer dimensions thereof disposed substantially at right angles to the longitudinal axis of said outer shearing member, the perforations in each row being offset longitudinally with relation to the perforations in the other rows, an inner shearing member, shearing elements on said inner shearing member formed by spaced slots extending across said inner shearing member at an oblique angle corresponding to the longitudinally offset relation of said perforations in the outer shearing member, and means for holding the shearing elements on the inner shearing member into effective shearing engagement with the shearing elements on the outer shearing member.

5. In a dry shaving head, the combination of an outer member having a curved shearing portion and straight side portions tangential thereto, 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 spaced slots extending from said shearing portion into said tangential portions thereof, 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 formed by spaced slots extending transversely of said shearing portion thereof and disposed beneath said perforations and said slots of said outer member.

6. In a dry shaving head, the combination of an outer shearing member having a cylindrical shearing segment reduced to a substantially thin uniform cross section and tangential side portions extending from each side of said segment, said side portions being of thicker sheet material having portions tapering in thickness adjacent said segments to provide smooth inner and outer surfaces, equally spaced shearing elements on said segments and adjacent side portions formed by equally spaced perforations, an inner shearing member having an extent of operating movement at least double the spacing between said shearing elements of the outer shearing member, and equally spaced shearing elements on said inner shearing member formed by equally spaced slots therein, the spacing between said shearing elements of the inner shearing member being greater than the spacing between said shearing elements of the outer shearing member and having an irrational ratio thereto.

7. In a dry shaving head, the combination of a sheet metal outer member having a cylindrical segment with straight side portions tangential thereto, transverse corrugations at the ends of said cylindrical segment and said straight side portions, the part of said cylindrical segment between said corrugations being ground to approximately two thousandths of an inch in thickness, shearing elements formed in said cylindrical segment by spaced perforations, and a cylindrical inner member having shearing elements engaging only the inner surface of said cylindrical segment of the outer member.

8. In a dry shaving head, the combination of an outer sheet metal member having a partially cylindrical shearing portion of uniform thickness less than half as thick as the adjacent portions thereof, a plurality of substantially straight transversely extending cutter bars formed by rows of rectangular perforations in said partially cylindrical shearing portion, a plurality of transversely extending combing and shearing bars formed in said head and extending from said shearing portion into adjacent side portions of said outer member, an inner cutter member having a partially cylindrical shearing portion formed with inclined spaced slots providing inclined cutter bars, the ends of said sheet metal forming the outer member terminating in spaced parallel relation in said side portions, and means acting on said inner member arranged between said side portions to hold said cutter bars of the inner cutter member in effective shearing engagement with the cutter bars of said outer member.

9. A dry shaver head comprising a strip of thin

sheet metal formed with a plurality of small rectangular punched apertures in the central portion to form a shaving section, said sheet metal having the central portion of said strip forming said shaving section of partially cylindrical form and reduced in thickness to approximately two thousandths of an inch, the inner and outer surfaces of said shaving section being concentric, said sheet metal being formed at the opposite ends of said shaving section with corrugations cooperating to retain said shaving section in shape and said strip of sheet metal in substantial U-shape, said apertures forming cutter bars therebetween extending transversely of said shaving section, and an inner cylindrical cutter member formed to provide a plurality of spaced transversely extending cutter bars, having the outer surface of the cutter bars thereof slidably engaged with the inner surface of said shaving section for reciprocating movement longitudinally therein for cutting cooperation.

10. A dry shaver head comprising an outer cutter member having a cylindrical segment and side portions extending from each side thereof, said segment having a plurality of cutter bars formed by longitudinal rows of rectangular perforations forming a plurality of spaced parallel cutting edges on said bars extending transversely of said segment substantially perpendicular to the axis thereof, the cutting edges and bars in each row being offset longitudinally with relation to the cutting edges and bars in adjacent rows, the offset of corresponding cutting edges in the several rows being uniform, and an inner cutter member having a cylindrical section in surface contact with the inner face of said cylindrical segment formed with a plurality of spaced parallel cutter bars having cutting edges on the sides thereof extending across said section at an angle corresponding to the angle of offset of corresponding portions of corresponding cutting edges on said outer cutter member, said cutter bars of said inner cutter member having the cutting edges spaced apart a greater distance than the corresponding edges of the outer cutter member and having an irrational ratio for producing progressive multiple cutting cooperation.

11. In combination in a dry shaver, an outer cutter member formed of sheet metal having a cylindrical segment of reduced thickness connecting opposite side portions, said segment having a plurality of cutter bars formed by longitudinal rows of rectangular perforations forming a plurality of spaced parallel cutting edges on said bars extending in transverse perpendicular relation to the axis of said segment, the cutting edges and bars in each row being offset longitudinally with relation to the cutting edges and bars in adjacent rows, the offset of corresponding cutting edges in the several rows being uniform, an inner cutter member having a cylindrical outer surface in contact with the inner face of said cylindrical segment formed with a plurality of spaced parallel cutter bars having cutting edges on the sides extending across said inner cutter member at an angle corresponding to the angle of offset of corresponding portions of corresponding cutting edges on said outer cutter member, said cutter bars of said inner cutter having the cutting edges spaced apart a greater distance than the corresponding edges of the outer cutter member with an irrational ratio of spacing between the cutting edges of the inner and outer cutter members, and means for reciprocating the inner cutter relative to said outer cutter to produce cutting cooperation between each cutting edge on the inner cutter and more than one cutting edge on the outer cutter.

12. In combination in a dry shaver, an outer cutter member having a cylindrical segment and side portions extending from each side thereof, said member being formed of sheet metal with the thickness of said segment reduced in cross section and formed to provide concentric inner and outer surfaces, said segment having a plurality of cutter bars extending transversely thereof in spaced relation and provided with cutting edges on opposite sides thereof extending transversely of said segment substantially perpendicular to the axis thereof, transversely extending corrugations formed in said outer member at opposite ends of said segment connecting the side portions and retaining said segment in cylindrical relation, an inner cutter member having a cylindrical outer surface in surface contact with the inner face of said cylindrical segment and formed with a plurality of spaced parallel cutter bars having cutting edges on the sides thereof extending across said inner cutter member at an angle to the cutting edges of said outer cutter member, the cutting edges on said inner cutter member being spaced apart a greater distance than the corresponding edges on the outer cutter member and having an irrational ratio to produce progressive multiple cutting cooperation between the cutting edges of the inner and outer cutter members, and means for reciprocating said inner cutter member relative to said outer cutter member to an extent wherein each cutting edge on said inner cutter member will have cutting cooperation with more than one cutting edge of said outer cutter member in progressive relation.

13. In combination in a dry shaver, an outer cutter member formed of sheet metal having a cylindrical segment of reduced thickness connecting opposite side portions, said segment having a uniform thickness with concentric inner and outer surfaces, said segment further having a plurality of cutter bars arranged in longitudinal rows in spaced parallel relation, each cutter bar having cutting edges on the sides thereof extending in transverse perpendicular relation to the axis of said segment, said outer cutter member having the cutter bars arranged in a plurality of sections with a plurality of cutter bars in each section arranged in corresponding positions, an inner cutter member having a cylindrical outer surface in contact with the inner face of said cylindrical segment formed with a plurality of spaced parallel cutter bars having cutting edges on the sides extending across said inner cutter member in angular relation to the cutting edges of said outer cutting member, the angle of the cutting edges on said inner cutter member being such that no one of said cutting edges will intersect two corresponding cutting edges on the outer cutter member at the same time, said cutter bars of said inner cutter member having the cutting edges spaced apart a greater distance than the corresponding edges of the outer cutter member and arranged in a plurality of sections corresponding to the sections of the outer cutter member with an irrational ratio of spacing between the cutting edges of each section of the inner and outer cutter members, and means for reciprocating the inner cutter member relative to said outer cutter member to produce cutting cooperation between each cutting edge on the inner cutter member and more than one cutting

edge on the outer cutter member, corresponding cutting edges on the cutter bars of each section cooperating simultaneously to produce multiple progressive cutting cooperation.

14. In combination in a dry shaver, an outer cutter member formed of sheet metal having a cylindrical segment of reduced thickness connecting opposite side portions, said segment having a plurality of cutter bars formed by longitudinal rows of rectangular perforations forming a plurality of spaced parallel cutting edges on said bars extending in transverse perpendicular relation to the axis of said segment, the cutting edges and bars in each row being offset longitudinally with relation to the cutting edges and bars in adjacent rows, the offset of corresponding cutting edges in the several rows being uniform, said segment having its reduced thickness of uniform cross section providing concentric inner and outer surfaces, said outer cutter member having elongated cutter bars formed by slots extending from opposite edges of said segment into adjacent portions of said side portions and arranged in corresponding offset relation relative to said first mentioned cutter bars with transversely extending cutting edges on the side edges of said last-mentioned elongated cutter bars, an inner cutter member having a cylindrical outer surface in contact with the inner cylindrical face of said cylindrical segment and spaced from the remaining portions of said outer cutter member, said inner cutter member having a plurality of spaced parallel cutter bars formed with cutting edges on the sides extending across said inner cutter member at an angle corresponding to the angle of offset of corresponding portions of corresponding cutting edges on said outer cutter member for cutting cooperation therewith, said cutter bars of said inner cutter member having the cutting edges spaced apart a greater distance than the corresponding edges of the outer cutter member with an irrational ratio of spacing between the cutting edges of the inner and outer cutting members, and means for reciprocating the inner cutter member relative to the outer cutter member to produce cutting cooperation between each cutting edge on the inner cutter member with more than one cutting edge on the outer cutter member whereby multiple progressive cooperation will be obtained between the cutting edges of said inner and outer cutter members.

15. In combination in a dry shaver, an outer cutter member formed of sheet metal having a cylindrical segment of reduced thickness and uniform cross section connecting opposite side portions, transversely extending corrugations at opposite ends of said segment connecting said opposite side portions for retaining said segment in cylindrical form, said segment having a plurality of rows of spaced parallel cutter bars formed therein by rectangular perforations between said cutter bars in each row, the outer rows of perforations extending from said segment into said side portion, each of said cutter bars having cutting edges on the sides thereof extending in transverse perpendicular relation to the axis of said segment, the cutting edges and bars in each row being offset longitudinally with relation to the cutting edges and bars in adjacent rows in a uniform manner, an inner cutter member having a cylindrical outer surface in contact with the inner face of said cylindrical segment formed with a plurality of spaced cutter bars having cutting edges on the sides extending across said inner cutter member at an angle corresponding to the angle of offset of the corresponding portions of the corresponding cutting edges on said outer cutter member, said cutter bars of said inner and outer cutter members being formed in sections longitudinally of said cutter members with a plurality of cutter bars in each section arranged in corresponding relation therein, the cutter bars of said inner cutter member having the cutting edges spaced apart a greater distance than the corresponding edges of the outer cutter member with an irrational ratio between the spacing of the cutting edges of the inner cutting edges relative to the outer cutting edges, and means for reciprocating the inner cutter member relative to said outer cutter member to produce cutting cooperation between each cutting edge on the inner cutter member and more than one edge on the outer cutter member obtaining multiple progressive cutting cooperation.

16. In a dry shaving head of the type comprising an outer member having a curved shearing portion and a relatively movable inner member having shearing elements formed by slots extending at an oblique angle across the shearing portion of the outer member, the combination of a plurality of shearing elements formed by rows of rectangular perforations in the shearing portion of said outer member, the perforations in each row being offset longitudinally with relation to the perforations in the other rows to align transversely with the oblique angle of the shearing elements of said inner member, and a plurality of combing and shearing bars formed by rows of slots extending from the shearing portion into the adjacent side portions of said outer member.

17. In a dry shaver having an outer cutter with a partially cylindrical shearing section, and a longitudinally movable inner cutter having a plurality of spaced transversely extending cutting edges extending in inclined relation across said shearing section, the combination of a plurality of rows of spaced cutter bars having a plurality of transversely extending cutting edges in each row, corresponding cutting edges and said bars in each row being offset longitudinally to register with the incline of the cutting edges of said inner cutter for simultaneous cutting operation in each row.

18. In a dry shaver having an outer cutter with a curved shearing section, and a longitudinally reciprocable inner cutter having in a row a plurality of uniformly spaced transversely extending slightly oblique cutting edges thereon, the combination of a plurality of longitudinally extending rows of transverse cutting edges formed on said shearing section in uniformly spaced parallel relation, corresponding cutting edges in each row being offset longitudinally equal to the oblique angle of the movable cutting edges, the movable cutting edges being spaced apart a greater distance than the stationary cutting edges, having group cutting cooperation with the cutting edges on said shearing section and arranged to have each movable cutting edge in said group relation operate in successive order with the cutting edges of the outer cutter to provide progressive group cutting cooperation.

19. An outer cutter for shavers comprising a sheet metal strip formed to provide a cylindrical segment connecting opposite side portions having uniform thickness and concentric inner and outer surfaces, a plurality of longitudinal rows of spaced parallel straight transversely extending cutting edges formed on said segment, the cut-

ting edges in each row being offset longitudinally relative to the corresponding cutting edges in adjacent rows and corrugations formed in said strip at the ends of said segment for retaining said segment in cylindrical form.

20. An outer cutter for shavers comprising a sheet metal strip formed approximately into a U-shape to provide a cylindrical segment between opposite side portions, corrugations at the ends of said strip for retaining said strip in said U-shape, a plurality of rows of small rectangular openings in said segment forming a plurality of rows of transversely extending straight cutting edges thereon, corresponding cutting edges in adjacent rows being offset longitudinally, a row of slots on each side of said plurality of rows formed in said section and extending outwardly into said side portions to provide elongated cutter bars with cutting edges at each side of said first-mentioned cutting edges for long hair cutting, and said segment having a substantially thin cross-section between said corrugations compared to the remainder of said strip to provide for close shaving at the cutting edges thereon and said cutter bars having a thickness increasing toward the outer ends.

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