

[54] **SHEARING SYSTEM FOR DRY SHAVERS**

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[57] **ABSTRACT**

A shearing foil for use with a dry shaving apparatus as an upper cutter having a major hole field formed therein, for allowing entry of the hair therinto, such hole field containing a plurality of hole-like apertures having a predetermined lateral extension, a plurality of slots having a predetermined length, the length of each of the slots being greater than the largest dimension of the lateral extension of each of the hole-like apertures, the hole-like apertures and the slots being formed in the body of the foil in a mixed fashion and being separated from each other by strips resulting from the formation of adjacent ones of hole-like apertures and the slots.

[30] **Foreign Application Priority Data**

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[52] U.S. Cl.30/43, 30/43.72, 30/346.51

[51] Int. Cl.**B26b 19/04**

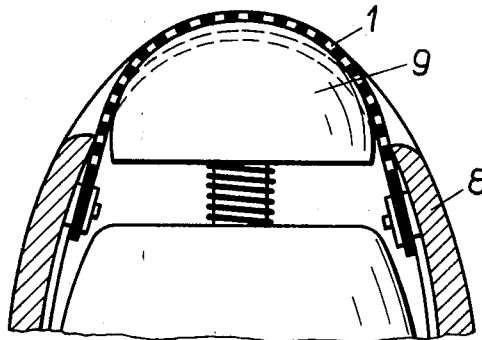
[58] Field of Search.....30/346.51, 346.61, 43, 43.92

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15 Claims, 8 Drawing Figures



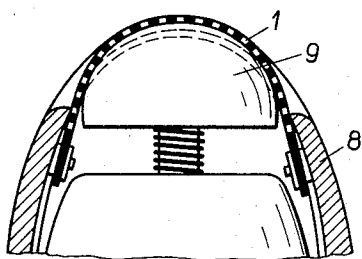


Fig. 1

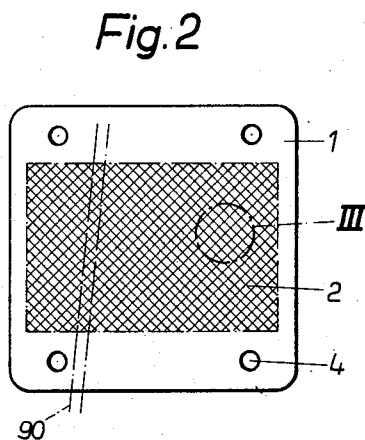


Fig. 2

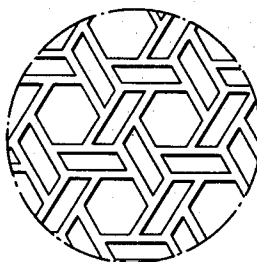


Fig. 3

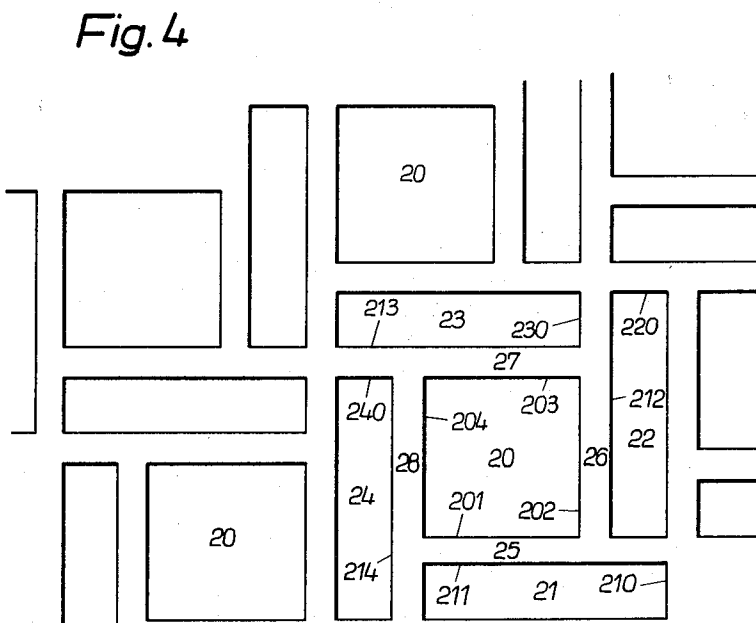


Fig. 4

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Fig. 5

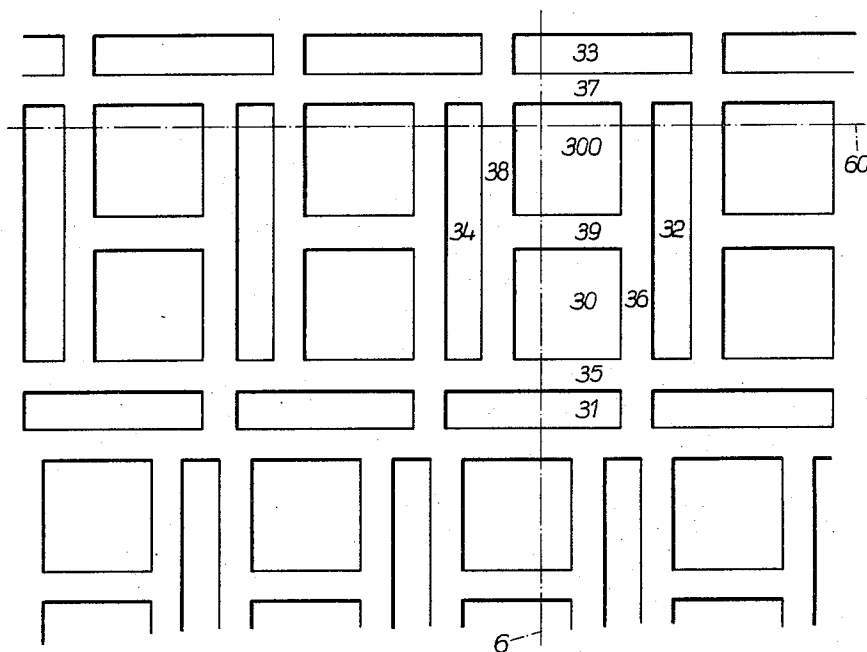
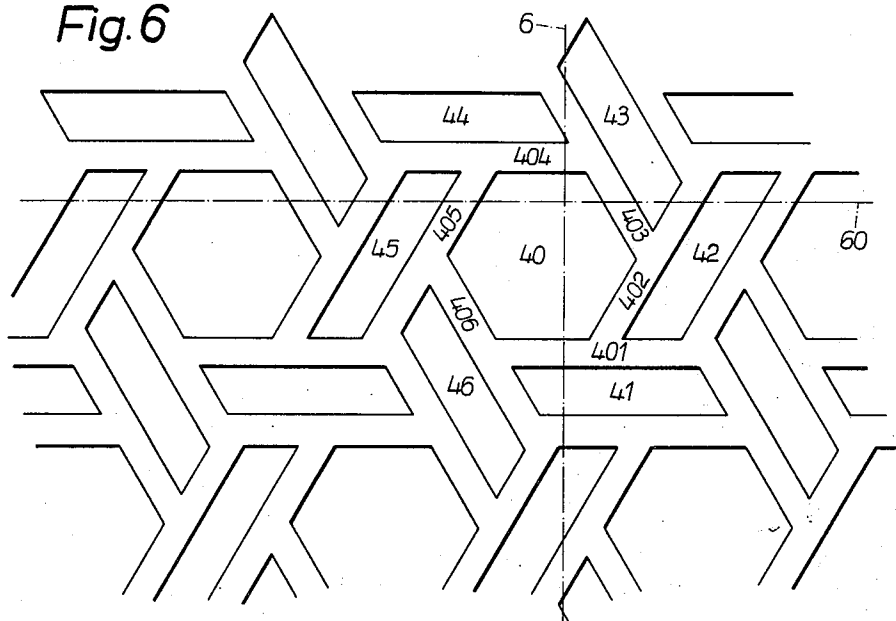
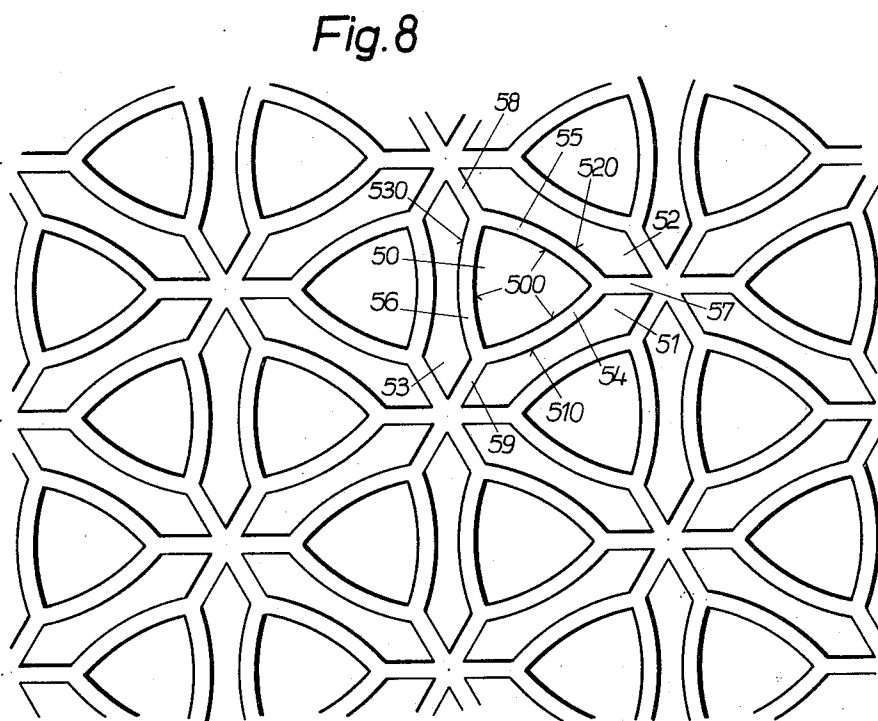
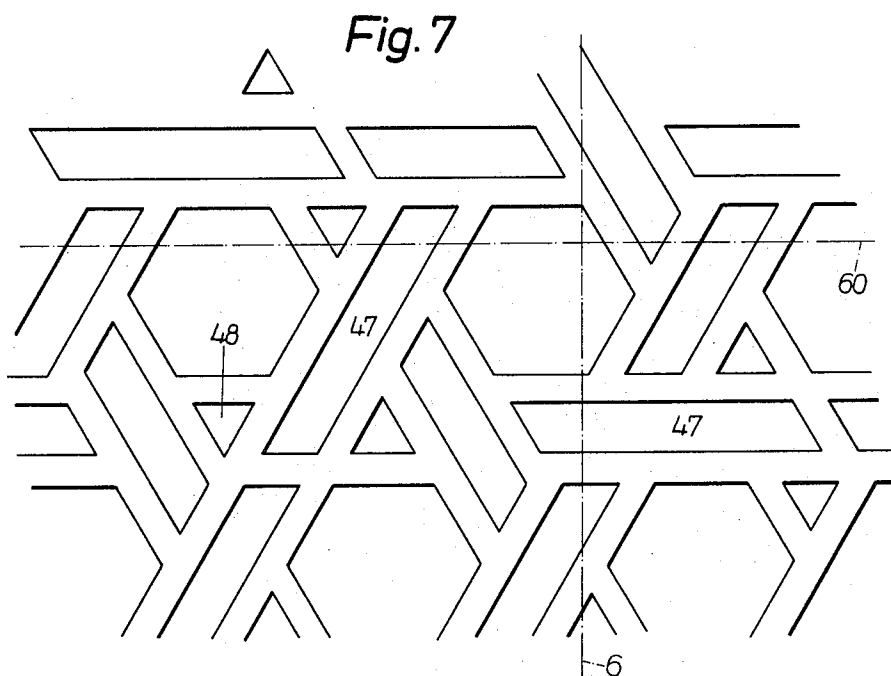


Fig. 6



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SHEARING SYSTEM FOR DRY SHAVERS**FIELD OF THE INVENTION**

The present invention relates to a shearing system for dry shavers having an upper cutter which is provided for the entry of the hair with a plurality of apertures separated from each other by strips and which are at least of two kinds.

Basically one is concerned to make the upper cutter as thin as still permissible in view of stability requirements and thereby to cut the hair as short as possible. In order to be able to provide the maximum number of apertures in a hole field on the cutter, the strips which separate the individual apertures should be made as narrow as possible, however, the strips in case of very thin foils cannot be made less narrow than a certain width for reasons of stability. Also one is concerned with keeping the smallest possible width along the entire length of the strip since only a small widening of the width of the strip even at points becomes detrimental to the aperture relation factor of the shearing foil. Here under the phrase "aperture relation factor" one understands the relation of the entire surface of the apertures into which the hair can enter to the entire surface of the separating strips.

On the other hand, one is concerned to design the hole field having the maximum possible number of apertures. The maximum possible width of an aperture is, however, limited by the consideration that the skin should not enter into the aperture further than to avoid getting irritated or injured by the inside cutter. The dimensions flowing from the above consideration are different with each aperture contour and with the thickness of the shearing foil.

BACKGROUND OF THE INVENTION

Aperture contours became known in a wide variety of forms which can be divided into two groups or types completely differing in their properties. One type called "hole" in the following description in a circular or circle-like aperture having a uniform dimension and which is the most advantageous contour to permit entry of short hair thereinto from all directions.

The other aperture form or type has one dimension which is distinctly larger than the other dimension thereof, such as in a rectangle. Such apertures having one larger dimension than the diameter of the adjacent hole, are capable to catch longer hair pieces along the direction of their longitudinal extent and in the following description are designated as "slots."

It has been found that hole fields which are provided only with "holes" cannot completely eliminate long hair pieces while hole pieces which contain exclusively slots cannot avoid not to cause irritations or abrasions of the skin or, in the event such disadvantage is taken care of by a reduced slot width, they have a bad shaving performance.

Inasmuch as both aperture types possess mutually exclusive advantages, attempts have been made, in order to retain the advantages and to eliminate the disadvantages of each type, to combine these two types in one upper cutter in which the hole field became divided into zones or tracks with each zone or track containing a certain type of aperture. It has been however found that the expectations were not fulfilled since the hole field zones assigned to an individual aperture type

were too small in order to become effective and the aperture relation of the entire hole field became unfavorably affected by the transition sections between the tracks and the overall shaving performance has deteriorated.

A device became known in which with a view that longer hair pieces could be also taken care of by a directionally neutral hole field and, at the same time, a good aperture relation could be kept, rhombic-shaped slots are provided in different directions. In connection with this device which originally contained only slots associated with the above described disadvantages of similar hole fields, has been proposed, to eliminate a portion of the strips and thereby combining three rhombic-shaped apertures into a hexagonal hole, whereby a hole field is created which consists of slots and apertures which are approximately circular in shape.

In the above described proposition the field containing the slot like apertures could not meet the expectations since such slots could not any more accommodate the long hair pieces due to the fact that in their largest dimension, that is in their length, they became shorter than the apertures which resulted from the combination of such slots, therefore, they could not accommodate shorter hair pieces either.

Thus, it can be stated that an efficient combination of slots and holes in a single field so far has not been successfully solved.

SUMMARY OF THE INVENTION

It is, therefore, an object of the present invention to provide a novel and improved shearing system for a dry shaver having a hole field efficiently combining at least two kinds of apertures capable of accommodating short and long hair pieces at high efficiency of shaving.

According to the invention a hole field is created by the combination of the two types of apertures which is capable of removing short and long hair pieces in one sweep and also the possibility is provided to catch at the same time long hair pieces lying in different directions without causing a skin irritation and without unfavorably affecting the optimum aperture relation factor.

The invention arose from the realization of the problem that the width of the slots, the practical purpose of which is to catch the long hair pieces which were left behind by the apertures adjacently located and being capable only of removing short hair pieces, be kept at a minimum in order to avoid skin irritations.

With the above in view the invention proposes that the holes and slots of the above described type be placed in a hole field in a mixed fashion and, at the same time, to make useful length of the slots larger than the diameter of the associated holes.

An upper cutter built along the above proposition according to the invention catches the normal whiskers by letting them enter the holes. The holes can be circular, however, it is preferred that they are rather circular-like in shape or polygonal, since the last mentioned shapes in combination with the slots provide an advantageous aperture relation and result in a better cutting angle than the strictly circular holes.

In practicing the invention the holes can be made in any shape polygonal from triangular to hexagonal. A

higher number of angles would come closer to a circular hole so that the aperture relation factor and the shaving efficiency would be unfavorably influenced.

Considering the advantages associated with a better aperture relation factor, it is preferred to have only one kind of holes in one hole field. It is, however, within the scope of the present invention that holes having different number of edges can be placed within a field and combined with slots. It is also within the scope of the present invention that in the same hole field differently shaped slots can be placed and combined with holes.

Most preferred are such arrangements in which the slots are running in different directions and angularly with respect to each other so that mixedly lying hair pieces can also be caught by such arrangement. This can be done by the selection of a polygonal hole and when the slots are running along the angularly related hole edges so that the slots surround the hole in a rosette-like fashion.

In accordance with the invention, in most cases, it is sufficient when between two or more holes or between a hole group consisting of at least a hole each, one or two slots are placed. As a result, the number of the slots becomes limited, however, the object of the invention although not met by an optimum fashion, becomes still satisfied in a preferred form even where in each direction within the hole field every second hole is followed by a slot.

According to the invention combinations are also preferred in which between each pair of holes a slot is placed, that is, with each hole edge or side a slot is associated. In an optimum fashion each having a substantially constantly remaining width which then separates the hole from the slot.

The more closely approximates the border line of the holes a straight line, the better total aperture relation factor for the hole field can be attained as a rule. For the magnitude of the useful aperture surfaces the kind and magnitude of the strips are decisive, such strips lying between the individual apertures. It is even preferred that the slots be provided with edges running parallel with each other since in such a case an advantageous hole relation factor can be attained. There are other solutions possible according to the invention which attain an advancement with respect to the known combined hole fields.

According to the invention the useful length of at least a portion of the slot must be larger than the diameter of the associated hole in order to be able to accommodate the longer hair pieces.

As a rule, the length of the slots placed between the holes is greater by at least a slot width than the edge of the associated hole. There are according to the invention solutions in which the slot length is uniform, however, there are also solutions wherein the slot lengths are not uniform.

With respect to the cutting performance and the capability of catching hairs out of a bunch as well as long hairs, the basic hole form is preferred in a hexagonal shape and it is also a preferred consideration, although not exclusive limitation of the invention, that each edge or side of the hexagon-shaped hole has a slot associated therewith. The hexagon-shape produces a slot position in three directions similarly to a triangle, however, the hole in this form is still greater than a square or triangle would be.

The hexagonal hole which in the practice proved itself especially advantageous in simple hole fields as giving rise to favorable aperture factors and, therefore, became known since many years, is particularly preferred for practicing the present invention in the proposed combination with the slots.

In the embodiment employing a hexagonal hole the slots are formed as parallelograms and are placed in a rosette fashion around each hexagonal hole so that between each pair of hexagonal holes slots are placed in a generally vertical and horizontal directions, the slots running in three different directions and, thereby, they are capable to catch any kind of hair formations in combination with the holes. In the event that all the slots are uniform in length then a uniform pattern of holes and slots is created.

In order to be able to catch especially long hairs which are left behind after a careless and quick shaving and stand out individually, the invention provides, without thereby changing the hole arrangement, that long slots be provided, that is distributed over the entire hole field in an individually placed fashion. Preferably such longer slots are running in different directions.

Good results have been also obtained with quadrangularly formed holes. Such hole shapes make it possible that slots can be assigned to a hole pair so that each slot falls between a pair of holes. As a result, relatively long slots can be made without the necessity of changing the shape and size of the holes within a hole field.

The triangle as a hole shape is not in any degree less capable to satisfy the requirements of the present invention. This hole shape permits the use of hole edges or sides which deviate from a straight line. With this form a field pattern can be created in which the slots narrow in the middle of their length and widen toward the end so that the slots can be made very long without causing skin irritations and, at the same time, the slots can be made so wide that the hair pieces can be reliably caught therein.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will become more readily apparent from the following description of preferred embodiments thereof shown in the accompanying drawings, in which:

FIG. 1 is a schematic representation of a shaving head used with a shaving apparatus;

FIG. 2 illustrates a shearing foil in plan view;

FIG. 3 is a magnified view of the portion enclosed in a circle in FIG. 2;

FIG. 4 is a schematic representation of a hole field of a shearing foil according to the present invention having square shaped holes with slots having equal length;

FIG. 5 is a schematic representation of a hole field similar to FIG. 4 in which a slot is assigned to each hole pair;

FIG. 6 is a schematic illustration of a portion of a hole field with hexagonal holes and slots having equal length;

FIG. 7 is a schematic illustration of a portion of a hole field with hexagonal holes and slots having different length; and

FIG. 8 is a hole field with triangularly shaped holes.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 illustrates a shearing head 8 in which a shearing foil 1 according to the present invention is secured under tension over a cutter block 9 in a known manner. The cutter block or knife block 9 is formed in a lamellae fashion and is arranged under an angle along line 90 shown in FIG. 2. Such arrangement of the knife block 9 is especially advantageous with the configuration of the shearing foil shown in FIG. 4.

With reference to FIG. 2 it is seen that the shearing foil 1 is provided with a hole field 2 from which a unit portion enclosed in the circle 3 is shown in a magnified fashion in FIG. 6. Foil 1 is provided with preferably holes 4 for mounting purposes.

It is within the scope of the present invention to employ in connection with the shearing foil 1 either the knife block system 9 arranged under an angle along line 90 as shown in FIG. 2 or an arched typed knife.

The shape of the foil 1 as shown in FIG. 2 is square, however, it is within the scope of the invention to adapt the shape of the foil 1 to any shaving head such as to form it in a circular shape in the form of a round screen.

In the embodiment shown in FIG. 4 the holes 20 are square-shaped having edges 201 and 204 which are straight. Each of these edges 201 and 204 is separated by a strip 25 and 28 from the adjacently located longitudinal slots 21 and 24, having edges similarly running along a straight line. Inasmuch as corresponding adjacent aperture edges are parallel with each other, the resulting strips 25 and 28 have consequently constantly remaining widths. For example, the strip 25 is formed by both edges 201 and 211, strip 26 is by edges 202 and 212, strip 27 by edges 203 and 213, and the strip 28 is formed by the edges 204 and 214.

The slots 24 are arranged in a counter clockwise fashion about the hole 20 which they surround and, it is seen that slot 21 is longer than the edge 201 of hole 20 by the width 220 of slot 22 and by the width of the strip 26 and thereby it is longer than the diagonal of the hole 20. Inasmuch as the holes are arranged symmetrically, the above consideration holds also for the slots 22 and 24. The widths 210, 220, 230 and 240 are equal with each other, therefore, all strips 25 and 28 are also equal in their width. By using the square hole shape illustrated one obtains slots in two directions related with each other by 90° so that any kind of hair mixture can be well taken care of by such aperture combination.

FIG. 5 is an illustration employing square shaped holes, however, it intends to show how holes and slots can be combined in a uniform fashion under conditions when a slot is not enclosed between two holes as it was in FIG. 4.

Both holes 30 and 300 are arranged in pairs, that is they are separated only by a strip 39. The hole pair 30, 300 is surrounded by slots 31 and 34 between the two of them having strips 35 and 38.

This arrangement has the advantage that on the same hole field more holes 30 and 300 can be arranged than it would be the case with the pattern shown in FIG. 4. Furthermore the slots 32, 34 are longer so that this shearing foil 1 is able to accommodate much longer hair pieces as well. In this embodiment the slots are also

running in several directions angularly related with respect to each other.

The holes 30, 300 forming the slot pair in FIG. 5 are arranged over each other, that is, the pairs of holes lie in column 6 while along line 60 between each hole a slot is arranged.

In order that the long slots 32, 34 could be placed also in a second direction, in another hole region the hole pair 30, 300 can be placed along the vertical line 60 and long slots can also be placed along such line.

FIG. 6 illustrates a portion of the hole field encircled in FIG. 2 in a magnified fashion, and which is more particularly shown in a less magnified manner in FIG. 3. All holes 40 are formed as hexagons. To each edge of the hexagon a slot 41 and 46 is arranged and are separated by strips 401 and 406.

It is seen that the hexagon produces slot positions in three directions angularly related with each other. In this embodiment strips 401 and 406 are of the same length and similarly shaped, that is, they have a constantly remaining width throughout their length so that with them it is not only possible to catch the longer hair pieces in any position but also this embodiment provides for an advantageous aperture relation factor.

The embodiment illustrated in FIG. 7 differs from the embodiment shown in FIG. 6 in that in the latter slots with similar length 41 and 46 are shown, while in FIG. 7 it is seen that long slots 47 can also be distributed in a hexagonal field. Notwithstanding the fact that in this embodiment small apertures 48 are created which hardly can be said to be adapted to cut the hair and this embodiment has a somewhat reduced aperture relation factor, however, even also this uniform hole field distribution is adapted to take care of long hair pieces by the presence of longer slots.

Just as well as holes having straight edges according to the invention can be combined with slots, it is also possible to combine holes having curved edges with slots.

This is shown in FIG. 8 in which the shearing foil is provided with triangularly shaped holes 50 having edges 500 which are curved and which have a larger radius of curvature than the circle which could be drawn about the corners of the triangular holes 50.

The greater is such radius the more closely approximates the curvature a straight line.

In the just described hole field construction the resulting slot shape differs from a rectangle or parallelogram and a uniformly remaining slot width cannot be attained with this embodiment, although previously it has been said that the primary intention was to have the strips be constructed with a constantly remaining width.

Despite the above considerations slots 51 and 53 are very desirable, since they are especially long, they can easily handle long hair pieces, they are narrow in the middle of their length due to the curve like edges of the associated holes, which fact has the advantage that the skin cannot enter these long slots, therefore, skin irritations are avoided which otherwise would be a common place with very long slots. The slots 51 and 53 widen out about their ends so that long hair pieces are easily taken care of by such slots.

From the above, it is apparent that although the invention has been described hereinbefore with respect

to certain specific embodiments thereof, it is evident that many modifications and changes may be made without departing from the spirit of the invention. Accordingly, by the appended claims, we intend to cover all such modifications and changes as fall within the true spirit and scope of this invention.

I claim:

1. A shearing means for use with a dry shaving apparatus as an upper cutter means comprising a body portion having a major hole field formed therein, for allowing entry of the hair thereinto, said hole field containing a plurality of polygonal apertures formed in said body portion and having a predetermined lateral extension, a plurality of slot means having each a predetermined length, the length of each of said slot means being greater than the largest dimension of said lateral extension of each of said polygonal apertures, said polygonal apertures and said slot means being formed in said body portion in a mixed fashion, said body portion including strip means separating said polygonal apertures and said slot means from each other, wherein each of said slot means has an edge running parallel with an adjacent edge of an associated polygonal aperture.

2. A shearing means as claimed in claim 1, wherein each of said slot means is formed between a pair of adjacent hole-like apertures.

3. A shearing means as claimed in claim 1, wherein said hole-like apertures are formed in groups each containing at least one aperture, each of said slot means being formed between adjacent groups of said hole-like apertures.

4. A shearing means as claimed in claim 1, wherein each of said hole-like apertures is surrounded by adjacent slot means in a rosette-like fashion.

5. A shearing means as claimed in claim 1, wherein all of said hole-like apertures of said hole field are similarly shaped and sized and all of said slot means of said hole field are similarly shaped and sized, and wherein the length of each of said slot means is equal to sum of the length of the adjacent edge of an associated one of said hole-like apertures, the width of an adjacent one of said slot means and the width of said separating strip means lying therebetween.

6. A shearing means as claimed in claim 1, wherein all of said hole-like apertures of said hole field are similarly shaped, a predetermined number of said plurality of slot means having a length equal to the sum of twice the lateral dimension of one of said hole-like apertures and the width of one separating strip.

7. A shearing means as claimed in claim 1, wherein each of said hole-like apertures has a hexagonal shape, said slot means being formed in a rosette fashion about said hexagonal apertures and having four longitudinal edges each running parallel with at least one edge of an associated one of said hexagonal hole-like apertures.

8. A shearing means as claimed in claim 8, wherein each of said slot means is formed as a parallelogram and being arranged with respect to said hole-like apertures such that at least one smaller edge of each of said slot means lies along a straight line with an edge of each associated hole-like aperture lying in the same row.

9. A shearing means for use with a dry shaving apparatus as an upper cutter means comprising a body portion having a major hole field formed therein, for al-

lowing entry of the hair thereinto, said hole field containing a plurality of polygonal apertures formed in said body portion and having a predetermined lateral extension, a plurality of slot means having each a predetermined length, the length of each of said slot means being greater than the largest dimension of said lateral extension of each of said polygonal apertures, said polygonal apertures and said slot means being formed in said body portion in a mixed fashion, said body portion including strip means separating said polygonal apertures and said slot means from each other, each of said slot means having an edge running parallel with an adjacent edge of an associated polygonal aperture, each of said polygonal apertures being square-shaped and each of said slot means being rectangularly shaped.

10. A shearing means for use with a dry shaving apparatus as an upper cutter means comprising a body portion having a major hole field formed therein, for allowing entry of the hair thereinto, said hole field containing a plurality of polygonal apertures formed in said body portion and having a predetermined lateral extension, a plurality of slot means having each a predetermined length, the length of each of said slot means being greater than the largest dimension of said lateral extension of each of said polygonal apertures, said polygonal apertures and said slot means being formed in said body portion in a mixed fashion, said body portion including strip means separating said polygonal apertures and said slot means from each other, each of said slot means having an edge running parallel with an adjacent edge of an associated polygonal aperture, said hole-like apertures being triangularly shaped.

11. A shearing means as claimed in claim 1, wherein all edges of said slot means and of said hole-like apertures are straight.

12. A shearing means as claimed in claim 1, wherein the edges of said hole-like apertures and the adjacent edges of said slot means are curved.

13. A shearing means as claimed in claim 8, wherein all of said hole-like apertures of said hole field are similarly shaped, a predetermined number of said plurality of slot means having a longitudinal dimension equal to the sum of the distance between the parallel edges of said hexagonal hole-like aperture, a width of a strip and the width of a slot means.

14. A shearing means as claimed in claim 13, wherein said predetermined number of said slot means are placed in said field in at least two directions.

15. A dry shaving apparatus comprising in combination an upper shearing means adapted to come into contact with the face of the user during shaving, an inner shearing means capable of undergoing a shearing movement and lying under pressure against said upper shearing means, said upper cutter means comprising a body portion having a major hole field formed therein, for allowing entry of the hair thereinto, said hole field containing a plurality of hole-like apertures formed in said body portion and having a predetermined lateral extension, a plurality of slot means having a predetermined length, the length of each of said slot means being greater than the largest dimension of said lateral extension of each of said hole-like apertures, said hole-like apertures and said slot means being formed in said body portion in a mixed fashion and being separated from each other by strip means of said body portion

resulting from the formation of adjacent ones of said hole-like apertures and slot means wherein each of said slot means has an edge running parallel with an adjacent edge of an associated hole-like aperture.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,696,508 Dated October 10, 1972

Inventor(s) Werner Messinger

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 7, line 59, "8" should read -- 7 -- .

Signed and sealed this 1st day of May 1973.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents