

[54] RETICULATE FOIL AND ITS APERTURE  
SHAPE FOR ELECTRIC DRY SHAVER

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

[58] Field of Search..... 30/346.51, 346.61,  
30/346.57

[56]

References Cited

UNITED STATES PATENTS

3,602,991	9/1971	Heinrich .....	30/346.51
2,198,833	4/1940	Muros .....	30/346.51 X
3,093,899	6/1963	Fütterer .....	30/346.51 X

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[57]

ABSTRACT

The invention relates to an electric dry shaver, and more particularly to the construction of the reticulate foil used by said electric dry shaver, the aperture shape and its arrangement.

3 Claims, 7 Drawing Figures

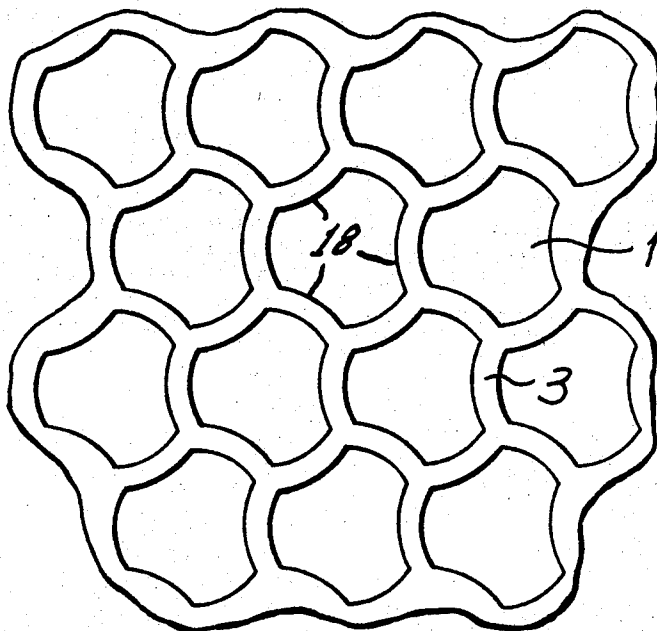


FIG. 1

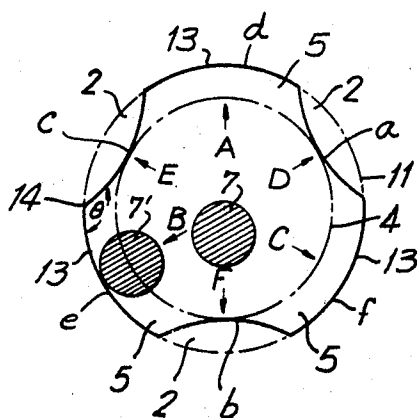


FIG. 3

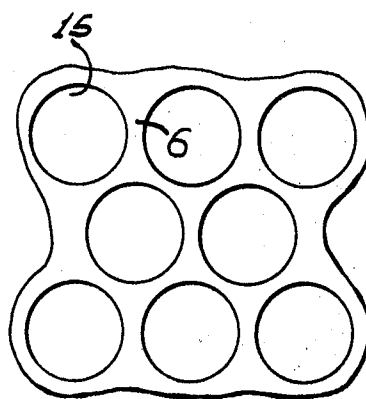


FIG. 2

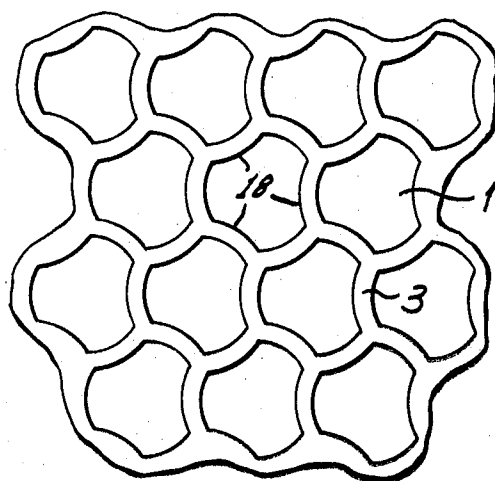


FIG. 4

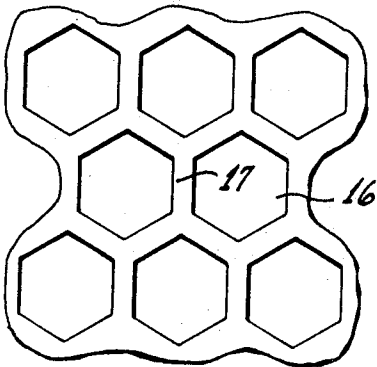


FIG. 5

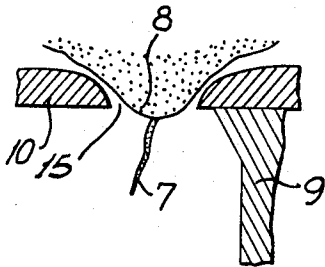


FIG. 6

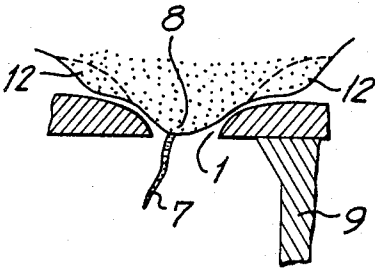
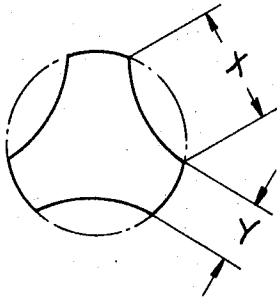


FIG. 7



# RETICULATE FOIL AND ITS APERTURE SHAPE FOR ELECTRIC DRY SHAVER

## BACKGROUND OF THE INVENTION

In general, the reticulate foil for an electric dry shaver is composed of thin metal having many hair-cutting apertures. Said foil introduces a hair and cuts it in cooperation with the inner blade. Thus, the function of said foil is the most fundamental for shaving and determines the shaving efficiency. The main elements in construction of said foil, which determines the shaving efficiency, are as follows:

## SUMMARY OF THE INVENTION

Shape and size of the cutting aperture; method of its arrangement; opening ratio of the reticulate foil; and the thickness of the foil. When all of these elements are suitable, shaving efficiency is most favorable. Generally, good shaving requires cutting hair short, fast and smoothly as far as possible without injuring the skin by the inner blade.

According to the invention, the opening ratio is increased by means of suitable shape and size of the cutting aperture and method of its arrangement as stated above. Therefore, a hair is introduced into the aperture very fast, it being advantageous that the hair only is inserted deeply into the aperture by means of a special cutting aperture shape. It would thus be possible to shave without injuring the skin by the inner blade. The point of the invention intends to form arch-type convexity respectively at the inner three points which divide the aperture into equal parts, and arrange those apertures in such a manner that the bridge width of the reticulate foil is constant.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows the most favorable and effective aperture shape according to the invention;

FIG. 2 is a sectional view showing the most effective arrangement of the apertures, the shape of which is shown in FIG. 1;

FIG. 3 shows the part of the arrangement of the circular aperture shapes which are the most popular shapes at present;

FIG. 4 shows part of the arrangement of the hexagonal apertures shown in U.S. Pat. No. 3,093,899;

FIG. 5 is a sectional view showing that the skin also enters in a conventional cutting aperture together with a hair;

FIG. 6 is a cross sectional view showing that only a hair enters into a cutting aperture in accordance with the present invention; and

FIG. 7 shows the aperture shape in which dimensions X and Y are different.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

The following explains in detail the object of the invention by means of one embodiment shown in the drawings, compared with the conventional aperture shape of the reticulate foil.

According to the invention, the most convenient and concrete aperture shape is shown in FIG. 1, its arrangement being shown in FIG. 2. In FIG. 2, the apertures have three arch-type convexities and are arranged so that the bridge width 3 between the apertures 1 are kept constant.

The arrangement is such that the bridge width 3 between the apertures is kept constant and to arrange the cutting apertures most effectively on the foil. Also, said arrangement is the fundamental element necessary to increase the opening ratio of the foil. Therefore the cutting efficiency is heightened and the hair is inserted more quickly because of said arrangement. The constant width of the foil bridges assures the same strength over the entire surface of the foil, so that while the opening ratio is high, the foil is strong.

The circular aperture shape, shown in FIG. 3, is in wide use at the present time. The bridge width 6 of said circular aperture is low. The hexagonal aperture, shown in U.S. Pat. No. 3,093,899, makes the opening ratio higher and is the most practical. The arrangement of said hexagonal aperture is shown in FIG. 4 of the invention.

The aperture shape and its arrangement according to the present invention provides an equal or higher opening ratio to the hexagonal aperture. Moreover, compared with the hexagonal aperture, the aperture shape of the present invention is more efficient in cutting the hair as short as possible without injuring the skin by the inner blade.

In order to cut the hair as short as possible, it is necessary to insert the hair deeply into a cutting aperture as shown at 15 in FIG. 5 and 1 in FIG. 6. For this purpose the aperture 1 is made larger and the foil is made thinner. If the aperture is made too large or the foil is made too thin, not only the hair but also the skin is inserted into the aperture, as in FIG. 5 thus injuring the skin by the inner blade and reducing the shaving efficiency. The present invention, however, provides a unique aperture shape shown in FIG. 1, into which the hair alone is deeply inserted without injuring the skin by the inner blade. The outline concerning this aperture shape has been mentioned above, and the effectiveness of said aperture shape during shaving is explained below.

According to the invention, the most favorable aperture shape, as shown in FIG. 1, has arch-type convexities 2 at inner three points, said three convexities being very important as described later in the invention.

However, the object of the invention is not only accomplished by means of forming convexities 2 at the inner side of the circular aperture.

According to the invention, the circle 4, which passes three peaks *a*, *b*, *c* of the convexities 2, is imagined. Considering said imaginary circle 4 as the cutting aperture, the peaks *a*, *b*, and *c* are arranged on said cutting aperture (said imaginary circle 4) so that the skin is not inserted together with the hair. In FIG. 5, 15 is an aperture, 7 is a hair, 8 is the skin inserted into the aperture, 9 is the inner blade and 10 is the foil. Compared with the circular aperture of the foil having proper size circular apertures, said imaginary circle 4 is smaller.

The outer circuit of the aperture is the circle 11 which passes the three points *d*, *e*, and *f* in FIG. 1. The size of said circle 11 is determined so that the hair is inserted easily, and is larger than that of the circular aperture of the foil having proper size circular apertures. By applying stronger pressure to the foil during shaving, only the root of the hair is inserted into the aperture as shown in FIG. 6 due to the peaks *a*, *b*, and *c*. At the same time, the skin 12, which has been pushed out by the peaks *a*, *b*, and *c*, is pushed away into the concavity 5. If the electric dry shaver is moved over the

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skin for shaving, the root of the hair, being pushed out, is moved in an instant to the cutting foil 13 which is shown by the thick lines in FIG. 1. The hair is then cut by said cutting foil 13 and the inner blade.

In the aperture shape of the foil of the invention, in order to raise the shaving efficiency, changing the aperture shape somewhat may be readily accomplished according to the type of inner blades, their efficiency, the thickness of the hair and the strength of the skin. In FIG. 1, by means of changing the dimensions X and Y, (changing the size of three convexities 2) it is possible to cut the hair easily under all conditions. For example, in the aperture shape shown in FIG. 7, X is no longer than Y. This shape is suited to shave the longer hair. However, if the difference between X and Y is too great, the bridge width 3 on the foil is not constant, thereby decreasing the opening ratio. As a result, shaving efficiency is reduced. According to the present invention, the most favorable way is to make the dimensions of X and Y constant. This is the only way to make the arrangement of the apertures most effective. By arranging the said aperture, therefore, the opening ratio becomes highest.

Moreover, by arranging the apertures in such a manner that X is different from Y, the universal shaver for cutting all kinds of hair can be manufactured. According to the invention, said aperture shape can cut the hair effectively without regard to cutting direction of the hair; namely, the position of the hair in the cutting aperture, and moving direction of the inner blade.

In FIG. 1, when the inner blade moves in the direction shown by the arrows A, B, and C the hair 7 in the aperture moves to the concavity 5 in an instant (7' after the movement), and is cut down by the foil 13 shown by the thick lines. When the inner blade moves in the direction shown by the arrows D, E, and F, the hair moves first to the convexity 2, then moving to the concavity 5 by means of said arch-type convexity 2 and cut down by the foil 13 shown by the thick lines.

The aperture shape of the invention does not set the cutting direction, so the shaving efficiency is not affected by the moving direction of the inner blade. Therefore, the cutting efficiency is not affected because of such arrangement. The angle of the edge 14 of the cutting foil 13 is comparatively small, so the hair which is inserted into the concavity 5 (for example 7') does not run away from the concavity 5. Moreover, the cutting foil 13 shown by the thick lines is somewhat concave. This prevents the hair from moving and also avoids injuring the skin during shaving.

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As described above, the unique aperture shape of the invention cuts the hair shortest without injuring the skin by the inner blade. Said aperture shape catches the hair effectively, which is introduced into the aperture, and cuts the hair in any direction. By arranging said aperture shapes, the opening ratio is greatly increased.

Therefore the most favorable advantage of the invention, i.e. the highest opening ratio provides very fast shaving, comfort and shaving efficiency in cutting the hair short without injuring the skin by the inner blade.

As described in the preceding clauses of this specification, the summary or the basic idea of the invention is to provide arch-type convexities at three points inside the aperture. The effectiveness of said convexities is not affected by the size or the shape of said convexities. There is no special necessity for equalizing the dimension X with Y. In order to maintain constant bridge width, each concave arc in a given aperture must have the same center as the corresponding convex arc in the adjacent aperture. This is evident from FIG. 2. Consequently, each concave arc must be slightly larger than the convex arc in the same aperture.

Furthermore, the invention does not limit the quantity and the position of arch-type convexities 2. However, in order to make our invention most effective and favorable, it is desirable to provide the highest opening ratio by means of equalizing the dimensions of X and Y as far as possible and arrange the convexities 2 as a regular triangle at three points which divide the aperture into three equal parts. Thus the invention provides the excellent shaving efficiency.

What is claimed is:

1. In an electric dry shaver, an improved reticulate foil wherein each aperture is bounded by a total of six alternate convex and concave arcs, so arranged that the width of the bridge between adjacent apertures is essentially constant each bridge being bounded by a pair of said arcs, each said pair of said arcs consisting of one concave and one convex arc, each said pair of said arcs further having the same center of curvature.

2. An improved reticulate foil as defined in claim 1, wherein each aperture has therein six corners, each of said corners being formed by the junction of a convex and a concave arc, each of said corners being adapted for lodgement of a hair therein during use of said shaver, thereby facilitating the operation of shaving.

3. An improved electric dry shaver as defined in claim 1, wherein said apertures lie in a triangular array.

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