Oct. 30, 1962 J. F. WAHL 3,060,571

BLADE FOR ELECTRIC SHAVER

Filed June 10, 1959

FIG. 1

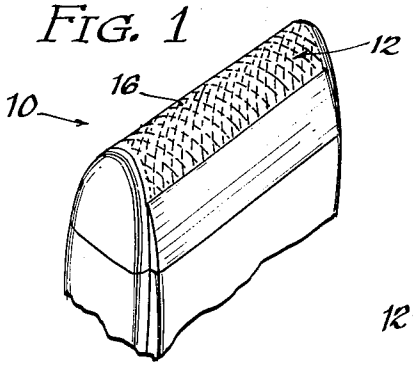


FIG. 2

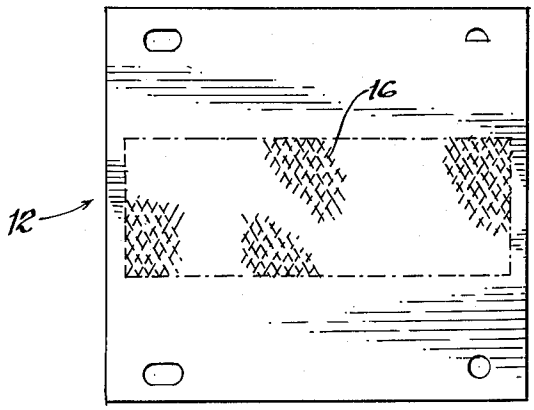


FIG. 3

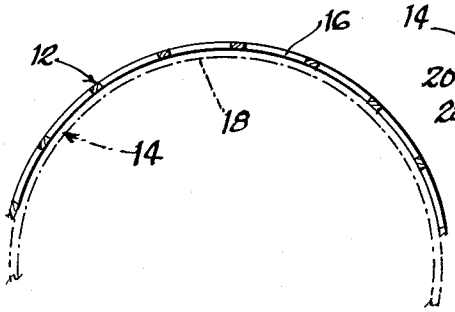


FIG. 4

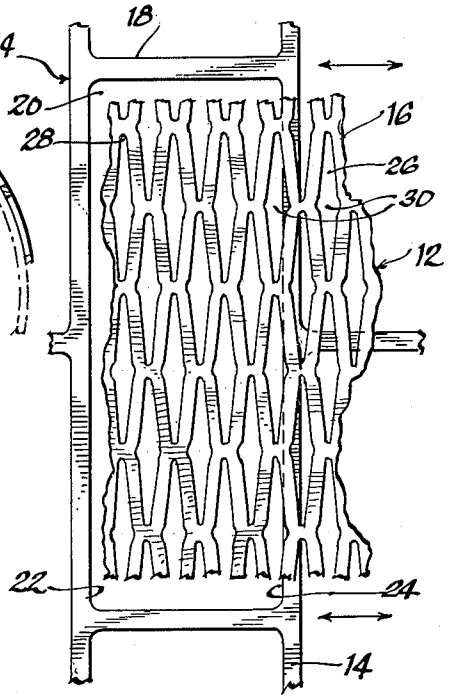
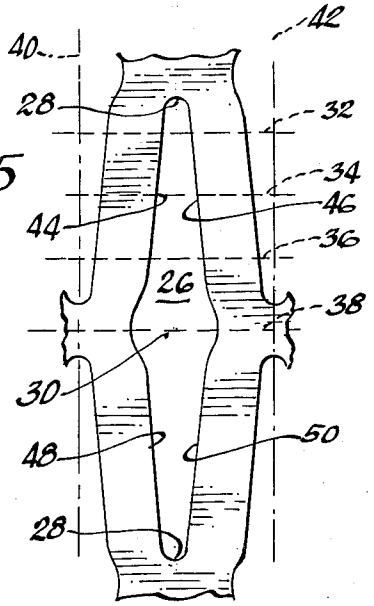


FIG. 5



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BLADE FOR ELECTRIC SHAVER

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4 Claims. (Cl. 30—43)

This invention relates to a blade for an electric shaver, and more particularly to a fixed outer blade which is formed from thin pre-hardened sheet metal and which when bent automatically assumes a continuous curvature in cross section.

The fixed outer blade of an electric shaver is often formed from thin sheet metal which is mounted on the cutting head of the shaver in such a way that at least a portion of the outer blade is arcuate in cross section. This arcuate portion is provided with apertures to permit the entrance of hairs therein so they can be cut by a movable inner blade in a manner well known in the art.

It is highly desirable for the curvature of the cutting region of the outer blade to be continuous and without flats or other discontinuities because they affect the uniformity of the engagement between the cutting region of the fixed outer blade and the movable inner blade. This results in a poor cutting characteristic and causes the shaver to irritate the skin when it is being used and in addition causes a rapid deterioration of the blades.

The desired continuous cross sectional curvature of the fixed outer blade was not easy to obtain because in prior blades the ratio of slot space to metal in each incremental cross sectional strip parallel to the axis of blade curvature was not uniform. As a consequence the resistance to bending or each cross sectional incremental strip was not constant. The difference in the bending resistance of the incremental strips caused the blade to have lines of strength and lines of weakness. Consequently when such a blade was flexed and mounted on the shaver numerous flats or other discontinuities formed on the blade so that its curvature in cross section was not continuous. The inner movable cutting blade has a continuous curvature because it is formed differently so that flats or other discontinuities in the fixed outer blade cause mismatching resulting in poor cutting action. The only way these discontinuities could be reduced was by an expensive lapping process, in its final curved shape, or by forming the blade from an initially soft metal and then hardening it after the blade was formed, which was equally expensive.

What is more desirable, and among other things comprises an important object of this invention is to devise a blade which can be formed from pre-hardened flat sheet metal and which when bent automatically forms a continuous curvature in cross section.

This and other objects of this invention will become more apparent when read in the light of the accompanying drawing and specification wherein:

FIG. 1 is a perspective view of a shaver head.

FIG. 2 is a plan view of the fixed outer blade before it is mounted on the shaver.

FIG. 3 is a side sectional view showing the arrangement of the inner and outer blades when mounted on the shaver.

FIG. 4 is an enlarged fragmentary plan view of the fixed outer blade with its diamond-shaped slots and a fragmentary view of the cooperating movable inner blade.

FIG. 5 is an enlarged plan view of a single diamond-shaped slot formed in the fixed outer blade.

Referring now to the drawing, an electric shaver indicated generally by the reference numeral **10** (FIG. 1) comprises an initially flat fixed outer blade **12** and a movable

inner blade **14**, see FIGS. 3 and 4. In this particular embodiment both blades are formed from thin resilient prehardened sheet metal. As seen in FIGS. 2, 3 and 4, the blades have perforated portions **16** and **18** defining cutting regions.

Each perforation in the cutting region of the blades comprises an elongated slot, and as seen in FIG. 4, slots **20** in the movable inner cutting blade **14** are rectangular in shape with elongated parallel cutting edges **22** and **24**. The movable inner cutting blade is movably mounted in the casing by any conventional means (not shown) and in this particular embodiment the blade is mounted for vibratory movement in directions transverse to the parallel cutting edges of blade **14**. It is understood, however, that these are not essential conditions and as will become apparent below, other arrangements are possible and are contemplated.

As seen in FIG. 2, fixed outer blade **12**, when flat, has a rectangular shape, and the perforated cutting region **16** of the blade is also rectangular, although this is not critical. The slots **26**, see FIGS. 4 and 5, are elongated and generally diamond shaped. These slots are long in length to permit long whiskers to feed into them and be cut by the movable inner cutting blade **14**, while their width is narrow to prevent the skin from entering the slots **26** and being cut by contact with the inner blade. Furthermore the ends of the slots are rounded as shown at **28** both for ease of production and to prevent the base or stump of the hairs from being wedged therein causing the shaver to pull the hair and irritate the skin.

As seen in FIG. 4, slots **26** in blade **12** are disposed on parallel lines in end to end relationship and the rounded ends **28** of the slots **26** in each line are adjacent the central part **30** of the slots in the adjacent line. These central parts **30** are rounded, as seen in FIG. 5, to compensate for the rounded ends **28** of the slots, for reasons to become apparent below.

The spacing of the parallel lines of slots **26** in blade **12**, the separation of the slots in each line, and the particular slot shape are such that over the cutting region **16**, incremental strips transverse to the direction of elongation of the slots and parallel to the axis of blade curvature will have the same ratio of hole space to metal. This can be seen in FIG. 5 where a measurement of the incremental strips represented by lines **32**, **34**, **36**, and **38** in the vicinity of a single slot **26** in blade **12**, within limits bounded by dotted lines **40** and **42**, shows that in each incremental strip the ratio of metal length to hole space is approximately 22:15. The openings **26** are positioned regularly throughout the perforated region **16**, and this uniform relationship in each parallel incremental strip is maintained throughout the width of the cutting region **16**, as seen in FIGS. 2 and 4.

With this arrangement, a geometry of holes has been established such that any incremental strip will offer the same resistance to bending over the cutting region, and there will be no lines of strength and lines of weaknesses in blade **12**. Consequently, when blade **12** is curved around an axial line transverse to the direction of elongation of slots **26**, as shown in FIG. 3, its curvature in cross section will be continuous and without flats. The radius of curvature of the fixed outer blade is selected so that very long whiskers can bend into a slot **26** and be cut off at the base.

The blade of this invention may be formed in one stamping and perforating operation. Then it can be flexed and mounted on the casing of the shaver where it will automatically assume an exact continuous curvature in cross section, without any further treatment. Furthermore, if perforating the flat sheet stock causes burrs which must be removed, these burrs can be removed by grinding or lapping the sheet stock in its flattened condi-

tion. It is apparent that this is an economical and improved way of manufacturing the outer blade of the shaver.

The movable inner cutting blade **14** is biased against the fixed outer blade **12** by any suitable means (not shown), and with the fixed outer blade **12** mounted on the casing, the cutting region **18** of the movable inner blade **14** will exert a uniform pressure on all parts of the cutting region **16**. Consequently the blades **14** and **16** will last longer and the shave will be smoother and closer.

As seen in FIG. 4, the movable inner blade **14** vibrates in the direction shown by the double headed arrows. The cutting edges **22** and **24** of the slots **20** in this inner blade are consequently always at an angle to the cutting edges **44**, **46**, **48** and **50** of the slots **26** in the fixed outer blade. This arrangement provides a double shearing action between the blades resulting in smoother hair cutting. Furthermore, because there are no parallel cutting edges between blades **12** and **14**, there is no chance for their cutting edges to abut each other, causing damage to the blades or stalling them entirely.

The invention may be embodied in other forms without departing from the spirit or essential characteristics thereof as set forth in the claims, and the present embodiment is therefore to be considered as illustrative and not restrictive, and it is intended to include all changes which come within the scope and range of the claims.

I claim:

1. A blade for an electric shaver comprising thin, resilient sheet material adapted to be curved in use about an axial line, said material having a perforated portion defining a cutting region, all incremental strips in said cutting region parallel to said axial line having the same ratio of total perforation length to total material length whereby said cutting region possesses uniform resistance to curving and when curved in use will have continuous curvature.

2. A blade for an electric shaver comprising thin, resilient sheet material adapted to be curved in use about an axial line, said material having a perforated portion defining a cutting region, the perforations each constituting an elongated slot extending generally at right angles to said axial line, all incremental strips in said cutting region parallel to said axial line having the same ratio of total perforation length to total material length whereby said cutting region possesses uniform resistance to curving and when curved in use will have continuous curvature.

3. A blade for an electric shaver comprising thin, resilient sheet material adapted to be curved in use about an axial line, said material having a perforated portion defining a cutting region, the perforations each constituting an elongated, generally diamond-shaped slot extending generally at right angles to said axial line, all incremental strips in said cutting region parallel to said axial line having the same ratio of total perforation length to total material length whereby said cutting region possesses uniform resistance to curving and when curved in use will have continuous curvature.

4. A fixed outer blade for an electric shaver comprising thin, resilient sheet material adapted to be curved in use about an axial line, said material having a perforated portion defining a cutting region, the perforations each constituting an elongated, generally diamond-shaped slot extending generally at right angles to said axial line, each slot having a central circular enlargement and compensatingly rounded ends, said slots located in said cutting region with a rounded end of one slot in proximity to the central circular enlargement of a laterally adjacent slot, all incremental strips in said cutting region parallel to said axial line having the same ratio of total perforation length to total material length whereby said cutting region possesses uniform resistance to curving and when curved in use will have continuous curvature.

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