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SAFETY RAZOR BLADE AND PROCESS OF MANUFACTURING THE SAME

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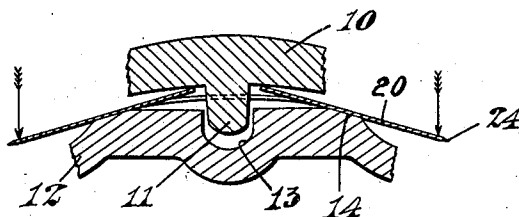


Fig. 1.

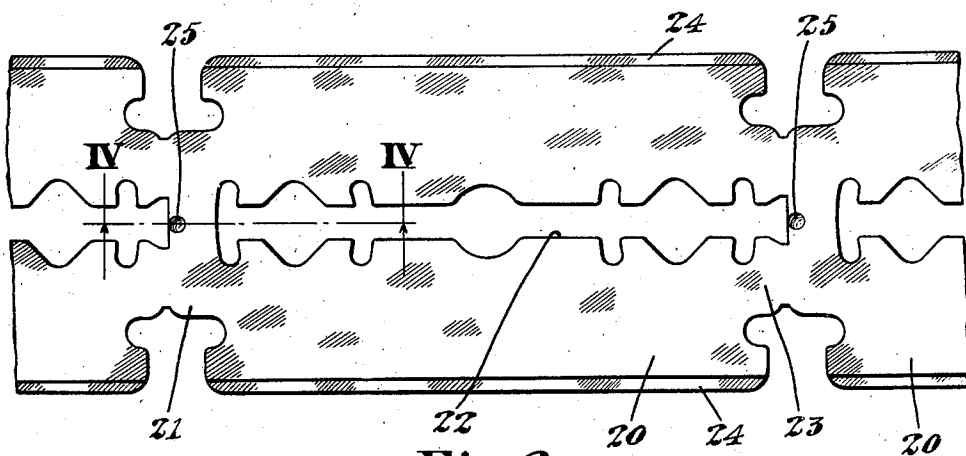


Fig. 2.

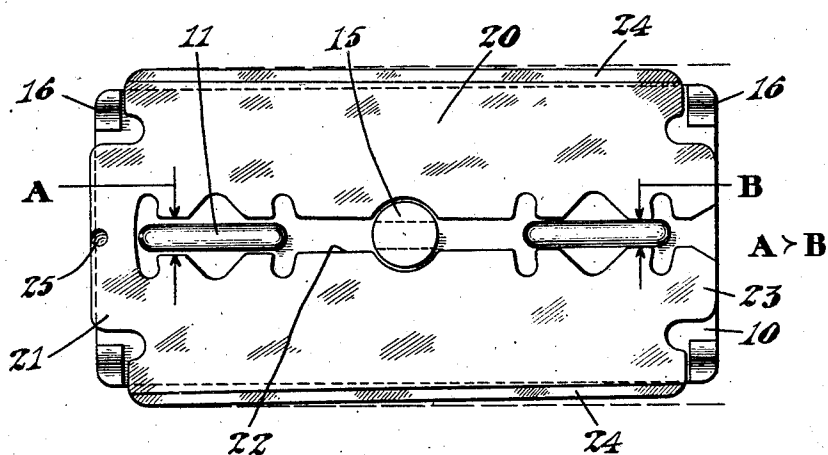


Fig. 3.

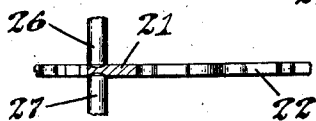


Fig. 4.

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SAFETY RAZOR BLADE AND PROCESS OF
MANUFACTURING THE SAME

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7 Claims. (Cl. 76—104)

This invention relates to safety razor blades and consists in improvements in blades of the thin flexible open-end type and in a novel process of manufacturing such improved blades.

Open-end razor blades, that is to say, blades having a longitudinal slot opening through one of the transverse end edges of the blade, have the advantage that they may be presented by end-wise movement in shaving position between the blade-supporting members of a safety razor, thus obviating the necessity of detaching and separating the parts of the safety razor with the incidental possibility of misplacing or losing them. Obviously, blades of this type may also be used in razors, the cap and guard members of which are not permanently connected. I have discovered that in safety razors of the type wherein the blade is transversely flexed when it is clamped in shaving relation, as in the "Gillette" type of safety razor, the two side portions of an open-end blade and the shaving edges contained therein are frequently deflected out of their normal relation. Whereas the two sharpened longitudinal edges may be disposed accurately in parallel relation when the outline of the blade is initially formed, when the blade is flexed the two edges are found to diverge toward the open-end of the blade. This is due partly to the fact that the transverse portion at the closed or solid end of the blade has a restraining effect on the two side portions which is entirely absent at the open-end of the blade. Going more into details, the side portions of the blade are tied together at the closed end of the blade by a flexible connection which, when transversely curved by the cooperating clamping elements of the razor, causes the cutting edges of the blade to approach one another. However, inasmuch as the side portions of the blade adjacent to its open end are free or unconnected, the free ends stay or fall behind in their movement in relation to the closed end of the blade. These differences in structure and behavior and possibly other reasons result in a departure from parallelism of the two sharpened cutting edges of the blade. Such variation detracts from the precision of the assembled razor, producing variations in the edge exposure of the blade between the two ends of the blade and may even result in excessive edge exposure which sometimes becomes dangerous and which is always responsible for variations in the shaving efficiency of the blade at different points along its length.

I have improved the structure and functioning of open-end razor blades and have solved the problem of uneven edge exposure by initially com-

pensating for the possible divergence of the blade edges when the blade is transversely flexed. This I am able to do by altering the length of one transverse edge of the solid end of a blade from its initial dimension, thereby causing the two side portions of the blade to converge slightly toward the open end. This may be conveniently done, for instance, by a slight swaging operation either lengthening the outer edge of the solid end of the blade or reducing the length of the inner edge of the solid end of the blade, or by heating the outer edge of the solid end of the blade. By either one of these expedients the free ends of the blade sections may be drawn or caused to draw together sufficiently to compensate for the expanding tendency incident to transverse flexing and clamping of the blade.

The timing of the step of altering the length of one edge of the solid end portion of the blade or otherwise treating it is of secondary importance. It may be carried out upon the blade blank before its outline is complete and while it remains an integral portion of the strip steel stock from which the blade is to be formed, or it may be carried out after the blade has been completed in outline. Where blades are formed continuously from ribbon steel stock the swaging operation may be performed upon the strip stock at any station preceding the complete separation of the blade from the stock but the same desirable results may be secured after the outline of the blade has been completed.

In case a swaging operation is employed to cause convergence of the side portions of the blade I have found it desirable to make the operation equal in intensity and location upon the opposite flat faces of the blade being treated. By treating the blade in this manner it is maintained in its initial flat condition and exhibits no tendency to dish or become curved out of a single plane.

In one aspect my invention comprises the novel process of making open-end safety razor blades above outlined. In another aspect it comprises the improved open-end blade herein disclosed by whatever process it may be produced.

The features and characteristics of the invention will be best understood and appreciated from the following description of a preferred embodiment thereof, selected for purposes of illustration and shown in the accompanying drawing together with an explanation of its process of construction.

In the drawing:

Fig. 1 is a fragmentary sectional view on an enlarged scale showing portions of the blade-

clamping elements of a safety razor with a blade between them;

Fig. 2 is a plan view of a section of thin steel ribbon in which blades have been outlined;

Fig. 3 is a plan view showing a single blade in position on the cap of a safety razor; and

Fig. 4 is a fragmentary view in longitudinal section on the line IV—IV of Fig. 2 illustrative of the swaging step.

In Fig. 1 is shown a portion of the cap 10 of a safety razor of the "Gillette" type. The blade-engaging surface of the cap is transversely concaved and is provided with a projecting blade-locating rib 11. The cap 10 cooperates with a guard member 12 having a longitudinal groove 13 to receive the rib 11 of the cap. Its blade-engaging face is generally convex and is herein shown as provided with fulcrum shoulders 14 which extend longitudinally throughout the length of the guard and over which the blade is transversely flexed. When the cap and guard are drawn together in the blade-clamping operation the side edges of the cap 10 overhang the shoulders 14 and engage the blade along the lines adjacent to its cutting edges in substantially the position indicated in Fig. 1 by the vertical arrows. The cap 10 is also provided with a central threaded stem 15 and with reinforcing corner lugs 16 as shown in Fig. 3.

A preferred embodiment of the blade of my invention is shown in plan view and on an enlarged scale in Fig. 3. The blade 20 is nearly rectangular in outline being provided with reentrant recesses in each corner. Two of these recesses form an elongated unsharpened end portion 21 at the solid end of the blade. The blade is also provided with a centrally-disposed longitudinal slot 22 and this opens through the outer transverse edge of the elongated unsharpened end portion 23 and thus forms the open end of the blade. The slot 22 is designed to receive the blade-locating rib 11 of the cap with slight clearance and is provided with an intermediate circular enlargement to receive the threaded stem 15 of the cap. It has also other intermediate enlargements for the reception of blade-locating projections of the various designs that might be found in other safety razors. At the solid end of the blade the slot 22 terminates in a curved enlargement which has the effect of distributing bending stress in the blade and defining a hinge connection section between the two side portions of the blade. At its open end the slot 22 flares somewhat to facilitate engaging the blade-locating rib when the blade is presented endwise and entered between the cap and the guard members of the razor. The blade 20 is sharpened at its opposite longitudinal edges 24.

It will be apparent from an inspection of Fig. 3 that the edges of the slot 22 are not parallel but that they converge slightly toward the open end of the blade. Similarly the two side portions of the blade and specifically its two sharpened edges 24 also converge toward the open end of the blade. This is indicated in Fig. 3 by arrows indicating the width A of the slot 22 at the solid end of the blade and its width B at the open end of the blade with the legend indicating that the dimension A is greater than the dimension B.

In producing the blade herein shown a series of blades 20, disposed end-to-end, is first outlined in a ribbon of thin flexible steel suitable for razor blade material. As suggested in Fig. 2 the outline of each blade is complete except for the transverse line of separation bounding the

solid end portion 21 of one blade and the divided or open-end portion 23 of the next blade. The slot 22 is formed in the ribbon stock and the longitudinal edges of the blade are completely ground and stropped. The strip is advanced in the process of manufacture in an intermittent manner and successive operations are performed in sequence at consecutive stations. At any convenient station, prior to that at which the final separation of the blade is effected, the solid end portion of each outlined blade is treated by a swaging operation as suggested in Fig. 4. In this operation very shallow curved depressions 25 are formed in opposite faces of the steel ribbon in an area closely adjacent to the dividing line between one blade and the next. This may be effected by swaging tools 26 and 27 having operative end faces of the same size and curvature. As already explained, it is advantageous to perform the swaging operation in this manner so that the material of the blade shall be treated equal on both faces, expanding the steel without tendency toward dishing it or distorting it from the initial flat condition of the blade stock. The swaged depressions 25 are indicated in the ribbon stock in Fig. 2 and in the finished blade in Fig. 3.

As each individual tempered blade is separated from the strip by breaking it on a transverse line of separation adjacent to the swaged depressions 25 the effect of the swaging operation becomes apparent in a converging movement of the two side portions of the blade at their open end. In practice a converging movement of .009" has been found to be the desired amount, although this may be varied according to the requirements. The swaging operation apparently expands the material of the solid end portion 21 of the blade in an area adjacent to its outer edge and the internal stress of this expansion is relieved by the converging movement of the side portions of the blade as soon as this is free to occur.

When the blade is clamped in between the cap and guard of the razor, as suggested in Fig. 1, it will be seen that the solid end portion 21 tends to draw in those ends of the side portions of the blade into which it merges, and this movement is exactly compensated for by the initial drawing in or contraction of the side portions at the free end of the blade. Accordingly, when clamping a blade constructed in accordance with the present invention it will be found that its cutting edges are brought into parallel relation to one another.

Having thus disclosed my invention and described a preferred embodiment thereof, I claim as new and desire to secure by Letters Patent:

1. The process of making open-end blades which includes the steps of cutting from sheet steel a longitudinally slotted blade complete in outline having one solid end and one open end, altering the length of one transverse edge of the solid end of the blade from its initial dimension, and thereby deflecting its longitudinal edges out of parallelism.

2. A process of making open-end safety razor blades which includes the steps of cutting from sheet steel a longitudinally slotted blade complete in outline with one solid end and one open end, and expanding the outer edge of the solid end of the blade thereby reducing the width of its open end.

3. The process of making open-end blades which includes the steps of outlining in a ribbon of sheet steel individual blades, each having parallel outer longitudinal edges and side portions

connected at one end and spaced apart at the other end of the blade, expanding the steel ribbon in an area in the connection between the side portions of the blade and thereby causing a deflection of their longitudinal edges out of parallelism when separated from the ribbon.

4. The process of making open-end blades which consists in outlining in thin sheet steel a blade having side portions with parallel outer longitudinal edges connected at one end by a solid transverse portion and spaced at the other end of the blade, swaging the material of said solid portion equally in both faces in an area adjacent to its outer boundary line, and then separating the blade from the sheet and thereby permitting its initially parallel outer longitudinal edges to converge toward the open-end of the blade.

5. An open-end blade for safety razors, having side portions connected by a solid flexible transverse portion at one end, spaced apart at the other end of the blade and having sharpened

outer longitudinal edges, said side portions converging toward the open end of the blade.

6. An open-end blade for safety razors, having side portions connected by a solid flexible transverse portion at one end, spaced apart at the other end of the blade and provided with sharpened outer longitudinal edges, the solid portion having equal depressions in its flat faces near the end edge of the blade and having its cutting edges converging toward the open end of the blade.

7. An open-end blade for safety razors comprising two elongated flexible side portions spaced apart at one end of the blade and connected by a solid transverse portion at the other end of the blade and having outer sharpened edges, the said transverse end portion containing a swaged area and the sharpened edges of the side portions converging uniformly toward the open end of the blade.

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