United States Patent

Welsh

[15] **3,660,893**

[45] **May 9, 1972**

[54] REPLACEABLE BLADE UNIT FOR A SAFETY RAZOR

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[21] Appl. No.: **22,237**

[30] **Foreign Application Priority Data**

Mar. 26, 1969 Great Britain 15,845/69

[52] **U.S. Cl.** **30/50,** 30/52

[51] **Int. Cl.** **B26b 21/06,** B26b 21/22

[58] **Field of Search** 30/40, 40.1, 47, 50, 51, 52, 30/67, 76, 32, 115, 116, 117

[56] **References Cited**

UNITED STATES PATENTS

2,817,897	12/1957	Meohas	30/32
1,016,267	2/1912	Holt	30/52
1,069,668	8/1913	Bell	30/51
1,079,174	11/1913	Holt	30/52
1,231,215	7/1917	Sterrick	30/40.1
1,975,757	10/1934	Gray	30/52 X
2,033,262	3/1936	Strauss	30/47
3,013,553	12/1961	Averbach	30/339 X
3,363,312	1/1968	Fayed	30/40.1

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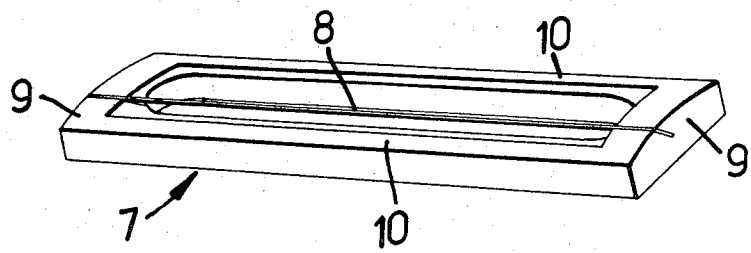
[57] **ABSTRACT**

A replaceable blade unit for a safety razor in which the blade is secured in the blade unit at its ends only and the intermediate portion of the blade, on which the cutting edge is formed, is unclamped and held under tension directed longitudinally of the blade parallel to the cutting edge.

5 Claims, 10 Drawing Figures



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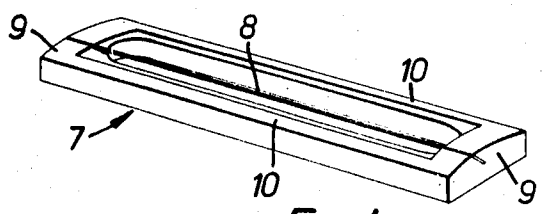

FIG. 1.

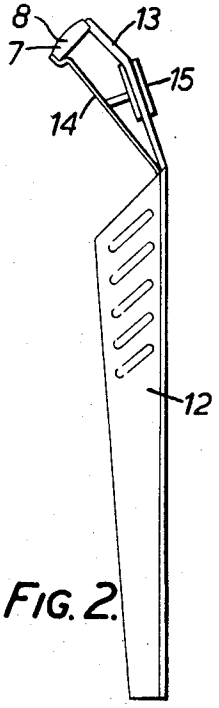

FIG. 2.

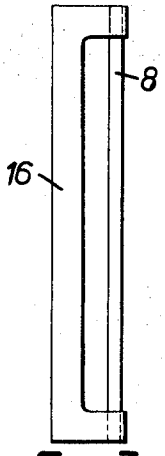

FIG. 3.

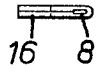

FIG. 4.

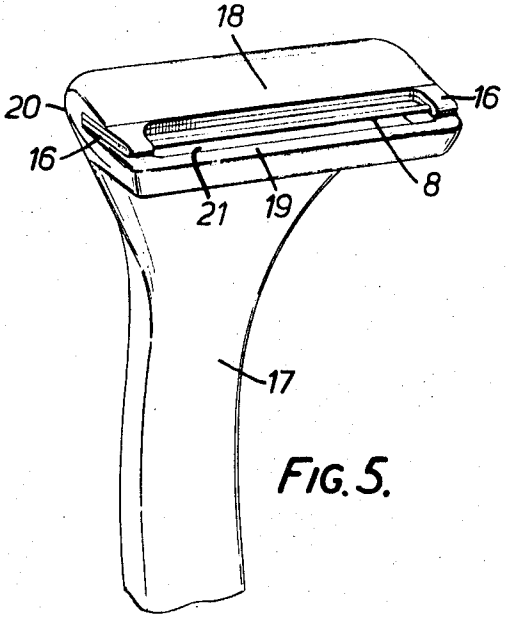

FIG. 5.

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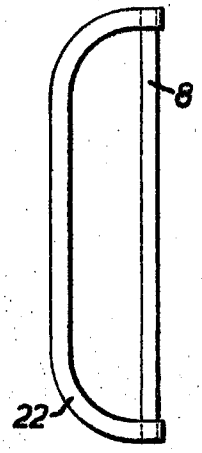

FIG. 6.

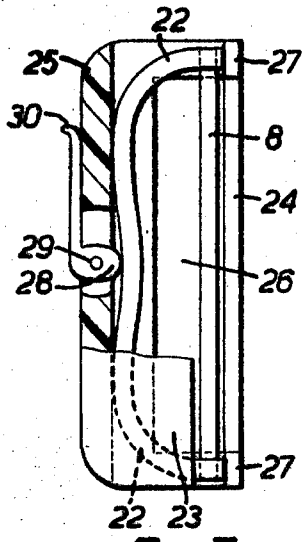

FIG. 7.

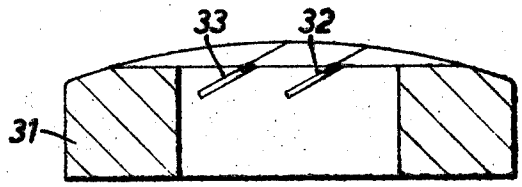

FIG. 8.

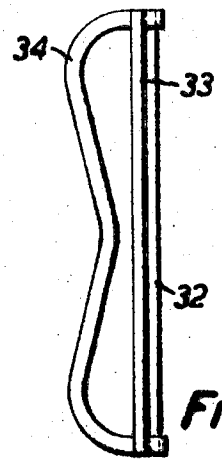

FIG. 9.

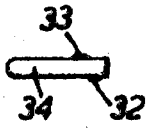

FIG. 10.

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REPLACEABLE BLADE UNIT FOR A SAFETY RAZOR

The safety razors of the present invention differ from the many constructions which have been used or proposed in the past by the fact that the blade is secured in the razor at its ends only, the intermediate portion of the blade, on which the cutting edge is formed, being left unclamped and being held under tension directed longitudinally of the blade, parallel to the cutting edge.

One form of blade in accordance with the invention consists of a steel strip of about the length of a conventional razor blade (say 1¾ inches) having a width of about one-eighth inch and a thickness of about 0.004 inch, the end portions only of this strip being anchored in a non-relaxing structure which applies to the strip a longitudinal tensioning force of from 4 to 10 lb. weight and leaves free and unsupported the intermediate portion of the strip, this intermediate portion at least of the strip (measuring, say, 1½ inches in length) having one of its edges sharpened to a cutting edge.

However, the thickness and width of the blade and the tensioning force applied to it may all be varied within wide limits, these three parameters being to some extent at least interdependent. When the blade is made of strip metal, it may have any thickness within the range of thicknesses employed in commercially available safety razor blades, that is from about 0.0015 inch up to about 0.010 inch, but the maximum thickness of the blade may exceed the latter figure, particularly when the blade does not have two parallel faces, but is (for example) of triangular section, as further explained below.

While satisfactory results can be obtained with a blade strip 0.125 inch in width, it appears advantageous to employ a narrower strip, having a width of 0.100 inch or less, and a width in the range 0.030 to 0.060 inch appears to be particularly advantageous. In general, the narrower the blade strip, the greater is the tensional force which is required to hold the unclamped central portion of the strip sufficiently rigid to constitute a satisfactory shaving instrument. The drag imposed on the blade during shaving tends to twist the blade about its longitudinal axis so as to increase the angle at which the cutting edge engages the skin and this angle should not be allowed to increase beyond a maximum of about 35°. By way of example, the blade may be set initially at an angle of 20° and so tensioned that in normal use the angle will not increase beyond 25°. The applied tension may leave the blade with some degree of lateral flexibility and this appears to be advantageous, as allowing the blade to conform to some degree to the shape of the surface being shaved. With a relatively wide blade a tensional force of as little as one-half lb. weight may be sufficient to hold the strip against twisting, but with narrower blades greater tension is necessary. However, the narrower and thinner the blade strip, the less is the maximum tensional force which it can withstand. A blade strip of stainless steel measuring 0.040 inch in width and 0.004 inch in thickness, for example, will snap under a tensional force of about 35 lb. weight and to provide an adequate margin of safety the tensional force applied preferably does not exceed about half the breaking stress. The practically useful range of tension which can be employed with blade strips of the varying cross-sectional dimensions mentioned above extends from about one-half to about 20 lb. weight.

The narrow blades of the present invention may be sharpened by appropriate modifications of the standard sharpening procedures employed commercially for wider blades, a steel strip of great length being sharpened along one or both its longitudinal edges and subsequently severed transversely to form individual blades. The narrow blades may be made by sharpening the edge of a wider strip of metal and then slitting this strip longitudinally to give a blade strip of the required width. Thus, for example, blades one-eighth inch in width may be made by sharpening both longitudinal edges of a strip one-fourth inch in width and subsequently slitting this strip along its longitudinal center line. Alternatively, the strip may be given approximately its final cross-sectional dimensions before sharpening. Such a strip may be produced by forming a rod or wire through appropriately shaped and dimensioned dies to produce a strip of triangular, lenticular, or other cross-section. By way of example, one suitable section is an isosceles triangle having a base (maximum strip thickness) of about 0.015 inch and a height (strip width) of about 0.040 inch.

The narrow blades of the invention can be applied directly to appropriately designed safety razors, adapted to clamp the blade at two spaced points and to apply the requisite tensioning force to the length of blade between these points. Such a system can conveniently be adopted in razors of the band or ribbon type, making use of a blade strip of substantial length, only a small part of which is used for shaving at any one time, the strip being advanced step by step through the razor to bring fresh lengths into position for use successively.

When the blade is of the normal single length, handling is facilitated by anchoring the two ends of each blade strip in a suitable supporting structure in the course of manufacture, the composite unit thus produced being fitted by the user to the razor and discarded when the blade reaches the end of its useful life for replacement by a fresh unit. The blade may be held pre-tensioned by the supporting structure itself, or the blade may be held untensioned (or only lightly tensioned) before the unit is fitted to the razor, the supporting structure being deformed by its engagement with the razor so as to apply the requisite tension to the blade. The supporting structure is preferably so formed that it presents surfaces which in use will engage the skin in front of and behind the cutting edge of the blade and will thus accurately locate the cutting edge relative to the skin, in the same way as do the guard and cap of conventional safety razors. The replaceable blade unit then constitutes a complete shaving unit or razor head, so that the razor itself need be no more than a simple handle provided with means for releasably securing the replaceable head.

The majority of plastics materials relax or yield progressively when subjected to continuous stress and we accordingly at present prefer the use of metal for the supporting structure of the blade unit. The ends of the blade strip can be secured to the supporting structure by spot welding. It is also possible to effect attachment by the use of an adhesive, such as an epoxy resin, but such materials are also subject to relaxation, so that the desired blade tension may not be maintained. The method which we at present prefer to use for anchoring the blade strip to the supporting structure is to deform the material of the supporting structure so that it exerts a clamping force on the blade strip, after the two parts have been brought into the required relative positions, for example by inserting each end of the blade strip into a slot formed in the support and then forcing the walls of the slot together to grip the blade strip between them. Alternatively the ends of the blade strip may be curled over or otherwise shaped to prevent the strip from being pulled out of the slots in the supporting structure.

The blade units may include two or more blade strips disposed with their cutting edges parallel and arranged to follow one another over the skin to be shaved. It has already been recognized that a closer shave can be obtained by the use of two cutting edges thus arranged in tandem and safety razor constructions have been proposed in which two blades of conventional form, held apart by a spacer member inserted between them, are clamped between the guard and the cap of the razor. With any such construction shaving debris tends to accummulate in the channel formed between the cutting edges of the two blades and the edge of the spacer member, detracting from the performance, whereas when blade strips in accordance with the present invention are employed, no such difficulty occurs, since the gap between two blade strips disposed in tandem can be left fully open.

Blade units in accordance with the present invention may also be made with two blade strips disposed with their cutting edges parallel and facing one another, in the manner described in U.S. Pat. No. 3,488,764.

The accompanying drawing shows, by way of example only, a number of constructions in accordance with the invention. In this drawing:

FIG. 1 is a perspective view of a blade unit incorporating a single pre-tensioned blade strip;

FIG. 2 is a side view of a complete razor, fitted with a blade unit of the form shown in FIG. 1;

FIG. 3 is a plan view and FIG. 4 an end view of another form of blade unit;

FIG. 5 is a perspective view of a complete razor fitted with a blade unit of the form shown in FIGS. 3 and 4;

FIG. 6 is a plan view of a third form of blade unit;

FIG. 7 is a plan view, partly in section, of a complete razor fitted with a blade unit of the form shown in FIG. 6;

FIG. 8 is an enlarged transverse section, not drawn to scale, through a blade unit incorporating two blade strips in tandem, and

FIGS. 9 and 10 are plan and end views respectively of another form of blade unit incorporating two blade strips.

The blade unit shown in FIG. 1 comprises a metal supporting structure 7 in the form of a rectangular frame, or open-bottomed box, having a substantially plane upper surface, which engages the skin during shaving. A blade strip 8 extends freely across an opening in this upper surface, being in engagement with the supporting frame at its ends only. In assembling the parts, the blade strip is held at its ends and subjected to the desired degree of tension. The tensioned strip is inserted into slots provided in the end members 9 of the frame and with the blade still held tensioned the material of the frame is deformed to close up the slots and clamp the blade. The projecting ends of the blade strip are subsequently trimmed away. The end members 9 of the frame have convex upper surfaces, so that they project above the plane of the front and rear members 10, allowing the full width of the blade strip to be inserted into the slots in the end members but leaving the cutting edge with the required degree of exposure. The overall width of the shaving head may be about one-fourth inch and preferably does not exceed about one-half inch, so that access is easily possible to difficult parts of the face, such as under the nose.

FIG. 2 shows a blade unit, such as that of FIG. 1, in position in a razor. The razor comprises a handle 12, to which are secured two strips 13 and 14 of resilient sheet metal, whose free ends are shaped to locate and grip the blade unit. A finger button 15, secured to strip 14 and projecting through an opening in strip 13, allows the strips to be sprung apart sufficiently to release the blade unit and permit the insertion of a fresh unit.

In the blade unit shown in FIGS. 3 and 4, the blade strip 8 is secured at its ends to a support member 16, constituted by a rectangular frame of aluminum or other suitable metal which has been doubled over about its center line so as to clamp the previously tensioned blade between the two halves of the frame. To improve the grip between the frame and the blade, the end portions of the latter may be roughened or indented, as by file marks.

FIG. 5 shows the blade unit of FIGS. 3 and 4 fitted into a razor. The razor is in this case constituted by a one-piece molding of a suitable synthetic resin material shaped to provide a handle 17 and a head which comprises an upper jaw 18 and a lower jaw 19, connected together by a rear wall 20, the frame 16 of the blade unit being a frictional sliding fit between the two jaws. The lower jaw, which is apertured as indicated at 21 to allow escape of shaving debris, provides a guard surface for engaging the skin ahead of the cutting edge of blade 8, while the top surface of the upper jaw 18 provides a cap surface engaging the skin behind the cutting edge.

In the blade unit shown in FIG. 6, the blade strip 8 is secured at its ends, by spot welding for example, to the ends of a bow-shaped metal rod 22. The blade may again be held under the required tension by the supporting structure 22, in which case the unit may be employed with a razor essentially similar to that shown in FIG. 5.

Alternatively the blade may be held untensioned, or only very lightly tensioned, by the structure 22 before the unit is inserted in a razor. In either of the last two cases the unit is employed with the razor illustrated in FIG. 7. This razor is again generally similar to that illustrated in FIG. 5, the molded plastics head comprising an upper jaw 23 and a lower jaw 24 connected together by a rear wall 25, the support member 22 of the blade unit fitting slidably between the jaws. The lower jaw 24, which is formed with an aperture 26, provides a guard surface for engaging the skin ahead of the blade 8 while the upper jaw 23 provides a cap surface for engaging the skin behind the blade. In this construction, however, stops 27 project upwardly from the front corners of the lower jaw to provide abutments for the ends of the support member 22 and the rear wall 25 is formed with an opening which accommodates a cam member 28. Cam 28 is pivoted at 29 to the head and has an integral extension 30 which can be operated to turn the cam about its pivot so that it is withdrawn clear of the path of the blade unit, allowing the latter to slide easily into and out of the position shown. When the blade unit is in position, cam 28 is turned into the position shown to bear against the member 22 (forward movement of which is prevented by the stops 27) and deform it as shown, thereby applying the required tension to the blade.

The movable cam 28, which serves to distort the frame member of the blade unit after the latter has been positioned in the razor, may be replaced by a fixed abutment, so that the action of inserting the blade unit in the razor itself serves to distort the support member and thus apply tension to the blade without the need for any separate tensioning operation.

FIG. 8 shows a blade unit generally similar to that of FIG. 1, but including two blade strips 32, 33 secured at their ends to the same box-like supporting structure 31 and arranged so that their cutting edges act in succession on the surface to be shaved. With such tandem blades, the second or follower blade can be given a greater exposure than would be desirable for the first or leading blade, or for a single blade used alone. Accordingly, the follower blade 33 is preferably given a greater exposure than the leading blade 32. Either the leading blade or both blades may be given a negative exposure. By way of example only, a tandem blade unit of the character shown in FIG. 8 gives highly satisfactory results if the arrangement and dimensions are as follows. Each blade is set at an angle of 25° to the plane tangent to the parts of the upper surface of the structure 31 which lie ahead of and behind the blades. The leading blade 32 has a positive exposure of 0.003 inch and a span of 0.050 inch. The follower blade 33 has a positive exposure of 0.006 inch and the perpendicular distance between its plane and that of the leading blade is 0.027 inch, so that the span between the two cutting edges is approximately 0.052 inch. Whilst positive exposures up to 0.006 inch are generally given to the follower blade higher exposures may be used. Satisfactory shaving results can be obtained with a follower blade having zero exposure in combination with a leading blade having a negative exposure of −0.003 inch. By "exposure" is meant the perpendicular distance from the cutting edge to the plane tangent to the skin-engaging surfaces disposed in front of and behind the cutting edge, the exposure being considered positive when the cutting edge projects beyond this plane and negative when it lies further from the skin than that plane. By "span" is meant the width of the gap between the cutting edge and the nearest part of the skin-engaging guard surface ahead of it. The angle of the blade is measured between the median plane of the blade and the above-mentioned tangent plane.

The blade unit shown in FIGS. 9 and 10 also includes two blade strips 32, 33 secured at their ends to the same supporting structure and arranged to act in tandem, as described with reference to FIG. 8. In this case, however, the supporting structure is similar in character to that of FIG. 6, though the bow member 34 is of a different shape. The two blade strips are secured, as by spot welding, to opposite faces of the supporting bow, whose thickness thus determines the spacing between them.

It will be appreciated that the blade units shown in FIGS. 1 and 8 themselves provide the surfaces which engage the skin ahead of and behind the cutting edge or edges, whereas with the units shown in FIGS. 3 and 4, FIG. 6 and FIGS. 7 and 9,

the surfaces which locate the cutting edge relative to the skin are formed by parts of the razor and not by parts of the blade unit.

I claim:

1. A replaceable blade unit for a safety razor having a support structure defining a first transversely extending support portion and a second transversely extending support portion disposed rearwardly of and spaced from said forward support portion, a blade permanently secured to said support structure at its ends only, the intermediate portion of the blade, on which the cutting edge is formed, lying clear of the support structure and being held under tension directed longitudinally of the blade, parallel to the cutting edge, said first support portion defining a guard surface for engaging the skin ahead of and spaced from the cutting edge of said blade and said second support portion defining a cap surface for engaging the skin behind and spaced from the cutting edge of said blade, said blade being disposed at an angle of less that 35° relative to the plane tangent to said first and second support portions.

2. A blade unit in accordance with claim 1, in which the blade has a width not exceeding 0.125 inch and a thickness in the range from 0.0015 to 0.015 inch and is held under a tension in the range from one-half to 20 pounds weight, the tension not exceeding one half the breaking stress of the blade.

3. A blade unit in accordance with claim 2 in which the width of the blade is 0.100 inch or less.

4. A blade unit in accordance with claim 2 in which the width of the blade is in the range from 0.030 to 0.060 inch.

5. A blade unit in accordance with claim 1 and further including a second blade mounted to said support structure whereby both blades are disposed with their cutting edges parallel and arranged to follow one another over the skin to be shaved, each of said blades being secured at its ends only the intermediate portion of the blade being left unclamped and held under tension directed longitudinally of the blade.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,660,893 Dated May 9, 1972

Inventor(s) Norman C. Welsh

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

On the cover sheet [30] patent number "15,845/69" should read -- 15,848/69 --.

Signed and sealed this 7th day of November 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334.