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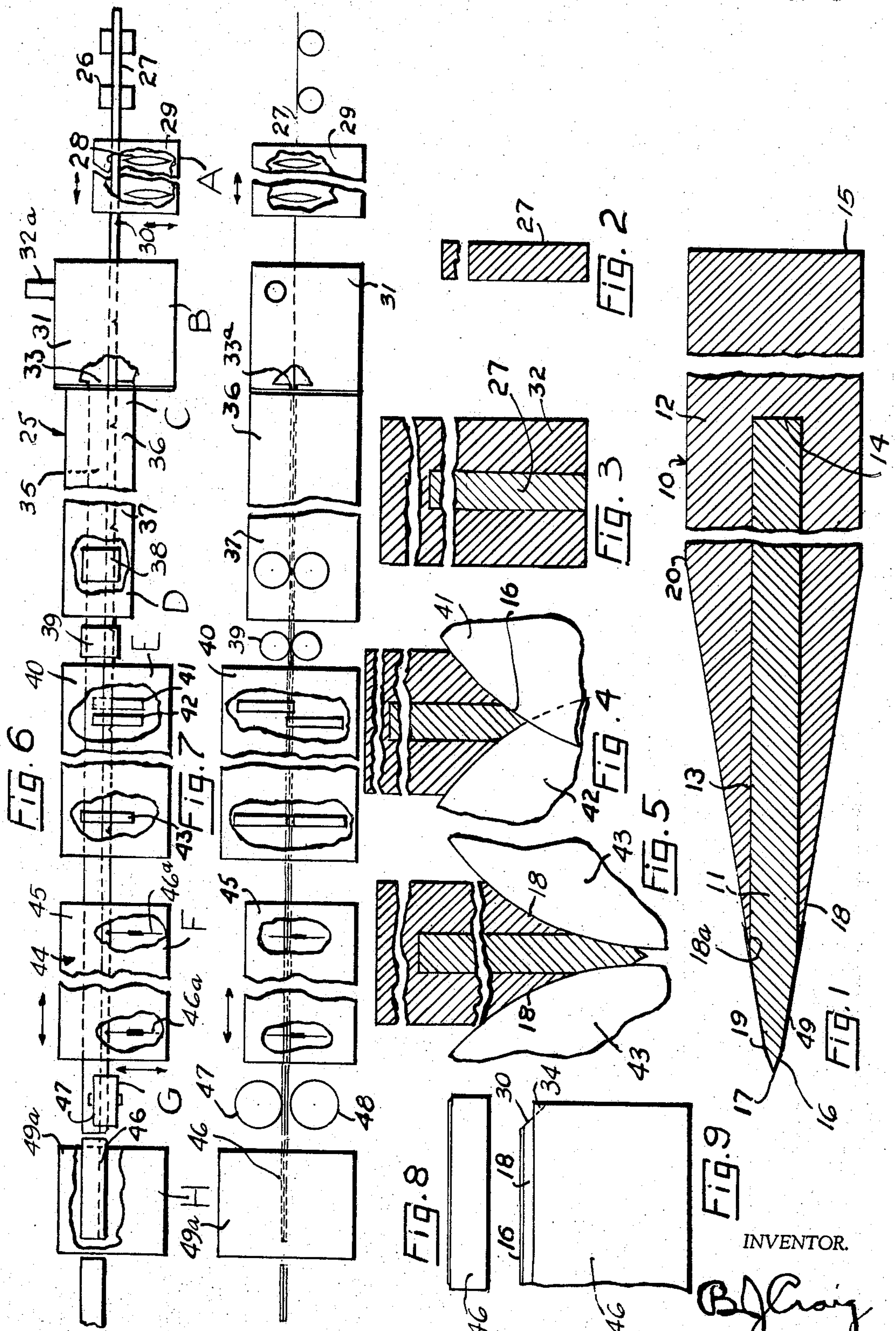
B. J. CRAIG

3,349,488

RAZOR BLADES

Original Filed March 22, 1965

2 Sheets-Sheet 1

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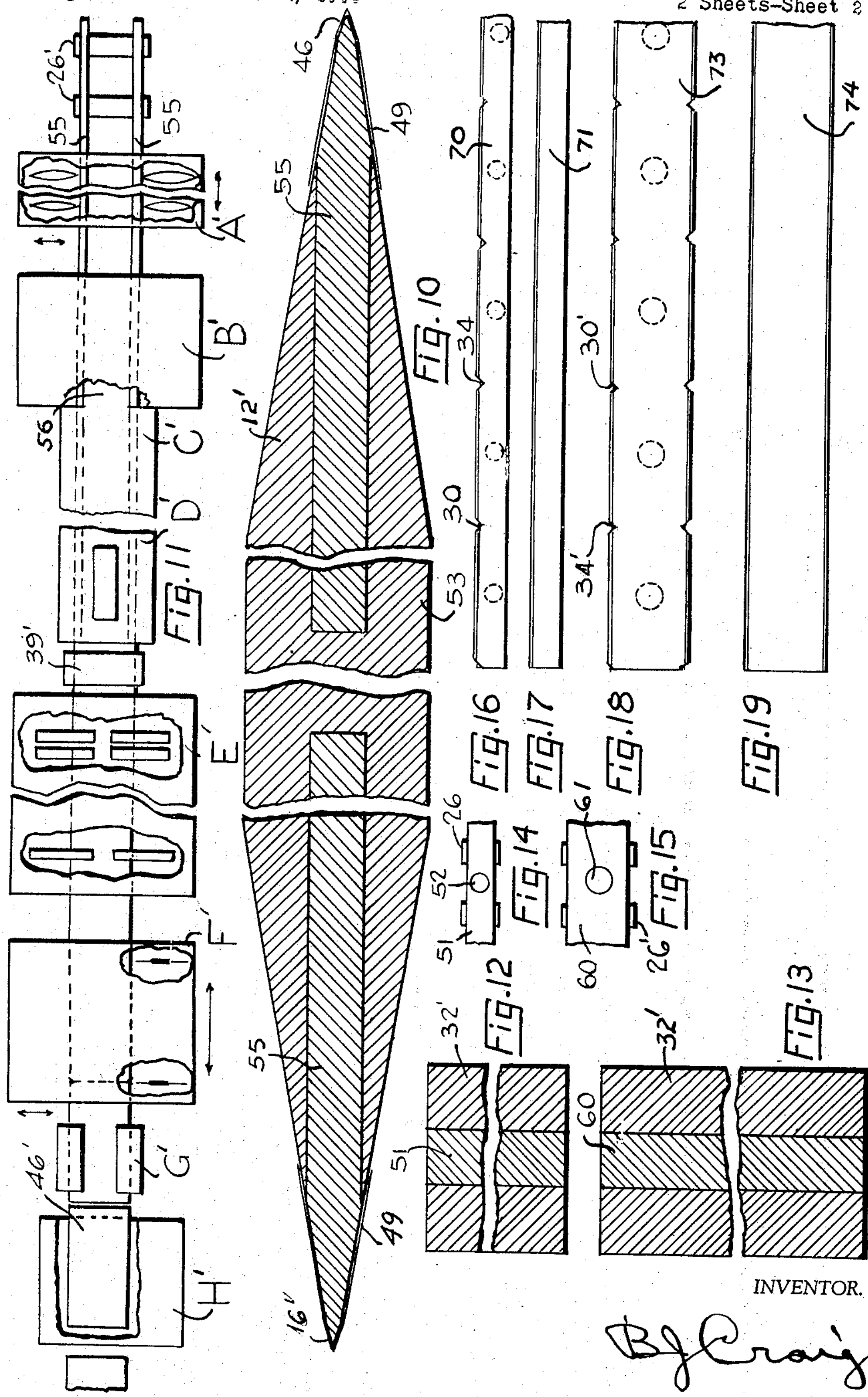


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## RAZOR BLADES

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Continuation of application Ser. No. 441,691, Mar. 22, 1965. This application Aug. 9, 1966, Ser. No. 572,393
1 Claim. (Cl. 30—346.6)


### ABSTRACT OF THE DISCLOSURE

Safety razor blades having a metallic core supported in an adhering body, the body providing support for a cutting edge formed on the core to enable the blade to be worked, sharpened and supported in a razor frame for the shaving action.


This is a continuation of co-pending application Ser. No. 441,691, filed Mar. 22, 1965, now abandoned.

The invention hereof relates to single edged or double edged safety razor blades which are adapted to be clamped in razor frames.

Conventional safety razor blades are usually from 0.003 to 0.015 inch thick and have facets which provide a wedge-shaped cutting edge, the included solid angle of the facets is usually greater than 14° and less than 35°. The faceting on each cutting edge need not have only one set of planar uninterrupted continuous surfaces or facets, but may consist of two or more sets of facets, as for example primary and secondary facets formed by successive grinding or honing operations and intersecting each other along zones generally parallel to the ultimate edge.

The primary facet, i.e., the facet immediately adjacent the ultimate edge, may have a width at its base as little as 0.0003 inch or even less as compared to the diameter of a beard hair which averages about 0.004 to 0.005 inch, while the thickness of the ultimate edge itself is generally less than 6000 angstrom units and preferably less than 2500 angstrom units.

The primary facets form an isosceles triangle, the base of which triangle has a length equal to the thickness of the base of the primary facets which as stated may be .0003 inch or less. The included solid angle of the primary facets as stated above may be 14° to 35°. Assuming that the base is .0003 inch in length and the included solid angle is 26° then the altitude of the isosceles triangle formed by the primary facets will be approximately .00065.

The primary facet which provides the ultimate edge includes all of the blade which performs the shaving act. This minute cutting area edge portion embodied in the primary facet is all that is needed for shaving. The rest of the blade has the sole function of supporting the primary facet area.

This extremely thin and narrow blade edge or primary facet is too small in dimensions, too flexible, too brittle, et cetera, to be worked during manufacture or to be handled by a user of a razor and the primary facet edge portion is so small that it could not be held in a razor for the shaving act.

The secondary facets, as stated, have no function as far as shaving is concerned. The secondary facets which extend from the primary facets have an included solid angle which is less than the solid angle included by the primary facets to provide clearance so that the body which supports the primary facets will not obstruct movement of the razor in the shaving act.

It is desirable that safety razor blades for use in blade holders be made of material which will take and hold a sharp edge for a maximum number of shaves.

Such blades, whether used in single edged injector razors, in double edged razors or in other razors, must have certain length and width and must be ground or honed to a desired degree of keenness. Most razor blades in use today are made of high carbon or stainless steel and when made of such material retain their sharpness for a number of shaves.

Some other materials such as tungsten carbide, diamond impregnated material, Phosphor bronze, ceramic materials, glass, et cetera, have in some instances the advantage that they will last much longer and in other instances will provide a more comfortable shave than the high carbon and stainless steel blades mentioned above. Blades made, however, from the more desirable material are apt to cost more because the material used is more expensive, so that the added blade life and the added comfort in shaving may be secured only at a higher cost per blade.

Also, blades made from some of the more desirable materials are difficult to work to the size required to fit the standard razor frame. Some blades may be too brittle to handle and to clamp in a razor frame. Also blades made from some of the other materials available must be so extremely thin that they are not strong or rigid enough and require stiffening reinforcement for the shaving operation.

The applicant has found that a razor blade having the primary facets thereon arranged on a core containing a minimum amount of the better and/or more expensive material and with the core having a stiffening and supporting body of low cost material adherently connected, will provide a razor blade which can be worked, handled, and suitably supported in a razor frame and which will provide a superior, longer lasting shaving edge, and can be made at a low cost.

The objects and advantages of the invention will be apparent from the following description and the accompanying drawings, wherein:

FIG. 1 is a sectional view showing a single edged blade;

FIG. 2 is a transverse sectional view of the core;

FIG. 3 is a sectional view showing the core with the body thereon;

FIG. 4 is a fragmentary sectional view with parts in elevation showing the abrasive wheels and the manner in which the primary facets are formed;

FIG. 5 is a view similar to FIG. 4 showing the formation of the secondary facets;

FIG. 6 is a diagrammatic top plan view showing an apparatus for making a single edged blade;

FIG. 7 is a side elevation of the apparatus shown in FIG. 6;

FIG. 8 is an elevation of a single edged blade;

FIG. 9 is a fragmentary enlarged elevational view showing blade details;

FIG. 10 is a sectional view showing a double edged blade;

FIG. 11 is a diagrammatic plan view showing an apparatus for making a double edged blade;

FIG. 12 shows a blank for making a single edged blade wherein the core extends substantially the full width of the blade;

FIG. 13 shows a blank for making a double edged blade wherein the core extends substantially the full width of the blade;

FIG. 14 shows a full width core for a single edged blade;

FIG. 15 shows a full width core for a double edged blade;

FIG. 16 shows a ribbon of notched single edged blades;

FIG. 17 shows a ribbon of single edged blades without notches;

FIG. 18 shows a ribbon of notched double edged blades; and

FIG. 19 shows a ribbon of unnotched double edged blades.

Referring to the drawing by reference characters the features of this invention are shown in a razor blade which is adapted for clamping in a razor frame and which is indicated, on a greatly enlarged scale, generally at **10**.

As shown the blade includes a core **11** and a body **12**. The core **11** is the shaving portion and preferably comprises a thin layer or foil of material which is hard and suitable to be sharpened but which is too thin and flexible to be handled and requires support.

The body **12** serves to stiffen and reinforce the core **11** and provides means to support the core while it is being worked and also to support the blade when it is fitted in the head portion of a razor.

The core **11** may be approximately .0005 inch to .001 inch thick or thicker and may be made of any suitable hard material which can be pre-formed to the desired shape and which when sharpened will provide a comfortable shave and will have a long life. Among the materials from which the core **11** may be made are carbides (such as tungsten carbide), steel alloys, diamond impregnated material, phosphor bronze, glass, ceramic materials, etc.

The body **12** may be approximately .004 inch thick or thicker and may be made of metal, such as steel, brass, metal alloy, ceramics, plastics, glass fiber plastics, metal fiber plastics and other materials.

The core **11** is shown as mounted in a slot **13** in the body portion and it may be secured in place by adhesion, by welding, etc. In the type of blade shown in FIG. 1 the core ends at **14** remote from the unsharpened edge **15** of the blade.

The core at its exposed edge is provided with a primary facet **16** on each side thereof to provide an ultimate cutting edge **17**. The primary facets **16**, as stated above, may have an included solid angle which is greater than 14° and less than 35°. The primary facets may have a width as little as .0003 inch with the ultimate extreme edge having a thickness generally less than 6000 angstrom units and preferably less than 2500 angstrom units.

The area of the body in the vicinity of the end **14** of the core and remote from the primary facets **16** is adapted to be engaged by the clamping portion (not shown) of a razor frame to hold the blade in shaving position.

Intermediate each face of the core **11**, and remote from the facets **16**, I provide secondary facets **18** which intersect the primary facets **16** on the core at **19** and continues along the body and terminates on the body at **20**. The faceted portion **18** of the body **12** meets the faceted portion **18** of the core **11** in a feather edge **18'**, as shown in FIG. 1. As a result of this construction the body **12** furnishes substantial support for the core **11** throughout almost the entire length of the core.

The core continues past the termination **20** of the facets **18** for a short distance as for instance .1 inch and the facets **18** include a lesser solid angle than do the facets **16**. The width of the facets **18** may approximate .1 inch so that the overall width of the core may be about .2 inch. The blade may be about 5⁄16" wide and about 1½ inches long, which are the dimensions of the conventional injector blades now being marketed.

The blade **10** is adapted for use in the well known injector type of razors in which used blades are discarded and new blades inserted.

The primary facets **16** and the secondary facets **18** are shown as hollow ground and the primary facets are preferably ground first while the blade blank is strong at the edge being ground. The secondary facets may preferably be ground after the first facets are formed. By employing the order of grinding as set forth the blade edge may be sharpened to what is believed to be the best advantage. Other procedure in the blade grinding and in honing and/or polishing may be followed.

A novel apparatus for the manufacture of the blade described is indicated generally (FIGS. 6 and 7) at **25**. As shown, the apparatus includes conveyor means, shown as rolls **26** for conveying a ribbon **27** of material for forming the core **11** previously described. The ribbon is shown as rectangular in cross section, in FIG. 2.

The rolls **26** advance the ribbon to a notching station A. This notching station may include gangs of V-shaped wheels **28** which are mounted on a carriage **29** and are suitably driven. The carriage **29** moves with the advancing ribbon **25** to the left in FIG. 1 and during its advancing movement it moves laterally and cuts V-shaped spaced notches **30** along one edge of the ribbon. The notches **30** are spaced in accordance with the length of the finished blade.

After the carriage has reached the limit of its forward movement (to the left in FIG. 1) it will move laterally to bring the wheels out of contact with the strip. The carriage will then move to the right to its initial position and the notching operation will be repeated. The gang of abrasive wheels **28** may include any suitable number of wheels. Carriages operated like the carriages **29** are well known in the grinding and polishing art. If notching is not desired station A will be deactivated or the station may be entirely omitted.

From notching station A the ribbon **27** advances to an extruding or covering station B where the body **12**, previously described, is applied to the ribbon **27**. As shown, station B includes a chamber **31** which chamber may contain a supply of the extrusion material **32**.

The material **32** may be supplied to the chamber **31** through a conduit **32**$^a$. The chamber **31** includes a discharge orifice **33** through which the ribbon **27** passes and as it does so it is covered by the extruded material **32**. In this manner the ribbon **27** is provided with the body **12**, as shown in FIG. 3. Guides **33**$^a$ hold the ribbon disposed in the median plane midway between the sides of the body **12** as the body is extruded so that the body **12** is symmetrical with respect to the median plane of the core to thus provide a reversible blade. The extruded material **32** enters the notches **30** and forms ears **34** (FIG. 9) which engage the wall of the notches **30** to prevent shifting of the core **11** in the body **12**. The material extruded onto the core will be of such a nature that it will adhere to the core.

The covered ribbon now forms a blank blade strip **25** which moves from the orifice **33** into a treating chamber **36** at station C where the body **12** provided by the extrusion is cured or otherwise finished. In the event that no curing or treatment of the extrusion is required, the blank blade strip **35** may pass through station C without being operated upon or station C may be entirely omitted.

The blank blade strip next proceeds to station D which, as shown, includes a housing **37** in which are arranged rotary punching rolls **38** by means of which the blank blade strip **35** may be punched with circular or elongated holes usually found in conventional safety razor blades. The punching rolls **38** may also punch out the body above the ears **34** (FIG. 9) so that the upper portion of the notches **30** will be exposed. Station D may be deactivated for some blades or the station may be entirely omitted as desired. To avoid confusion by too many lines in the drawing, the strip **35** is shown as imperforate in FIGS. 6 and 7 and station D is presumed to be deactivated.

The blank blade strip may be advanced in any suitable manner, for example by rolls **39** which engage the blank blade strip **35** beyond station D and advance the strip to station E, whereat one edge of the strip is sharpened. Station E includes a faceting device which embodies a support as indicated at **40**. The support **40** is stationary and the strip is faceted as it moves across the support.

The support **40** includes gangs of abrasive wheels **41** and **42** which are shown as arranged in pairs and are suitably driven. The wheels **41** and **42** work on opposite sides of the strip 35 to form the primary facets 16, previously mentioned. The support 40 is stationary and the wheels 41, 42 and 43 perform the grinding operation while the blank strip advances. The wheels shown provide hollow ground facets. Other types of wheels and support may be employed.

The covered and faceted blank blade strip 35 then advances to station F, where a cut-off device 44 which includes a carriage 45 has cut-off wheels 46ª which are disposed in gangs thereon.

The carriage 45 moves forward and to the left in FIG. 1 with the blank blade strip 35 and as the carriage moves with the extruded strip the cut-off wheels move across the strip to sever the strip into individual blades 46. After the blades are cut off the wheels 46ª move away from the strip area while the strip is still advancing. After the wheels 46ª have cleared the carriage, the latter moves to the right in FIG. 1, with the wheels 46ª remaining in their retracted position to again start cutting operation at the proper time. Carriages and cut-off devices like the carriage 45 and the wheels 46ª are well known in the art.

From cut-off station F the individual blades move into contact with upper and lower coating wheels 47 and 48 at station G. The wheels 47 and 48 are suitably supplied with coating integument forming material 49 (FIG. 1) of a character to be later described. The wheels 47 and 48 coat the faceted edge of the individual blades as the blades move along and the wheels are preferably so arranged that the coating covers both the first and secondary facets and extends beyond the secondary facets some distance along the extruded material.

The application of various integument forming materials, such as fluorocarbon, Teflon, et cetera, to the cutting edges of razor blades to improve the shaving qualities of the blade is old and is in general practice. Such materials applied by coating or by condensing material upon the blade and thereafter sintering the condensed material, and in other ways to form a strong bond between the coating and the substrate.

The applicant has found that by employing a foil-like core for the blade and laminating the core, which is too thin for use alone, to a body which strengthens the core for working, handling and use, he can provide an improved blade. The addition of a coating 49 such as described improves the shaving qualities of such a laminated blade. Moreover the applicant has found that by extending the coating such as that described above across the core and onto the facets and some distance along the faceted body so that the coating crosses the feather edge where the body joins the core he provides a new function for the coating, namely, that the bond between the core and the body is greatly strengthened and the thin adhered coating gives greatly improved mechanical support throughout the extent of the blade edge and reduces blade drag and increases smoothness of shave. The thickness of the integument 49 does not appear to be critical nor need the thickness of the integument be uniform throughout its extent.

From station G the blades move to station H which includes a chamber 49ª in which the coating 49 is heat treated or otherwise cured. From station H the blades move away individually for inspection and packaging.

Instead of the core 11 previously described the core may be wider and may extend substantially across the body 12 to form a blank which in some instances may have better characteristics than have the blades with the narrow cores. A ribbon from which such wide core may be made is shown in FIGS. 12 and 14 at 51. This ribbon is carried on rolls 26 like the rolls 26 previous described. The manufacturing apparatus shown in FIGS. 1 and 2, which has been described as adapted to be used when the ribbons are narrow may also be employed in connection with the blades made from the wide ribbon 51.

When the wide core 51 is employed the core may have holes 52 therein. The extruded material 32 may pass



through the holes 52 from one side of the body to the other side of the body to form a rivet to anchor the extrusion to the ribbon.

The present invention also provides double edged blades and includes method and apparatus for making double edged blades.

In FIG. 10, I show a reversible double edged blade 53 which is similar to the single edged blade shown in FIG. 1. In FIG. 11, I show an apparatus for making the double edged blade, which apparatus is similar to the apparatus previously described and shown in FIGS. 6 and 7. In describing the blade and apparatus shown in FIGS. 10 and 11 parts similar to those previously described will be referred to by single primed reference numerals.

In the apparatus of FIG. 11 two narrow ribbons 55 are advanced by rolls 26′ to a notching station A′ where the outer edges of the two ribbons 55 are notched. The notched ribbons then advance to the extruding station B′ where the ribbons are covered with a body forming material 12′ which unites the ribbons 55 and forms a blank strip 56.

The blank blade strip 56 may then move to a treating station C′ for curing. The blank blade strip 56 may be suitably punched at station D′. Feed rolls 39′ move the double edged blank blade strip to station E′ where faceting of both edges of the blank blade may occur. From station E′ the double edged blank advances to station F′ where the blank is cut into blade lengths. The individual blades 46′ may then move to station G′ where they may be coated and then to station H′ where the blade coatings may be cured.

Instead of employing individual spaced ribbons for the double edged blade, I may make the core of a single member which may be as wide as the entire body. In FIG. 13 such blade core 60 is employed. The core may be advanced by rolls 26′ as shown in FIG. 15. The progress of the wide insert through the manufacturing apparatus will be the same as that previously described. The core 60 may have holes 61 therein to cause the extruded material to pass through these holes to form anchorage.

In FIG. 16, I show a continuous ribbon of single edged blades 70 in strip form and with notches 30 and the holes 52 previously described. The ribbon of blades in FIG. 16 may have a narrow or a wide core as previously described. A ribbon of blades of this nature may be used in a reel type magazine razor which employs a spool for used blades and a spool of unused blades and wherein when a blade becomes dull it may be advanced to the used spool and a new blade from the unused spool substituted. In this connection the notches 30 in addition to the functions recited above are useful for indexing the advance of the ribbon of blades.

In FIG. 17, the continuous ribbon of blades 71 is similar to that previously described but the notches 45 and the holes 52 are omitted. The core in the ribbon of blades 71 may be narrow or wide.

FIG. 18 shows a notched continuous ribbon 73 of double edged blades similar to the strip of single edged blades shown in FIG. 16. The ribbon 73 is notched and has holes previously described. In FIG. 19 a ribbon of notched double edged blades 74 is shown. This ribbon 74 has no edge notches and no holes 61. In FIGS. 18 and 19 the ribbon of blades may have a pair of narrow cores or a single wide core as previously described.

What is claimed is:

A razor blade adapted to be clamped in a razor frame, said razor blade including a foil-like core which is formed of material which is hard and capable of being sharpened but is thin and flexible and requires longitudinal and transverse stiffening reinforcement and support during the final sharpening operation and for later engagement with a razor frame and for the shaving operation, said core having a reinforcing and supporting body secured thereto, said body being thicker than the core and extending rearwardly from a location in the rear of the front edge of the core, said body providing the core with reinforcement for working, for sharpening, for support in a razor frame, and for shaving, said core having an exposed front edge, said exposed front edge having ultimate edge forming facets thereon which form the cutting edge, the body on each face thereof, rearwardly of the ultimate edge forming facets, including an area for engagement with a razor frame, there being feather edges at the location where the faceted portions meet the body, and an integument on the body, said integument extending across the facets and over the feather edges and continuing some distance across



the body beyond the feather edges, said integument serving to prevent peeling of the feather edges from the body.


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