Jan. 19, 1971 T. S. LASZLO 3,555,682

GUARDED RAZOR BLADE

Filed Feb. 3, 1969 2 Sheets-Sheet 1

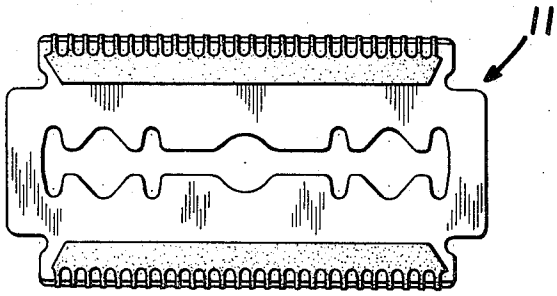


FIG. 1

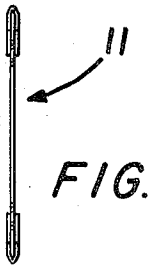
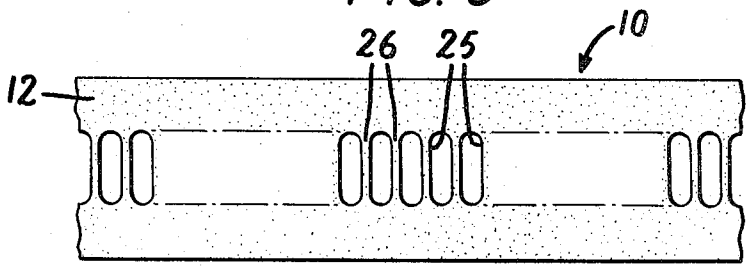


FIG. 2

FIG. 3



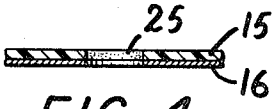


FIG. 4

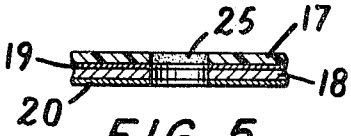


FIG. 5

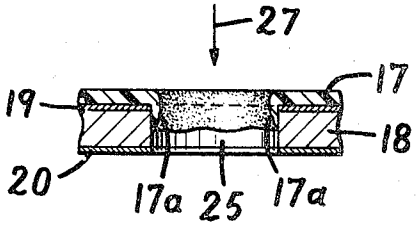
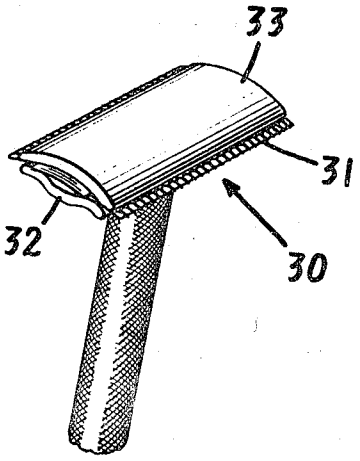


FIG. 5a

FIG. 6

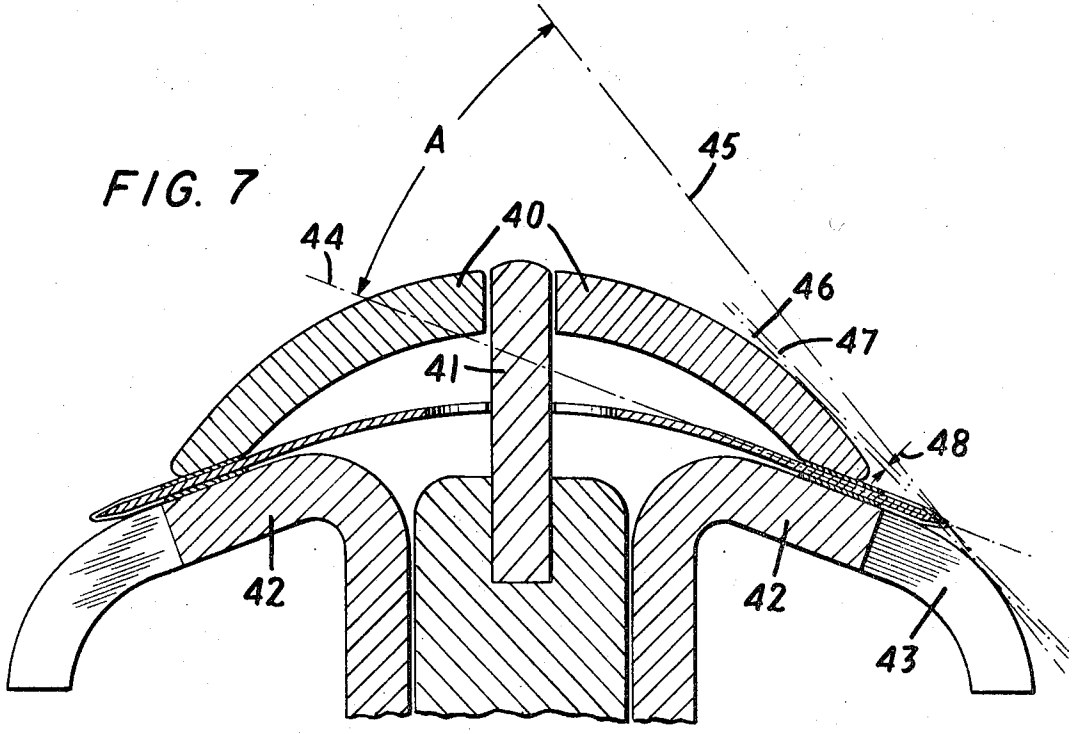


Jan. 19, 1971 T. S. LASZLO 3,555,682

GUARDED RAZOR BLADE

Filed Feb. 3, 1969 2 Sheets-Sheet 2

FIG. 7



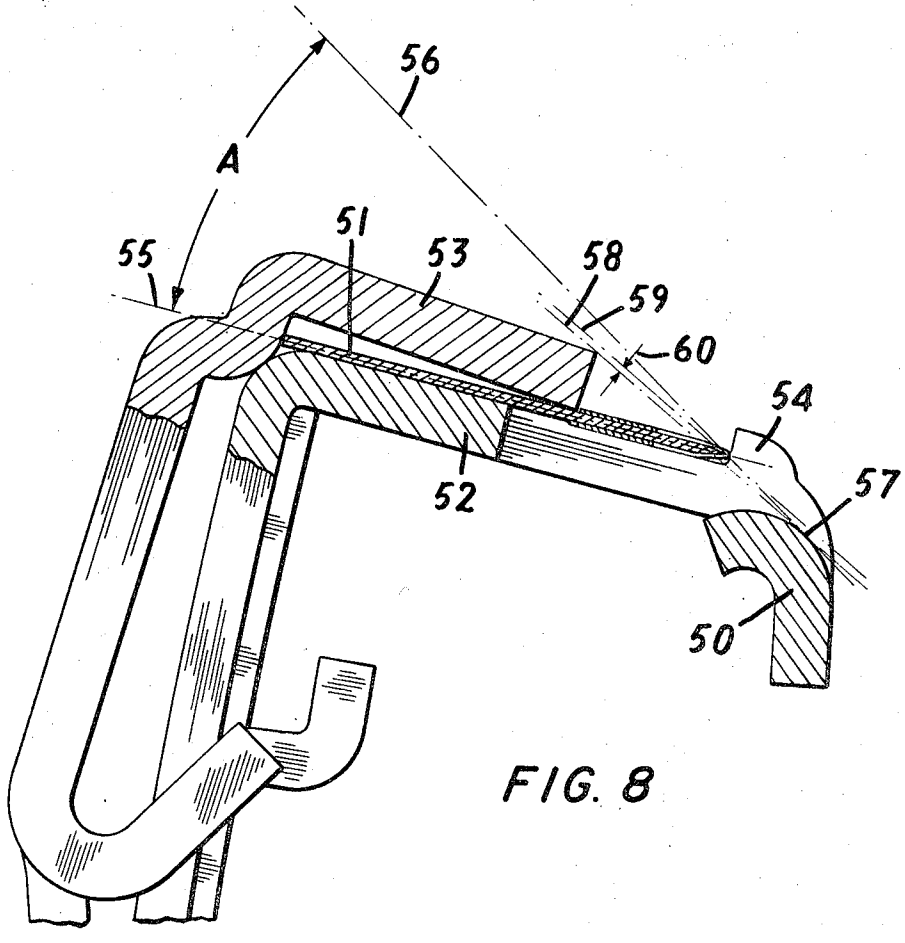


FIG. 8

United States Patent Office 3,555,682 Patented Jan. 19, 1971

3,555,682

GUARDED RAZOR BLADE

Tibor S. Laszlo, Richmond, Va., assignor to Philip Morris Incorporated, Richmond, Va., a corporation of Virginia

Filed Feb. 3, 1969, Ser. No. 796,035
Int. Cl. B26b 29/00
U.S. Cl. 30—346.56 6 Claims

ABSTRACT OF THE DISCLOSURE

A razor blade having a self-contained permanently attached guard comprising a thin flexible sheet with a row of aligned holes and intervening lands, the holes and lands being looped over the blade cutting edge and the sheet being secured to the opposed blade surfaces, the sheet having an outer surface of low coefficient of friction material, and the holes, and lands having specified dimensions and relationships, the blade being capable of use in a simple holder without other guard means but also advantageously embodied in a razor combination including a guard bar with an increased blade edge exposure over that of a conventional similar type razor employing a naked blade.

THE PRIOR ART IN GENERAL

The prior art extending back over many years contains a variety of proposals directed to the application to a cutting blade in permanent or detachable form of guard means intended to make the operation of shaving smoother and more free from irritation and in general safer in use in reducing the danger of nicking or more severe cutting of the skin.

An early patent in this respect is Dickenson 1,035,548 issued Aug. 13, 1912, which discloses a so-called straight razor having a long blade foldable into a slot in the handle, the blade having spirally wound thereon a wire or thread of other material to form a guard. However, the wire turns are shown as widely spaced with no indication or recognition of any criticality in the spacing of the successive loops of the wire nor of the wire diameter. The device undoubtedly would present practical difficulties in manufacture particularly in getting the loops of wire uniformly spaced and without damaging the blade edge.

The patent to Thompson 1,846,622, issued Feb. 23, 1932, proposes to provide the razor blade edge with a series of spots of a metal or a lacquer such as Bakelite. It would appear quite difficult to obtain an arrangement of the dots sufficiently small and uniformly arranged to result in a close and uniform shave. Furthermore, it would appear that these isolated dots might be too easily dislodged and the loss of one or more from a supposedly protected blade could represent a greater hazard than an unprotected blade.

In O'Connor 2,262,248, issued Nov. 11, 1941, there is disclosed the idea of applying a thin sheet of celluloid, Bakelite or metal having an elongated aperture, the sheet being folded along the center line of the aperture so that the blade may lie within the folded halves but with its edge exposed through the entire length of the aperture and covered only at the ends of the long aperture. If this so-called guard has a narrow enough aperture transverse to the blade edge to give real protection to the skin the shaving efficiency of the blade would be seriously reduced.

The more recent patent to Ferrara 3,263,330, issued Aug. 2, 1966, shows some advanced thinking and improvements over the previous art. It describes preforming in a strip of sheet material a series of aligned round holes and folding the sheet over the blade edge along the center line of the holes the sheet being adhesively secured to the opposed faces of the blade. In a specific example

the sheet comprises an outer ply or layer of metal foil such as aluminum, a lower ply of paper and an inner coating of pressure sensitive adhesive for securing the sheet to the blade. The patent gives some suggested dimensions for the size of the holes and the width of the strip between holes but without much discussion as to the most desirable dimensions and relations, and the patent does not take into consideration other factors such as the effect of friction or the resistance to movement of the edge across the skin. Also it is not concerned with any of the refinements or special applications of the blade in a razor in association with a guard bar.

SUMMARY OF THE INVENTION

It has been found that various factors may be combined and related in a blade which obviate disadvantages of the prior art proposals and which produce a shave greatly improved as to smoothness, comfort and closeness and freedom from abrading, and nicks or cuts. The blade embodies a permanently attached guard in the form of a thin sheet folded over the blade edge having a combined relation of size and shape of holes and width of the lands or guard strips between holes and in particular the sheet has an outer surface of a low coefficient of friction plastic material whereby the blade glides smoothly and easily over the skin and effects a close comfortable shave with greatly reduced hazard of nicks or abrasion.

In a specific form the sheet is comprised of a supporting layer or lamina of metal foil such as of aluminum with an outer layer of polytetrafluoroethylene plastic which has an unusually low coefficient of friction. The holes are rectangular in shape or at least have parallel sides perpendicular to the blade edge and are formed by a punching operation with the punch advancing from the plastic side thereby the plastic is caused to flow over the edges of the metal foil around the holes and protect the skin from the ragged edges of the holes in the foil. Although the irregularities are minute it has been found that but for the protection they can cause scratching and irritation of the skin. Also the sides of the holes being substantially perpendicular to the blade edge and nonconverging there is eliminated the tendency of hairs to become caught between the blade surface and the sheet, or between the layers of the sheet in case there is any slight separation of the layers around the holes.

The invention further concerns the incorporation of the blade in a razor having a guard bar the character of the blade enabling in such a combination an increased blade edge exposure to provide a closer shave without increasing the hazards of skin damage or discomfort.

Various other features and advantages will become apparent from a consideration of typical embodiments of the invention described hereinafter and depicted in the drawings, in which:

FIG. 1 is a plan view of a razor blade of a conventional type with the guard means of the present invention applied thereto;

FIG. 2 is an end view of the blade of FIG. 1;

FIG. 3 is a section of a guard strip of the present invention adapted for application to a razor blade such as is shown in FIGS. 1 and 2;

FIG. 4 is a cross section of a guard strip such as shown in FIG. 3 of one form of sheet;

FIG. 5 is a similar cross section of another form of the sheet;

FIG. 5*a* illustrates the effect of punching holes in the metal backing sheet precoated with a plastic;

FIG. 6 is a perspective view illustrating in general the incorporation of the blade in a simple razor without the usual soap or guard bar;

FIG. 7 is a vertical cross sectional view of a double edge razor illustrating the invention as embodied in the

combination of the blade with an associated guard bar; and

FIG. 8 is a view generally similar to FIG. 7 but illustrating the invention in a single blade injector type razor.

Referring to FIG. 3 there is shown in plan a section of sheet material **10** adapted for application to a razor blade, and FIGS. 1 and 2 show a double edge razor blade **11** with such a strip folded over each cutting edge of the blade, the manner of application may be in accordance with selected manufacturing operations best and most economically suited for the purpose, as for example the strip may be in continuous form applied to a continuous strip of connected blades or a continuous succession of individual blades. When the blade is of the double edge type as shown in FIGS. 1 and 2 a strip like that of FIG. 3 is applied to each cutting edge and for a single edge blade a single strip only is required. The width of the strip is not critical other than it have sufficient area to insure its remaining secured in place over the cutting edge and on the adjacent opposed surfaces of the blade.

An important feature of the invention resides in the employment of a guard strip having an outer skin-engaging surface of low coefficient of friction. Various polymeric materials have this characteristic. Specifically, a preferred polymer is a perfluoroalkyl polymer such as polytetrafluoroethylene available commercially under the trade name "Teflon" which has a particularly low coefficient of friction. Other fluorochloro alkyl polymers and polyalkenes, such as polyethylene, and polypropylene, and also silicones may be used for the purpose.

The guard sheet may be solely a layer of foil of the low friction material such as the polytetrafluoroethylene with an adhesive backing for securing it to the blade. The sheet material should be capable of withstanding the operation of initial application and subsequent pressures in use without being cut through by the sharp blade cutting edge. In this respect the material may have embedded therein strengthening and toughening material such as glass fibers. A sheet of the character just described is shown particularly in the cross section of FIG. 4 which embodies an outer or skin-contacting surface of the low friction material **15** with an adhesive backing **16**.

A type of sheet particularly useful and advantageous for the purpose is indicated in FIG. 5. The sheet there illustrated has an outer layer of the low friction plastic material **17** and an underlying backing or supporting layer **18** capable of resisting cutting at the cutting edge, the layers **17** and **18** being secured together by a suitable adhesive **19**. In addition the sheet is provided with a suitable adhesive **20** at its back surface for attachment to the blade. The layer **18** in order to provide the desired characteristic referred to may be a thin sheet metal such as steel but particularly useful is an aluminum foil. The thicknesses of the layers in both FIGS. 4 and 5 are considerably exaggerated in the interest of clarity. As just described the plastic layer in FIG. 5 is laminated to the metal foil by adhesive but the composite sheet may be made by spraying the plastic material onto the backing layer or it may comprise a self-sustaining layer of the plastic laminated to the backing layer by heat or other means, or combination of treatment. It is important that the layer not become separated under the conditions of use which include subjecting the blade to the action of soap or other materials used in shaving and also elevated temperatures which may be encountered with hot lather or in rinsing the blade under a hot water faucet.

A sprayed outer low friction layer would normally be relatively thin as for example in the range of .001 down to .00025 of an inch or even less. In the case of the laminated layers each may be in the range of about .001 to .003 of an inch in thickness. The plastic material in particular may be thin depending upon practical considerations involved in laminating it to the metal backing. As a specific example of a laminated sheet the backing of aluminum foil may be about .002 of an inch in thickness

and the plastic lamina of polytetrafluoroethylene may be about .001 of an inch in thickness with an overall thickness including the adhesive of about .004 of an inch. In general in the interest of closer shaves it is preferred that the thickness be in the range below .008 of an inch.

The character of the adhesive means for securing the sheet to the blade may vary. Hot melt adhesive has been employed. A pressure sensitive adhesive is particularly practical and effective from the standpoint of ease and economy of application of the strip to the blade.

The character, size and spacing of the holes in the strip are of critical importance, and also of importance is the width of the lands between the open exposed sections of the blade edge.

FIG. 3 in particular illustrates the arrangement of the holes **25** preformed in the strip **12** prior to the application of the strip to the blade. The holes are separated by lands or guard ribs **26** which extend over the blade cutting edge. In achieving the desired results of closeness of shave with avoidance of cuts or nicks the width of the holes in the direction of the cutting edge is of prime importance. The width of the lands between holes has some importance in respect of the possibility of ironing down hairs or passing over hairs that happen to become engaged under the lands, although the fact that shavers usually make more than one pass over a skin area minimizes such phenomenon. The thickness of the land extending over the blade edge has some minor effect with respect to the closeness of the shave. Normally the sheet can have a total thickness up to about .008 of an inch but preferably substantially less, a limiting factor in that direction being assurance that the sheet does not cut through under conditions of use which depends not only upon the thickness but particularly upon the toughness or resistance to cutting of the sheet material engaged against the cutting edge.

It has been found, dependent upon various conditions, that the holes in the guard sheet may be in the range of .010 to .070 of an inch, but preferably should be in the somewhat lesser range of .025 to .040 of an inch with lands in the sheet between holes of .010 up to perhaps .020 of an inch but preferably close to the lower value of .010 to minimize the need for repeated strokes where the lands may have ironed down one or more hairs.

The length of the holes in the direction perpendicular to the cutting edge as preformed in the strip should be not less than a minimal dimension but otherwise that dimension is not important. A practical size has been found to be ⅛ of an inch total in the direction transverse to the strip which means that the hole extends back 1/16 of an inch from the extreme cutting edge at each face of the blade. However, it is important that the sides of the holes extend substantially straight back from the cutting edge for an appreciable distance of which the dimension of 1/16 of an inch is considered quite adequate. As indicated in FIG. 3 the holes have parallel sides. The purpose is to insure that hairs do not get caught under the edges of the lands with the consequent discomfort to the shaver, as is possible with holes having sides that converge toward each other as is the case with small round holes. Other than to avoid the disadvantages just noted, the shape of the holes may vary.

As indicated above a preferred form of the invention embodies a laminated type of sheet such as illustrated in the cross section of FIG. 5 which includes a backing sheet of metal. The metal affords the necessary strength and avoidance of the blade edge cutting through the strip and the low friction outer layer provides a smooth gliding movement over the skin area. However, the outer plastic material provides an additional advantage over the use of a plain metal uncoated strip. It is practically impossible to punch a series of holes in a strip of metal without leaving some sharp ragged edges which may be invisible to the naked eye but which may produce an uncomfortable scratching or burning effect on the skin. In the case of the present invention, if the plastic coating

is sprayed on after the holes are punched the plastic flows over and coats the raw edges around the holes in the metal layer; or if the holes are punched after the sheet has been sprayed or the outer plastic laminated thereon the punches, if advanced from the plastic layer side, will automatically draw the plastic down over the edges of the holes in the metal producing the same protective result, and also nullifying any tendency of the layer to separate around the hole. This result is illustrated in general on an enlarged scale in FIG. *5a* where the arrow **27** indicates the direction of the punch and the references **17***a* indicate the plastic as drawn down over the edge of the hole **25** in the metal foil **18**.

The blade illustrated in FIGS. 1 and 2 is of the double edge type corresponding to blades being sold commercially in large quantities and adapted to fit the double cover safety razor in common use which is sometimes referred to as the clam shell type. It will be readily apparent, however, that the permanent self-contained guard feature may be embodied in any type of razor blade adapted for any type of razor such as a single edge type blade or in fact any type of blade intended for shaving or similar purposes.

The blades per se may be plain uncoated blades, or the entire edges may be precoated with a low friction material such as the polytetrafluoroethylene described in the patent to Fischbein 3,071,856; the polyethylene described in the patent to Alter 3,071,858; or the organosiloxane described in the patent to Granahan et al. 2,937,976.

Since the blade includes its own permanently attached guard, it comprises a self-contained unit which may be employed in a simple type of holder of inexpensive character without any normal razor guard or adjustable features, and blades of the character described have been so employed and comfortable close shaves obtained. As particular examples blades thus employed had an applied sheet with holes and intervening lands of the character and size within the ranges described above, the sheet comprising a backing of aluminum foil with an outer layer of polytetrafluoroethylene. FIG. 6 illustrates a simple razor **30** of the character concerned having a blade **31** with its attached guard mounted between a platform **32** and a cap **33**. The razor parts may be of plastic material and the cap removable for blade replacement or if intended as a disposable razor the cap may be fixed in place by any suitable means as by heat or ultrasonic sealing.

The blade, however, has additional important advantages in combination with a razor having a guard or soap bar. FIG. 7 pictures the geometry of a conventional double edge blade razor of the type disclosed in, for example, the patent to Muros 2,009,272 and in later patents containing detail improvements such as Shnitzler et al. 2,848,806. Various details are not important with respect to the present invention but it may be noted in general that a razor of this type includes a pair of hinged cover clamps **40**, a central bar **41** vertically movable in conjunction with the opening and closing of the clamps **40**, and blade platform or supporting means which in the present illustration of a simple form of the razor comprises the flanges **42** against which the blade is clamped in closed position. Associated with each blade cutting edge is a soap bar or guard **43** integral with the platform members **42**. The guards together with the cover clamp members determine the shaving angle and the blade exposure. The shaving angle comprises the angle between a plane **44** passed through the blade exposed portion and a plane **45** passed through the extreme cutting edge and tangent to the guard bar **43**. This angle indicated at A may vary in different razors but about 25° to 30° may be regarded as a representative range. The blade exposure is determined or measured as the distance between a plane **46** passed tangent to the clamp **40** and the soap bar **43** and a second plane **47** parallel to the plane **46** passed through the cutting edge of the blade. The arrows **48** indicate this exposure. Normally this exposure in a nonadjustable razor is relatively small in the range of about .002 to .003 of an inch. Greater blade exposure permits a closer shave but on the other hand it increases the hazards of cuts or nicks and burning scraping effects on the skin. These conditions are subject to personal preferences and habits and razors are commercially available which permit the user to adjust and select the exposure desired within a limited range. In embodiments of the guarded blade in a conventional razor, as in the case of the razor of FIG. 7 where the blade is elevated above the platform **42** by the thickness of the guard sheet the exposure may appear to be further increased slightly by reason of the elevation, but that is offset largely by the elevation also of the cover **40**. It will be recognized that some of the dimensions in FIG. 7 are exaggerated in the interest of clarity.

An advantageous feature of the present invention resides in the fact that by embodiment of the blade with its self-contained guard in a razor of the character in general use the blade exposure may be increased over that of a standard razor without increasing the hazards of skin cutting or nicks or scraping to the degree which would occur with a similar increased blade exposure with a standard unguarded blade. It has been determined by tests that in using a blade of the character here concerned the blade exposure may be about doubled over that of a similar non-adjustable razor combination employing a standard type blade without increasing the danger of harmful effects. A preferred range for the blade exposure of the present guarded type is about .003 to .006 of an inch. However, the advantages of the guarded blade in a holder combination are obtainable but to a lesser degree in some instances within a much larger range and accordingly the useful range may be stated to be up to .011 of an inch and down to about .002 of an inch. Also even though the blade of the present invention embodies its own guard means, the association therewith of a guard bar in the razor has additional advantages particularly in that it serves to set up and shape the face ahead of the blade into a more favorable contour for shaving and aids in establishing the best angle of engagement of the blade with the skin.

The increased blade exposure over that of conventional razors may be achieved in various ways. For example in the case of a double edge blade and a razor of the character illustrated in FIG. 7 with conventional guards and dimensional relationships the blade may be made a few thousandths of an inch wider; or if the radial distance of the razor guard from the center line is appropriately reduced the width of the guarded blade may be substantially the same as a presently standard commercial blade. It will be understood that the blade edge exposure herein discussed is with reference to the exposed naked edge sections and not with reference to the outer surfaces of the lands.

The blade of the present invention having its self-contained guard has further advantages resulting from its capability of being employed with greater blade exposure than a naked blade employed under otherwise similar conditions without increasing the liability of nicks or discomfort. In a double edge blade razor as illustrated in FIGS. 1 and 7 the blade has a central slot adapted to engage over the locating bar **41**. Since the slot must be appreciably wider than the bar thickness for free application of the blade there is necessarily opportunity for the blade to be displaced laterally to one side or the other in the direction of the soap bar with the resulting increased blade exposure at one side. To overcome this, the average blade exposure is reduced below the optimal shaving efficient value. With the present invention, the blade-razor relationship is such that even with the greatest possible lateral displacement, the safety feature is preserved. Any abnormally large blade exposure described above for the

naked blade is greatly minimized in the present invention because of the safety feature of the built-in guard which keeps the relative position of the safety guard and the blade within safe and effective shaving limits regardless of whatever way the blade is inserted in the razor.

As heretofore stated, the features and principles of the invention may be embodied in various types of blades usable in various types of razors or instruments. FIG. 8 shows the head of an injector type razor with the relations as to shaving angle and blade exposure generally similar to those described in connection with FIG. 7. The razor includes a soap bar or guard **50** the blade **51** being clamped between a platform **52** and an overhanging cap **53** the outward position of the blade being determined by a lug **54** at each end of the blade cutting edge. The shaving angle is indicated by the angle between the plane **55** passed through the blade including the cutting edge and a plane **56** passed through the blade cutting edge and tagent to the soap bar surface **50** at **57**. The blade exposure is measured as the space between plane **58** passed tanget to the outer edge of the cap **53** and tangent to the soap bar **50** and a plane **59** parallel to the plane **58** passed through the cutting edge. The blade exposure is indicated by the arrows **60**.

As indicated in the foregoing the physical details of the guarded razor blade may vary within substantial ranges and likewise the type of blade holder and the relation of the blade therein varied and still obtain the advantages of the invention. As one illustrative embodiment the guarded blade was of the double edge type similar to that pictured in FIG. 1 and comprised of stainless steel coated at its edges with polytetrafluoroethylene. The applied guard strip comprised a film of polytetrafluoroethylene about .001 of an inch thick secured by adhesive to an aluminum foil about .002 of an inch thick, the width of the strip being about five-sixteenths of an inch, and having an overall thickness of about .004 of an inch. The rear surface of the strip was coated with a pressure sensitive adhesive for securing it over the blade cutting edges. The holes were generally rectangular with parallel sides having a width in the direction of the blade edge of about .040 of an inch and extending back from the extreme cutting edge for approximately one-sixteenth of an inch. The width of the lands between holes and correspondingly of the ribs extending around the blade edge was about .015 of an inch. The blade was wider by about .006 of an inch than the standard double edge blade.

Blades of the above character were used in standard non-adjustable commercial razors of the clam shell type like that shown in general in FIG. 7 by a shave panel and subjected to shaving tests in comparison with standard naked blades in like razors. The guarded blades of course extended about .003 of an inch farther in each radial direction from the axis of the razor, although because of the angles involved, as may be seen in FIG. 7, the added blade exposure was not quite that much. In absolute terms the edge exposure for the naked blade was a little more than .002 of an inch on the average, and for the wider guarded blade was nearly .004 of an inch on the average. The shave angle represented by the angle A in FIG. 7 was also greater by a few degrees in the case of the guarded blade. The results of the shave panel including smoothness and comfort of shaving and freedom from nicks were recorded for each panel member in accordance with standard procedures and tabulated. The results showed a distinct preference for the guarded blade particularly in the areas of comfort and minimizing of nicks.

As has been described to some extent various changes

in the physical character of the applied guard may be made and various adaptations made of the blade in different type blade holders all within the principles of the invention and it is intended that all matter contained herein shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. A razor blade having a self-contained guard in the form of a thin flexible sheet having a row of aligned holes with intervening lands, the sheet being secured to the opposed blade surfaces with the holes and lands extending over and around the blade cutting edge, the said sheet comprising a supporting backing layer and a surface layer of a low coefficient of friction plastic material, said holes having a width in the direction of the cutting edge in the range of about .025 to .040 of an inch and the lands between holes having a width less than .020 of an inch.

2. A razor blade having a self-contained guard in the form of a flexible sheet having a row of aligned holes with intervening lands, said sheet being secured to the opposite blade surfaces with the holes and lands extending over and around the blade cutting edge and said sheet comprising a supporting backing layer of metal foil and an outer surface layer of polytetrafluoroethylene laminated thereto having a lower coefficient of friction than said metal foil, said holes having a width in the direction of the cutting edge in the range of .010 to .060 of an inch and said lands having a width in the range of .010 to .020 of an inch the thickness of the lands over the cutting edge being in the range below .008 of an inch, said holes being preformed in the sheet prior to being secured to the blade by punching in the direction from the polytetrafluoroethylene whereby the latter extends into the holes in the metal foil over the outer edges thereof.

3. A razor blade in accordance with claim **2** in which the holes have substantially parallel sides perpendicular to the cutting edge.

4. A safety razor having therein a blade and a guard bar associated with the cutting edge of the blade, said blade having a self-contained guard in the form of a flexible sheet permanently secured to the blade, said sheet having a row of aligned holes with intervening lands, the sheet being secured to the opposed blade surfaces with the holes and lands extending over and around the blade cutting edge, the outer surface of said sheet including the lands comprising a low coefficient of friction plastic material, the cutting edge being arranged relative to the razor parts including the guard bar to provide a cutting edge exposure in the range of about .002 to .011 of an inch.

5. A safety razor in accordance with claim **4** in which the cutting edge exposure is in the range of .003 to .006 of an inch.

6. A razor in accordance with claim **4** in which said sheet comprises a backing layer of aluminum foil and an outer layer of polytetrafluoroethylene laminated thereto.

References Cited

UNITED STATES PATENTS

1,534,312	4/1925	Goza	30—78
1,823,808	9/1931	Thompson	30—346.56
3,064,349	11/1962	Futterer	30—346.51
3,263,330	8/1966	Ferrara	30—346.56

FOREIGN PATENTS

1,050,244	12/1966	Great Britain.

THERON E. CONDON, Primary Examiner

J. C. PETERS, Assistant Examiner