

March 17, 1970

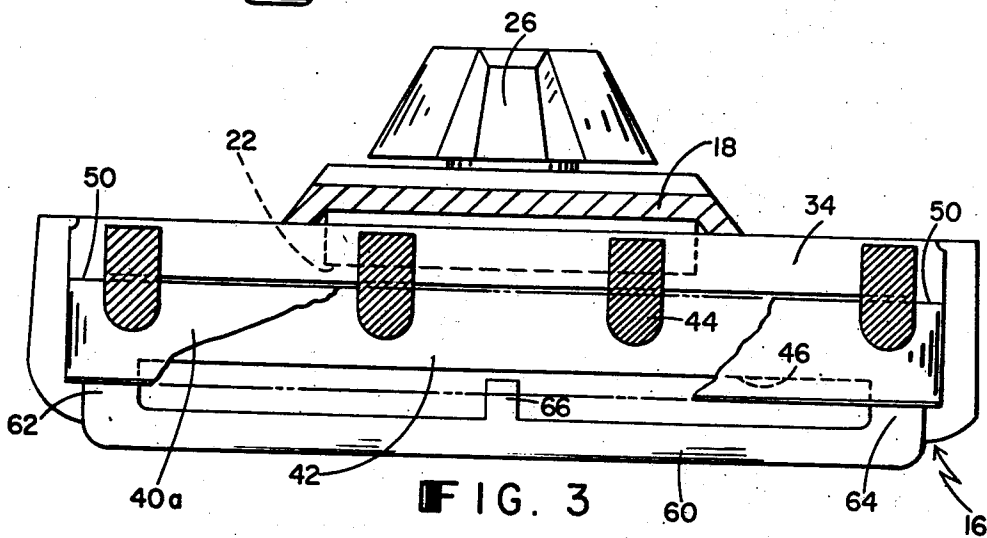
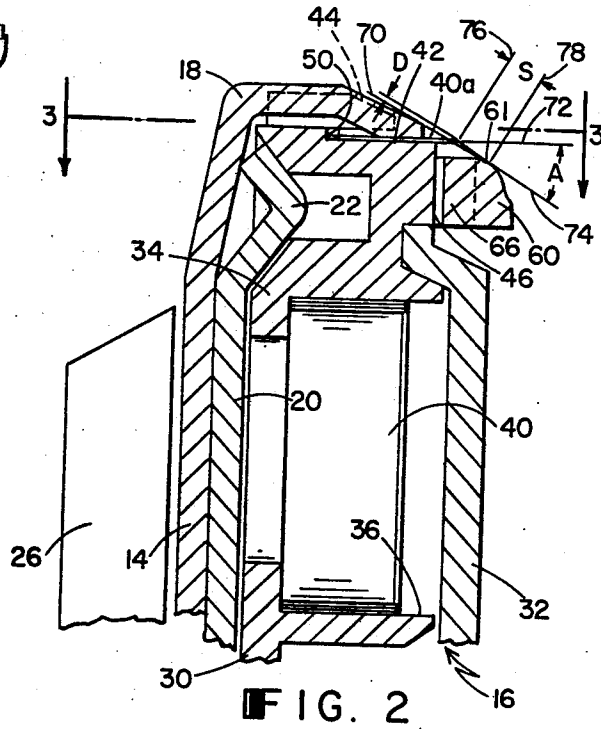
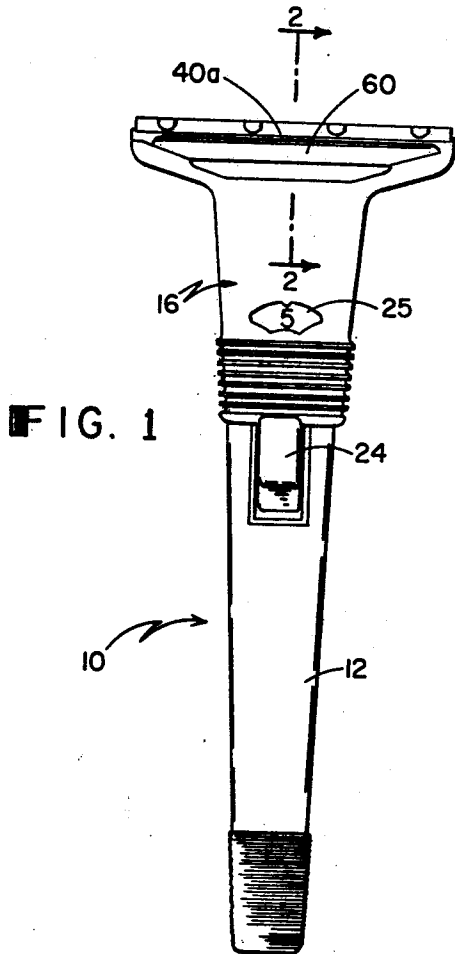
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SAFETY RAZOR WITH FLEXIBLE GUARD

Filed May 16, 1967

3 Sheets-Sheet 1



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SAFETY RAZOR WITH FLEXIBLE GUARD

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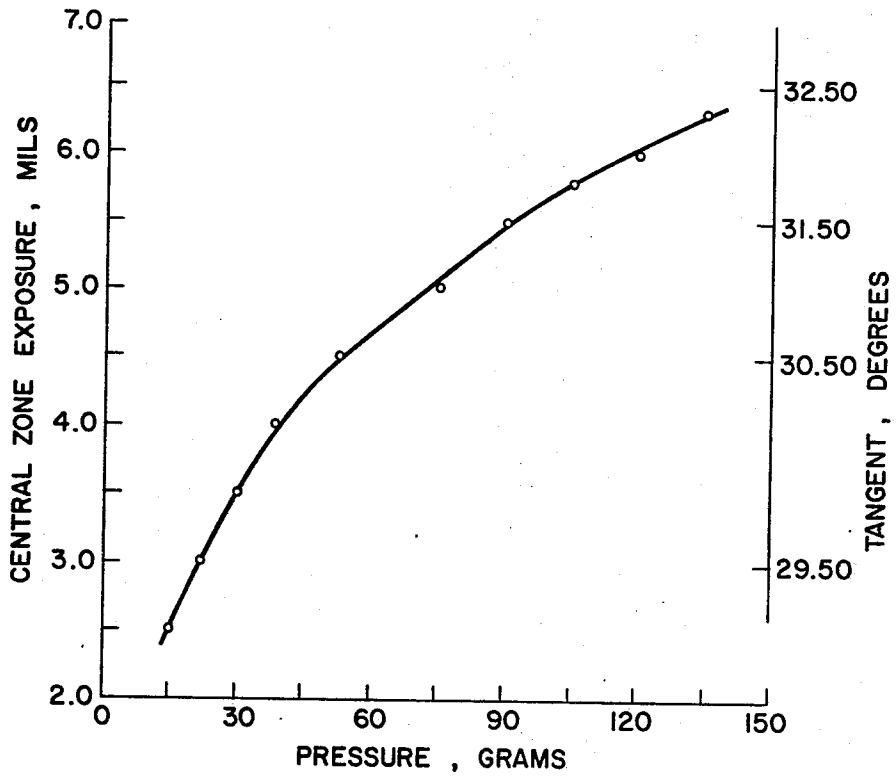


FIG. 4

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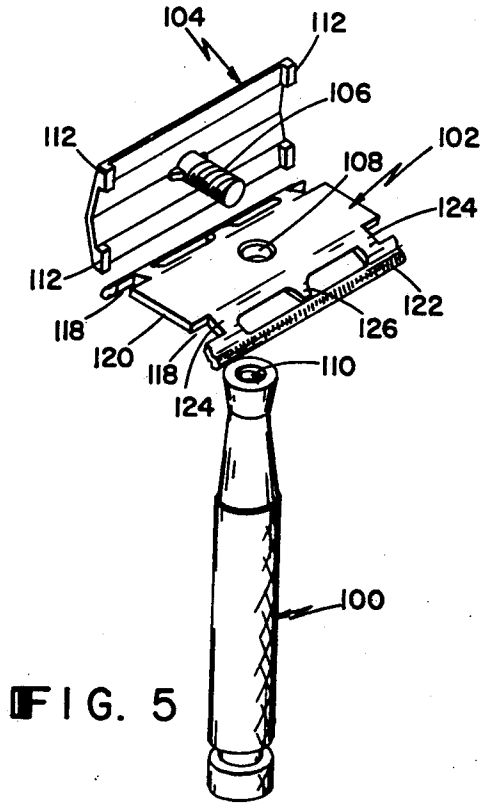


FIG. 5

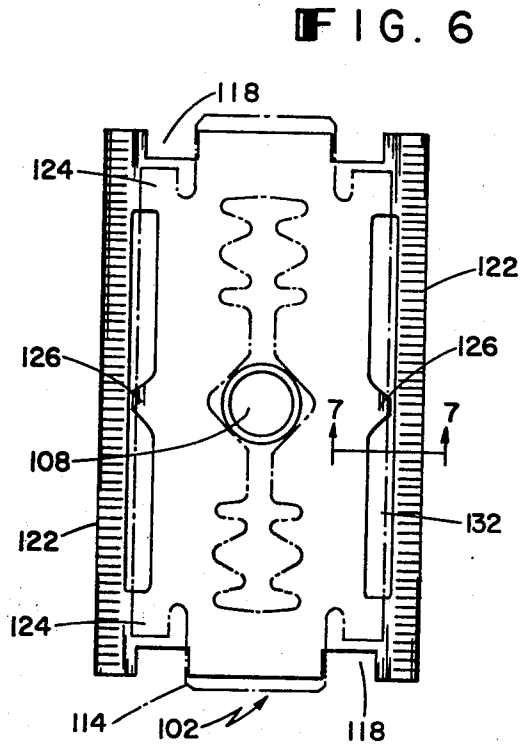


FIG. 6

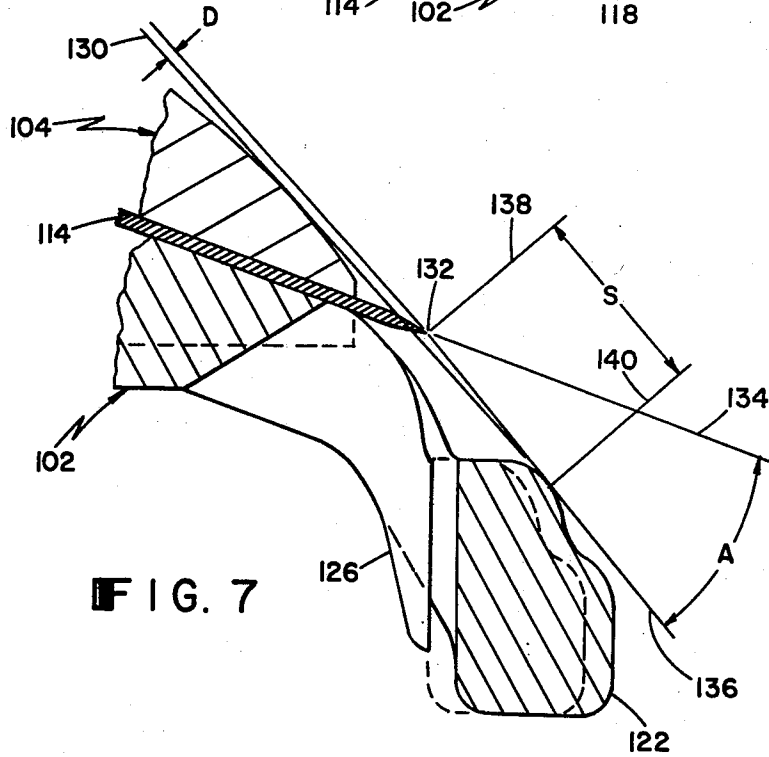


FIG. 7

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**SAFETY RAZOR WITH FLEXIBLE GUARD**

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7 Claims

**ABSTRACT OF THE DISCLOSURE**

A safety razor blade holder includes a blade support platform and a flexible guard bar capable of resilient deformation that is spaced forwardly and downwardly from the front edge of the platform. The platform and guard bar are a unitary acetyl plastic member with the ends of the guard bar attached to the support platform by webs and a stop projecting from the front of the platform toward the center of the bar for limiting the dynamic movement of the bar to about 0.009 inch. The guard bar has a cross-sectional thickness ranging from 0.040 inch at its narrowest point to 0.055 inch at its widest point. The guard bar may be moved through its range of dynamic positions under force applied by the user during a shaving stroke to vary the shaving geometry of the razor.

**Summary of invention**

This invention relates to safety razors and more particularly to a blade holder construction for use in such razors which incorporates an arrangement allowing adjustment of the shaving geometry of the razor.

It is frequently desirable to provide a construction in a safety razor which enables the user to adjust the shaving geometry (the relationship between the sharpened edge of the razor blade as exposed in the blade holder with respect to the shaving guard and/or the clamping cap) to suit his individual preferences and/or shaving requirements and it is an object of this invention to provide a novel and improved razor blade holder structure which provides adjustable and yet a precise range of shaving geometry configurations.

Another object of the invention is to provide a novel and improved shaving geometry adjustment arrangement in a safety razor which is easy and safe to use and which permits adjustment of the shaving geometry over a wide range of values.

A further object of the invention is to provide novel and improved safety razor blade holder construction incorporating a shaving geometry adjustment arrangement that is economically adaptable to high volume production techniques.

A further object of the invention is to provide novel and improved razor blade holder construction incorporating an arrangement for adjustment of shaving geometry in automatic response to the force with which the razor is pressed against the user's face during the shaving stroke.

In accordance with the invention there is provided a razor blade holder adapted to receive and position a razor blade in a shaving zone. The shaving zone structure of the holder includes a blade support platform that receives a blade and supports that blade in shaving position. A blade guard structure includes an elongated member that is secured to and extends along the length of and in generally parallel spaced relation to the blade support platform. The elongated guard member includes a movable portion having a first position spaced from the front edge of the platform when the razor is not in use. The movable portion of the guard structure has in addition a range of dynamic positions closer to the front edge of the platform than the first position, including a dynamic position mid-

way between said front edge and said first position. In the preferred embodiments, the elongated guard member is flexible and sufficiently resilient to move from its first position along a path generally parallel to the plane of the blade to a selected one of the dynamic positions under the corresponding influence of the force with which the razor is pressed against the user's face during a shaving stroke, and to return to the first position upon completion of the shaving stroke.

In a first particular embodiment the invention is incorporated in a magazine having housed therein a continuous ribbon-like razor blade that includes several shaving portions in series, which magazine is adapted to be removably received in a handle member to form a safety razor. The magazine member is formed of two principal components, a back and a cover, and includes structure that defines a blade supply position, a blade take-up position and a blade path that extends through a shaving zone from the supply position to the take-up position. Formed integrally with the back component in that embodiment is the blade support platform and the blade guard structure is disposed forwardly of and downwardly from the blade support platform.

In another particular embodiment, the invention is incorporated in a razor blade holder of the three piece type having a blade support member, a cap member, and a handle member. The blade support platform includes, on either side thereof, a blade guard structure that extends in generally parallel spaced relation to and is disposed beyond and generally downward from the blade support platform. The guard structure is an elongated flexible bar secured at either end to the blade support member at points generally coincident with the ends of the sharpened edge of the blade (the shaving zone). The blade support platform member also includes a fixed stop that projects outwardly towards the blade guard and limits its permitted motion.

The invention provides a safety razor having precise shaving geometry which geometry may be adjusted during the shaving stroke to suit the user's individual preferences or particular shaving requirement. The geometry adjustment, while variable over a significant range is limited well within limits of safety. Further the adjustment may be graduated over the length of the shaving zone, no adjustment being provided at the ends of the shaving zone as a safety feature in the preferred embodiments. The components of the blade holder that affect shaving geometry may be manufactured as an integral part of conventional holder component at a production cost that is economically competitive with conventional blade holders. The adjustment is easy to make and permits a wide range of shaving geometries while not creating any potentially hazardous condition for the user.

Other objects, features, and advantages of the invention will be apparent from the following description of specific embodiments thereof, taken together with the drawings in which:

FIG. 1 is an elevational view of a razor constructed according to the invention;

FIG. 2 is a sectional view taken along 2—2 of FIG. 1; FIG. 3 is a sectional view taken along 3—3 of FIG. 2; FIG. 4 is a graph of the dynamic shaving geometry adjustment action of the razor shown in FIG. 1;

FIG. 5 is a perspective view of a second form of razor constructed according to the invention;

FIG. 6 is a plan view of the blade support member of the razor shown in FIG. 5; and

FIG. 7 is an enlarged sectional view, taken along the line 7—7 of FIG. 6, showing the dynamic shaving geometry adjustment action of the razor shown in FIG. 5.

## Description of particular embodiments

With reference to FIG. 1, razor 10 includes a handle 12 having a receptacle portion 14 extending upwardly therefrom to receive a blade magazine 16. The upper part of receptacle 14 forms generally L-shaped head 18. Magazine guiding element 20 is mounted on the inner face of receptacle 14 and has an offset magazine locating portion 22. Snap action latch 24 is provided at the top of handle 12 to retain the magazine in place. Number dial 25 indicates the number of blade shaving lengths remaining. The razor is of the general type disclosed in Nissen Patent 3,262,198.

Blade advancing lever 26 is mounted on the back of razor 10 and controls a shaft journaled in the receptacle 14 and connected to coupling mechanism (as shown in the aforementioned Nissen patent) at the front of the receptacle for advancing the blade in the magazine.

Magazine 16 has a back 30 and a cover 32 secured to the back by snap type connectors. Back 30 and cover 32 are preferably of an acetal plastic material sold under the name Delrin.

Back 30 includes generally planar base 34 having upstanding cylindrical wall 36 defining a cylindrical supply chamber for a coil of shaving blade 40. At the top of base 34 is formed an upstanding planar blade support platform 42. A series of hold down elements 44 are disposed above platform 42. A planar surface 46 extends downwardly from the platform. Blade 40 follows a path from its supply position inside wall 36 upwardly and over platform 42 between the platform and elements 44, and down to a take up position at a take up arbor (not shown) below wall 36. The blade portion 40a in the shaving position on platform 42 has its sharpened edge extending forward of the front edge of the platform. The unsharpened back edge of the blade rests against back surface 50 below hold down elements 44.

Below and forward of the blade support platform is a guard structure 60 having a curved guard surface 61 and end portions 62, 64 integral with base 34. Stop member 66 protrudes from guard 60 toward surface 46 midway between portions 62 and 64.

Several distinct relationships are useful in understanding the shaving geometry employed in this razor. With reference to FIG. 2, a line 70 may be drawn tangent to the outer front surface of head 18 and guard surface 61. The distance D that the sharpened edge of the blade projects in a direction perpendicular to line 70 may be termed "exposure." Another concept useful in defining shaving geometry is the tangent angle A between line 72 (the plane of the blade) and line 74 (a line tangent to the surface of guard 60 and the sharpened edge of the blade). A further dimension of significance is the distance S ("span") between the sharpened blade edge and the tangent point of the guard 60 as indicated by lines 76 and 78, respectively.

Guard 60 has a thickness in the plane of the blade ranging from 0.040 inch at its narrowest point to 0.055 inch at its widest point, and is capable of elastic deformation along a path parallel to the platform 42 under the forces with which the razor is normally applied to the face of a user during a shaving stroke. This elastic deformation will be greatest at the midpoint of the guard and will be limited there by the eventual abutment of the surface of stop 66 against surface 46, a travel of about 0.009 inch. The deformation will lessen gradually toward the ends of the guards and will be zero at the ends. The guard must be constructed of a material capable of undergoing this resilient deformation under normal shaving pressures. The Delrin guard of the preferred embodiment has a shaving geometry dynamic characteristic as indicated in FIG. 4. (Empirical values of "exposure" as a function of pressure are indicated on the graph and the corresponding values of the tangent angle are indicated on a third scale.)

With reference to FIGS. 5-7, a razor holder for receiving a double edged blade includes a handle 100, a blade support member 102, and a cap member 104. Cap member 104 has a central threaded stud 106 which extends through hole 108 in support member 102 and is secured by the threaded bore 110 in the end of handle 100. Cap 104 also includes four projecting tabs 112 at its corners which engage cutouts at the corners of the blade 114 (shown in dotted line configuration in FIG. 6) and locate blade 114 in proper position on support member 102 when that blade is clamped in position.

Support member 102 includes recesses 118 into which the projecting tabs 112 fit. Exposed on either side of body 120 is a guard bar 122 which is secured to body 120 by webs 124 projecting outwardly from body 120. Located equidistantly from webs 124 is a stop 126.

The shaving geometry configuration of this embodiment is indicated in FIG. 7. Line 130, tangent to the outer top surface of cap 104 and to the corresponding surface of guard 122 provides a reference line and the distance D that the sharpened edge 132 of blade 114 projects in a distance perpendicular from line 130 is termed "exposure." The angle A between line 134 (the plane of blade 114) and line 136 (a line tangent to the surface of guard 122 and blade edge 132) is termed the "tangent angle," while the distance S between the sharpened blade edge 132 and the tangent point on guard 122 (indicated by lines 138 and 140) is termed "span."

In this embodiment the support member is molded of a general purpose styrene acrylnitrile plastic sold under the trademark Tyril. Guard 122 is capable of elastic deformation along a path generally parallel to the blade support surface provided by support member 102 under the forces to which the razor is normally subjected by the user during a shaving stroke. The deformation of the guard 122 may be increased by increased pressure which increases the tangent angle while reducing the span, thus permitting dynamic adjustment of the shaving geometry to the particular condition or conditions encountered during the shaving operation. The elastic deformation of the guard 122 is greatest at its midpoint and is limited by stop 126 to a deformation of about 0.008" in this embodiment at the midpoint while the shaving geometry at the ends of the guard remain unaltered as a safety factor with respect to the ends of the shaving edge of the razor blade.

In the embodiments shown, when the guard is in its undeformed position the tangent angle is 29°, the "exposure" is about 0.0025 inch, and the "span" is about 0.058 inch. During a shaving stroke the guard will be deformed to one of a range of possible dynamic positions in which, at all points spaced from the ends of the guard, the tangent angle will be increased, the exposure increased, and the span decreased. In the position of 0.008 inch deformation, the tangent angle is about 32° 15', the exposure is about 0.006 inch, and the span is about 0.052 inch. The reduced deformation at the ends of the guard ensures a safe shave. At the completion of the shaving stroke the guard will return to its undeformed position.

What is claimed is:

1. In a safety razor, a blade support platform component, and a blade guard structure component extending in generally parallel spaced relation to the front edge of said blade support platform, said guard structure and said platform being a single unit of synthetic organic polymeric material, said blade guard structure including a flexible portion having a first position of predetermined spacing from said front edge of said platform when said razor is not in use so that the edge of a sharpened blade disposed on said platform has a first exposure, the ends of said flexible portion being rigidly mounted relative to the front edge of said platform whereby the possible movement away from said first position of said flexible portion is greatest at the point midway between said ends and gradually decreases toward zero at points spaced toward said ends from said midpoint, a stop surface separate from said flexible portion of

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said guard structure and said flexible portion of said guard structure having a cooperating surface directed toward but spaced from said stop surface when said flexible portion is in said first position, said flexible portion having a range of dynamic positions closer to said front edge of said platform than said first position, said range including a dynamic position in which the blade exposure is double said first exposure, said flexible portion being sufficiently resilient to move from said first position along a path generally parallel to the plane of said blade shaving length to any of said dynamic positions under the corresponding influence of the force with which said razor is pressed against the user's face during a shaving stroke and to return to said first position upon the completion of said shaving stroke, the movement of said flexible portion away from said first position through said range of dynamic positions being limited by abutment of said cooperating surface against said stop surface.

2. The safety razor structure of claim 1 wherein said first exposure is less than 0.003 inch.

3. The safety razor structure of claim 1 wherein said flexible portion of said guard structure has a thickness in the plane of said blade of the order of 0.05 inch.

4. The safety razor structure of claim 1 wherein said shaving geometry dynamic characteristic in terms of tangent angle as a function of pressure is substantially as indicated in FIG. 4.

5. The safety razor structure of claim 1 wherein said shaving geometry dynamic characteristic in terms of exposure as a function of pressure is substantially as indicated in FIG. 4.

6. The safety razor structure as claimed in claim 1 wherein said structure is a magazine adapted to store a ribbon-like blade of uniform width having a longitudinally extending rear edge and a parallel sharpened front edge, and

said magazine includes structure defining a blade supply position, a blade take up position, and a blade path extending between said supply position and said

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take up position, said structure defining said blade path including said blade support platform which defines a shaving zone for receiving a shaving length of blade in supporting position with the sharpened edge of the blade projecting beyond the front edge of said support platform, and

take up mechanism coupled to said take up position for advancing a blade stored in said magazine member to position a sequence of shaving portions of said blade on said blade support platform.

7. The safety razor structure as claimed in claim 1 wherein said structure further includes a cap component adapted to be juxtaposed on said support platform for clamping a razor blade in shaving position on said platform component, and a handle component for securing said cap and platform components in clamping position.

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JAMES L. JONES, JR., Primary Examiner

U.S. Cl. X.R.

30—63, 71, 80