SAFETY RAZOR EMBODYING BLADE PRESSURE CONTROL

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Abstract

The disclosure introduces a new concept in safety razor construction; that of the floating head. A floating head is herein defined as a blade support assembly which is mounted for movement transverse to the path of movement undergone by the pressure guard. A safety razor utilizing a floating head construction of the type herein described is insensitive not only to variations in the application of handle pressure but also to the angle at which the razor is held relative to the skin. A biased blade support assembly, comprising the floating head, is mounted for controlled pivotal movement toward and away from a skin pressure guard integral with the razor handle whereby a constant blade pressure will be exerted on the skin irrespective of the pressure exerted on the handle and pressure guard.

1 Claim, 13 Drawing Figures
FIG. 1

FIG. 2

FIG. 3
SAFETY RAZOR EMBODYING BLADE PRESSURE CONTROL

The present application is a continuation-in-part of my previous patent application Serial No. 29,788 filed April 20, 1970, now abandoned.

BACKGROUND OF THE INVENTION

The original safety razor development afforded a method of achieving a close shave without the very real danger of serious injury that had previously attended the use of straight razors. Although the safety razor has eliminated the possibility of serious injury, the very knowledge of this fact on the part of the user has tended to increase the number of minor abrasions and "nicks" occasioned by its use since one tends to shave with less care and precision than would be the case were serious injury possible.

Although the evolution of the safety razor and the concomitant development of improved blade alloys and honing techniques have contributed greatly to the ease and comfort of shaving, these prior developments have been primarily concerned with methods of achieving a more precise blade angle control relative to the guard, a faster blade interchange and longer blade life. Present day safety razors show little improvement over the original models insofar as the provision of a true "nick-proof" construction is concerned as is readily apparent to any person who uses such a razor.

The problem is, perhaps, more pronounced in the case of feminine use where the areas to be shaven are not always readily visible; however, even the most experienced shaver is not immune to the skin "nicks" which are caused by hurried or careless shaving. The most common cause of these minor injuries is the application of excessive blade pressure. This may occur, for example, in shaving a particularly sensitive area, such as the neck or underarms, or in the failure to vary pressure application as the blade moves across a varying skin contour. A secondary cause of injury is the failure to maintain razor handle and its rigidly interconnected blade at a proper angle relative to the skin.

Although the general proposition of mounting a blade in such a manner that it may undergo relative movement in relation to its supporting handle has been previously recognized, as in U.S. Pat. Nos. 1,479,690; 2,059,172 and 2,125,135; in all of these prior constructions there has been a direct relationship between the pressure exerted by a user on the razor handle and the blade pressure against the skin. Thus in U.S. Pat. No. 2,059,172, the blade edge may undergo limited relative movement parallel to the axis of the razor handle and may also rotate about a generally vertical axis. In U.S. Pat. Nos. 1,479,690 and 2,125,135 the blade edge is pivotally supported to follow the contour of the skin. Various patents show the blade held to a fixed seat or against fixed stops by spring means. The above U.S. Pat. No. 2,125,135 is one such to which may be added the U.S. Pat. Nos. 637,511 and 2,311,913 as embodying that general feature. In each case, however, the spring is so arranged and of a strength such as to hold firmly the blade in its fixed shaving position relative to its supports under normal conditions and is retracted or released only for the purposes of blade changing. Accordingly in those cases any excessive pressure application at the razor handle is reflected in an excessive blade edge pressure. Stated differently, the prior art as not recognized the advantages in the provision of a safety razor construction wherein the total blade pressure is due solely to an independent biasing force and is totally independent of applied handle pressure.

SUMMARY OF THE INVENTION

The invention resides in the provision of a safety razor having a blade mounting assembly which is mounted for controlled pivotal movement toward and away from the normal path of movement undergone by the pressure guard during a shaving operation. The pressure guard may be rigidly secured to the razor handle and the total pressure applied to the skin, by the application of handle pressure, is through the pressure guard. An independent biasing force provides the desired blade edge pressure and this force will be the same whether the pressure guard is under a light or heavy pressure application from the handle.

In a preferred embodiment, a main pressure guard is rigidly secured to the handle and occupies the same position relative thereto as does the pressure guard of a conventional injector type razor. The blade support assembly is pivotally mounted in overlying relationship to the main pressure guard for limited movement between first and second positions respectively adjacent to and spaced from the pressure guard. Any desired biasing means such as a coil spring, leaf spring, torsion spring or a mass of resilient material may be provided to react between the blade mounting assembly and either of the rigidly related handle or pressure guard which, together, comprise the handle assembly. Alternatively, a magnetic biasing force may be used. In any event, the blade holder assembly is normally biased toward engagement with the main skin pressure guard at which position the blade edge is closely related to the skin engaging edge of the pressure guard and in such relation thereto as to define a conventional blade angle position relative to the pressure guard. As the razor is moved along the skin and the pressure guard describes its path of travel along the skin surface, the blade edge is held into contact with the skin surface solely by the strength of the biasing force. Any variation in the angle at which the razor is held tending to produce an improper blade to skin angle or any increase in pressure applied to the handle beyond the strength of the biasing force is compensated for by movement of the blade edge, against the biasing force, away from the skin in a direction transverse of the path of movement undergone by the pressure guard. It will thus be apparent that irrespective of the angle at which the razor is held or the pressure that is applied thereto, the blade edge pressure against the skin will never exceed the strength of the biasing force and will, in effect, float across the skin as though being towed by the pressure guard which may be pressed against the skin with any desired force. Normally the floating head will have blade holding parts including auxiliary guard means that float with the head which absorb some of the pressure so that the actual pressure on the blade edge will be a little less than the total biasing force.

It will, of course, be apparent that it would be possible to hold the razor at such an angle that the blade holder assembly would reach its outermost position at which time the same would act very much like a conventional razor lacking a floating head. To assure against injury in the unlikely event that the razor should be held at such an extreme angle, the pivotal relationship of parts is chosen such that, at its outermost posi-
tion relative to the main pressure guard, the angle made by the blade edge with respect to the skin approaches zero.

The strength of the biasing force is, desirably, adjustable to take into account individual variables as regards toughness of beard, skin sensitivity, etc.

DESCRIPTION OF THE DRAWINGS

The achievement of the foregoing and other advantages will become more apparent from the ensuing description of a number of modifications when considered in conjunction with the attached drawings, wherein:

FIG. 1 is a schematic illustration of the concept involved in each of the following specific embodiments;

FIG. 2 is a perspective view of one embodiment of the invention wherein the floating head is biased toward the pressure guard by an adjustably biased compression spring;

FIG. 3 is a sectional elevation taken along line 3—3 of FIG. 2;

FIG. 4 is a side elevational view, with parts broken away, of a razor similar to that shown in FIG. 2 but wherein the compression spring is arranged between the pressure guard and blade assembly and the pivot point is moved forward;

FIG. 5 is a side elevational view, with parts broken away, of a razor constructed in accordance with the invention wherein a leaf spring is used to provide the adjustable bias;

FIG. 6 is a side elevational view of a razor similar to that of FIG. 5 but wherein the skin engaging edge of the pressure guard is resiliently related to the handle;

FIGS. 7 and 8 are side elevational views depicting, respectively, the use of attractive and repulsive magnetic forces to provide the desired bias;

FIG. 9 is a side elevational view of a razor which includes further details of a particular embodiment of the invention;

FIG. 10 is a front view thereof looking in the direction of arrow X;

FIGS. 11 and 11A are fragmentary views illustrating some of the geometry and relation of parts involved in a razor such as that of FIGS. 9 and 10; and

FIG. 12 likewise depicts some of the geometry including the force factors.

DESCRIPTION OF PREFERRED EMBODIMENTS

In FIG. 1 is schematically illustrated the basic concept herein disclosed as embodied in a safety razor 10 having a handle 12, a related member 14 carrying a pressure guard at its outer end and a floating head or blade support assembly 16. The handle 12 and pressure guard member 14 comprise the handle assembly. Blade support assembly 16 includes a conventional blade clamp 18 for mounting a blade 20 whose lower cutting edge 22 is biased about pivot axis 24 into the solid line position, defining a proper shaving angle 26 with respect to skin surface 28, by biasing means 30 which in FIG. 1 is of elastic material with a rigid non-rotary connection to the razor at point 24. So long as the shaving pressure applied at handle 12 in the direction of arrow 32 does not exceed the value of biasing means 30, the blade edge 22 will track, or follow, the skin engaging edge 31 of pressure guard 14 in the relative position shown in solid lines and the value of the biasing means, alone, will determine the blade pressure applied to the skin. As soon as the handle pressure, such as along arrow 32, is increased beyond that which may be resisted by biasing means 30, the blade support assembly and blade edge 22 will move upwardly either to the phantom line position shown in FIG. 1 or to some intermediate position dependent upon the degree of handle pressure application and the depression of the skin surface by the application of such pressure thereto through the skin engaging edge of the pressure guard.

Thus, assuming a force of X grams to be applied at blade edge 22 by biasing means 30 and a force application along arrow 32 insufficient to override the biasing means it will be appreciated that the parts would maintain the solid line position of FIG. 1 and the shaving operation would proceed with a force of X grams at the blade edge. As handle pressure is increased to indent the skin surface, as indicated in the lower dotted line position 33 of FIG. 1, it will be appreciated that it is only the pressure guard which is exerting a greater pressure on the skin; the blade support assembly having pivoted upwardly so that blade edge 22 still exerts a force of only X grams on the skin surface. Similarly, as the angle at which handle 12 is varied such as, for example, as to decrease angle 26, the blade support assembly will pivot upwardly about axis 24 while, simultaneously, inherently reducing the angle of attack between blade 20 and the skin surface.

Turning now to a description of FIGS. 2—8 portraying exemplary ones of specific razor constructions embodying the features conceptually shown in FIG. 1, it will be noted that each employs a floating head; the primary distinctions being the manner in which the bias is applied.

A first more specific embodiment of the invention is illustrated in FIGS. 2 and 3 wherein a plastic handle 112 rigidly supports a skin pressure guard plate 114 onto the upper surface of which is pivotally mounted a floating head or blade support assembly 116 for limited pivotal movement about pivot 124 under the influence of spring 130 adjustable as to tension by screw 133 threaded into the boss 135 secured to the guard plate 114. In accordance with common razor head and blade construction the floating head includes a bridge member 140 having a platform 141 on which is seated the blade 120 the blade being secured between the bridge platform and the overhead clamping plate 145 formed integral with the floating head main frame member 146. The bridge member is urged into the angle formed by the frame parts 145, 146 by suitable spring means common in the injector razor art comprising in the present case a leaf spring member 142 bearing against a lug 140a integral with the bridge member 140. The bridge platform 141 has the usual stops 147 with which the blade cutting edge 122 engages. The blade is replaceable in the manner common in injector type razors through insertion of a magazine tang into the opening 143 to spring apart slightly the platform 141 and clamping plate 145 to free the blade. The bridge member is also provided with an auxiliary blade edge guard 148 which engages normally with the stationary main guard 149 fixed on the plate 114. Spring 130 normally biases the blade support assembly to the position shown in FIGS. 2 and 3 wherein the blade edge guard 148 is bottomed on the upper surface of the main pressure guard 149. The biasing forces maintaining the relationship of parts shown in FIG. 3 may be adjusted by rotation of set screw 133.
In FIG. 3 the skin surface is indicated by the line 150 and it will be noted that as the razor travels over the skin in the direction indicated by arrow 137 the blade edge guard 148, the blade cutting edge 122 and the forward edge at least of the cap plate 145 all engage the skin when the razor is held at an appropriate angle. The major force tending to rock the floating head reversely about its pivot 124 is of course the pressure against the blade cutting edge particularly when cutting hairs. However, forces derived from the frictional engagement of surfaces 148 and 145 with the skin contribute to some extent to the total force tending to swing the floating head on its pivot, the relative forces varying dependent upon the conditions including the relation of the razor parts.

As a net result in operation as the main pressure guard 149 is moved along its path of travel over the skin surface, as indicated by arrow 137, the blade edge 122 will "track" the pressure guard 149 and blade edge guard 148 will remain in contact therewith until such time as the total force tending to rock the floating head exceeds the counter force derived from the bias of spring 130 at which time blade support assembly 116 will move upwardly to floatingly track the pressure guard while still exerting an adequate and substantially constant blade edge cutting pressure. As previously noted the major force tending to rock the head against the counter force effected by the biasing is normally that applied to the blade cutting edge. In no case, however, does the force with which the cutting edge engages the face exceed that determined by the biasing spring. The matter of preferable forces and relation of the parts will be discussed more fully hereinafter after describing further examples of biasing means.

FIGS. 4 to 8 depict different types and arrangements of biasing means. Each figure is intended to illustrate an injector razor having a floating head embodying the principles of the present invention but with the blade holding means shown in simplified diagrammatic form. The spring biasing means shown in FIG. 4 differs from that of FIGS. 2 and 3 in that the pivot point 224 is positioned forwardly of the biasing spring 230 and the same is non-adjustably positioned between the pressure guard 214 and floating head 216 to normally bias the parts to the solid line position.

The razor 310 shown in FIG. 5 employs a leaf spring 330 reacting between a collar 331 secured to handle 312 and the upper surface of floating head 316. The position of spring 330 is adjustable, such as between the solid and dotted line positions shown in FIG. 5, by finger pressure applied to upstanding tang 333 to thereby adjust the bias applied to floating head 316 in the direction of pressure guard 314. Otherwise, the operation of the razor is the same as that described in connection with FIGS. 2 and 3.

Razor 410, shown in FIG. 6, is substantially identical to that shown in FIG. 5 with one major exception which is that the skin engaging edge of pressure guard 414 resiliently, rather than rigidly, related to the handle 412. This is accomplished by the utilization of a flexible, rather than a relatively rigid, metallic member as the pressure guard. The flexibility of pressure guard 414 is, of course, less than the flexibility of leaf spring 430 in any of its adjusted positions. Stated differently, the deflection which can be undergone by pressure guard 414 due to its pressure application against skin surface 428 is always less than that which can be undergone by blade support assembly 416 whereby the same floating action of the floating head relative to the pressure guard is retained.

Razor 510, shown in FIG. 7, relies upon the use of magnetic attraction to provide the biasing force. Unlike, attractive magnets 530 are mounted, respectively, to the lower surface of floating head 516 and the upper surface of pressure guard 514 which is rigidly carried by handle 512. A stop pin 513 limits the opening movement of assembly 516 relative to the pressure guard. Magnets 530 may be directly opposed, as shown, or offset relative to each other to provide the desired bias force and it will be seen that as the application of skin pressure against blade edge 522 exceeds the magnetic attractive forces, the floating head will move upwardly against the magnetic bias in a manner analogous to the spring biased heads.

The razor 610, shown in FIG. 8, differs from that of FIG. 7 in that like magnets 630 are respectively carried by pressure guard 614 and floating head 616 through the intermediary of brackets 615 and 617. In this case, it is the repulsive force of like magnets that is relied upon to provide the bias toward the solid line positions.

FIGS. 9 and 10 show another embodiment of the invention in quite complete form. The main frame assembly includes a handle 712, a main guard plate 714 fixed therein having a main skin pressure guard 715. The floating head assembly embodies a main blade supporting member 716 having a boss portion 717 pivoted at 718 between a pair of spaced lugs 719 turned up from the plate 714. The blade head is generally similar to that of FIG. 3 and includes an angular bridge member 720 urged into the angle formed by the cap member 721 on the member 716 by a leaf spring 722 bearing against a lug 723 integral with the bridge member 720. The blade 725 is thereby clamped between the bridge member 720 and the cap portion 721. The blade cutting edge 730 is engaged against stops 731. Release of the blade in changing is effected in the usual manner by inserting the magazine tang into the space 732. The bridge member carries the auxiliary blade edge guard 734 which is normally urged into contact with the main stationary guard 715 by the compression spring 736 which has an end fitted into the end of adjusting screw 737 threaded through the boss 738 on the member 716. Preferably a stop is associated with the screw 737 to insure against excessive biasing force on the floating head, the stop comprising here a shoulder formed by the enlarged portion 738 on the screw.

Some of the criteria to be considered in a practical embodiment of the invention will be described in connection with FIGS. 11, 11A and 12 which show on an enlarged scale certain elements corresponding to elements of the razor of FIG. 9. As in standard razors shown in prior art patents the present floating head razor is designed to have an appropriate shave angle. Referring to FIG. 11 the shave angle A comprises the angle between a plane 750 passed tangent to the surface of the floating head guard 734 and to the edge of the cap 721 and a plane 751 passed through the center of the blade including the cutting edge. This angle A may vary substantially dependent upon various related conditions but in a razor such as that of FIGS. 9 and 10 it is preferably in the range of about 20° to 38°.

Another related factor is the blade exposure which (FIG. 11A) comprises the space B between the plane 753 passed tangent to the floating head guard 734 and
the outer edge of the cap plate 721 and another plane 754 parallel thereto passed through the cutting edge 730 of the blade. Preferably the geometry and relation of the parts are such in the case of the floating head razor illustrated in FIGS. 9 and 10 that the fixed guard 715 is also approximately tangent to the plane 753 when the parts are at rest. As in the case of the shave angle the blade exposure A may vary dependent upon the circumstances and the relation of the various parts but it has been found that in most cases a blade exposure in the range of about 0.000 to 0.010 of an inch is desirable.

A major factor for satisfactory functioning of the razor is of course the biasing force which means the shaving pressure at which the floating head begins to retract. The total force applied to the razor head during shaving is in a direction generally corresponding to the line 760 in FIG. 12. This of course has components indicated by the line 761 extending through the blade and in the general direction of the razor movement along the skin and a line 762 extending from the blade edge perpendicular to the line 761. The force tending to rock the floating head rearwardly away from the skin about its pivot is resisted by the spring biasing which should not of course be sufficiently high to defeat the purpose, but within that limitation it can vary considerably dependent upon the particular design of the razor as a whole including the selected shave angle and blade exposure. Such variation of course can be embodied in the spring adjusting means where that feature is included. In general it has been found for practical purposes that the biasing means should preferably be of such character and strength as to require a force at the effective direction indicated by line 760 in the range of about 50 to 200 grams.

The drawings and the foregoing description illustrate various applications of the principles of the invention but it will be apparent that still other adaptations may be made and accordingly it is intended that all matter contained herein shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A safety razor comprising a handle assembly having a main skin pressure guard fixed thereto, a blade support having a blade secured therein and an auxiliary skin guard arranged adjacent the blade cutting edge, said support blade and auxiliary guard being mounted for floating movement toward and away from said main guard and including biasing means urging the support and blade toward the main guard but permitting movement away from the main guard when the force imposed thereon by pressure of the razor against the skin exceeds a predetermined amount.

2. A safety razor in accordance with claim 1 in which said auxiliary guard is arranged to engage said main guard under the urging of said biasing means.

3. A safety razor in accordance with claim 1 in which said biasing means comprises an elastic member.

4. A safety razor in accordance with claim 2 in which said elastic member comprises a spring.

5. A safety razor in accordance with claim 1 in which said biasing means comprises magnetic means.

6. A safety razor in accordance with claim 1 in which said blade support includes an outer cap member spaced rearwardly of the blade cutting edge and adapted in normal shaving operation to contact the skin.

7. A safety razor in accordance with claim 1 in which said blade support is pivotally mounted on the handle assembly.

8. A safety razor in accordance with claim 6 in which said biasing means comprises a coil spring arranged to urge the blade support toward said main pressure guard.

9. A safety razor in accordance with claim 1 in which said biasing means has an effective force urging the blade support toward the main guard in the range of about 50 to 200 grams.

10. A safety razor in accordance with claim 1 in which said blade support is constructed to enable the ready replacement of blades therein.

11. A safety razor comprising a handle assembly including a main skin pressure guard fixed therein having a skin engaging surface, a blade support assembly pivotally mounted on said handle for floating movement toward and away from said main pressure guard, said blade support assembly including a blade and an auxiliary guard arranged underneath the blade adjacent to but spaced rearwardly of the blade cutting edge and an outer cap member overlying the blade and spaced rearwardly thereof, and spring biasing means for biasing said blade support assembly toward said main pressure guard for positioning the blade edge in spaced juxtaposed shaving position relative to said main skin engaging surface whereby as said main skin engaging surface is further depressed into the skin said blade support assembly including the blade cutting edge may move away from said main skin engaging surface.