ABSTRACT OF THE DISCLOSURE

An adjustable double edge safety razor of the sectional cap type in which the blade seat is fixed relative to the handle. The guard is provided with guide means and an adjustment to permit incremental variance of the clearance between the blade edge and the guard. The guard means maintains the guard properly located during adjustment and razor permits cleaning of the razor by flushing. The clamping pressure on the razor does not vary with changes in adjustment and the razor may be opened and closed without affecting the adjustment.

This invention relates to safety razors of the adjustable type and more specifically is directed to adjustable safety razors of the double edge type.

A considerable amount of attention has been given during recent years towards the development of an adjustable safety razor having a means to vary the blade clearance to provide beneficial functional results and yet be sufficiently practical from the standpoint of production to be commercially feasible. As expected, a large number of razor designs have been proposed which represent considerable progress, however, there remains an opportunity for improvement in specific areas.

Certain prerequisites must be embodied in an adjustable safety razor if the desired ends or results with regard to function and cost are to be achieved. Safety razors of the type above described must be mass produced and yet, when assembled, provide extremely fine control with respect to blade adjustment. The multiple parts forming the finished safety razor design must be economically, accurately, and expeditiously produced as well as being easily assembled.

In the research program to obtain these characteristics, the additional characteristics of structural simplicity must not be overlooked as it is well known that over-sophistication not only increases cost as a rule, but also breeds unreliability and reliability in the frequent and accurate adjustment of the razor is an indispensable attribute. Simplicity of the razor design along with achieving reliability results in an adjustable razor which is economically produced and reliable in use.

In summary, the present invention relates to an adjustable double edge razor in which the guard is fixed relative to the clamped blade. A cam track formed with undulations permits ready selection of any desired degree of blade clearance while permitting the blade to remain fixed relative to the razor handle. In an alternate embodiment, the guard is held rigid relative to the blade and a double cam track co-operates with a cam follower having double track engaging portions to shift the double edge blade after it is clamped on the blade seat up and down relative to the guard to permit selection of any desired degree of clearance. The double cam arrangement provides a simple form of adjustment which may be molded or otherwise easily formed and in which the applied force is uniformly distributed in an annular pattern beneath the blade seat to prevent cocking or tilting of the same relative to the fixed guard.

The present invention proposes a practical solution to the problem outlined above within the framework of the considerations stated.

It is an object of this invention to provide a new and improved adjustable safety razor which is simple in structure and operation and which may be mass produced accurately and economically.

It is a further object of this invention to provide a new and improved safety razor of the adjustable type in which accuracy of adjustment may be achieved.

It is a still further object of this invention to provide an adjustable safety razor having a novel means to guide and maintain the clamped blade and guard in proper relation throughout the entire range of adjustment.

Other objects of this invention will become apparent from the detailed description to follow:

Within the contemplation of this invention is an adjustable safety razor of the double edge type employing a spider stem mounting a spider having transverse spider arms at opposite ends. Mounted on the transverse spider arms are a pair of cap sections of conventional design having pivot arms which have the lower ends thereof engageable with either the guard member or the blade seat whereby substantial shifting of the spider causes an opening and closing of the cap sections in a well known manner. Disposed beneath the cap sections is a blade supporting seat which serves to co-operate with the closed cap sections to clamp a double edge razor blade in shav ing relation above the guard member. Suitable means is provided to incrementally vary the distance between the guard member and the razor blade to establish the desired razor blade clearance for comfortable shaving. This means consists of a simplified adjustment construction utilizing a cam track and co-operating cam follower which when rotated relative to each other varies the blade clearance, permitting the full range of adjustment to be accomplished with one full turn of the knob. A novel guide arrangement insures that the parts will be properly oriented relative to each other at all times during adjustment. Additional means is provided which permits the cap sections to be opened and closed irrespective of the position of the cam means and without affecting the adjustment. Other important detailed features will become apparent on description of the embodiments below.

In the drawings:

FIG. 1 is an exploded perspective view on one preferred form of safety razor incorporating the features of the invention;

FIG. 2 is an enlarged cross sectional view through the embodiment of FIG. 1 after assembly with a double edge razor blade clamped for shaving;

FIG. 3 is a fragmentary cross sectional view through the lower portion of the handle of the embodiment of FIGS. 1 and 2;

FIG. 4 is a bottom plan view taken generally along the lines 4—4 of FIG. 2;
FIG. 5 is an enlarged fragmentary front elevational view of the razor of FIG. 4 taken along the lines 5—5 of FIG. 4, and illustrating the co-operation of the guard bar and blade seat;

FIG. 6 is a fragmentary side elevational view of the razor of FIGS. 1-5 taken along the lines 6—6 of FIG. 4 and illustrating the guard bar adjusted to minimum clearance;

FIG. 7 is a fragmentary developed view of the cam track used in the embodiment of FIGS. 1-6;

FIG. 8 is an exploded perspective view of a modified form of the invention;

FIG. 9 is an enlarged cross sectional view of the embodiment of FIG. 8 after assembly with a portion of the handle broken away;

FIG. 10 is an enlarged fragmentary cross sectional view of the handle of the embodiment of FIGS. 8 and 9;

FIG. 11 is an enlarged bottom plan view of the razor of FIGS. 8-10 taken along the lines 11—11 of FIG. 9;

FIG. 12 is an enlarged fragmentary front elevational view of one end portion of the razor taken generally along the lines 12—12 of FIG. 11;

FIG. 13 is a fragmentary side elevational view taken generally along the lines 13—13 of FIG. 11 with the adjustment in the position of minimum blade clearance;

FIG. 14 is a fragmentary cross sectional view of the razor head with the blade clearance at minimum;

FIG. 15 is a developed view of the cam track embodiment of FIGS. 1-14.

Referring now to FIG. 1, the basic elements forming the adjustable safety razor of the present invention are illustrated in exploded relation and include a spider and cap assembly indicated generally at 11, a blade seat assembly 12 and coil spring 13 adapted for reception in a guard assembly 14. Also included is an adjusting knob 15, provided with an indexing ring 16, and a spacer sleeve 17 positioned in a tubular handle 18 receiving at its lower end a bearing collar 19 serving to mount an operating knob 20. A rivet 21, shown to the left of the upper end of the tubular handle 18, may be provided to join the blade seat assembly and tubular handle in a manner to be described in detail in conjunction with FIG. 2.

The spider and cap assembly includes a spider stem 22 having a lower threaded end 23 with the upper end attached to a conventional spider 24. A pair of cap sections 25 and 26 are of identical construction and include pivot arms 27 and 28 which are mounted on transverse spider arms 29 and 30 carried at opposite ends of the spider 24. The spider and cap assembly is of conventional design being specifically described in my co-pending application, Ser. No. 450,927, filed Apr. 26, 1965, entitled Adjustable Razor, which has matured into U.S. Patent No. 3,293,744, granted Dec. 27, 1966 and therefore reference may be had to that application for additional detailed features.

The blade seat assembly 12 consists of a blade seat member 31 joined to a tubular seat mounting member 32 having the lower end provided with a knurled or ridged surface 33. The blade seat member 31 is provided with spider guide grooves 34 and 35 which receive opposite downwardly projecting ends of the spider 24 and serve to guide it as it reciprocates during adjustment of the blade clearance, and opening and closing of the cap sections 25 and 26. Vertical guides for the pivot arms of the cap sections 25 are provided at 36 and 37 with similar guides 38 and 39 provided for the section 26. The guides are symmetrically spaced on opposite sides of the spider guide grooves 34 and 35. As is well known in the safety razor art, substantial shifting of the spider 24 causes a flange on the lower end of each pivot arm to engage the underside of the blade seat member 31 to cause opening and closing of the cap sections 25 and 26.

As seen in FIGS. 1 and 2, the guard assembly 14 includes a guard member 45 joined to a tubular mounting neck 46 by staking, riveting or the like. The guard member 45 includes a main body 47 having guard flanges 48 and 49 formed at opposite ends of the main body. Elongated slots 50 and 51 are provided intermediate the body and the guard bar portions 48 and 49 and function to permit the shaving product to flow therethrough during the shaving operation. Spider guide grooves 57 and 58 are formed at opposite ends of the main body 47 and guide the spider 24 in its movements relative to the guard member 45.

The tubular mounting neck 46 on the guard member 45 has an enlarged cylindrical portion 52 at the upper end which merges into a portion of reduced diameter 53 at the lower end. A key or stop 54 may be provided on the tubular mounting neck 46 to serve as a stop for the opposite limits of the blade clearance adjustment. The cylindrical portion 52 is provided with an enlarged bore 55 which accommodates the coil spring 13. A coaxial bore 56 of reduced diameter receives the tubular mounting member 32 on the seat assembly 12 with a sliding fit.

As is best seen in FIGS. 1 and 4, the guard member 45 is provided with guide flanges 60 and 61 formed at opposite ends of the guard bar 48 with similar flanges 62 and 63 formed at opposite ends of the guard bar 49. The flanges 60-63 engage vertical guide flanges 64-67 formed at the four corners of the blade seat 31 to maintain the guard bars 48 and 49 accurately aligned between the guide flanges 64-67, respectively, during vertical adjustment of the guard member 31. In this unique guide arrangement, adequate clearance is provided between the end of the guard bar and the guide flange to preclude pulling of the whiskers and permit easy flushing, yet the guides may be made to close tolerances for continuous engagement.

The adjusting knob 15 shown in cross section in FIG. 2 is provided with a counterclockwise 70 which receives the enlarged portion 52 of the neck 46. At the base of the counterclockwise bar and the guard flange to preclude the thrust. The guard bars 48 and 49 at opposite margins of the guard member may be elevated and lowered by simply
rotating the adjusting knob to select the desired blade clearance. As shown in FIG. 2, a razor blade 76 having cutting edges 77 and 78 at opposite margins is clamped between the blade seat 31 and the cap sections 25 and 26. Each of the cutting edges is positioned over the associated guard bar 48 and 49, which may be elevated and lowered to vary the clearance, with the extremes of the adjusted positions being generally illustrated in FIGS. 2 and 6.

Referring now to FIG. 3, the lower end of the handle 18 is illustrated in cross section with the adjusting knobs 20 assembled to the threaded end 23 of the spindle stem 22. The upper end of the adjusting knob 20 has a cylindrical bearing portion 80 of reduced diameter, which merges into an enlarged knob-like formation 81 defining the area in which the split bearing collar 19 is positioned. The split bearing collar 19 may have the longitudinal split positioned on opposite sides of a key or the like formed in the lower end of the handle to prevent the bearing from rotating relative to the handle, thereby confining the relative rotation between the bearings 19 and the reduced cylindrical portion 80 on the knob 20. The knob 20 is provided with an internal bore 81 having threads 82 at the lower end which engage the threaded end 23 of the spindle stem 22. A washer 83, riveted to the lower end of the threaded spindle within an enlarged bore 84 of the lower end of the knob and movable into engagement with a radially extending shoulder 85 to limit the total upward movement of the steam. The total movement available is sufficient to open the cap sections 25 and 26 without complete disengagement of the spindle body 24 with the guide slots 36-39. Rotation of the knob 20 merely serves to open and close the cap sections 25 and 26 without affecting the previously established adjusted relation between the blade edge and the guard member. Accordingly, the caps may be loosened for flushing, razor storage between shaves, or the like, without affecting the preferred setting of the adjusting knob 15.

In operation, the razor blade 76 is positioned on the blade seat 31 and cap sections 25 and 26 are moved to the closed position by rotation of the operating knob 20. The desired degree of blade clearance may be obtained by rotation of the adjusting knob 15 which causes a shift in the location of the guard 14 inasmuch as the lower end of the key 54 will ride on the cam track 71. Accordingly, the clearance between the sharpened edges 77 and 78 of the double edge razor blade 76 relative to the guard bars 48 and 49 will be varied to obtain the preferred degree of clearance suited to the shaver's skin and beard. Referring now to FIG. 8, a modified form of the adjustable safety razor forming the present invention is illustrated with the parts in exploded relation. The modified form of safety razor includes a spider and cap assembly indicated generally at 111, a blade seat assembly 112, a guard assembly 114, adjusting knob 115, and index ring 116 adapted to fit around the adjusting knob 115. Also included is a tubular handle 118, coil spring 113 adapted to be received in the handle 118, bearing assembly 119, and operating knob 120 joined to the spider stem by a rivet washer 183 and covered by a trim cap 110. A cam follower 117 is shown positioned to the immediate right of the lower end of the blade seat assembly and upper end of the guard assembly 114. A rivet 121, shown to the immediate left of the tubular handle 118, serves to join the handle and guard member in a manner to become apparent.

The spider cap assembly 111 includes a spider stem 122 having threads 123 formed at its lower end with a spider body 124 of known form mounted on the upper end. Cap sections 125 and 126 are pivotally supported on transverse spider arms 128 and 129 at opposite ends of the spider body 124. The arms are of identical construction and include downwardly projecting arms 127 and 128 which facilitate pivotal mounting in the manner described. A more detailed description of the construction of the spider and cap assembly may be had in the application alluded to above.

The blade seat assembly 112 consists of a blade seat member 131 joined to a tubular seat mounting member 132. An opening 133 is formed in the seat mounting member 132 for reasons to become apparent. The blade seat member 131 is provided with spider guide grooves 134 and 135 which accommodate the downwardly extending ends of the spider body 124 and guidingly engage it as it is elevated and lowered during adjustment of the blade clearance as well as during opening and closing of the cap sections 25 and 26. The opposite margins of the blade seat engage a razor blade during clamping by the cap sections in the manner previously described in connection with FIG. 9.

The guard assembly 114 includes a guard member 145 joined to a tubular mounting neck 146 by swaging or the equivalent. As best seen in FIGS. 8 and 9, the guard member 145 includes a main body 147 having guard bar portions 148 and 149 at opposite margins. Elongated slots 150 are provided intermediate the body 147 and the guard bar 148 while similar slots 151 are formed intermediate the guard bar 149 and the body 147, both of which function to permit the shaving product to flow beneath the guard member during the shaving operation. At opposite ends of the projecting arms of the spider body 124, to maintain the parts properly oriented during shaving, adjustment, and opening and closing of the cap sections.

On opposite sides of the handle slots 157 and 158 are formed guide slots 136 and 137, 138 and 139, respectively. These slots guidingly engage the pivot arms on the cap sections 125 and 126 and also engage a flange (not shown in FIG. 8) on the lower end of each pivot arm as the spider and cap assembly 111 is elevated, thereby to cause opening and closing of the cap sections 125 and 126. The opening and closing of the caps occurs only on substantial shifting of the spider relative to the guard member, the caps remaining tightly closed during adjustment.

The tubular mounting neck 146 is provided with an enlarged portion 152 at the upper end and a portion of smaller diameter at the lower end. Elongated slots 153 and 154 are formed in the enlarged tubular portion 152 and extend downwardly into the tubular portion of reduced diameter. The lower end of the tubular mounting neck 146 is fastened to the body 147 to provide means for guiding the opening 133 in the seat mounting member is large enough to permit shifting between the two.

The cam follower 117 includes a tubular body portion 155 having outwardly projecting cam track engaging portions 156 and 157 disposed at the lower end portion thereof. The cam track engaging portions 156 and 157 are slidably received in the slots 153 and 154 and move upward and downward in response to rotation of the adjusting knob 115. The cam track engaging portions 156 and 157 may be positioned in the slots 153 and 154 before the mounting neck is joined to the guard member 47, so that the cam follower 117 will be permanently assembled to the guard assembly 114.

As is best seen in FIG. 9, the adjusting knob 115 is provided with a counterbored portion 160 terminating in cam tracks or surfaces 161 and 162 which are of identical construction each occupying slightly less than 180° of knob rotation. The shape of this portion is appreciated by reference to FIG. 15 which illustrates them in a developed view. An upward stop 163 separates the two tracks 161 and 162 and serves to limit the total rotation during adjustment to about ½ turn. Each cam track consists of repeating undulations formed along an imaginary line which is angularly disposed relative to the longitudinal axis of the adjusting knob.

Referring again to FIG. 9, it is obvious that the cam
tracks 161 and 162 may be formed separately and positioned in the knob in any desired manner. The cam track engaging portions 156 and 157 are held in engagement with the cam tracks 161 and 162 through the biasing action of the spring 113, which in the present modification is located in the lower end of the handle. Biasing force is transferred to the cam follower 117 through the tubular body 155 which engages a radial shoulder 164 formed at the upper end of the mounting member 152 on the blade seat assembly 112.

The manner in which the biasing force is transmitted from the lower end of the handle to the cam follower is best understood with reference to FIG. 10 in which the lower end of the handle 118 and operating knob are shown assembled and in cross section. The lower end of the blade seat mounting member 132 is joined to the bearing collar 119 by swaging the lower end of the mounting member 132 into an annular groove 164 formed within the bearing assembly 119. An enlarged circumferentially raised portion 165 having a frusto-conical surface is provided at one end and an abrupt shoulder 167 at the opposite end is formed on the outer periphery of the bearing collar 119. The operating knob 120 has a counterebore 168 provided with an annular groove 169 of sufficient width to receive the raised portion 165 on a bearing assembly 119. Suitable threads 170 are formed in a bore of reduced diameter in the operating knob 120.

The operating knob 120 may be assembled to the bearing by merely pushing the knob into place since the frusto-conical surface 165 will expand the counterebore 168 at the upper end of the knob allowing it to snap into position permanently. Thereafter, rotation of the knob 120 causes the spider stem 122 to reciprocate within the mounting member 132.

The upper end of the bearing 119 serves as an abutment for the spring 113 which is received in a counterebore 171 and bottomed on the opposite end against a shoulder 172 in the handle 118. The spring urges the bearing assembly 119 away from the handle 118 thereby constantly urging mounting member 132 downwardly whereby the upper end portion described above will resiliently urge the cam followers into engagement with the cam tracks 161 and 162.

The operating knob is maintained in threaded engagement with threads 123 on the lower end of the spider stem 122 by washer 183 which is riveted or otherwise suitably attached to the lower end of the spider stem 122. The washer 183 is carried with the stem and moves into an enlarged bore 173 formed in the lower end of the knob 120. A radial shoulder 174 is formed at the bottom of the enlarged bore and terminates at the threads 170. When the cap sections 125 and 126 are in the fully opened position, the washer 183 engages the shoulder 174 to prevent further upward travel of the spider stem 122. A trim cap 110 may be knurled or the like at its upper end and press fitted into the lower end of the counterebore 173 to prevent ingress of foreign matter into the area of the threads and also to lend a finished appearance to the assembly.

The razor illustrated in FIGURES 8-15 may be prepared for use by inserting a conventional double edge razor blade of the type shown in FIGURE 9 and specifically described in connection with FIGURE 2. The operating knob 110 is then rotated to close the sectional caps 125 and 126, clamping the blade to the blade seat 131. The desired degree of blade clearance relative to the guard bars 148 and 149 may be obtained by rotation of the adjusting knob 115. Such rotation causes the track-engaging portions 156 and 157 of the cam follower 117 to follow the contour of the cam tracks 161 and 162. This causes a change in the elevational position of the blade seat 131 relative to the fixed guard bars 148 and 149, varying the clearance to permit the shaver to select the desired degree of clearance most satisfactory to his skin and beard and providing for maximum shaving comfort.

After a consideration of the foregoing, it is obvious that the present invention embodies a novel safety razor design which permits incremental adjustment of the blade clearance which is unaffected by opening and closing of the cap due to the unique design of the operating mechanism. The parts forming the safety razors may be economically manufactured and easily assembled without detracting from the accuracy and high quality of the finished product. The simplified form of adjustment is accurate and easily operated, and as may be seen in the drawings, particularly FIGS. 2, 6, 9 and 14, a rather wide range of blade clearance is available for maximum shaving comfort.

In the embodiment of FIGS. 1-7, since the guide flanges are disposed inside the vertical guides, the ends of the guard bars 48 and 49 may be adequately spaced from the sides of the vertical guides to preclude pinching of the flesh or pulling of the whiskers and provide good clearance for ease in lathering.

Upon a consideration of the foregoing, it will become obvious to those skilled in the art that various modifications may be made without departing from the invention embodied herein. Therefore, only such limitations should be imposed as are indicated by the spirit and scope of the appended claims.

1. An adjustable safety razor of the double edge type comprising a tubular handle, razor blade clamping means carried by said tubular handle, said razor blade clamping means including a blade supporting seat member having a tubular mounting portion extending into said tubular handle and a pair of cap sections co-operating with said blade supporting seat member, a guard member positioned below said blade supporting seat member, means to incrementally vary the distance between said guard member and said clamped razor blade, said last named means including an adjusting knob having a portion thereof engaging said tubular handle to hold it against axial movement, cam track means carried on said adjusting knob, cam follower means carried on said guard member and engageable with said cam track means of said adjusting knob, spring means urging said cam follower means against said cam track means whereby said portion of said adjusting knob will be urged against said handle, and one of said members being engageable with said cam follower means and shiftable in response to rotation of said adjusting knob.

2. An adjustable safety razor of the double edge type comprising a tubular handle, razor blade clamping means carried by said tubular handle, said razor blade clamping means including a blade supporting seat member having a tubular mounting portion extending into said tubular handle and a pair of cap sections co-operating with said blade supporting seat member to clamp a razor blade to said blade supporting seat member, a guard member having guard bar portions at opposite margins and being positioned below said blade supporting seat member, means to incrementally vary the distance between said guard bar portions and said clamped razor blade, said last named means including an adjusting knob having a portion thereof engaging said tubular handle to hold it against axial movement, cam track means carried on said adjusting knob, cam follower means engageable with said cam track means of said adjusting knob, spring means having one end thereof urging said cam follower means against said cam track means whereby said portion of said adjusting knob will be urged against said tubular handle, the opposite end of said spring means urging said blade supporting seat member away from said guard member, first guide means formed on said guard member, and second guide means formed on said guard member, and second guide...
means on said blade supporting seat member and slid-ably engaged by said first guide means during movement of said adjusting knob thereby to maintain said guard bar portions properly oriented relative to said razor blade.

3. The adjustable safety razor of claim 2 wherein said first guide means is positioned inwardly of said guard bar portions to permit increase clearance between said guard bar portions and said blade supporting seat member for easy flushing of said razor.