to duplicate the shaving procedure employed by professional barbers to the end that a close shave may be attained in the safest and most efficient manner.

The invention will now be described in greater detail in conjunction with the accompanying drawings in which the invention is illustrated in connection with a "two-piece" safety razor and a "one-piece" safety razor.

Fig. 1 is a sectional side elevation taken along the length of an illustrative "two-piece" safety razor constructed in accordance with the invention;

Fig. 2 is a cross-section taken on the line 2—2 of Fig. 1 and showing the safety razor adjusted to provide a light shave with the cutting edge of the razor blade which protrudes to the right of the figure and a heavy or close shave with the cutting edge of the razor blade which protrudes to the left of the figure;

Fig. 3 is a cross-section, similar to Fig. 2, and showing the safety razor adjusted to an intermediate or central position in which the two cutting edges of the razor blade protrude equally and to an intermediate extent;

Fig. 4 is a partial end elevation of the assembled safety razor of Fig. 1;

Fig. 5 is a cross-section taken on the line 5—5 of Fig. 3, the view having been rotated 90° in a counterclockwise direction;

Fig. 6 is a perspective view of the laterally shiftable safety guard including unit, looking at the unit from beneath the same;

Fig. 7 is a perspective view of the cam adjusting member;

Fig. 8 is a top plan view of the laterally shiftable unit;

Fig. 9 is a bottom view of the blade supporting plate with the rotatable stem being shown in section;

Fig. 10 is a sectional side elevation taken along the length of an illustrative "one-piece" safety razor constructed in accordance with the invention, the blade guiding bar and supporting stem being shown in elevation;

Fig. 11 is a cross-section taken on the line 11—11 of Fig. 10;

Fig. 12 is a partial end elevation showing the "one-piece" safety razor of Fig. 10 in its open position;

Fig. 13 is a section taken on the line 13—13 of Fig. 10;

Fig. 14 is a detailed partial end elevation showing the manner in which the cap sections, which together constitute the upper clamping plate, are opened, and

Fig. 15 is a perspective view showing the blade supporting plate and the laterally shiftable unit in sliding interengagement with the under surface thereof.

Referring to the drawings and more particularly to Figs. 1—3 thereof, the safety razor illustrated comprises a stem 10 which is rotatably secured at its upper end to a blade supporting plate 11. A blade 12 is shown supported upon the blade supporting plate 11 by being clamped to the upper surface of the blade supporting plate 11 by an upper blade clamping plate 13.

As is usual in safety razors of this type, the upper blade clamping plate 13 is provided with a downwardly projecting threaded stud 14 and the upper extremity of the stem 10 is formed with an internally threaded axial cavity 15. As is customary, the blade clamping plate 13 is secured upon the blade supporting plate 11 by inserting the threaded stud 14 into the axial cavity 15 and then rotating the stem 10 to draw the clamping plate 13 downwardly to thereby clamp the razor blade 12 between the blade supporting plate 11 and the clamping plate 13. The blade clamping plate 13 is also provided with the usual downwardly depending positioning lugs 16 which project through suitable apertures in the blade 12 to properly align the same in the razor.
Rotatable securement between the stem 10 and the supporting plate 11 is achieved in conventional manner by turning down the upper extremity of the stem 10 as indicated at 17 where it projects through central opening 18 in the plate 11 to loosely position the plate 11 upon a shoulder 19 at the upper end of the stem 10 (note Fig. 3).

In accordance with the invention a laterally shiftable unit 20 underlies the blade supporting plate 11. The laterally shiftable unit includes the customary safety guards or bars 21 and 22 and, in accordance with the invention, is provided with downwardly depending lugs 23 and 24. The lugs 23 and 24 are laterally spaced across the width of the razor head and provide abutment means which permit the laterally shiftable unit to be laterally displaced without relinquishing the ability to cut. The lugs 23 and 24 are located such that they engage the cutting edges of the razor blade 12 in the forward position of the blade 12 and the safety guards or bars 21 and 22 which are associated therewith to regulate the blade exposure and cutting angle, as well as to more fully hereinafter set forth.

In the embodiment shown, the under surface of the supporting plate 11 is provided with extensions 25 which are preferably ground flat and the upper surface of the unit 20 slidably contacts the extensions 25. The supporting plate 11 is formed with a downwardly depending portion 26 which receives the blade position lug 16 of the clamping plate 13. The portion 26 of the supporting plate 11 is received within a central recess 27 in the upper surface of the shiftable unit 20. The recess 27 is wider than the portion 26 to permit the unit 20 to be laterally shifted with respect to the plate 11.

In accordance with the invention the laterally shiftable unit 20 is guided by a sliding engagement between the unit 20 and portions of the supporting plate 11. Preferably, the supporting plate 11 is formed with downwardly depending flanges 28 which depend from the longitudinal extremities thereof.

The flanges 28 function to engage the end surfaces of the shiftable unit 20 to maintain the guards 21 and 22 parallel with the cutting edges of the blade 12. The manner in which the flanges 28 slidingly engage the end surfaces of the shiftable unit 20 can be seen with particular clarity in Fig. 5.

The laterally shiftable unit 20 is preferably formed in two secured together pieces as can most clearly be seen in Fig. 6 of the drawings. Fig. 6 also shows the central opening 26 which is provided to enable the stem 10 to extend through the unit 20. The unit 20 is also provided with the customary elongated openings 31 adjacent the safety bars or guards 21 and 22.

Adjustment of the lateral position of the unit 20 is achieved in accordance with the invention by a cam member 32 which is mounted coaxially about the upper end of the stem 10 for rotation thereabout. More particularly, the cam member 32 is constituted by an upper eccentrically positioned cam element 33 which is preferably constituted by an eccentrically positioned disk, as shown, and a lower tubular handle portion 34. Desirably, a portion of the handle portion 34 is knurled, as shown in Figs. 4 and 7 and another portion of the handle portion 34 is provided with indicia 35. The indicia 35 cooperate with indicia 36 on the safety guards 21 and 22 so that the position of each of the guards 21 and 22 with respect to the associated cutting edge of the blade 12 can be easily ascertained.

The lugs 23 and 24 are the only factors involved in the lateral positioning of the guards 21 and 22. Accordingly, the rotational position of the cam member 32 entirely determines the blade angle and blade exposure of each cutting edge of the razor blade 12. In this respect, the marking system shown facilitates a rapid determination by the user of the blade exposure and cutting angle which is present and is simply illustrative. Many other marking systems will be apparent.

4 In the preferred form shown, the cam element 33 is circular in shape and is eccentrically positioned with respect to the handle portion 34. The cam portion 34 is axially bored as indicated at 37 and the lower end of the bore 37 is enlarged as indicated at 38. The stem 10 fits within the bore 37 and this forms an annular chamber 39 between the bore 38 and the stem 10. An expansion spring 40 is compressed within another annular chamber 39 to resiliently bias the cam member 32 against the under surface of the supporting plate 11. In this way, the cam member 32 can be easily rotated to shift the unit 20 despite the fact that the blade 12 is clamping secured between the plates 11 and 13.

The spring 40 is maintained in compression within the annular chamber 39 by a bushing 41 having an upper end 42, a lower end 44 of reduced diameter and an intermediate outwardly extending circumferential rib 43, the upper end 42 being forced within the lower end of the annular chamber 39. The bushing 41 is held in place by a tubular barrel 45 which is locked in position by a head 46 which is threadedly secured to the lower end of the stem 10, as indicated at 47 and the head 46 is locked in position by nut 48 which is threaded (left-hand thread) in axial bore 49 in the lower end of the stem 10.

It will be appreciated that rotation of head 46 will rotate the stem 10 and enable clamping and release of the blade 12 without disturbing cam 32 and hence the position of the safety guards 21 and 22. In this respect, the head 46 is not threadedly so as to jam the barrel 45 and hence the bushing 41 and the cam 32 against the under surface of the plate 11. Instead, a small amount of play is permitted and this permits rotation of the cam 32 without rotating the barrel 45, the head 46 or the stem 10. This play also permits the stem 10 to be rotated by head 46 without rotating the cam 32. In either event, one simply grasps the barrel 45 and rotates either the cam 32 or the head 46 depending upon whether the blade is to be changed or the guard position regulated.

The manner in which the cam member 32 functions to laterally shift the laterally shiftable unit 20 will be particularly apparent from a consideration of Figs. 2, 3, 4 and 5. In Figs. 3, 4 and 5, the outer extremities of the safety guards 21 and 22 are equally spaced from the associated cutting edges of the blade 12. As can be seen in Fig. 5, this intermediate position of Fig. 5 corresponds with the position of cam 33 which is shown and in which the surfaces of the cam element 33 contact the lugs 23 and 24 are easily distant from the center of the stem 10. When the cam 32 is rotated in the direction indicated by the arrow in Fig. 5, the cam element 33 forces the lug 23 away from the stem 10 and this forces the safety guard 21 to the right as indicated by the arrows in Figs. 3 and 4.

The displaced position of the unit 20 in which the safety guard 21 is at a substantial distance from the cutting edge of the razor blade which is associated therewith and in which the safety guard 22 is closely adjacent its associated cutting edge is shown in Fig. 2. When shaving is then performed with the safety guard 21 adjacent the surface to be shaved, a light shave will be obtained and the angle between the cutting edge of the blade 12 and the surface to be shaved will be slight. On the other hand, if the safety guard 22 is placed adjacent the surface to be shaved, the cutting edge of the blade will bear heavily against this surface and be at a steep angle with respect thereto. It will be manifest that further rotation of the cam 32 in the direction indicated by the arrow in Fig. 5 will cause the unit 20 to return to the position shown in Fig. 3 and that still further rotation of the cam element 33 will force the lug 24 away from the center of the stem 10 so that the safety razor will assume a position exactly opposite
to that shown in Fig. 2, e.g. the unit 20 will be projected to the left instead of to the right as is shown in Fig. 2.

The present invention is particularly adapted to the provision of a “one-piece” safety razor having the basic operation set forth in the patent to Muro No. 2,009,272, dated July 23, 1935. This form of the invention is illustrated in Figs. 10–15, inclusive.

Referring to Figs. 10, 11, 12 and 13, the “one-piece” safety razor illustrated is constituted by a vertically reciprocable unit 60, a laterally shiftable unit 80 and a stationary frame 100.

The vertically reciprocable unit 60 of the safety razor includes a stem 61, a blade guiding bar 62 which is secured at the forward extremity of the stem 61, said bar carrying transversely outwardly extending arms 63 to the outer ends of which are pivotally secured concavely formed cap sections 64 which together constitute an upper blade clamping plate. Each of the cap members 64 are formed at the outer ends of arms 65, the ends of the arms 65 remote from the cap 64 being pivotally connected to the transverse arms 63. As will later more fully appear, the arms 65 are provided with outwardly extending lugs 66 which cooperate with a portion of the stationary frame 100 so that elevation of the vertically reciprocable portion 60 will result in opening of the cap 64 into the position shown in Fig. 12. Moreover, the arms 65 cooperate with the stationary frame 100 so that lowering of the vertically reciprocable portion 60 will result in closing of the caps 64 into the blade clamping position shown in Fig. 11.

Raising and lowering of the vertically reciprocable portion 60 is effected by projection and retraction of the stem 61. This is accomplished by rotation of the tubular head member 67 which is in threaded engagement with the lower extremity of the stem 61 as shown at 68. The lower end of the head 67 is bored to an enlarged diameter, as indicated by numeral 69 and a nut 70 having an enlarged head 71 is secured to the lower end of the stem 61 to limit the upward movement thereof. It will now be apparent that upward projection of stem 61 is limited by engagement of the head 71 of the nut 70 with the upper extremity of the bore 69.

The laterally shiftable unit 80 is best seen in Figs. 11, 13 and 15 and comprises a guard plate 81 carrying opposed safety guards 82 and 83. The plate 81 is also formed with abutment means constituted by the laterally spaced downwardly extending lugs 84 and 85. The unit 80 is laterally shifted, in the same manner as previously set forth in the embodiment shown in Figs. 1–9, by a cam member 86 which coaxially surrounds the stem 61. The cam member 86 comprises an eccentrically mounted cam element 87 of circular cross-section which engages the lugs 84 and 85 and is provided with an internal annular chamber 88 within which an expansion spring 89 functions to force the cam member 86 upwardly and hence to bias the plate 81 against the under surface of the blade supporting plate which is part of the stationary frame. The cam member 86 is identical in construction with that shown in Fig. 7 and will not be further described.

The stationary frame includes a barrel 101 surrounding the stem 61. The lower end of the barrel 101 rests upon the head member 67 and surrounds an upwardly projecting portion thereof 102 of which it is secured in a manner permitting free rotation of the head 67. More particularly, head 67 has an upwardly projecting portion 72 which forms with a circumferential recess 73. The lower portion of the barrel 101 surrounds the portion 72 and is turned or pressed into locking relationship with the circumferential recess as indicated at 103.

The upper end of barrel 101 is forced into a bushing 103 and the upper end of the bushing 103 is secured to a blade supporting plate 104 as indicated at 105. This can be seen with particular clarity in Fig. 10.

Referring to Figs. 12, 13 and 15, the blade supporting plate 104 is formed with downwardly depending guiding flanges 106 which engage the end surfaces 90 of the plate 81 to maintain the guards 82 and 83 parallel with the cutting edges of the blade. The blade is identified in Figs. 10 and 11 by the letter 50.

Referring more particularly to the opening and closing of the cap sections 64, and with particular reference to Fig. 14, the caps 64 are opened by projecting the vertically reciprocable unit 60 and such projection is indicated in Fig. 14 by arrow 110. In this manner, arms 63 are raised and the lugs 66 on the cap supporting arms 65 engage with the undersurface of end guards 107 on the blade supporting plate 104. This engagement forces the lugs 66 downwardly as shown by arrow 111 and causes cap 64 to pivot about the hinge connection 74 as indicated by arrow 112.

When the caps 64 are fully opened, the lugs 66 have slipped by the end guards 107 as shown in Fig. 12. The closing of the caps 64 takes place when stem 61 is retracted, the arms 65 engaging the upper surface of end guards 107 so that, as the arms 63 are lowered, the caps 64 are folded inwardly into a closed position.

In accordance with the invention, the “one-piece” opening and closing action is substantially undisturbed and there has been added a lateral adjustment of the safety guards so that the blade exposure and angle can be varied at will. As will be apparent, the barrel 101 can be grasped by one hand and rotation of the head 67 can be employed to open or close the caps 64 to enable the blade to be changed in rapid and efficient manner and without altering the blade exposure and cutting angle. On the other hand, the barrel 101 can be grasped by one hand and the cam member 86 rotated. In this manner, the laterally shiftable unit 80 can be moved to regulate the blade exposure and cutting angle and without disturbing the position of the caps 64. In other words, when the caps 64 are closed to clamp the blade, the cutting angle and blade exposure can be adjusted without in any way disturbing the cramped condition of the blade. The same is true when the caps 64 are in open position for blade changing.

The invention has been illustrated in connection with a “two-piece” razor using a double-edged flexible blade and also with a “one-piece” razor using the same type of blade. It will be understood that the invention is not limited to the embodiment thereof which have been specifically illustrated but can be adapted to single-edged blades and also to non-flexible blades. Further, while the invention is particularly adapted to the regulation of a “two-piece” razor of the type illustrated in Figs. 1–9 and is especially adapted to the regulation of a “one-piece” razor, as shown in Figs. 10–15, as to which the invention is of outstanding utility, and value, the invention can also be adapted to other types of safety razors. The invention is, therefore, not to be limited to the specific forms thereof which are shown in the drawings, but is instead defined by the claims which follow.

I claim:

1. A safety razor comprising a stem, a lower blade supporting plate, means defining an upper blade clamping plate, means to releasably secure said upper blade clamping plate to said lower blade supporting plate in blade clamping engagement thereof whereby a razor blade between said clamping plates, a laterally shiftable unit comprising a guard plate underlying and separate from said blade supporting plate in sliding engagement therewith, said unit being laterally shiftable while the blade is clamped between said clamping plates, at least one safety guard secured to said guard plate for lateral movement therewith, said means rotatably mounted coaxially with said stem, said cam means including a cam element eccentrically positioned with respect to said stem, said cam element interengaging with said guard plate whereby rotation of said cam means with respect to said stem will laterally shift said guard
plate to regulate the distance between said safety guard and the cutting edge of a blade clamped between said blade supporting plate and said blade clamping plate to vary the blade exposure and cutting angle of said blade.

2. A safety razor as recited in claim 1 in which spring means resiliently biases said guard plate into sliding engagement with the under surface of said blade supporting plate.

3. A safety razor as recited in claim 1 wherein said lower blade supporting plate is rotatably secured to the upper end of said stem, said means to releasably secure said upper blade clamping plate to said lower blade supporting plate includes a downwardly depending stud on said upper clamping plate and means to releasably secure said stud to the upper extremity of said stem whereby said upper blade clamping plate may be drawn downwardly upon said lower blade supporting plate in blade clamping engagement therewith, said guard plate includes a pair of laterally spaced apart opposed safety guards, said guard plate having a central opening through which said stem extends, said blade supporting plate includes longitudinally spaced downwardly depending guiding flanges, said guard plate including end surfaces in sliding engagement with said flanges, spring means are provided resiliently biasing said cam means toward said blade supporting plate, said cam element comprising a cam disk, said blade supporting plate has a pair of laterally spaced apart downwardly depending lugs secured thereto, said cam disk being engaged in said lugs for engagement therewith whereby rotation of said cam means with respect to said stem will cause said cam disk to move said lugs and thereby laterally shift said guard plate to regulate the distance between said safety guards and the cutting edges of a double-edged blade clamped between said blade supporting plate and said blade clamping plate to vary the blade exposure.

4. A one-piece safety razor comprising a vertically reciprocable unit, a laterally shiftable unit and a stationary frame, said vertically reciprocable unit including a stem, a blade guiding bar secured at the forward extremity of said stem, said bar carrying transverse arms positioned at the longitudinal extremities thereof, a pair of cap sections pivotally secured to said arms by means of transverse cap carrying arms, and means to vertically reciprocate said stem along the length thereof with respect to said stationary frame, said laterally shiftable unit comprising a guard plate carrying opposed laterally spaced apart safety guards and cam means coaxial with said stem and interengaging with said guard plate for laterally shifting said guard plate with respect to said stationary frame, said stationary frame including a barrel surrounding said stem and a blade supporting plate fixed with respect to said barrel, said blade supporting plate overlying said guard plate, said guard plate slidably disposed with respect to the under surface of said blade supporting plate, said blade supporting plate including guide means for maintaining said safety guards parallel to the cutting edges of a blade clamped between said cap sections and said blade supporting plate and means carried by said blade supporting plate and engageable with said cap carrying arms for opening and closing said caps upon protrusion and retraction of said stem, said blade supporting plate and said cap sections clamping therebetween a razor blade, said laterally shiftable unit being shiftable without affecting the clamped condition of the blade between said blade supporting plate and said cap sections.

5. A one-piece safety razor as recited in claim 4 in which said cam means surrounds said barrel and said guard plate includes a pair of downwardly depending laterally spaced apart lugs and said cam means includes a cam disk eccentrically positioned with respect to said stem, said cam disk being engaged in said lugs for engagement therewith.

6. A one-piece safety razor as recited in claim 4 in which said cam means is resiliently biased upwardly against said guard plate to maintain said cam means in engagement with said guard plate and to urge said guard plate against the under surface of said blade supporting plate.

7. A one-piece safety razor as recited in claim 4 in which said cam means is provided with a bore extending therethrough, the lower end of said bore enlarged, a tubular barrel surrounding said stem and projecting into the lower end of said enlarged bore, a bushing fitted within the bore of said cam means, said bushing secured to said blade supporting plate at its upper end and to said barrel at its lower end, said bushing and said enlarged bore defining an annular chamber therebetween and an expansion spring compressed within said annular chamber.

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