SAFETY RAZOR HAVING PREDETERMINED OVERLOAD YIELDING MEANS

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This invention relates to safety razors in general, and more particularly to a new and improved means to prevent over-tightening of a razor blade clamped in the safety razor.

In the standard safety razor, the clamping force applied to the razor blade depends to a large degree upon the amount of rotational force applied to the knob means which, on rotation, serves to open and close the cap sections on the razor. The amount of rotational force applied will vary with the individual user and thus the amount of clamping force applied against the blade in the razor will also vary. As the clamping force affects the blade exposure, it is varied accordingly. While certain razor blades can be allowed in manufacture and design in an attempt to eliminate the wide variance of blade exposure, the precision characteristics of the safety razor makes it highly desirable to provide uniform clamping force in all instances independent of the rotational force applied by the user in order to provide for a higher degree of shaving comfort and safety.

The present invention is directed to a new and improved drive means which is operable to insure uniform clamping force on the razor blade independent of razor closing force applied by the user. Suitable means is provided which releases the driving connection when the resisting force reaches a predetermined value. While such release may be readily detected by the user, additional means is included to provide an audible indication to inform the user that the proper clamping pressure has been attained and the razor is ready for use.

In the preferred form of the invention, a conventional blade clamping means is opened between particular positions by the novel drive means of the present invention. The drive means includes a drive knob and stem with a spring means interposed therebetween. When the clamping force on the razor blade reaches the designed value, slippage occurs in the drive knob and spring. At that time, an audible indicating means serves to alert the user of such occurrence and later also serves as a positive drive between the knob and stem during unclamping of the razor blade.

A greater appreciation and better understanding of the salient features of the present invention may be had by a consideration of the objects achieved and a description of one embodiment of the invention. While the novel principles broadly described above are given in conjunction with the description of a double edge safety razor design, it will become obvious to those skilled in the art that the principle is adaptable to razors of other types having a similar type of operating means to clamp the razor blade in the razor head.

An object of this invention is the provision of means to limit the total clamping force which may be applied to a razor blade in a safety razor.

It is a further object of this invention to provide a new and improved safety razor having audible indicating means to inform the user that the appropriate clamping force on the blade has been attained.

It is a further object of this invention to provide an audible indicating means on a safety razor to indicate that the appropriate clamping force on a razor blade has been attained and wherein the audible indicating means forms a positive drive during unclamping of said razor blade.

It is a still further object of this invention to provide a new and improved safety razor design having a blade supporting guard and cap sections adapted to clamp a blade to said guard and further having means to limit the clamping force of said cap sections in a blade to a predetermined value regardless of the torque applied by the user.

Further and fuller objects will become readily apparent when reference is made to the accompanying drawings wherein:

FIG. 1 is an exploded perspective view of a double edge safety razor incorporating the principles of the present invention;

FIG. 2 is a side elevational view of the safety razor of FIG. 1 in the assembled condition with the head and one-half of the handle shown in axial cross section;

FIG. 3 is an enlarged side cross sectional view of the lower end of the handle assembly of FIG. 2 illustrating the detailed features of the drive means of the present invention;

FIG. 4 is an enlarged perspective view of the ratchet stem forming a part of the driving assembly between the knob and spider stem and;

FIG. 5 is an enlarged perspective view of the ratchet spring which forms a part of the audible indicating means of the present invention.

Referring now to FIG. 1, the safety razor 10 includes a spider assembly 11 received in a handle assembly 12 for axial shifting movement in order to permit insertion and removal of a razor blade with such shifting being achieved through a clamping drive assembly indicated generally at 13. The spider assembly 11 is composed of a spider stem 14 joined to a spider 15 which has transverse arms 16 and 17 disposed at opposite ends. Cap sections 18 and 19 are carried on the transverse arms 16 and 17 for pivoting movement to open and close in response to shifting of the spider stem 14 in a manner well known in the art.

The handle assembly 12 includes a guard or blade supporting platform 20 joined to an attaching neck 21 which in turn is joined to the guard 22 having a generally truncoidal over-all contour. The handle may have ribs formed along its outer circumference to enhance the ease with which the razor may be gripped and also improve the over-all appearance.

The clamping drive assembly includes an annular bearing 23 adapted to be received in the handle 22 for mounting a ratchet stem illustrated generally at 24. A torsion type annular spring 25 is positioned around the ratchet stem 24 and is dimensioned so as to be expanded outwardly when received internally of a driving knob 26 as will become apparent. A retaining washer 27 holds the clamping assembly to the spider stem 14 while a ratchet spring 28 coacts with a lower portion of the ratchet stem providing an audible indicating means to indicate that a predetermined level of clamping force has been attained and forms a positive drive during unclamping rotation of the drive knob 26. An end cap 29 serves to hold the ratchet spring 28 in operative relation to the ratchet stem 24 as will be seen when a detailed description of FIGS. 2 and 3 is given.

As seen in FIG. 2, the razor head indicated generally at 30 illustrates the spider assembly 11 and handle assembly 12 in operative or assembled relation with a razor blade 31 supported on the guard 20 and clamped by the cap sections 18 and 19 in the shaving position.
The cap sections are formed with downwardly projecting arms 32 and 33 at opposite ends which co-operate with respective grooves 34 and 35 (FIG. 1) on the guard 20 to cause the cap sections to open and close in response to axial shifting movement of the spider stem 14.

As is evident upon inspection of the razor head shown in cross section in FIG. 2, the force applied to the razor blade 31 through the cap sections 18 and 19 will vary the blade exposure or angle as it is sometimes referred to. Accordingly, it is imperative, because of the critical tolerances and blade placement, that the clamping pressure be uniform and can be applied by each individual user in order for the blade exposure to conform to that anticipated based on the design of the razor and thereby permit shaving in the manner expected. To the attainment of this end, the novel clamping assembly 13 shown at the lower portion of the handle 22 has been provided.

As seen in FIG. 3, the lower end of the spider stem 24 is threaded as at 36 for co-operation with internal threads 37 formed in the central bore 38 of the ratchet stem 24. Relative rotation between the ratchet stem 24 and the spider stem 14 causes relative axial shifting therebetween to accomplish opening and closing of the razor.

Referring to FIGS. 1–4, the lower outer circumference of the ratchet stem 24 includes a knog 39 of frustoconical shape which terminates in a radially extending shoulder 40 extending between the knog 39 and a bearing portion 50. An opposite facing shoulder 41 is formed in the opposite end of the bearing portion 50 by its intersection with an annular circumferential portion 42 of increased diameter.

An annular land 43 is defined by radial shoulders 45 and 46 which land is of larger diameter than the adjacent portion 42. The shoulder 46 connects the outer circumferential portion of the land 43, while the outer radial shoulder 45 is radially inwardly terminating at the junction with an annular spring seat section 44. The spring seat section 44 is of uniform diameter extending to the lower end of the ratchet stem, which is serrated as at 47 by forming a series of notches-like formations 48.

The central axial bore 38 in the ratchet stem 24 is provided with a boss 51 of increased diameter 49 at the lower end which forms an internal radial shoulder 65 adapted to engage the retainer washer 27 to limit the total upward movement of the stem 14. The retainer washer 27 or an equivalent may be riveted or otherwise suitably joined to the lower end of the stem 14.

The bearing 52 on the upper end of the ratchet stem 24 is disposed between the shoulders 40 and 41 and receives the split sleeve bearing 23 so as to rotatably mount the ratchet stem within an annular bore 51 formed in the lower end of the razor handle 22. As the handle 22 may be formed of plastic or the like, a longitudinal key may be formed at molding in the bore 51 to co-operate with the ends of the split sleeve bearing 23 to prevent relative rotation between the handle 22 and the sleeve bearing 23. Accordingly, the sleeve bearing 23 supports the ratchet stem 24 for free rotation in the lower end of the handle 22 to thereby permit shifting of the spider stem 14. A shoulder 52 is formed in the lower end of the handle 22 and transmits axial thrust applied at the lower end of the bearing 23 directly to the handle 22. Accordingly, when the cap sections are in the closed or clamped condition as in FIG. 2, the thrust on the shoulder 52 serves to hold the stem end cap sections closed on the razor blade supported platform 49 in a manner well known.

The drive knob 26 may be formed of generally frustoconical design to merge smoothly with the over-all contour of the handle 22 and is provided with a central bore 53 having a radially inwardly extending annular land 54 which is slidable received between the lower end of the bearing 23 and the land 43 on the ratchet stem. The lower end of the central bore 53 is interrupted by a pair of axially extending keyways 55 and 56 which are diametrically opposed to each other and serve to position a function to become apparent.

The torsion spring 25 is disposed between the central bore 53 in the drive knob 26 and the circumferential spring seat portion 44 on the ratchet stem 24. As is apparent in FIGS. 1–3, the torsion spring 25 has an inwardly projecting end 57 which is disposed at assembly in an axially extending groove 58 in the ratchet stem 24. The axially extending groove 58 may be formed by milling, sawing or the like and terminates short of the serrated portion 47 of the ratchet stem 24 in order to retain the spring 25 on the ratchet stem and enhance the ease in assembling the drive knob 26. Upward and downward movement of the spring is limited by engagement with the radially extending shoulder 45 on the land 43 and the intumed end 57 engaging the lower end of the groove.

The torsion spring 25 is dimensioned relative to the central bore 53 so as to continuously be constrained thereby. Expressed in another manner, the torsion spring 25 in its free state is slightly greater in diameter than the central bore 53 so that on assembly into the knob 26, the two will be in frictional engagement and provide a driving connection between the drive knob 26 and the ratchet stem 24. By controlling the total amount of interference or gripping force between the spring 25 and the central bore 53 on the driving knob 26, the total amount of downward force applied to the cap sections before release of the drive between the ratchet stem 24 and the knob 26 can be predetermined. When the clamping force reaches a predetermined magnitude, the forces resisting rotation of the ratchet stem 24 exceed the driving forces developed between the clamping knob 26 and the torsion spring 25 causing the torsion spring to yield to permit the drive knob 26 to rotate relative to the ratchet stem 24. Reverse rotation has the effect of tending to enlarge the torsion spring 25 to establish a drive between the ratchet stem 24 and the drive knob 26. During reverse rotation this drive is assisted by the ratchet spring 28 in a manner to become apparent.

Referring now to FIG. 5, an enlarged free body perspective view of the ratchet spring 28 is illustrated. The ratchet spring 28 includes a main body portion 60 in the shape of a disk. At opposite ends of a diameter across the main body portion 60 are provided axially directed lugs 61 and 62. Along the peripheral margins of the main body portion 60 and intermediate of the axially extending lugs 61 and 62, a pair of axially extending lug 64 and 65 are punched out of the main body portion 60 and formed by deforming the free end portion upwardly out of the plane of the main body portion.

As seen in FIGS. 2 and 3, when the ratchet spring 28 is positioned within the bore in the drive knob 26, the upstanding lugs 61 and 62 are received in the axially directed keyways 55 and 56 respectively. In this manner, rotation of the drive knob 26 causes the ratchet spring 28 to be rotated. The ratchet stem 24 and torsion spring 25 will also rotate in the absence of other restraining forces as is evident.

The end cup 29 holds the ratchet spring 28 positioned within the bore and closes the end of the internal bore 53 in the drive knob 26 to present a finished appearance.

In FIG. 3, where the ratchet spring 28 is shown in full elevation, it can be observed that the tangs 63 and 64 project upwardly beyond the plane of the serrated end 47 of the drive knob 24. As long as both the drive knob 26 and ratchet stem 24 co-rotate, this is of no apparent consequence. However, when the ratchet stem 24 is prevented from further rotation as by the clamping forces reaching the predetermined limit, the torsion spring 25 is released while the lugs 64 and the ratchet spring is rotated relative to the ratchet stem 24. At such time, the serrated end 47 of the ratchet stem 24 rotates relative to the ratchet spring 28.
causing the tangs or tongues 63 and 64 to alternatively be depressed and released for extension to the free position illustrated, thereby to provide an audible indicating means in the form of a clicking sound serving to alert the user that the predetermined clamping force has been attained. On reversal of the direction of rotation, as in unclamping the blade, the free end portions of the tangs 63 and 64 engage the sides of the notches 48 to form a positive driving connection to rotate the ratchet stem 26 in the reverse direction and thereby release the clamping force on the blade.

In operation, the cap sections 18 and 19 are open by rotating the drive knob 26 in a counterclockwise direction. During such rotation, tangs 63 and 64 engage the sides of the notches 48 to provide a positive drive. The razor blade 31 is then positioned on the guard, and the knob 26 rotated in a reverse or clockwise direction closing the cap sections 18 and 19. When the cap sections 18 and 19 reach the blade clamping position shown in FIG. 2, and rotation of the drive knob 26 is continued, slippage occurs between the spring 25 and the drive knob 26. Since the ratchet spring 28 rotates with the drive knob 26, the tangs 63 and 64 are compressed and released as they move into and out of the notches 48 causing an audible sound alerting the user that the proper clamping force has been reached and that further rotation of the drive knob 26 has no effect on the clamping force.

It is now apparent that the novel razor design described above provides many advantages in the form of simplicity of design permitting economical manufacture and yet providing a novel means to prevent over-tightening of the razor blade. The novel audible indicating means adds to the economy of the design in that it also serves to provide a positive drive between the knob and ratchet stem. Since the blade is uniformly clamped, the proper designed blade exposure can be had regardless of the torque applied to the knob 26.

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 inventive concepts embodied herein. Accordingly, only such limitations should be imposed as are indicated by the appended claims.

I claim:

1. A safety razor comprising a razor head having means for clamping a razor blade therein, drive means to operate said clamping means, said drive means including a drive knob and a ratchet stem, torsion spring means operatively interposed between said drive knob and ratchet stem, said torsion spring having means thereon co-operating with said ratchet stem for rotation thereof with and being positioned in frictional engagement within a bore formed in said drive knob, said ratchet stem being operable to open and close said clamping means in response to rotation of said knob, said torsion spring and said drive knob being adapted to rotate relative to one another on continued rotation of said drive knob, said relative rotation between said drive knob and said torsion spring preventing application of further clamping force on said razor blade after said razor blade has been properly clamped.

2. The safety razor of claim 1 wherein audible indicating means is provided in said knob and is operable on continued rotation of said drive knob to indicate that application of further clamping force on the razor blade is not possible, said audible indicating means including notch-like formations on said ratchet stem and a spring means having at least one resilient tongue engageable with one of said notch-like formations to form a positive drive therebetween when said knob is rotated in a direction to unclamp said blade.

3. A safety razor comprising a blade supporting guard, a handle assembly joined to said guard, a spider assembly including a pair of cap sections and a spider stem, said cap sections being movable and co-operating with said guard to open and close in response to axial shifting of said spider stem, said spider stem being slidably received in said handle assembly, knob means mounted on said handle assembly for rotation relative thereto, drive means operable on rotation of said knob means to reciprocate said spider stem thereby to open and close said cap sections to release and clamp a razor blade on said guard, said drive means including a ratchet stem slidably received on said spider stem, and an annular torsion spring means interposed between a part of said ratchet stem and said knob means, said torsion spring means being rotatably connected to said ratchet stem and having a portion thereof in frictional engagement with said knob means whereby said torsion spring means will rotate on rotation of said knob means thereby to rotate said ratchet stem until the clamping force on said razor blade has reached a magnitude at which time continued application of torque to said knob means will result in relative rotation between said torsion spring and said knob means to prevent application of additional clamping force to said razor blade.

4. A safety razor comprising a guard, a handle joined to said guard, a spider stem slidably received in said handle, a spider assembly carried on said spider stem and having blade clamping means thereon for clamping a razor blade, a knob rotationally supported on said handle, said knob having an annular bore therein, a ratchet stem mounted within said knob and having a portion thereof in threaded engagement with said spider stem, an expandable torsion spring interposed between said knob and ratchet stem so as to substantially fill the space therebetween and engage the annular bore in said knob providing a frictional driving connection between said torsion spring and said ratchet stem whereby rotation of said knob rotates said ratchet stem to shift said spider stem and operate said clamping means, a series of notch-like formations formed on the lower end of said ratchet stem within the bore of said knob, and a resilient tongue rotatably driven by said knob and engageable with said notch-like formations when slippage occurs in said frictional driving connection thereby to audibly indicate when razor blade clamping force has been reached.

5. The safety razor of claim 4 wherein said notch-like formations have an axially extending side wall adapted to be engaged by said resilient tongue to form a positive drive between said knob and said ratchet stem when said knob is rotated to release said blade clamping means.

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