This invention relates to improvements in safety razors incorporating rollers for sharpening their blades and relates to the subject matter disclosed in copending application Serial No. 44,065, filed August 13, 1948, for Self-Sharpening Safety Razor.

The primary object of the invention is to provide structurally and mechanically superior formation and relative arrangement and coaction of the swingable razor blade holder, the sharpening roller, and the means whereby the blade holder is equally tensioned in opposite directions relative to the roller whereby the blade edge is sharpened uniformly on both sides throughout its length as the roller is rotated in opposite directions.

Another important object of the invention is to provide safety razors of the character indicated above wherein the tensioning means resisting deflection of the blade holder in opposite directions acts to hold the razor blade edge against the sharpening roller and acts also to return the blade holder to and maintain the blade holder in a normal or starting position in which the blade when positioned freely in the slot lies in a plane passing through the axis of the roller, so that the opposite sides of the blade edge are engaged with the sharpening roller with equal pressure during a sharpening operation.

Another important object of the invention is to provide more practical safety razors of the character indicated above which can be manufactured in an attractive and serviceable form at relatively low cost.

Another important object of the invention is to provide improved self-sharpening means in safety razors of the character indicated above in which the sharpening roller is formed with a radial slot to receive the blade edge, the external surface of the roller being formed with a spiral abrasive ridge or rib which projects radially from the surface of the roller and terminates at its opposite ends at opposite sides of and at opposite ends of the slot. The roller has lugs or projections similar in cross section to the terminal ends of the spiral rib positioned in opposition to the terminal ends of the rib at opposite sides of the slot therefrom whereby as the roller starts its rotation in either direction a lug in addition to a terminal end of the abrasive rib will engage the face of the blade, instead of only the terminal end of the rib, whereby balanced and equalized pressure is brought to bear on opposite ends of the blade against the resistance of the tensioning and positioning means, instead of only on one end of the blade.

Another important object of the invention is the provision of a sharpening roller of the character indicated above wherein the edges forming the sides of the blade slot are planar and parallel to each other and to a plane passing through the longitudinal axis of the slot and the axis of the roller whereby as the roller is turned in either direction the flat or planar slot sides initially engage the side of the blade flatwise instead of at an angle, thereby reducing distortion of the blade and undue wear thereon.

A further important object of the invention is the provision of a sharpening roller of the character indicated above wherein the exterior of the roller along one edge of the slot is formed with spaced projections serving as a blade edge guard in the shaving position of the blade and the roller.

Other important objects and advantageous features of the invention will be apparent from the following description and the accompanying drawing, wherein for purposes of illustration only, specific embodiments of the invention are set forth in detail:

Fig. 1 is a side elevation of one embodiment with the blade, its holder, and the sharpening roller in shaving position and showing in dotted lines one form of tensioning and positioning means;

Fig. 2 is a view similar to Fig. 1 partly in longitudinal vertical section;

Fig. 3 is a left-hand end elevation of Fig. 1;

Fig. 4 is a fragmentary horizontal sectional view of Fig. 1;

Fig. 5 is a transverse vertical section, taken on the line 5—5 of Fig. 1;

Fig. 6 is a side elevation of a combined sharpening roller and blade guard through the longitudinal axis of the slot;

Fig. 7 is a side elevation partly in vertical longitudinal section showing another form of blade tensioning and positioning means and another form of blade holder mounting;

Fig. 8 is a similar view showing another form of blade tensioning and positioning means and another form of blade holder mounting;

Fig. 9 is another similar view showing a further form of blade tensioning and positioning means;

Fig. 10 is a diagrammatic side elevation showing the untensioned normal position of the blade and holder with relation to the slot in the sharpening roller and

Fig. 11 is a plan view of a blank for forming a hollow sharpening roller by stamping and rolling.

Referring in detail to the drawings, wherein
like or similar numerals designate like parts throughout the several views, and first to Figs. 1 to 6 thereof, the numeral 10 designates an axially elongated handle having an annular should-
er 11 at its forward end beyond which projects a threaded boss 12 arranged to thread into a threaded hole 13 in the rearward middle portion 14 of the bight portion 15 of the razor head 16. The bight portion 15 has depending inwardly generally planar arms 17 on its ends. The lower ends of the arms 17 have holes 18 in which are journaled the axial pintles 19 on the ends of the sharpening roller 20. The upper forwardly displaced portions of the arms 17 have holes 21 in which are journaled the pintles 22 on the ends of the blade holder 23 which comprises spaced plates 24 between which the blade 25 is removably secured with its shaving edge 26 exposed and positioned in the region of the sharpening roller 20. In Figs. 1–5 the blade 25 is secured in place between the holder plates 24 by screws 27 threaded forwardly through the plates and traversing the blade 25.

The rearward one of the blade holder plates 24 has an upwardly and rearwardly angulated lug 28 formed with an opening which may be in the form of a transversely elongated closed slot 29 arranged to conform with the slots 30 in and positioning means which comprises a spring 30, here shown as a leaf spring, having a forward end 31 entering the slot 29 and terminating at its rearward end in a portion which is bent downwardly and forwardly and then upwardly along the spring 30 to define a longitudinally curved flat loop 32. The loop 32 is confined in a socket 33 formed in the forward end portion of the handle 10, and opening through the threaded boss 12, against sidewise movement by the wall of the socket 33, and against axial movement away from the razor head 16 by the rearward end 34 of the socket 33. Accidental displacement of the spring is prevented by its frictional engagement with the wall of socket 33, but it may be removed if necessary or desirable. The boss 12 being threaded in the hole 13 in the razor head with the shoulder 11 against the head and the forward end 31 of spring 30 having been inserted in the slot 29 in the lug 28, the spring 30 tends to yieldably hold the blade 25 in its normal position in which the spring 30 is relaxed or untensioned. This normal position of the blade 25 is substantially radial with respect to the sharpening roller 20 when the blade lies freely within the roller slot 35 as shown in Fig. 10.

The form of sharpening roller 20 shown in Fig. 6 comprises an all-aluminum cylinder formed with a longitudinal slot 35 opening through one side thereof, the slot 35 having planar edges 36 which are parallel to each other and to a plane passing through the longitudinal axis of the slot and the axis of the roller, as clearly illustrated in the drawings, for a purpose hereinafter explained. The bottom of the slot 35 is laterally or arcually enlarged as indicated at 37 to provide adequate clearance for the shaving edge 26 of blade 25.

The exterior surface of the roller 20 has projecting therefrom a symmetrical round-surface rib 38 which spirals around the roller and has terminal ends 39 located at opposite ends of and at opposite sides of slot 35, the end faces 40 of these terminal ends forming coplanar continuations of the slot edges 36. At the sides and ends of slot 35 and directly opposed to the terminal ends 39 of rib 38 across the slot 35 are formed lugs 41 of substantially the same elevation beyond the roller surface as the terminal ends 39 and having faces 42 parallel to end faces 40 and forming continuations of slot edges 36 to form a co-planar surface. The roller along one side of the slot may be formed with longitudinally spaced lugs 43 extending between adjacent lug 41 and rib end 39 which, in the shaving position of the roller 20 and blade 25 shown in Figs. 1 and 2, and also in Figs. 7–9, serve as a guard for the shaving edge 26 of the blade 25.

Opposite the slot 35 the roller is formed at one end with a recess or notch 44 adapted to be entered by a finger 45 on the free end of an arm 45 pivoted at 47 on the inward side of one of the razor head arms 17, as indicated in Fig. 1. The same end of the arm 45 has a lateral finger pull 46 projecting behind the head arm 17 by means of which the arm 45 can be swung rearwardly to retract the finger 45 from the recess 44 and free the roller 20 to be turned in either direction from shaving position, wherein one side of the blade edge 25 rests upon the top of a rib 38 and the other upon the top of a lug 41 at opposite ends of an edge of the slot 35, as shown.

In the normal position of the blade 25, referred to hereinafore, the shaving edge 26 of the blade 25 is the holder facing the roller slot 35, and the holder 23 is yieldably held by the spring 30 in a plane radial with respect to the roller 20. When the blade is centrally disposed with reference to the slot, as illustrated in Fig. 10, the faces 40 of rib ends 39 and the faces 42 of lugs 41, together with the slot edges 36 with which they form continuous planar surfaces at opposite ends of each side of the slot, are parallel to the opposite sides of the blade 25. These parallel planar slot edges are so spaced laterally that during roller rotation they engage the corresponding side of the blade 25 in a substantially datwise manner as the blade snaps back under spring tension following passage of the trailing edge of the slot past the blade edge. This is because the spring 30 on release of contact between roller and blade snaps the blade 25 to its normal position, radial with respect to the roller.

Since spring 30 operates to yieldably resist with equal force swinging movement of the blade 25 in either direction away from normal position, the abrading pressure exerted by the roller rib 33 is the same on both sides of the blade edge 25 and uniform, accurate sharpening of the blade is assured. Further, the force required to rotate the roller upon a surface to produce the sharpening action is equal in opposite directions and the operation is smooth and devoid of strains and inequalities which would otherwise subject the mechanism to undue wear.

In Fig. 7 is shown another embodiment of the invention wherein the threaded boss 12a on the forward end of the handle 10 passes through a hole 13a in the rearward part of the head 16a and is secured in place by a nut 51. The pintles 22a of the blade holder 23a are removably positioned in journal notches 21a opening through the upper end of the forward part of the head arms 17a. The upper edge of the blade holder is formed at its midpoint with a flat-bottomed notch 26a. The tensioning and positioning means in this instance takes the form of a leaf spring 30a which has a portion 54b bent forwardly to fully engage the bottom of the notch 26a and thereby yieldably maintain the hereinafore described normal position of the blade 25a. The spring portion 54a terminates at its rearward end in a
portion 55 which may engage the underside of the head 42c and a depending portion 56 formed with an opening through which the handle boss 12c extends, the nut 51 holding the spring base 56 in place.

In the embodiment of Fig. 8, the upper rearward part of the blade holder 23b is formed with a projection 25b having a plane vertical cam face 57 with which the plane forward end 68 of a cylindrical plunger 59 is engaged. The plunger 59 slides in a smooth socket 33b opening through the handle boss 12b into the handle 14b and having a rear end 34b. Compressed between the socket end 34b and the rearward end of the plunger 59 is a helical spring 30b which maintains the plunger against the blade holder cam face 57. The angular relationship of the plane end 56 of the plunger 59 and the face 57 of the cam projection 25b is such that swinging of the blade holder 23b out of its normal position, as described herein above, in either direction is resisted by the spring 30b.

In the embodiment shown in Fig. 9 the blade holder 23c has a rearwardly and downwardly extending lug 28c on its rearward side onto which is hooked the forward end 60 of a helical spring 30c extending freely through a socket 33c formed through the rear of the blade portion 15c of the razor head 16c and into the handle 14c. The spring has a rear end 61 hooked on a pin 62 at the closed end 34c of the socket.

The arrangement of this spring tensioning mechanism is such that, when the blade 25c is in neutral position, i. e., lying in a plane substantially radial to the axis of roller rotation, the point of engagement of spring 30c with hook 60 is in alignment with pin 62 to which the other end of the spring is anchored. At that point the hook 60 is at the point closest to pin 62 possible within the arc of swing of said hook 60 about the axis of blade holder rotation. Thus, when the blade is forced in either direction away from normal, the spring 30c is placed under added tension, there being sufficient clearance around the spring within the handle of the razor to permit slight transverse bodily displacement back and spring back and forth with swinging movement of the blade holder.

A simpler and cheaper form of sharpening roller is illustrated in Fig. 11. A rectangular blank 72 in the form of an aluminum sheet stamping embodies a diagonally extending raised bead 74, oppositely disposed apertured ears or end plates 76, and diagonally disposed corner portions 78 elevated beyond the plane of the sheet substantially the same distance as the bead 74.

This blank may be rolled to form a partial cylinder with a blade-receiving slot between the longitudinal edges of the blank, and the apertured plates 76 are bent into the plane normal to the cylinder axis. The apertures then serve to receive bearing pinteles in arms, such as 17, of the razor head to rotatably mount the roller. If preferred, end plates 76 may be provided with projections serving as pinteles for reception into apertures in arms 17. In either event the roller is rotatably journaled in the razor head as already described.

The blank illustrated in Fig. 11 has been described as a stamping, the sheet being of uniform thickness throughout its area before and after stamping. However, it will be appreciated that such blank could as well be a forging where-in head 74, corner portions 78, etc., are thicker than the remaining expanse of the blank while 75 still in the flat, i. e., before rolling into cylindrical form and bending the end plates 76.

Having described certain preferred forms of the invention, various modifications will be apparent to those skilled in the art and for that reason I wish to limit myself only within the scope of the appended claims.

What we claim is:

1. A self-sharpening safety razor comprising a handle, a head, a blade holder pivotally mounted in the head and containing a blade, a sharpening roller rotatably mounted in the head, said roller being longitudinally slotted for reception of the cutting edge of the blade, and yieldable means normally positioning the blade in a plane substantially radial with respect to the roller when the blade lies freely within the slot, said yieldable means being so correlated with the blade holder as to offer substantially equal resistance to swinging movement of the blade in either direction away from said radial plane, said slot defining slot edges having faces parallel to each other and to a plane passing through the longitudinal axis of said slot and the axis of said roller and being so spaced laterally that upon continued sharpening rotation of said roller in either direction the slot edges engage the shaving edge of the blade flatwise to deflect the blade to one side of its normal position.

2. A self-sharpening safety razor comprising a handle, a head, a blade holder pivotally mounted in the head and containing a blade, a sharpening roller rotatably mounted in the head, said roller being longitudinally slotted for reception of the cutting edge of the blade, yieldable means normally positioning the blade in a plane substantially radial with respect to the roller when the blade lies freely within the slot, said yieldable means being so correlated with the blade holder as to offer substantially equal resistance to swinging movement of the blade in either direction away from said radial plane, said slot defining slot edges having faces parallel to each other and to a plane passing through the longitudinal axis of said slot and the axis of said roller and being so spaced laterally that upon continued sharpening rotation of said roller in either direction the slot edges engage the shaving edge of the blade flatwise to deflect the blade to one side of its normal position, and an external spiral abrading rib on said roller forming continuous planar surfaces to engage the shaving edge of the blade as said roller is turned.

3. A self-sharpening safety razor comprising a handle, a head, a blade holder pivotally mounted in the head and containing a blade, a sharpening roller rotatably mounted in the head, said roller being longitudinally slotted for reception of the cutting edge of the blade, yieldable means normally positioning the blade in a plane substantially radial with respect to the roller when the blade lies freely within the slot, said yieldable means being so correlated with the blade holder as to offer substantially equal resistance to swinging movement of the blade in either direction away from said radial plane, said slot defining slot edges having faces parallel to each other and to a plane passing through the longitudinal axis of said slot and the axis of said roller and being...
so spaced laterally that upon continued sharpening of said roller in either direction the slot edges engage the shaving edge of the blade flatwise to deflect the blade to one side of its normal position, an external spiral abrading rib on said roller having terminal ends at opposite ends of and at opposite sides of the roller slot, said terminal ends having faces flush with the faces of the slot edges, the slot edge faces and the rib end faces forming continuous planar surfaces to engage the shaving edge of the blade as said roller is turned, and external lugs on the roller at the opposite sides of the slot and opposed to the terminal ends of the abrading rib, said lugs having faces flush with the related slot edge faces, whereby the lug faces engage the sides of the blade edge simultaneously with the related abrading rib end faces and at opposite ends of the blade edge.

4. A self-sharpening safety razor comprising a handle, a head, a blade holder pivotally mounted in the head and containing a blade, a sharpening roller rotatably mounted in the head, said roller being longitudinally slotted for reception of the cutting edge of the blade, and yieldable means normally positioning the blade in a plane substantially radial with respect to the roller when the blade lies freely within the slot, said yieldable means being so correlated with the blade holder as to offer substantially equal resistance to swinging movement of the blade in either direction away from said radial plane, said yieldable means comprising a spring member inserted in a socket formed in said handle and having a portion projecting forwardly toward said head, said holder having a portion apertured to receive the forward end of said spring member, said slot defining slot edges having faces parallel to each other and to a plane passing through the longitudinal axis of said slot and the axis of said roller and being spaced laterally that upon continued sharpening of said roller in either direction the slot edges engage the shaving edge of the blade flatwise to deflect the blade to one side of its normal position.

5. A self-sharpening safety razor comprising a handle, a head, a blade holder pivotally mounted in the head and containing a blade, a sharpening roller rotatably mounted in the head, said roller being longitudinally slotted for reception of the cutting edge of the blade, and yieldable means normally positioning the blade in a plane substantially radial with respect to the roller when the blade lies freely within the slot, said yieldable means being so correlated with the blade holder as to offer substantially equal resistance to swinging movement of the blade in either direction away from said radial plane, said yieldable means comprising a spring member operably mounted on a portion of said handle and comprising a rearward portion connected to said head and bearing against said head and a forwardly projecting portion engaged with respect to said rearward portion having a forward end engaging said blade holder, said slot defining slot edges having faces parallel to each other and to a plane passing through the longitudinal axis of said slot and the axis of said roller and being spaced laterally that upon continued sharpening of said roller in either direction the slot edges engage the shaving edge of the blade flatwise to deflect the blade to one side of its normal position.

6. A self-sharpening safety razor comprising a handle, a head, a blade holder pivotally mounted in the head and containing a blade, a sharpening roller rotatably mounted in the head, said roller being longitudinally slotted for reception of the cutting edge of the blade, and yieldable means normally positioning the blade in a plane substantially radial with respect to the roller when the blade lies freely within the slot, said yieldable means being so correlated with the blade holder as to offer substantially equal resistance to swinging movement of the blade in either direction away from said radial plane and including a cam portion on said blade holder having a rearwardly directed face, a plunger mounted in a socket formed in said handle having a forward end engaging said face, and a yieldable member compressed between the rearward end of said plunger and said socket urging said plunger into engagement with the face of said cam portion, said slot defining slot edges having faces parallel to each other and to a plane passing through the longitudinal axis of said slot and the axis of said roller and being so spaced laterally that upon continued sharpening rotation of said roller in either direction the slot edges engage the shaving edge of the blade flatwise to deflect the blade to one side of its normal position.
rotation of said roller in either direction the slot edges engage the shaving edge of the blade flatwise to deflect the blade to one side of its normal position.

9. A self-sharpening safety razor comprising a handle, a head, a blade holder pivotally mounted in the head and containing a blade, a sharpening roller rotatably mounted in the head, said roller being longitudinally slotted for reception of the cutting edge of the blade, and yieldable means normally positioning the blade in a plane substantially radial with respect to the roller when the blade lies freely within the slot, said yieldable means being so correlated with the blade holder as to offer substantially equal resistance to swinging movement of the blade in either direction away from said radial plane and including a spring member secured to said handle and having a portion projecting forwardly toward said head and engaging said holder, said slot defining slot edges having faces parallel to each other and to a plane passing through the longitudinal axis of said slot and the axis of said roller and being so spaced laterally that upon continued sharpening rotation of said roller in either direction the slot edges engage the shaving edge of the blade flatwise to deflect the blade to one side of its normal position.

10. A self-sharpening safety razor comprising a handle, a head, a blade holder pivotally mounted in the head and containing a blade, a sharpening roller rotatably mounted in the head, said roller being longitudinally slotted for reception of the cutting edge of the blade, and yieldable means normally positioning the blade in a plane substantially radial with respect to the roller when the blade lies freely within the slot, said yieldable means being so correlated with the blade holder as to offer substantially equal resistance to swinging movement of the blade in either direction away from said radial plane and including a spring member projecting forwardly toward said head into engagement with an opening in said holder, said slot defining slot edges having faces parallel to each other and to a plane passing through the longitudinal axis of said slot and the axis of said roller and being so spaced laterally that upon continued sharpening rotation of said roller in either direction the slot edges engage the shaving edge of the blade flatwise to deflect the blade to one side of its normal position.

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