Sept. 9, 1952 R. P. HARSHBERGER 2,609,602

VIBRATING SAFETY RAZOR WITH YIELDABLY MOUNTED BLADE GUARD

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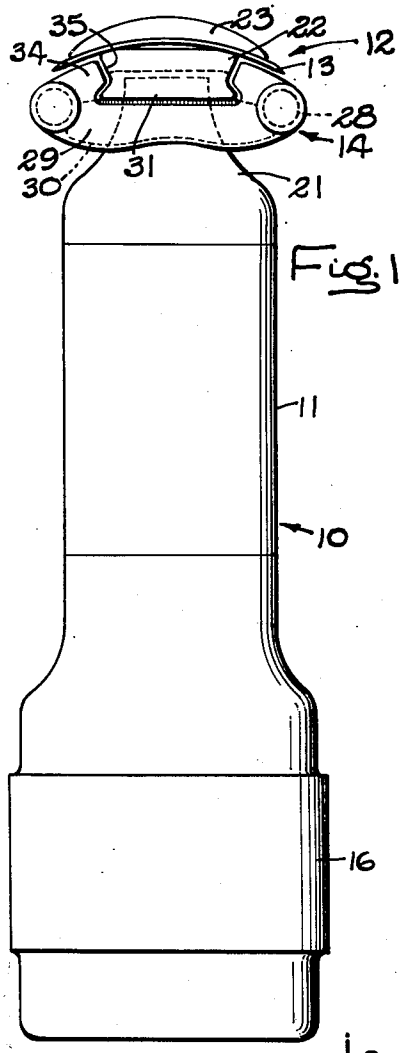

Fig. 1

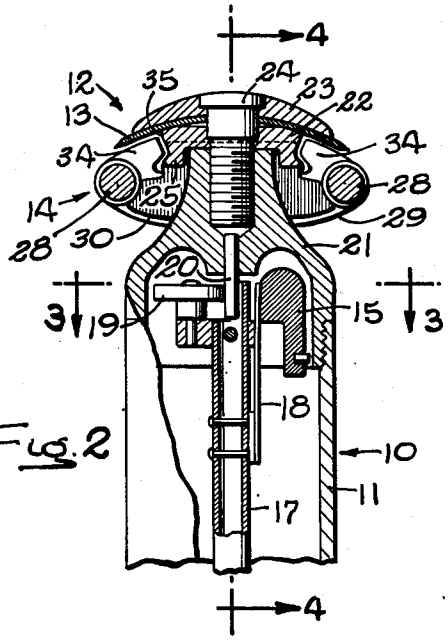

Fig. 2

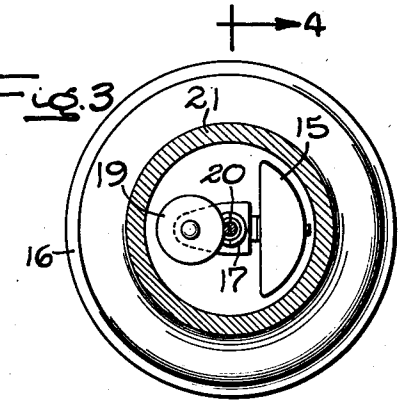

Fig. 3

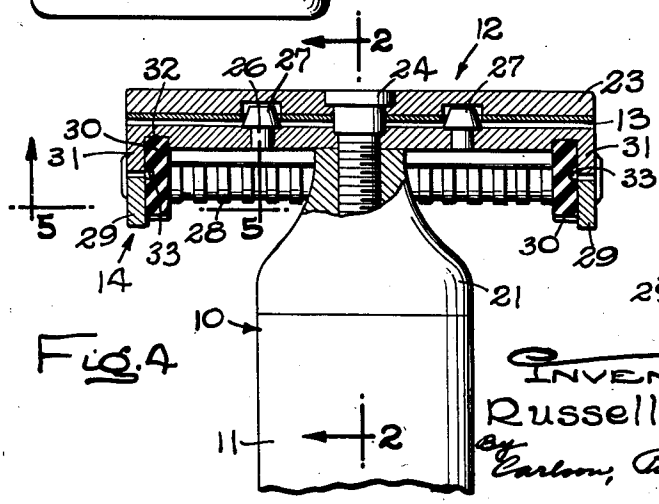

Fig. 4

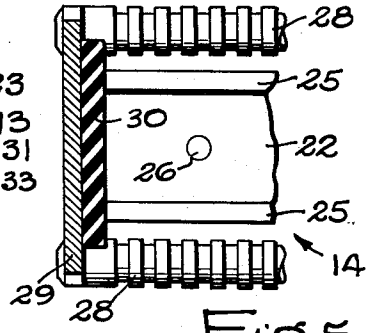

Fig. 5

INVENTOR

Russell P. Harshberger

by Carlson, Pitzner, Hubbard & Wolfe

ATTORNEYS

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VIBRATING SAFETY RAZOR WITH YIELDABLY MOUNTED BLADE GUARD

Russell P. Harshberger, Altadena, Calif.

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4 Claims. (Cl. 30—45)

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The present invention relates to improvements in safety razors of the general type disclosed in my Patent No. 2,362,998, issued November 21, 1944, and embodying power driven means for imparting a reciprocatory movement to the cutting element.

In razors of the foregoing type, the shaving pressure is applied against a guard member which is yieldably connected to the cutter head in such a manner that vibrations imparted to the head will cause the cutting element to reciprocate longitudinally within the guard member. In prior structures, metallic leaf springs have been employed as the connecting means for supporting the relatively floating guard member. These springs present exacting requirements, such as the necessity for extreme accuracy of manufacture and preciseness of assembly, often difficult of attainment, and hence are comparatively expensive to produce and tedious to handle. Metallic springs are also subject to breakage in the event of abuse of the razor by the user. One of the objects of the invention, therefore, is to provide a razor of the foregoing type in which the guard member is supported by a simple and inexpensive non-metallic connecting means not subject to the aforesaid difficulties.

A more specific object is to provide a connecting means for the guard member which will provide a synchronized rebound at the end of each stroke of the cutting element to improve the reciprocatory action, and which will have a long effective life.

Other objects and advantages will become apparent as the description proceeds.

In the accompanying drawings:

Fig. 1 is a side elevational view of a razor embodying the features of the present invention.

Fig. 2 is a fragmentary axial sectional view taken transversely of the head end portion of the razor.

Fig. 3 is a transverse sectional view taken along line 3—3 of Fig. 2.

Fig. 4 is a fragmentary view of the head end portion of the razor, with the cutter head in longitudinal section along line 4—4 of Fig. 2.

Fig. 5 is a fragmentary sectional view of the cutter head taken along line 5—5 of Fig. 4.

Referring more particularly to the drawings, the razor, constituting the exemplary embodiment of the invention, comprises generally an elongated hollow casing 10 conveniently dimensioned and shaped to constitute a handle adapted for the grasp of the operator. The casing 10 has a stem or barrel 11 with a cutter head 12 mounted

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on one end. The head 12 is adapted to support a cutting element, such, for example, as a conventional double-edge safety razor blade 13, for reciprocation in a generally straight-line longitudinal movement relative to a floating guard member 14 adapted for engagement with the user's skin. The casing 10 supports and preferably encloses a power operated motion producing mechanism tending to impart a vibratory or gyratory movement to the cutter head.

The present invention relates particularly to improvements in the cutter head 12, and hence the motion producing mechanism may be of any suitable character adapted to effect the desired reciprocation between the blade 13 and the guard member 14. Preferably, however, the mechanism is of the same type as disclosed in my aforesaid patent to which reference may be had for a more complete understanding of the construction, and, generally stated, comprises an eccentric weight 15 located adjacent the cutter head 12 and adapted to be revolved at a high speed by a spring motor (not shown) enclosed within an enlarged housing 16 on the other end of the stem 11. More particularly, the spring motor is connected to drive a tubular shaft 17 extending from the housing 16 axially through the stem 11 substantially to the cutter head 12. The eccentric weight 15 is secured to one side of the free end of the shaft 17 by means of a leaf spring 18, and has sufficient mass to impart a pronounced gyratory motion to the cutter head 12 when revolved at high speed in its circular or orbital path. To maintain the shaft 17 in coaxial relation to the stem 11 against the effect of the centrifugal force created by the revolving weight 15, an idler roller 19 is supported on the side of the shaft diametrically opposite the weight, and is disposed in free rolling engagement with a guide pin 20 fixed in the cutter head 12 in coaxial relation to the shaft.

The barrel or stem 11 is formed with a closed tapered end 21 constituting the supporting base of the cutter head 12. The other elements of the head 12 generally comprise an elongated inner blade supporting bed 22 and an outer cap 23, adapted to be rigidly secured with the blade 13 clamped therebetween to the stem 11 by means of a centrally located screw 24 removably threaded into the base 21. The bed 22 is of a narrower width than the cutting element or blade 13, and preferably is U-shaped in cross-section to define spaced parallel longitudinal side flanges 25. The outer cap 23 is generally crescent-shaped in cross section so as to flex the blade 13 and maintain it at the proper cutting angle against the

outer marginal edge surfaces of the bed 22. Longitudinally spaced pins 26 with tapered heads 27 for engagement with appropriate locating apertures in the blade 13 are secured to the bed 22 at opposite sides of the screw 24.

The guard member 14 is supported from the bed 22 through a yieldable connection for relative floating movement, and serves to translate the normal gyratory motion of the blade 13 generally into a straight-lined reciprocatory movement. In the preferred construction, the guard member 14 comprises two spaced parallel safety bars 28 rigidly interconnected at opposite ends by cross plates 29 so as to form a rectangular frame, and extending respectievly along the opposite cutting edges of the blade 13. It will be understood that in use, one or the other of the safety bars 28 is placed against the skin of the user and is subjected to the shaving pressure.

An important feature of the invention resides in providing a yieldable or resilient connection between the bed 22 and the guard member 14, which connection will effect the longitudinal reciprocatory motion between the guard member and the blade with a synchronized rebound, and which in general obviates the necessity for minute accuracy in the machining and assembly of the related parts. In the preferred form, the connection consists of two strips 30 of resilient rubber which are constructed and arranged to yield lengthwise of the blade 13 to a much greater degree than transversely of the blade. Thus, the rubber strips 30 are securely anchored along their inner longitudinal edge portions, as by a rubber to metal bond, to and along the inner surfaces of the respective end plates 29 of the guard member 14. The outer longitudinal edge portions of the rubber strips 30 are similarly anchored respectively to and along the inner surfaces of two end flanges 31 on the bed 22. Preferably, the extreme outer edge portions of the rubber strips 30 are also inset and anchored within interfitting grooves 32 formed in the lower surface of the bed 22 adjacent the flanges 31. As shown in Fig. 4, the end plates 29 are normally in edge to edge alinement with the end flanges 31, but separated therefrom by a slight clearance to permit freedom of relative reciprocation. The rubber connectors 30 preferably are formed in their outer surfaces with longitudinal grooves 33 in substantial registration with the clearance spaces between the plates 29 and flanges 31 so as to define lines of flexure. It will thus be seen that the rubber connectors 30 are subject to flexure mainly in a direction longitudinally of the blade 13, and only slightly in a transverse direction, thereby contraining the blade to reciprocate longitudinally relative to the guard member 14 in response to the motion producing impulses set up by the revolving eccentric weight 15.

It will be understood that the action of the rubber connectors 30 in effecting the longitudinal reciprocatory motion between the guard member and the blade is dependent on the ability of the connectors to resist bending by forces acting transversely of the blade relative to their ability to resist bending by forces acting in a direction parallel to the cutting edge of the blade. The resistance of each connector to bending is determined in part by the shape of the connector used and more particularly by the relative dimensions of the cross section of the connector taken along a plane parallel to the plane of the gyratory motion induced by the weight 15. These planes are, of course, perpendicular to the axis of

the casing 10. More specifically, the desired action of the connectors is obtained when the shape of the connectors is such that the moment of inertia of the cross-sectional area of each connector, just described, about a neutral bending axis parallel to the cutting edge blade 13 exceeds by a substantial amount the moment of inertia of the same area about a neutral bending axis perpendicular to the cutting edge. Each neutral bending axis extends through that central portion of the connector which is unstressed by bending forces acting in a direction perpendicular to the axis. In the preferred construction, best illustrated in Fig. 3, each connector 30 is shaped to have a cross-section which is elongated in a direction transverse to the blade to give the connector the characteristics just described.

In order to protect the rubber connectors 30 against undue strain, for example, when winding up the spring motor, a loose mechanical interlock is provided for preventing undue separation of the guard member 14 from the bed 22. In the present instance, each of the end plates 29 of the guard member 14 is formed with inwardly projecting points or lugs 34 which are loosely disposed within longitudinal grooves 35 formed in the outer sides of the flanges 25 on the bed 22. The lugs 34 do not interfere with relative longitudinal reciprocation between the guard member 14 and the bed 22, but serve to limit relative angular displacement between these parts and relative axial separation thereof so as to prevent excess flexure of the rubber.

The rubber connectors 30 provide a strong and secure support for the floating guard member 14. They are simple and inexpensive to produce and assemble since they do not necessitate precision machine work and fitting nor delicacy in handling. They are not subject to breakage or displacement out of desired position. In addition, they are not susceptible, as are metallic springs, of being bent out of shape or otherwise injured by excessive flexure and thereby rendered ineffective or inefficient. Because of the mass deflection pressure which is stored therein, they serve to improve the reciprocatory cutting action by imparting a quickly responsive or synchronized rebound to the cutting element at the end of each stroke.

I claim as my invention:

1. In a power driven razor, in combination with an elongated casing enclosing power operable means tending to impart a gyratory motion to one end thereof, a rectangular bed and overlying shoe adapted to clamp an elongated razor blade therebetween and centrally secured crosswise to said end of said casing, said bed having end flanges on the underside extending transversely thereof, a rectangular frame constituting a guard member extending freely about said end and underlying said bed, said frame having end plates normally disposed in edge-to-edge alinement with said flanges and spaced therefrom by a slight clearance, and two flat rubber strips molded against the inner surfaces of said flanges and plates whereby to provide a yieldable connection between said bed and guard member.

2. In a power driven razor, in combination with an elongated casing enclosing power operable means tending to impart a gyratory motion to one end thereof, a rectangular bed and overlying shoe adapted to clamp an elongated razor blade therebetween and centrally secured crosswise to said end of said casing, said bed having end flanges on the underside extending trans-

versely thereof, a rectangular frame constituting a guard member extending freely about said end and underlying said bed, said frame having end plates normally disposed in edge-to-edge alinement with said flanges and spaced therefrom by a slight clearance, and two flat rubber strips molded against the inner surfaces of said flanges and plates whereby to provide a yieldable connection between said bed and guard member, the underside of said bed being formed with transverse grooves immediately inside of said flanges, and said rubber strips being also inset and molded at their outer longitudinal edges in said grooves.

3. In a power driven razor, in combination with an elongated casing enclosing power operable means tending to impart a gyratory motion to one end thereof, a rectangular bed and overlying shoe adapted to clamp an elongated razor blade therebetween and centrally secured crosswise to said end of said casing, said bed having end flanges on the underside extending transversely thereof, a rectangular frame constituting a guard member extending freely about said end and underlying said bed, said frame having end plates normally disposed in edge-to-edge alinement with said flanges and spaced therefrom by a slight clearance, and two flat rubber strips molded against the inner surfaces of said flanges and plates whereby to provide a yieldable connection between said bed and guard member, said rubber strips being formed in their outer side surfaces with longitudinal grooves in registration with the clearances between said flanges and plates to define lines of flexure.

4. In a power driven razor, in combination

with an elongated casing enclosing power operable means tending to impart a gyratory motion to one end thereof, a rectangular bed and overlying shoe adapted to clamp an elongated razor blade therebetween and centrally secured crosswise to said end of said casing, said bed having end flanges on the underside extending transversely thereof, a rectangular frame constituting a guard member extending freely about said end and underlying said bed, said frame having end plates normally disposed in edge-to-edge alinement with said flanges and spaced therefrom by a slight clearance, two flat rubber strips molded against the inner surfaces of said flanges and plates whereby to provide a yieldable connection between said bed and guard member, depending longitudinal marginal flanges on the underside of said bed and formed with recesses in their outer side surfaces, and upwardly and inwardly extending lugs on the ends of said end plates projecting loosely into said recesses to limit relative twisting or separating movement between said bed and guard member except longitudinally of said bed.

RUSSELL P. HARSHBERGER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,160,987	Rand	June 6, 1939
2,301,552	La Cell	Nov. 10, 1942
2,362,998	Harshberger	Nov. 21, 1944