June 25, 1940. H. D. BOWMAN 2,205,590

SAFETY RAZOR

Filed Nov. 15, 1937 2 Sheets-Sheet 1

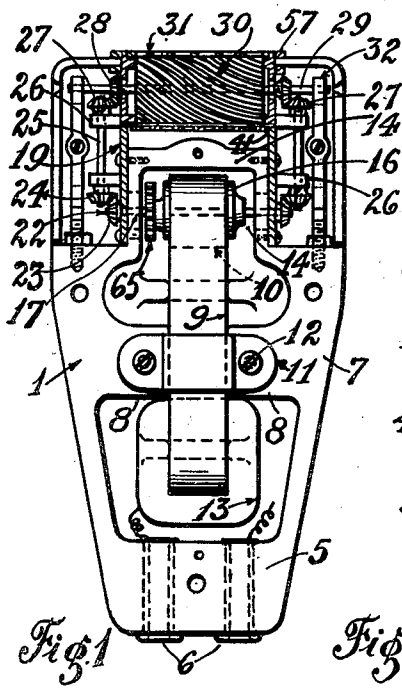


Fig. 1

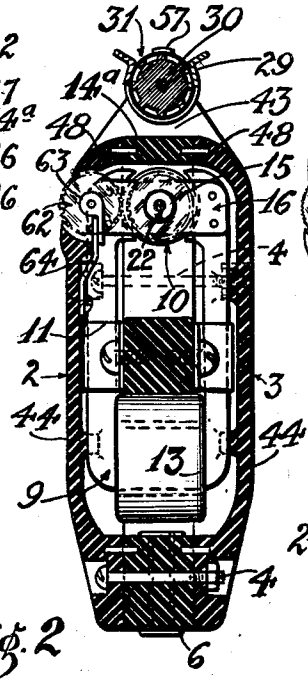


Fig. 2

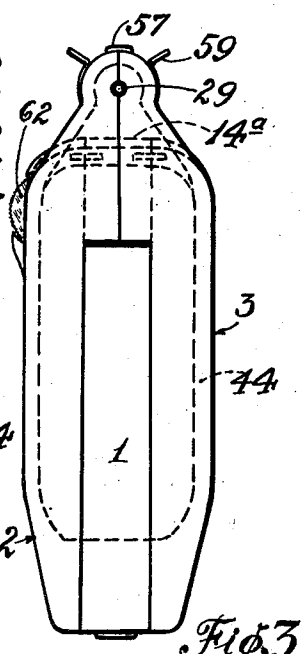


Fig. 3

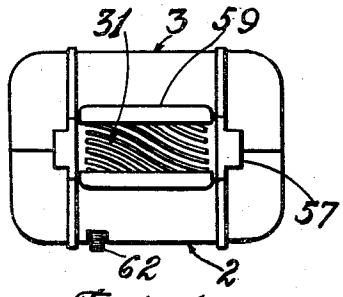


Fig. 4

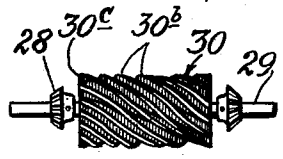


Fig. 5

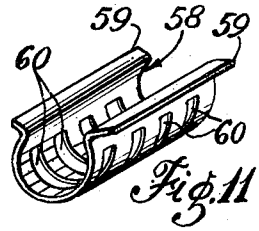


Fig. 11



Fig. 6

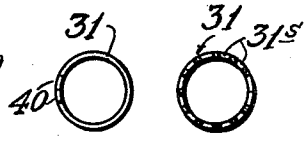


Fig. 7 Fig. 8

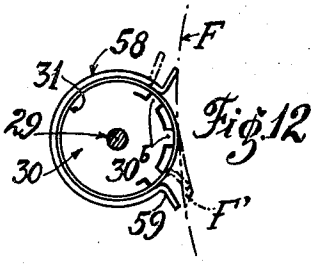


Fig. 12

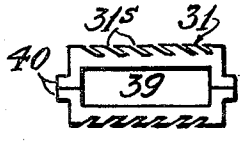


Fig. 9

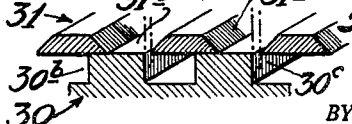


Fig. 10

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June 25, 1940. H. D. BOWMAN 2,205,590

SAFETY RAZOR

Filed Nov. 15, 1937 2 Sheets-Sheet 2

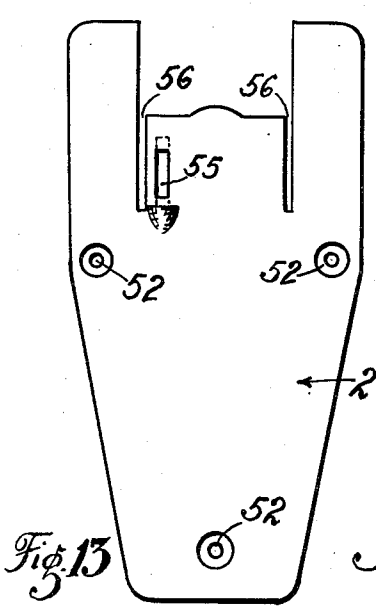


Fig. 13

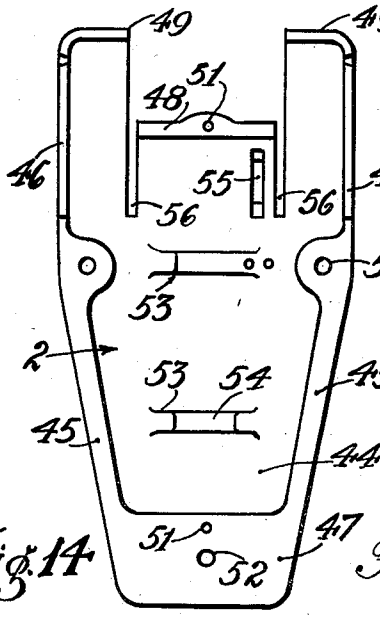


Fig. 14

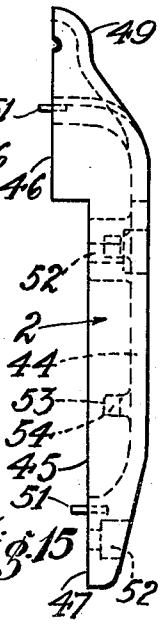


Fig. 15

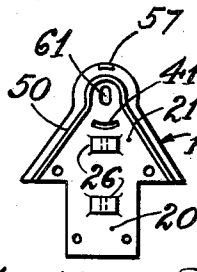


Fig. 16

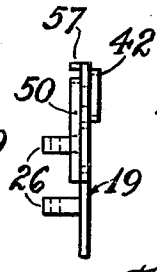


Fig. 17

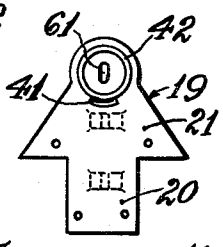


Fig. 18

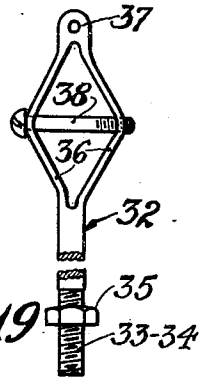


Fig. 19

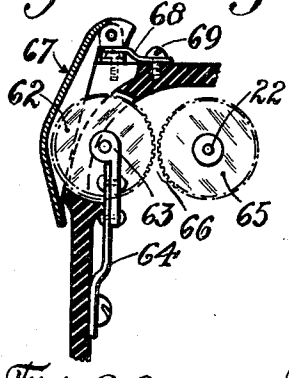


Fig. 20

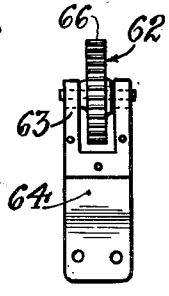


Fig. 21

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Patented June 25, 1940 2,205,590

UNITED STATES PATENT OFFICE

2,205,590

SAFETY RAZOR

Hyman D. Bowman, Pittsburgh, Pa.

Application November 15, 1937, Serial No. 174,591

10 Claims. (Cl. 30—43)

This invention relates to safety razors and more in particular to power actuated safety razors having a rotary cutting element.

One of the primary objects of this invention is to provide a safety razor having a rotary cutter provided with a plurality of, preferably, spirally wound cutting-blades formed integrally thereon and operating within a cylindrical guard having on its effective side slots spirally disposed, preferably parallel with said blades.

Another object of this invention is to provide a power actuated razor having a rotary cutter mounted in suitable bearings which are resiliently and adjustably supported, whereby to regulate the frictional engagement of said cutter against the effective side of the cylindrical guard thereof.

Yet another object of this invention is to provide a power driven safety razor which may be held at varying angles to the skin of the user and which is provided with a detachable device whereby said skin may be automatically stretched adjacent the point of application of the cutting element to insure a closer shave and prevent skin injury.

Still another object of this invention is to provide such a razor in which the removed hair particles will be expelled from the cutter by the very rotation thereof, thus preventing said hair from clogging the operating mechanism of the device.

Additional features and advantages of this invention will appear in the course of the following description considered in connection with the accompanying drawings forming part of this application.

In the drawings:

Fig. 1 is a top plan view, partly in section, of the power safety razor shown with one of the covers removed.

Fig. 2 is a longitudinal section, taken along varying planes, of the safety razor.

Fig. 3 is a side elevation of the safety razor.

Fig. 4 is a plan view of the front of the safety razor.

Fig. 5 is a side elevation of the rotary cutter used in the razor.

Fig. 6 is a top plan view of the cylindrical guard for the rotary cutter.

Fig. 7 is an end elevation of Fig. 6.

Fig. 8 is a cross-sectional view through the guard.

Fig. 9 is a plan view of the bottom side of the guard.

Fig. 10 is a diagrammatic view showing the cooperation between the rotary cutter and its guard for severing hairs, and also showing the roughened or corrugated nature of the radial sides of the cutter-blades and guard-slots.

Fig. 11 is a perspective view of the removable tensioning device adapted to stretch the skin while the razor is moved up or down along the skin.

Fig. 12 is a diagrammatic view showing the operation of the skin-tensioner.

Fig. 13 is a front elevation of one of the covers of the razor.

Fig. 14 is a similar view showing the inside of the cover.

Fig. 15 is a side elevation of Fig. 14.

Fig. 16 is a front elevation of one of the supporting end-plates for the rotary cutter and related parts.

Fig. 17 is a side elevation of Fig. 16, and

Fig. 18 is a rear elevation of said end-plate.

Fig. 19 is a side elevation, on an enlarged scale, of the resilient and adjustable support for the bearings of the rotary cutter.

Fig. 20 is a fragmentary sectional and enlarged view showing the starting mechanism for the electric motor used in the present embodiment of this invention, said view also showing the use of a spring-controlled cap to protect the starting wheel against undesired contact by the hand of the user, while shaving.

Fig. 21 is a front elevation, also on an enlarged scale, showing one method of resiliently mounting the starting-wheel.

Reference being had to the drawings, which illustrate an electrically operated razor, and wherein identical parts are identified throughout by the same reference numerals, the power actuated razor comprises a main-frame 1 upon which the power means as well as the driving mechanism for the rotary cutter are mounted; the upper cover 2 and the lower cover 3, both secured together and to the main-frame by means of through bolts 4. Said frame and covers may be made of any desired material, such as molded hard-rubber, synthetic resins, die-cast metals, etc., to suit the requirements of the trade.

The main-frame 1 is relatively thick and comprises a rear part 5 in which are suitably secured the electric plug-receptacles 6; a central part 7 having inwardly directed lugs 8 suitably spaced to receive therebetween the electromagnetic core 9 of the electric motor which drives the razor. Cleats 11 are fastened by screws 12 on both sides of said lugs to secure said core. In the space intermediate said lugs and the rear there is

placed on the core the electric coil 13 by means of which the former is magnetized.

In the hollow head portion 14 of the main-frame is situated the armature 10 of the electric motor, said armature being rotatably mounted in bearings 15 provided in suitable, non-magnetic, bearing-plates 16 secured across both pole-pieces of the core.

On both lateral sides 17 of the head 14 are secured by means of screws 18 the end-plates 19 having each a rectangular lower portion 20 secured to one of the sides 17 and a substantially triangular top portion 21. Upon said end-plates is mounted the gear mechanism by which the rotary cutter of the razor is actuated by the electric motor.

As shown especially in Fig. 1, the armature shaft 22 carries, (preferably at each end to obtan a balanced drive) a bevel gear 23 which meshes with a similar gear 24 secured at the lower end of its corresponding drive shaft 25 rotatably mounted in bearing supports 26 secured on the end-plate, or preferably cast integral therewith. At the upper ends of the drive-shafts are secured bevel gears 27 in mesh with other gears 28 secured on the transversely disposed shaft 29 of the rotary cutter 30.

The rotary cutter runs within a closely fitting cylindrical guard 31, centrally secured between both end-plates, and its shaft is resiliently and adjustably mounted for rotation in bearing pedestals 32, secured on the main-frame.

As shown in Fig. 19 in particular, each bearing pedestal is made of any suitable metal, preferably of rectangular cross-section, the lower portion 33 of which is turned cylindrical and provided with threads 34 for securement on the main-frame. Lock-nuts 35 may be used to secure these pedestals in adjusted position. The intermediate portion of the pedestal is split longitudinally and expanded outwardly to produce the lozenge-shaped and resilient support 36 of the bearing proper 37 for the shaft. A screw 38 joining the transverse apexes of the lozenge is used to obtain a very close adjustment of the rotary cutter 30 relative to the effective side of the razor-guard 31. In order to allow for the adjustment of said cutter, the holes 61 in the end-plates 19 through which the shaft 29 passes are made slightly oblong, as shown in Figs. 16 to 18.

The rotary cutter has on its periphery cutting-blades 30[b] preferably disposed in steep spiral formation and having on their radial and parallel sides very fine and sharp corrugations 30[c], as suggested in Fig. 10.

The guard 31 has on its forward or effective side narrow slots 31[a] which have preferably the same spiral form and are parallel to the above mentioned cutting blades and the sides of which are also finely corrugated, as at 31[c], Fig. 10. The reason for corrugating said parts is to provide a better grip on the hair and to prevent any sliding of the same, as might occur, were said parts made with absolutely smooth sides. The rear side of the guard has a large aperture 39 through which the hair particles may be expelled by the action of the rotary cutter which in this case acts substantially as a centrifugal blower or expeller.

The guard is preferably made of rust proof steel tubing in which the slots have been milled out; but in order to reduce the cost of manufacture, it may be found advisable to stamp the guard and its various slots out of flat sheets of thin, rust proof, steel and then form it into a cylinder, as assumed in the construction shown in Figs. 6 to 9 in particular. In this case there may be produced at the four corners of the metal blank the lugs 40, so that when the blank is rolled into a tube, the opposite lugs will butt against each other and form tongues adapted to fit closely in suitable slots 41 provided in both end-plates 19.

The cylindrical guard is held in concentric relation with the rotary cutter by means of circular flanges 42, Figs. 17 and 18, formed integrally with and on the inner side of the end-plates.

It will be seen, especially in Fig. 2, that the rotary cutter is mounted an appreciable distance above the front end of the main-frame, thus leaving an open space 43 through which the hair particles may be expelled from the rotary cutter and its guard, thus preventing any clogging of the motor mechanism within the body of the razor. It will also be noted that both covers 2 and 3 are suitably shaped to fully enclose said mechanism.

The general shape of the covers is illustrated in Figs. 13 to 15 which relate in particular to the top cover 2. As shown therein, each shell-shaped cover comprises a bottom 44 of varying width and having lateral walls 45 and 46, the rear end wall 47, the closure wall 48 abutting against the top side 14[a] of the main-frame, and the curved top wall 49 which serves to enclose the rear drive and fits about a similarly shaped bead 50 provided outwardly on each end-plate 19, Figs. 16 and 17. Dowel pins 51 and bolt holes 52 are also shown to properly locate and secure the cover on the main-frame. Suitably shaped cross-ribs 53 are formed on the bottom and provided with recesses 54 which serve to additionally maintain the magnetic core in its corect position. In the top cover there is also provided a suitable aperture 55 for the starting-wheel of the device. The longitudinal slots 56 at both sides of the cover serve to accommodate the sloping sides of the end-plates 19, which also serve to enclose the hollow spaces in which the gear drives are located. Lateral lugs 57 are provided on each end-plate to protect and align the rather thin abutting ends of the top-walls of each cover.

It is well known that better shaving results are obtained when the skin is held taut at the place a razor passes over it. To automatically stretch the skin, there is positioned about the razor-guard 31 the skin-tensioning element shown in particular in Figs. 11 and 12.

The skin-tensioner 58 is of parti-cylindrical shape and has at both sides suitably inclined longitudinal flanges 59 adapted to engage the surface of the skin. This tensioner is preferably made of thin, resilient and rustproof metal and may be snapped snugly about the guard 31, around which it may rotate and adjust itself in accordance with the angle at which the shaving device is held against the skin. Slots 60 are provided on the underside of the tensioner to increase its flexibility and also allow the hair particles to drop away from the rotary cutter, etc.

Referring to the diagrammatic Fig. 12, it will be noted that when the whole razor is held at an angle against the face and moved downward, the forward flange 59, in the direction of travel, will tend to dig itself into the face, as at F', in the manner suggested by the lower dotted flange, and thereby stretch the skin adjacent the cutting-line of the razor, while the other flange, of

course, assumes the raised position above the face. When shaving upward, the whole razor is held at an upwardly acute angle to the face, thus causing the upper flange to press into the skin, as will be readily understood.

In order to insure a very close shave, the sides of the slots 31ˢ in the guard 31 are bevelled off, as suggested in Fig. 10 at 31ᶜ. A slight pressure against the skin will force same into very close proximity of the cutting edges of the rotary cutter and thus produce the required results.

The electric motors used for power driven razors are generally of the universal type, operable on either alternating or direct current. These motors are usually not self-starting, but require that the initial impulse be given manually.

In the present design, the starting of the motor is effected by means of the starting-wheel 62, rotatably mounted in bearings 63 secured on a spring-base 64 suitably fastened on the bottom of the top-cover 2. The starting-wheel may be brought into contact with the rotor-wheel 65 fastened on the armature shaft of the motor. The normal tendency of the spring-base is to keep the starting-wheel away from the rotor-wheel so that the former will not rotate continuously while the motor is in operation. By depressing the starting-wheel and giving it a quick rotary start, preferably by means of the thumb, the armature may be readily started. To prevent slipping of the finger used over the starting-wheel and to insure a good engagement between the two wheels, they are preferably knurled peripherally, as suggested at 66.

If desired, in order to obviate accidental engagement of the starting-wheel by the hand of the user, a cap 67 hingedly mounted on the cover 2 and acted upon by a spring 68, also secured on the cover by screws 69 may be used, as suggested in Fig. 20.

Although in the above described device the use of an electric motor has been assumed, it will be readily understood by persons vested in the mechanical arts that other sources of power, such as flexible shafts, hydraulic or air motors, etc., could be substituted and also that other means than the ones illustrated for transmitting power to the rotary cutter could be employed satisfactorily.

It is desired to include all the above mentioned variations, as well as other structural details, as fall within the scope of the appended claims, in this application for Letters Patent.

I claim:

1. In a safety razor, a main-frame and covers therefor; a drive motor and a rotary cutter actuated thereby; a cylindrical guard for and surrounding said cutter, and means rotatably mounted about said guard to stretch the skin of a shaver during the shaving act.

2. In a safety razor, a main-frame and covers therefor; a drive motor and a rotary cutter actuated thereby; a cylindrical guard for and surrounding said cutter, and means removably and rotatably mounted about said guard to stretch the skin of a shaver while shaving.

3. In a safety razor, a main-frame and covers therefor; a drive motor and a rotary cutter actuated thereby; a cylindrical guard for and surrounding said cutter, and flexible means adapted for snap engagement about said guard and rotatable thereon to stretch the skin of a shaver while shaving.

4. In a safety razor, a main-frame and covers therefor; a drive motor and a rotary cutter actuated thereby; a cylindrical guard for and surrounding said cutter; means positioned on said guard to stretch the skin while shaving; said guard and stretching means having cooperating apertures for the exit of severed hair-particles.

5. In a safety razor, a main-frame and covers therefor; a drive-motor and a rotary cutter actuated thereby; a shaft for said cutter; a cylindrical guard for and surrounding said cutter, and bearing pedestals for said shaft, said pedestals being slotted intermediate their ends to resiliently support said shaft.

6. In a safety razor, a main-frame and covers therefor; a drive-motor and a rotary cutter actuated thereby; a shaft for said cutter; a cylindrical guard for and surrounding the cutter; bearing pedestals for said shaft slotted intermediate their ends and expanded outwardly into substantially lozenge-shape formation to resiliently support said shaft, and means to vary the width and length of said lozenge formation.

7. In a safety razor, a main-frame and covers therefor; a drive-motor and a rotary cutter actuated thereby; a shaft for said cutter; a cylindrical guard for and surrounding the cutter; bearing pedestals for said shaft slotted intermediate their ends and expanded outwardly into substantially lozenge-shape formation to resiliently support said shaft, and means positioned on said pedestals to vary the width and length of said lozenge formation.

8. In a safety razor, a main-frame and covers therefor; a drive-motor and a rotary cutter actuated thereby; a shaft for said cutter; a cylindrical guard for and surrounding the cutter; bearing pedestals for said shaft slotted intermediate their ends and expanded outwardly into substantially lozenge-shape formation to resiliently support said shaft, and screw-members effective at the horizontal apexes of said lozenge formation to adjust said cutter relative to the guard therefor.

9. In a safety razor, a main-frame and covers therefor; a drive motor and a cutter actuated thereby; a cylindrical guard for and surrounding said cutter, and means removably and rotatably mounted about said guard to stretch the skin of a shaver while shaving.

10. In a safety razor, a main-frame and covers therefor; a drive motor and a cutter actuated thereby; a cylindrical guard for and surrounding said cutter, and flexible means adapted for snap engagement about said guard and rotatable thereon to stretch the skin of a shaver while shaving.

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