Dec. 20, 1927. 1,653,484

J. M. SULLIVAN

RAZOR BLADE SHARPENER

Filed July 12, 1924

Fig. 1.

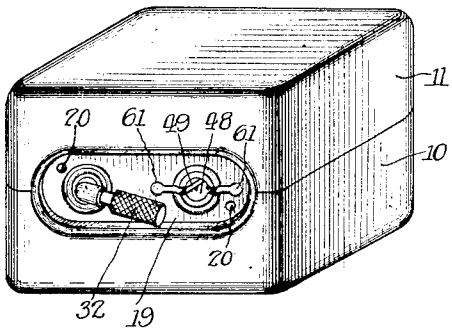


Fig. 2.

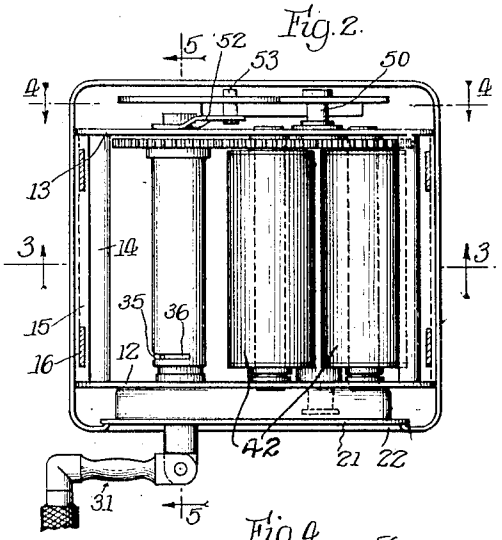


Fig. 3.

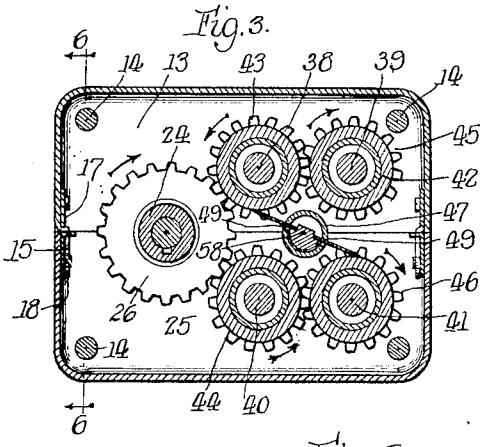


Fig. 4.

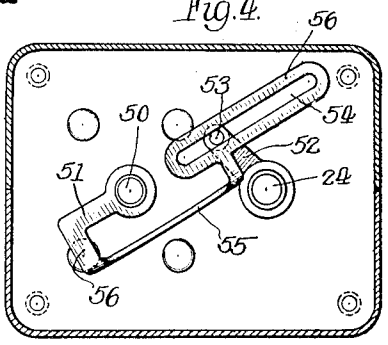


Fig. 5.

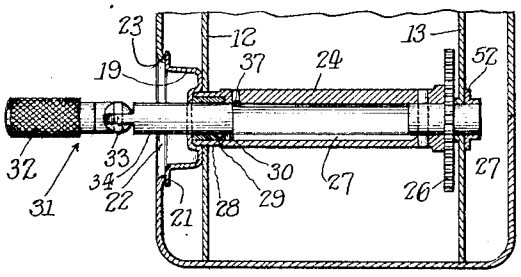


Fig. 6.

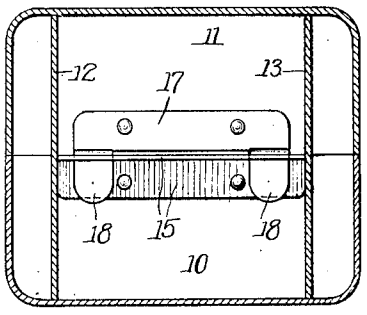
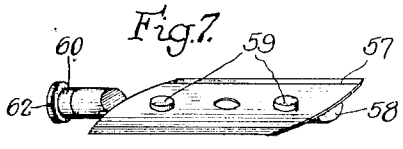


Fig. 7.



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Patented Dec. 20, 1927. 1,653,484

UNITED STATES PATENT OFFICE.

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RAZOR-BLADE SHARPENER.

Application filed July 12, 1924. Serial No. 725,534.

This invention relates to razor sharpeners but more particularly to mechanical sharpeners for blades of safety razors.

The general object of the invention is to produce a small compact machine of novel and improved construction adapted to be held in one hand of the operator while he turns the operating crank with the other.

A further object is to produce a machine particularly adapted for blades of the well known Gillette type comprising four sharpening elements or rolls and a blade holder arranged centrally with relation to said holes and of novel means for reciprocating or oscillating the blade to bring it into contact with opposed rolls alternately.

Another object of the invention is to provide a mechanism which is by itself a unitary operative structure and to provide a housing therefor constructively related to parts of the mechanism, in such a manner that perfect assembly results without securing means connecting the mechanism and the housing container.

Further objects and advantages will be apparent from the following description.

While there is shown in the drawings and described in detail one particular embodiment of my invention, it should be understood that this is exemplary and representative only and is not to be taken as a limitation of the invention, the scope of which will be pointed out in the appended claims.

The present machine is especially designed for double edge blades of the Gillette type and therefore comprises four sharpening rolls with a centrally located holder for such a blade. For a single edge blade only two of these rolls would be necessary but the four rolls will be useful if the holder be adapted to contain two such single edged blades with edges pointed in opposite directions. Many other modifications of the inventive idea will occur to persons skilled in this art.

In the accompanying drawings, Figure 1 represents a perspective view of the complete device.

Fig. 2 is a plan view of the device of Fig. 1 with the top part of the housing removed.

Fig. 3 is a cross sectional view of the device along line 3—3 of Fig. 2.

Fig. 4 is a rear end view of the mechanism, showing the box cut along the line 4—4 of Fig. 2.

Fig. 5 is a cross sectional view along the line 5—5 of Fig. 2 showing the construction of the actuating handle.

Fig. 6 is a detail view of the interior of the box structure.

Fig. 7 is a detail view of a blade holder.

The exemplary device shown in the drawings consists of four rolls held in a frame within the casing. A shaft containing a blade to be sharpened is positioned within the rolls so that the blade may contact each roll tangentially to be sharpened, thus providing one roll for each face edge. A crank is provided for rotating the rolls through suitable gearing and for moving the blade from one set of rolls to another.

A suitable attractive box or container is first provided for housing the mechanism. The mechanism within the container is provided as a unitary structure compactly enclosed therein, the interior of the container being arranged in size and dimensions to house the mechanism merely by the snug fitting relation resulting from the construction employed.

The container is designated generally by the two numerals 10 and 11 corresponding to the lower and upper half box-sections which form a split structure. These are preferably sheet metal stampings attractively provided with neatly rounded edges and a pleasing finish. The mechanism is mounted in spaced plates 12 and 13 which are rigidly associated by spacing rods 14. The plates conform in size and shape to the cross section of the interior of the closed container whereby the mechanism is held therein rigidly in two rectangular directions. In the third direction there are means on the container projecting inwardly between said plates to prevent possible motion of the mechanism therein. Such means are shown at 15 (Fig. 6) in the form of an angular flange on the bottom section 10, the flange being provided with holes 16. The

cover member 11 carries a plate 17 having projecting lugs 18 suitably arranged to fit into said holes 16 in the closed position of the box.

An opening is provided in the split container for an operating crank and for the insertion of the blade to be sharpened. The opening is arranged as a walled pocket or depression in the side of the container, formed by a cup-like casing which is unitary with the device carried inside the box. Figs. 1, 2, and 5 show an elongated dished casing 19 secured by rivets 20 to the side plate 12. The casing 19 is provided with a flange 21 which fits against corresponding openings 22 in the container parts. The terminal edges 23 of such openings are turned inwardly bringing the outer face of the flange 21 and the edges 23 of the container openings 22 into abutting relation.

The operating shaft 24 is tubular in form bearing in the side walls 12 and 13, and carrying a gear 26 rigid with it adjacent the plate 13. A longitudinal slot 27 extends substantially the length of the shaft internally thereof to a point adjacent one end 28 where a shoulder or stop 29 terminates the slot to receive the pin 30 carried by a handle 31 which slides into the tubular shaft 24. The handle 31 comprises two members which are hinged together in such a manner that they may form a linear rod which is then slidable into the tubular shaft 24, the pin 30 sliding in the slot 27. The crank 32 is the right angle member of the handle hinged at 33 to the other member 34 which carries the pin 30. In Figs. 2 and 5 the handle is shown in operative position with the pin 30 locking it against rotation within the tubular shaft. A transverse slot 35 is cut through the hollow shaft 24 and a U-shaped spring 36 partly encircles the shaft, there being a straight part 37 in the spring lying in the slot 35. Normally the part 37 lies across the opening of the hollow shaft 24 and in the withdrawn position of the handle the part 37 lies against the squared end of the handle member 34 as shown in Fig. 5. In the inserted position of the handle it presses against the member 32 and prevents free motion thereof in the shaft 24.

Fig. 3 shows the arrangement of the sharpening rolls on the shafts 38, 39, 40 and 41 the rolls being constructed of any suitable abrasive material 42. The shafts 38 and 40 carry gears 43 and 44 which mesh with gear 26 on the actuating shaft 24. The walls 12 and 13 provide bearings for all the shafts of the mechanism. Shafts 39 and 41 carry gears 45 and 46 meshing with gears 43 and 44 respectively. By this arrangement, rolls 38 and 40 travel oppositely to the operating shaft 24 while rolls 39 and 41 travel with shaft 24. The gears provided for the rolls are of uniform size giving uniform speed to all the rolls, and gear 24 is larger whereby the speed of the rolls is somewhat faster than the hand rotation of the actuating shaft 24.

The roller shafts 38, 39, 40 and 41 are centered at the corners of a rectangle at the diagonal center of which is located a second tubular shaft 47 concentric with an opening 48 in the casing 19. This shaft extends through the side plate 13 where oscillatory motion is imparted to it. The shaft is longitudinally split by diametrically opposite slots 49 extending substantially from side plate 13 to the extremity of the shaft at opening 48 in the casing.

The extension 50 of the shaft 47 through the plate 13 has thereon a rigid arm 51. The arm 51 is arranged to be oscillated by operation of the actuating shaft 24 which likewise projects through plate 13 and is provided with a crank 52 and a crank pin 53. The means connecting said shafts serves to transform rotary motion of shaft 24 into oscillatory motion of shaft 47. The arm 51 is so arranged that a portion thereof has a longitudinal slot 54 therein alined radially to shaft 50. Into this slot the pin 53 on the actuating shafts moves to produce the oscillation. However, the character of the arm is such that the oscillation is not necessarily positive, the arm being constructed with a long flexing portion 55. In order to provide a sufficient length of material for the flexing portion the arm 51 is directed substantially away from shaft 24 then reversed upon itself at one side of its axis through section 56 and then back toward the radial line of slot 54 which is contained in the longitudinal section 56 carried by the flexing portion 55.

The blade 57 which is chosen to illustrate this device is the Gillette type double edged flexible blade. Consequently, a blade holder is here shown adapted for this blade. It is in general a round shaft 58 with a half section removed substantially along its entire length from one end. The flat thus formed carries lugs 59 adapted to fit into the typical end openings in the Gillette blade as is clearly shown in Fig. 7. The end 60 of the blade holder 58 is left round to fit within the split shaft 47 and to provide a suitable handle therefor, which remains projecting into the casing 19. With the blade in place on the holder, the latter is inserted into the slotted shaft 47, the blade lying in the longitudinal slots 49. Suitable openings 61 are provided transversely of the opening 48 in the casing 19 and plate 12 to permit insertion of the blade. A mark 62 across the handle 60 at all times designates the position of the blade within the device.

In the operation of the device, the blade when inserted oscillates between two positions contacting first diagonal rolls 38 and

41, and then diagonal rolls 39 and 40. At contact with the rolls the normal reciprocation of the shaft 47 is interrupted but the arm section 55 then begins to flex exerting a harmonically varying pressure upon the rolls by the blade during contact. This permits the existence of slight inaccuracies in the mechanical relations of the various parts, and results in an efficient construction without the rigid requirements of accurate construction and delicate adjustments to ensure proper contact of the blade with the rolls.

Furthermore, it is an additional feature of the device that each edge of the blade reciprocates between rolls rotating in the same direction. For example, in Fig. 3, rolls 39 and 41 are indicated as moving clockwise. The blade edge at the right is being stopped on one face by roll 41 and will be honed by roll 39 on the other face after the reciprocating movement. By reversion of the operating handle, the opposite relation will obtain. Thus, it is possible to hone and strop each face edge with one setting of the blade. In the sharpening of each blade alternate honing and stropping strokes take place at each blade edge, the honing being repeated at the same face of the edge with one direction of hand rotation. It has been found that such a relation between the rolls and the blade gives a very satisfactory keen edge on the blade and the relation permits of the simplest mechanical structure having a minimum of mechanical parts.

It is important in a device of the character described that the whole surface of the rolls be utilized in the operation on the blade. For this reason it is important that the oscillation of the blade be non-synchronous with the rotation of the roll. In the device the separate actuating shaft, operating at a different velocity from the rolls, is used to oscillate the blade in order to equalize the wear of the rolls as will hereinafter be more apparent.

In the drawings, the device is shown as having a gear ratio of 4 to 3 from the actuating shaft 24 to the rolls. Hence, the blade oscillates three times to four revolutions of each roll. Each oscillation of the blade includes two roll contacts, one on each of two opposing rolls and two passages from roll to roll. It is further pointed out that the spaced relations of the rolls, the required angle of oscillation, the distance between the oscillating shaft and the actuating shaft, the gear ratio and the length of the crank arm 52 are all inter-related to give proper action to the device, the aim in particular being to utilize the full surface of the abrasive rolls to prevent repeated action on only parts thereof whereby ridges might be formed. In the present instance, the device of the drawings having a gear ratio of 4 to 3, and the other relations shown, causes a blade edge to contact one roll for slightly more than one-third of a revolution, the roll making nearly a complete revolution before a second contact whereby three overlapping zones of the roll are used in four successive revolutions before the cycle begins to repeat. Other relations may obtain with the same objects in view which would involve other constructions for the various parts. This invention includes any such devices which embody the foregoing principles and it is the aim in the appended claims to state the invention in its broadest scope limited only by the prior art.

I claim as my invention:

1. A razor blade sharpener comprising, in combination, a unitary blade sharpening mechanism, having an operating handle therein and a blade holder therefor, a dished member rigid therewith adapted to house the ends of said handle and blade holder, a container for said mechanism comprising separate sections, said container having an opening registering with the dished member to form a pocket in one side of the closed container, said container and mechanism being arranged for a snug fit of the mechanism in the interior of the casing.

2. A razor blade sharpener comprising, in combination, a unitary blade sharpening mechanism and a housing therefor comprising two open box sections adapted to fit end to end to form a closed box, said mechanism having parts thereof snugly fitting each section, said box having an opening therein, an open casing rigid with the mechanism and registering with said box-opening to form a pocket in the housing, the mechanism having operating parts disposed within said pocket for access thereto for operation of the device.

3. A razor blade sharpener having, in combination, a unitary blade sharpening mechanism, a housing therefor having two separable sections, parallel side plates in the mechanism, said plates being arranged in shape to fit snugly the interior of the housing, and means in the housing to hold said two sections in assembled relation, said means being arranged to fit between said plates whereby to prevent displacement of the mechanism within said housing, the housing having an opening therein through which the mechanism is accessible.

4. In a razor blade sharpener having a rotating member, a blade holder, and sharpening rolls, an oscillating mechanism for the blade holder comprising, in combination, a crank arm and pin on the rotatable member, a crank arm on the blade holder directed first away from the rotatable member, then reversed upon itself at one side of the blade holder axis, said reverse portion being flexible for motion transverse to the axis of the blade holder and extending past the blade

holder and toward the rotatable member, and an elongated portion carried by said flexible portion having an elongated slot therein radial to the blade holder, said crank pin being movable in said slot to produce oscillation of the blade holder, the blade in oscillating contacting the rolls to stop the oscillation, whereby the mechanism flexes during rotation of the rotatable member exerting pressure of the blade on the rolls.

In testimony whereof, I have hereunto affixed my signature.

JAMES M. SULLIVAN.