

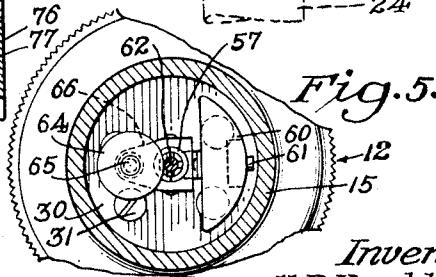
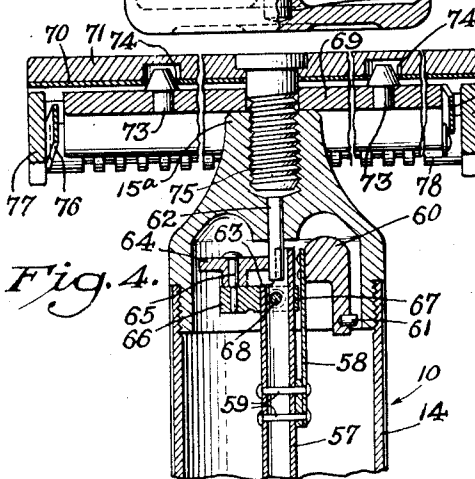
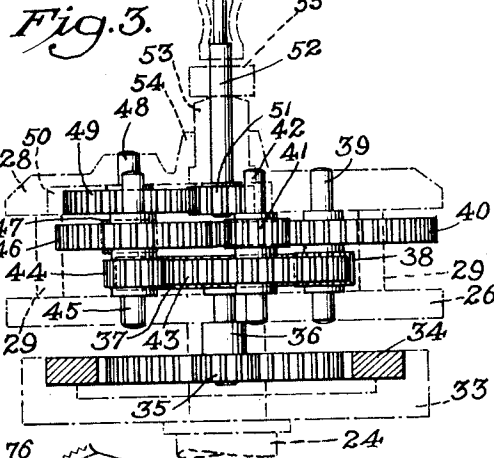
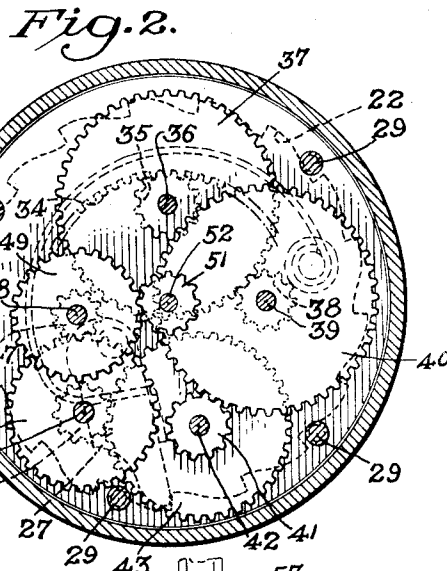
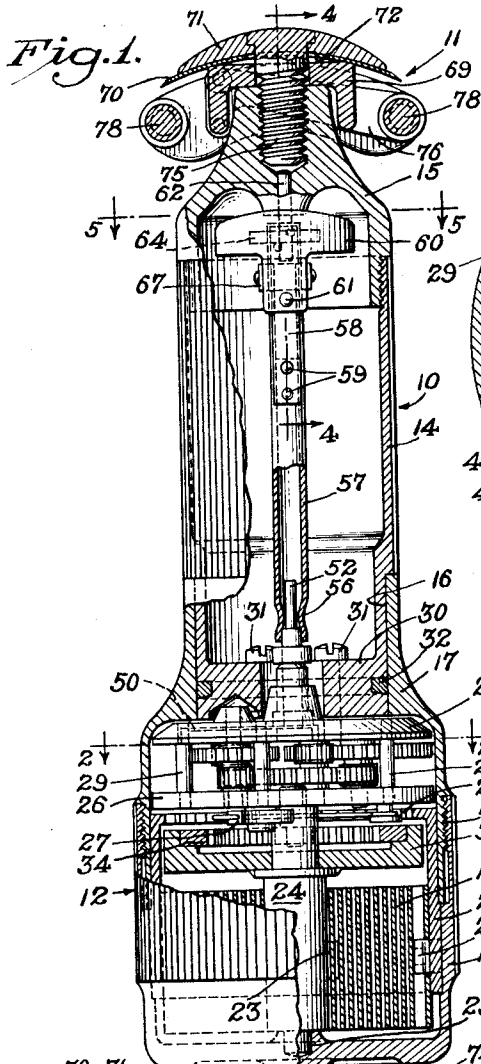
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2,362,998

RAZOR

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2,362,998

RAZOR

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11 Claims. (Cl. 30—44)

The invention relates to razors and more particularly to razor structures embodying power driven means for imparting rapid reciprocatory movement to the cutting element. The present invention pertains particularly to improvements in razors of the type disclosed in my copending application Serial No. 291,998, filed August 26, 1939, patented May 25, 1943, No. 2,319,815.

An object of the invention is to provide a new and improved razor structure of this character wherein the bulk of the weight of the instrument is substantially concentrated in the portion of the razor handle which in use is grasped by the operator whereby to minimize damping of the reciprocatory movement of the cutting element by the weight of the parts immediately supporting the element.

Another object of the invention is to provide a new and improved razor structure of this character which embodies a novel and simplified arrangement of the driving connections by which the relatively slow rotary movement of a prime mover is changed into a high speed reciprocatory movement of the cutting element.

More specifically stated another object of the invention is to provide in a device of this character novel power transmitting means between the prime mover and the cutting element including a new, improved and compactly arranged gear train located in the handle of the device remote from the cutting element, and a simple, yet effective, mechanism for translating high speed rotary movement derived from the gear train into a high speed uniform reciprocatory movement of the cutting element.

Other objects and advantages will become apparent in the following description and in the accompanying drawing in which:

Figure 1 is a view largely in axial section through a razor embodying the features of the invention, the plane of the section being at right angles to the cutting edges of the blade.

Fig. 2 is a sectional view showing the gear train on an enlarged scale, the view being taken substantially along the line 2—2 of Fig. 1.

Fig. 3 is an enlarged view of the gear train, the supporting elements thereof being shown in dotted outline for sake of clarity.

Fig. 4 is an enlarged axial sectional view through the head portion of the razor taken substantially along the line 4—4 of Fig. 1.

Fig. 5 is a sectional view on a radial plane taken substantially along the line 5—5 of Fig. 1.

While the invention is susceptible of various modifications and alternative constructions, I

have shown in the drawing and will herein describe in detail the preferred embodiment, but it is to be understood that I do not thereby intend to limit the invention to the specific form disclosed, but intend to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

The exemplary form of razor herein illustrated is in appearance generally similar to the razor disclosed in my copending application aforesaid and in my Patent No. 2,056,186 issued October 6, 1936. Structurally, however, the present razor differs from these other structures in a number of important respects.

As shown in Fig. 1 the razor includes an elongated hollow casing generally designated 10 conveniently dimensioned and shaped for the grasp of the operator and having at one end supporting means, generally designated 11, for the cutting element or blade. The opposite end of the casing, indicated at 12, is somewhat enlarged to provide a housing for the major portion of the driving mechanism. In the illustrated embodiment a spring motor 13 is provided as the prime mover or source of power for rotating a prime shaft at a relatively low rate of speed. It is to be understood, however, that any other suitable driving or power means may be employed in place of the spring motor.

According to the present invention, the low rotational speed of the prime shaft is changed by a gear train into high speed rotational movement of a drive shaft which carries a weight disposed eccentrically of the axis of the rotation of the drive shaft. The weight is located adjacent to the blade supporting means 11 and the eccentricity thereof at high speed imparts a gyratory movement to the head end of the device. This gyratory movement is then translated into a high speed reciprocatory motion of the blade relative to the user's skin. In the present device the spring motor and the gear train assembly are compactly arranged as may be seen in Fig. 1 in something less than the base half of the casing, permitting the other or head half to be so fashioned that it is light-weight and has comparatively little inertia. Consequently the gyratory effect produced by the weight traveling in an orbital movement about its axis is not minimized or damped by unnecessary weight in the head portion of the device and the reciprocatory movements of the blade are more effectively and efficiently produced.

Referring particularly to Fig. 1, the hollow

casing 10 includes an intermediate tubular section or barrel 14 closed at one end by a head 15 which tapers outwardly to terminate in an end portion 15^a of reduced diameter on which the blade supporting means 11 is mounted. The other end of the section 14 has an external rabbeted groove 16 therein which receives and rotatably supports the inner end section 17 of a motor and gear train housing. This housing is completed by an outer cup-shaped section 18 screw threadedly engaging the section 17 as at 19. The spring motor 13 and its associated parts are substantially the same as the arrangement illustrated and described in my Patent No. 2,056,186 issued October 6, 1936. Briefly describing it, however, the motor comprises a relatively heavy coil spring having its outer end suitably fixed, as at 20, to a sleeve portion 21 of an internal ratchet 22. The ratchet is rigidly fixed thru its sleeve with the housing sections 17 and 18. The inner end of the spring is drivingly connected as at 23 with a prime shaft 24 located on the axis of the device and journaled at its outer end in a bearing 25 provided in the base wall of the housing section 18. The other end of the shaft 24 is journaled in a bearing plate 26 which will hereinafter be more particularly described. A pawl 27 pivotally mounted on the bearing plate 26 coacts with the ratchet 22 to provide unwinding of the spring motor 13 after it has been wound by rotational movement of the motor housing 12 relative to the barrel 14.

For changing the relatively slow rotary movement of the shaft 24 into high speed rotary movement a compactly arranged gear train assembly is provided immediately adjacent to the spring motor and this assembly is arranged to be assembled in or removed from the device as a unit. Thus the bearing plate 26 is the outer one of a pair of bearing plates, the other or inner one of which is designated 28. These plates are held in fixed spaced relation by a plurality of spacing posts 29 disposed at circumferentially spaced points (see Fig. 2). The assembly of the bearing plates 26, 28 and the spacing posts 29 may for convenience be termed a gear cage and it is dimensioned to fit comparatively snugly in an internal space provided between the end face of the ratchet 22 and a transverse wall 30 on the adjoining or outer end of the barrel 14. The gear cage is held in place by a plurality of screws 31 extending through end wall 30 and engaging the bearing plate 28. This plate 28, therefore, serves to limit the outward movement of the housing section 17 from the barrel 14. A sealing gasket 32 may, if desired, be provided between the sections 14 and 17.

Referring to Figs. 2 and 3, it will be seen that the gear train which is almost wholly supported by the gear cage comprises a compactly arranged series of gears disposed circularly about the axis of the cage and arranged to greatly increase the rotational speed derived from the prime shaft 24. The driving connection from the prime shaft 24 through the gear train is as follows: Secured to the prime shaft 24 on the motor side of the ratchet 22 is an enlarged disk 33 carrying a large internal ring gear 34. This ring gear meshes with a small pinion 35 on a shaft 36 which extends through the bearing plate 26 and is journaled in the plates 26 and 28. Within the gear cage (i. e. between the bearing plates 26 and 28) the shaft 36 carries a large gear 37 in mesh with a small pinion 38 on a shaft 39. The shaft 39 carries a large gear 40

meshing with a small pinion 41 on a shaft 42 which in turn carries a large gear 43 meshing with a small pinion 44 on a shaft 45. A large gear 46 on the shaft 45 meshes with a small pinion 47 on a shaft 48 and this shaft carries a large gear 49 which is nested in a recess 50 (Figs. 1 and 3) in the bearing plate 28 for engagement with a small pinion 51 also located in the recess and secured to the end of a shaft 52 that extends outwardly of the gear cage through the plate 28. The shaft 52 is supported by a bearing 53 seated in a boss 54 preferably formed integral with the bearing plate. A collar 55 on a shaft 52 cooperates with the pinion 51 in preventing axial movement of the shaft.

In the foregoing assembly each of the shafts 36, 39, 42, 45 and 48 are journaled through their ends in the bearing plates 26 and 28. As seen in Fig. 2, it will be noted that these shafts and the gears thereon are arranged in clockwise progression for rotation about axes paralleling the axis of the casing. Moreover, the spacing between the bearing plates 26, 28 is such that the large and small gears on each shaft may be close together and closely spaced with respect to the adjacent plate 26 or 28. The arrangement of the large and small gears on successive shafts is of course reversed. Thus a gear train is provided which will effectively drive the shaft 52 at a rate of speed greatly increased over the speed of the prime shaft 24, yet the gears of the train are in a compact unit which occupies only a small portion of the overall length of the outer end of the device. This arrangement therefore concentrates the weight of the gear train and of the driving motor in the portion of the device that is held in the user's hand during shaving.

The projecting end of the shaft 52 is preferably flattened or otherwise suitably formed for driving engagement with the crimped end 56 of a tubular drive shaft 57 which extends axially toward the blade end of the casing to stop just short of the internal end wall of the head 15 (see Figs. 1 and 4). One end of a leaf spring 58 is connected as by pins 59 with the drive shaft 57 a short distance inwardly of the end thereof and extends along the drive shaft to support at its free end a weight 60 located within the head 15 rather closely adjacent to the internal end wall thereof. This weight is of sufficient mass to insure the development of a pronounced gyratory motion of the upper end of the device when the weight is moved at the high speed of the shaft 57 through a circular or orbital path about the axis of the device. A simple and effective governor for limiting the maximum speed of movement of the weight may be provided by inserting a plug 61 of suitable friction material, such as leather, in the outer face of the weight for wiping, braking engagement with the head 15 when the outward movement of the weight by centrifugal force carries the plug into such engagement. A predetermined maximum speed may be obtained by properly coordinating the mass and speed of rotation of the weight with the strength of the spring 58.

Simple, yet highly effective means is provided for maintaining the shaft 57 on its true axis of rotation in spite of the effect of the eccentric weight on the shaft. To this end a pin 62 (Fig. 4) is fixed on the head 15 to extend inwardly thereof on the axis of rotation of the shaft 57 and into the associated end of the shaft. This end of the shaft is cut away as at 63 on the side thereof opposite to the weight 60 to permit of the en-

gagement with the pin 62 of an idler wheel or anti-friction roller 64. The roller is freely rotatable on a pin 65 fixed in an enlargement 66 on one side of a collar 67 which is secured, as at 68, to the end of the shaft 57 near the cut-away 5 therein.

The arrangement is such that the engagement between the roller 64 and the pin 62 diametrically opposes the tendency of the shaft 57 to move radially under the influence of the centrifugal force exerted by the weight. Preferably the roller is of substantial diameter to reduce friction losses and to avoid the greater accuracy that might be required by a smaller element.

The structural arrangement of the parts of the blade supporting means 11 is substantially that shown and described in my aforesaid copending application. It embodies an elongated blade supporting bed 69 (Figs. 1 and 4) of U-shaped cross-section having an upper or outer surface of narrower width than the blade or cutting element 70 supported thereby. The blade is flexed to a proper cutting angle by a cap 71 having an arcuate blade engaging surface 72. Longitudinally spaced pins 73 have tapered heads for engagement with appropriate apertures 74 in the blade to position the blade accurately with respect to the bed and cap. The blade, cap and bed are operatively and detachably secured to the head 15 by such means as a centrally located screw 75.

It will be evident that the cap, blade and bed assembly will gyrate with the head 15 to which they are affixed. Means is provided for translating this gyratory motion of the blade into a straight line reciprocatory travel. Thus the bed, as shown in Fig. 4, is shorter than the cap and blade. One end of a flat leaf spring 76 is fixed to each end of the bed, the points of attachment being at diagonally opposite corners of the bed. These leaf springs extend slightly outwardly from the ends of the bed and at their free ends are connected with the end bars 77 of a rectangularly shaped guard means. The intermediate sides 78 of the guard means are face engaging members of suitable form, such as annularly grooved rods, located with respect to the cutting edges of the blade to space the blade edges properly with respect to the skin.

In this assembly the springs 76 float the guard means with respect to the razor blade assembly. The springs are substantially unyielding along their lengths or, in other words, in directions transverse to the cutting edges of the blade, and are yielding in a direction parallel to said cutting edges. Consequently, when either of the guard members 78 is engaged with the user's skin, the springs will translate all movement of the blade assembly into approximately a straight line reciprocatory movement in a direction paralleling the cutting edges of the blade. The blade accordingly has a short but positive reciprocatory movement at a high rate of speed with respect to the skin during the shaving operation.

It will be evident from the foregoing that a novel structure embodying a number of improved features has been provided. A concentration of the bulk of the weight of the driving mechanism in the portion of the device that is grasped by the operator during use locates the center of the gyratory movement in this portion of the device and insures the effective development of the gyratory movement at the proper point, namely, at the head of the razor. The compact form of the unitary gear assembly not only en-

ables the weight to be concentrated in the handle portion of the razor but permits the gears to be separately assembled and installed in or removed from the device as a unit. The gyratory motion at a uniform predetermined speed is derived by a simple, yet effective, arrangement of parts, all of which it will be noted are carried by the drive shaft 57. The assembly of this drive shaft is a simple matter of slipping one end of the shaft over its driving part and fitting the other end about the pin 62.

I claim as my invention:

1. In a power driven razor the combination of an elongated casing having blade supporting means at one end thereof, and means for reciprocating said blade including power driving means and gears driven thereby disposed at the other end of said casing to concentrate the weight thereof in the portion of the casing held by the user and space such weight in the half of the casing remote from the blade end of the device, means at the blade end of the casing arranged when driven to impart a gyratory motion thereto, connecting means between said gears and the gyratory motion imparting means for driving the latter, and mean for translating said gyratory motion to reciprocatory motion.

2. In a power driven razor the combination of a casing elongated for the convenient grasp of the user, supporting means for a cutting element at one end of said casing, driven means in said one end adapted when rotated to impart a gyratory movement to said one end of said casing, and driving means at the other end of said casing for rotating said driven means, the greater weight of the parts being concentrated in said other end to increase the effectiveness of the driven gyratory movement imparting means.

3. In a power driven razor, the combination of an elongated casing, supporting means on one end of said casing for a cutting element, and means for imparting gyratory movement to said one end of said casing including unbalanced means mounted in said one end for movement in a circular path about the axis of said casing, and driving means for said unbalanced means located at the opposite end of said casing in spaced relation to said unbalanced means.

4. In a power driven razor, the combination of a casing having means on one end thereof for supporting a cutting element, a weight mounted in said one end for movement through a gyratory path, a spring motor mounted in the other end of said casing, a change speed gear unit mounted adjacent to said motor in the same end of said casing, and means driven by said gear unit for moving said weight at a high rate of speed.

5. In a power driven razor, the combination of a casing having means on one end thereof for supporting a cutting element, a weight mounted in said end of said casing for movement through a gyratory path, a spring motor mounted in the other end of said casing, a prime shaft driven by said spring motor at a relatively low rate of speed, a pair of bearing plates spaced axially of said casing and located adjacent to said motor, a train of change speed gears supported between said bearing plates for rotation on axes substantially paralleling the axis of said casing and connected with said prime shaft, means for connecting said bearing plates together as a unit with said gears operatively mounted therebetween, a transverse member in said casing, means securing said unit to said transverse member, and a

weight driving shaft connected with the last gear of said train for movement thereby at a relatively high rate of speed.

6. In a power driven razor, the combination of a casing having means on one end thereof for supporting a cutting element, a weight mounted in said end of said casing for movement through a gyratory path, a spring motor mounted in the other end of said casing, a low speed shaft driven by said spring motor, a gear unit located adjacent to said motor in the same half of said casing and connected with said low speed shaft, said unit including a series of change speed gears mounted for rotation on axes substantially paralleling the axis of said casing, and a high speed shaft driven by said gears and drivingly connected with said weight.

7. In a power driven razor, the combination of a casing having means on one end thereof for supporting a cutting element, a weight mounted in said end of said casing for movement through a gyratory path, a spring motor mounted in the other end of said casing, a low speed shaft driven by said spring motor, a pair of bearing plates fixed to said casing immediately adjoining said motor in said other end of said casing, a train of change speed gears supported between said bearing plates in circular series about the axis of said casing, a high speed shaft drivingly connected with said weight, said train of gears being connected respectively with said low speed and said high speed shafts.

8. In a power driven razor, the combination of a tubular casing, means on one end of said casing for supporting a cutting element, and means for imparting a gyratory motion to said one end of said casing including a high speed shaft, a weight carried by said shaft and located at one side of the axis thereof, a pin mounted on said

casing substantially on the axis of rotation of said shaft, and means on said shaft engaging said pin on the side thereof substantially diametrically opposite said weight.

9. In a power driven razor, the combination of a tubular casing, means on one end of said casing for supporting a cutting element, and means for imparting a gyratory motion to said one end of said casing including a tubular shaft, a weight carried by said shaft and located at one side of the axis thereof, means on said casing extending axially into the end of said shaft, said end of said shaft being cut away on the side thereof opposite to said weight, and means on said shaft extending thru the cutaway portion thereof to engage the extending means.

10. In a power driven razor, the combination of a tubular casing, means on one end of said casing for supporting a cutting element, a driven shaft in said casing, a weight carried by said shaft at one side of the axis of rotation thereof, means on said casing located substantially on the axis of said shaft, and an antifriction roller carried by said shaft for engagement with said means on said casing on the side thereof substantially diametrically opposite said weight.

11. In a power driven razor of the character described, the combination with a casing, blade supporting means on one end of said casing and driving means, of means for imparting a gyratory motion to said one end of said casing including an assembly removable as a unit from the device and comprising a shaft, a weight carried by said shaft and disposed radially with respect to the axis of said shaft, and means on said shaft located diametrically opposite to said weight for engagement with a fixed part of said casing to maintain said shaft on its axis of rotation.

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