April 15, 1941. R. KNOPP 2,238,390

DRY SHAVER

Filed Aug. 1, 1938

Fig. 1.

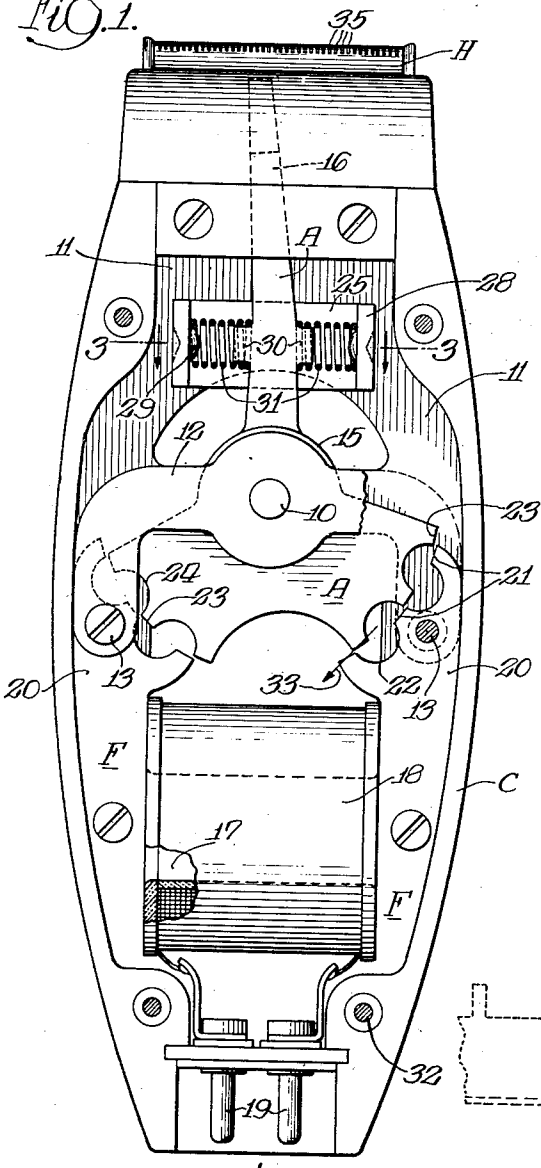


Fig. 2.

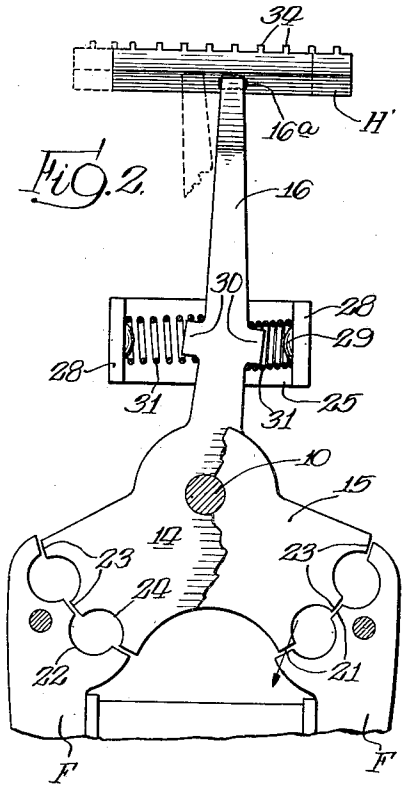


Fig. 4.

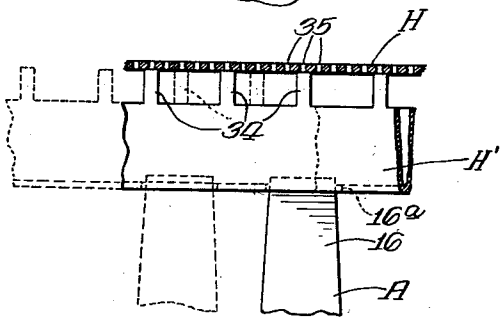
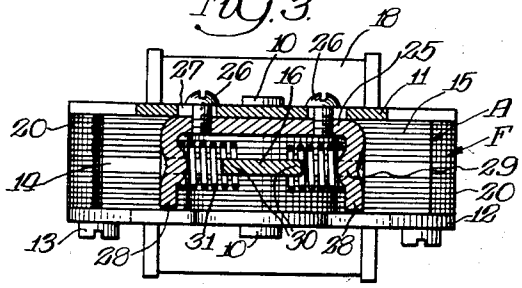


Fig. 3.



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Application August 1, 1938, Serial No. 222,459

1 Claim. (Cl. 172—126)

An object of my invention is to provide a dry shaver including a vibrator of simple, durable and inexpensive construction operable by energization from alternating current to actuate a hair cutting element.

A further object is to provide vibrator mechanism including a field member and an armature member having poles which are normally offset relative to each other and retained in such offset position by opposed springs when they are in balanced position.

A further object is to provide an armature pivotally mounted whereby, upon energization of the field coil of the field member with alternating current, there will be a tendency to reduce the degree of offset at the peak of the current wave and the springs will be permitted to return the armature to offset position as the current recedes to the base line of the current wave. The oscillations of the armature are thereby twice the frequency of the alternating current.

Still another object is to provide a vibrator type of mechanism for dry shavers and the like in which the clattering noise usually experienced by the movement of an armature toward a field pole is entirely eliminated by pivotally mounting the armature so that the armature poles are offset from the field poles and cannot in any position of rotation contact therewith, thereby insuring that even when the armature vibrates to an excessive degree, there will be no striking of pole pieces against each other.

A further object is to multiply the number of pole faces on each of the armature and field poles so as to substantially increase the torque on the armature when the field winding is energized and thus produce a vibrator which will have sufficient power to operate hair cutting mechanism yet which can be operated very economically because of its high degree of efficiency.

Another object is to provide a means for normally retaining the armature and field poles offset relative to each other whereby magnetization of the field poles by energization of the field winding will produce the desired torque about the pivot of the armature, such means consisting of springs which are mounted in opposed relation on opposite sides of the armature member and which are carried by a U-shaped bracket which is adjustable at the factory to a position to secure the desired degree of offset of the pole faces.

Still another object is to provide a vibrator type of actuator for dry shavers which has considerable throw without any possible contact of the armature and field poles with each other so that a hair cutting element having relatively widely spaced teeth can be used which results in better self-cleaning of the teeth during operation.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my structure, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claim, and illustrated in the accompanying drawing in which:

Figure 1 is a plan view of a dry shaver embodying my invention and showing the top half of the casing removed, the parts being shown in the deenergized position of the field coil, and the armature member thereby at one limit of its movement.

Figure 2 is a similar view of a portion of Figure 1 showing the armature member at the other limit of its movement as when the alternating current is at the height of its value.

Figure 3 is a sectional view on the line 3—3 of Figure 1; and

Figure 4 is an enlarged side elevation of the inner cutter element of my dry shaver and a sectional view of the outer cutter member coacting therewith, showing different positions of the inner cutter element.

On the accompanying drawing I have used the reference character C to indicate generally a casing. Within the casing C a field member F is mounted, which member is preferably of laminated construction and generally U-shaped in contour. An armature member A is pivoted on a pin 10. The pin 10 has its lower end supported in a frame plate 11 within the casing C and its upper end supported in a U-shaped bracket 12. The bracket 12 is secured to the field member F by screws 13, one of which is shown in section in Figure 1 and the corresponding arm of the bracket being broken away and its position being shown by dash lines, so as to facilitate illustration of certain pole faces of the field member and armature member.

The armature member A is also of laminated construction and includes a relatively thick central lamination 14 on each side of which relatively thin laminations 15 are mounted. The central lamination 14 has an arm-like extension 16 adapted to operatively coact with an inner hair cutting element H'. The hair cutting element H' is enclosed in an outer hair cutting element H which in turn is supported in one end of the casing C. The field member F has a central por-

tion 17 on which a field coil 18 is wound. The coil 18 is connected to terminal prongs 19 which may be received in a plug of a supply cord in the usual manner.

The field member F further includes a pair of arms 20 in which the screws 13 are mounted and which terminate in a plurality of pole faces 21. The pole faces 21 are formed by making notches 22 in the field poles 20. Similarly a plurality of pole faces 23 are provided for the armature member A by notching the armature member at 24.

The U-shaped bracket 25 is mounted on the frame plate 11 by a pair of screws 26 (see Figure 3). These extend through slots 27 of the frame plate, whereby the position of the U-shaped bracket may be adjusted at the factory for a purpose which will hereinafter appear. The U-shaped bracket 25 has a pair of arms 28, each of which is provided with a spring centering projection 29.

The arm 16 of the armature A has a pair of opposite projections 30. Springs 31 are interposed between the arms 28 and the armature arm 16 and located on the projections 30 of the armature arm. The springs 31 are thus mounted in opposition to each other and the distance between the arms 28 and the untensioned lengths of the springs are such that they are placed under tension when assembled as in Figure 1. They accordingly seek a point of balance and it is desirable when the arm 16 is held thereby in normal position that the pole faces 23 be substantially offset from the pole faces 21. At the factory this desired adjustment is made by properly locating the U-shaped bracket 25 relative to the frame plate 11 and then tightening the screws 26.

The casing C normally has a cover (not shown) mounted thereon and secured in position by screws 32 which are shown in section in Figure 1.

Practical operation

In the operation of my dry shaver, energization of the coil 18 with alternating current will produce oscillation of the arm 16. As the alternating current builds up from zero value to the peak of its wave, there will be an increasing magnetic pull of the six pole faces 21 on the companion pole faces 23. The direction of pull will be as indicated by the arrow 33 in Figure 1. Such pull, it will be noted, is substantially circumferential and a similar pull at all six points of the pole faces produces a substantial torque on the armature member A with comparatively small consumption of electrical energy. The tension of the springs 31 is such that at the peak of the wave when the armature A has reached its other limit of travel in Figure 2 as distinguished from Figure 1, the pole faces will have the relationship illustrated in Figure 2 wherein there is still considerable turning moment exerted on the armature member, whereas, if the pole faces 23 reach a position aligned with the pole faces 21, the turning torque would be reduced to zero.

The arrangement of pole faces as I have illustrated and their relative proportion to the arm 16, I have found produces considerable movement for the inner hair cutting element H'. This is desirable in a dry shaver so that the teeth 34 of the inner cutter element H' may be relatively widely spaced to minimize clogging thereof with hair after the hair is sheared off.

In Figure 4, I show the outer cutting element H having perforations or slots 35 which are relatively small and relatively closely spaced to receive the hair properly for being sheared off by the teeth 34. The teeth 34, it will be noted, are relatively more widely spaced so that the possibility of clogging is minimized. This is possible with an inner cutter that travels as far as is possible with a vibrator of the type I show. As long as any one tooth 34 travels far enough to overlap, in one of its positions, the next adjacent tooth in its opposite position, assurance will be had of the teeth 34 traveling across all the openings 35 and thus of proper shearing action.

My construction lends itself well to considerable motion of the inner cutter H', as shown by the opposite limits of movement in Figures 2 and 4, by solid and dotted lines respectively, and I am thus able to use an inner cutter with relatively widely spaced teeth.

Some changes may be made in the construction and arrangement of the parts of my structure without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claim any modified forms of structure or use of mechanical equivalents which may be reasonably included within its scope.

I claim as my invention:

In a vibrator, a casing, a symmetrical U-shaped field member mounted therein with its cross-piece adjacent the rear end of the casing, and its ends lying in the central portion of the casing, a coil on said cross piece, a pivot located forwardly of the ends of said field member, an armature on said pivot, the adjacent faces of said armature and the ends of said field member having their extremities formed, respectively, along circular arcs having said pivot as a center, notches in said adjacent faces, a drive lever mounted on said armature and extending forwardly therefrom, a pair of projections on said lever forwardly from said pivot, a bracket, arms on said bracket, on each side of said lever a compression spring engaging one of said projections and one of said arms, a support for said bracket, slots in said support extending transversely of said casing, and tie means extending through said slots and engaging said bracket.

RUDOLPH KNOPP.