June 24, 1941. G. DALKOWITZ 2,247,052

VIBRATING DRY SHAVER

Filed April 8, 1938

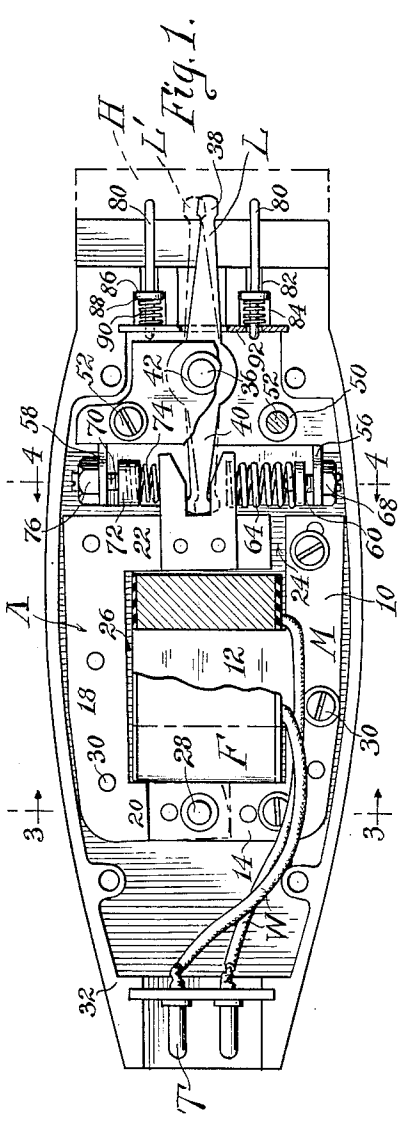


Fig. 1.

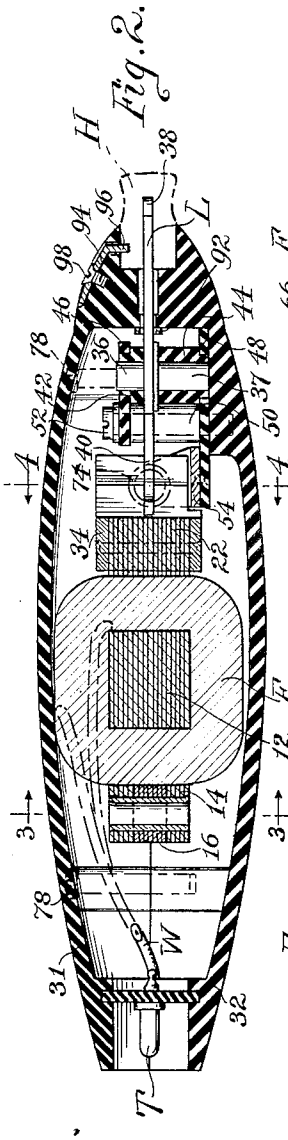


Fig. 2.

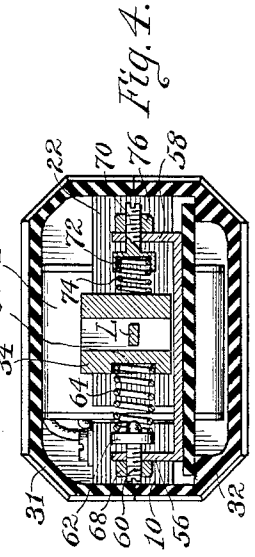


Fig. 4.

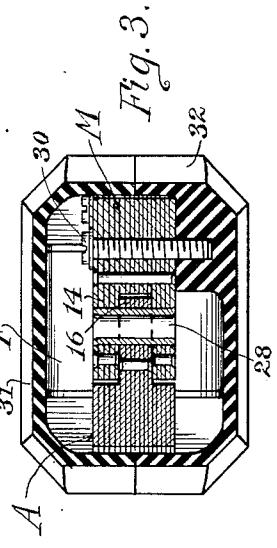


Fig. 3.

INVENTOR.
Godfrey Dalkowitz
BY Glust & Breitenfeld
ATTORNEYS

Patented June 24, 1941

2,247,052

UNITED STATES PATENT OFFICE

2,247,052

VIBRATING DRY SHAVER

Godfrey Dalkowitz, Brooklyn, N. Y., assignor to American Safety Razor Corporation, Brooklyn, N. Y., a corporation of Virginia

Application April 8, 1938, Serial No. 200,827

2 Claims. (Cl. 172—126)

This invention relates in general to shaving devices of the type known as dry shavers, in which the shaving operation is effected without the application of substances such as detergents or unguents to the surface to be shaved.

More particularly it relates to a dry shaver in which the shaving action is effected by relatively movable cutting edges, and in which movement of said edges is effected by the vibratory movement of the armature of an electromagnet.

While my invention has been herein disclosed in its application to dry shavers, it is to be understood that as to certain phases thereof it may have other applications.

Among the general objects of my invention is the provision in a dry shaver of the vibrator type of an improved construction that is simple, economical and effective in operation and that is simple and economical to manufacture.

I have disclosed my invention as applied to a dry shaver of the conventional type, in which a shaving head is carried by a casing adapted to be conveniently grasped in the hand of a user and containing the mechanism for actuating the shaver head. The latter has been shown as of a type using alternating current, the electrodynamic action of which is caused to attract a movable member or armature. Means are provided to cause a movement of the armature in a direction opposite that of the magnetic pull, and since the latter is intermittent, a vibratory movement of the armature results. It will be observed that the intermittent magnetic pull results directly from the use of alternating current, and no make and break means is required, as would be the case were direct current used. However it is to be understood that my invention is not limited in its application to vibrator mechanism of the alternating current type, but that it is also applicable to other types, such as those using direct current.

The movable member of such a vibrator in conjunction with the means for causing the return movement of the armature constitutes a system having a natural period of vibration. For efficient operation this natural period of vibration must be properly related to the frequency of the alternating current, as otherwise beats will occur, resulting in irregularity of operation evidenced by variation in the amplitude of movement of the movable member and variations in the "hum" incident to the operation of the vibrator.

Among the more particular objects of my invention is the provision of a vibrator construction in which the period of the movable parts are properly correlated to the frequency of the alternating current.

A further problem that presents itself is that of efficient transmission of the movement of the armature to the shaving head. Such transmission may be effected by the direct engagement of the armature, or of a piece fixedly associated therewith, with the movable parts of the shaver head, or it may be effected indirectly through one or more movable parts that receive their movement from the armature and transmit it to the shaver head.

It is also among the more particular objects of my invention to provide means in a dry shaver of the vibrator type whereby the transmission of the movement of the vibrator to the dry shaver is effected in a highly efficient manner.

These objects, and such other objects as will hereinafter appear or be pointed out, are attained by the illustrative embodiment of my invention disclosed in the drawing, in which:

Figure 1 is a plan view of an improved dry shaver according to my invention with the upper portion of the casing removed so as to expose the interior mechanism;

Figure 2 is a transverse longitudinal sectional view through the dry shaver of Figure 1;

Figure 3 is a sectional view on the lines 3—3 of Figures 1 and 2, looking in the direction of the arrows; and

Figure 4 is a sectional view on the lines 4—4 of Figures 1 and 2, looking in the direction of the arrows.

Referring now to the drawing in detail I have shown at M the core of an electromagnet having associated therewith a coil F of insulated wire that serves to energize the magnet. Pivotally associated with the magnet M as will be later more fully described in detail, is a movable part or armature A, that is intermittently attracted to the magnet M as alternating current is introduced into the coil F from a power source through the terminals T and the wires W, while means to be hereinafter described, moves the armature away from the magnet between its periods of magnetic attraction, and a vibratory movement of the armature results.

As the armature vibrates, it is caused, by mechanism to be hereinafter described, to impart an oscillating movement to a lever L, one end of which projects into the shaver head, indicated in dotted lines in the drawing and designated by

the letter H, and thereby causes relative movement of the parts thereof to effect the shaving operation.

The field magnet M, while not necessarily restricted to this form, is illustratively shown as in the form of a letter F having a main body portion 10, and an outwardly projecting transverse portion 12 on which is mounted the coil F, and also having another outwardly projecting portion 14 that is shown as forked, as clearly appears in Figure 3, and receives within this forked portion an extension 16 of the armature A.

The armature, as shown in an illustrative form in the drawing, may be described as shaped like the letter C, with a body portion 18 and two transverse end portions, one of which, 20, carries the aforesaid extension 16, and the other of which, 22, has its end facing the end of body portion 10 of the magnet M, so as to form together with the latter the faces of the air gap 24. It is to be understood however that I do not limit myself to the exact form shown, and that other forms may be found suitable.

It will be observed that the armature A and the magnet M of the illustrative embodiment surrounds the coil F, and that the magnetic flux passes from the extension 12 through an air gap 26 into the body portion 18 of the armature A where it divides, one portion going to the right through the arm 22 of the armature A and through the air gap 24 into the body 10 of the magnet M while the other portion goes to the left into the arm 20 of the armature A, then into the arm 14 of the magnet M, into the arm 10 of the magnet M, and finally back into the arm 12. By this arrangement economy of space and weight, which are important considerations in dry shavers design, are secured.

The forked portion 14 of the magnet M and the extension 16 of the armature A are pivotally united in any suitable or preferred manner, such as by the pin 28.

The armature and the magnet are preferably of the conventional laminated construction, and the laminations may be conveniently secured together by means such as rivets 30.

The magnet M is supported in any suitable or preferred manner within the casing, as for example by means of screws passing through the magnet and into the lower section 32 of the casing.

When alternating current is introduced into the coil F the magnetic pull will cause the armature to move about the pin 28 in a direction to tend to close the air gaps 24 and 26. Whenever the current diminishes sufficiently the armature is caused to move away from the magnet M into the position such as the one shown in Figure 1, in which the air gaps 26 and 24 are widened by any suitable or preferred arrangement such as the coil spring 64 that will be further referred to hereinafter. The inertia of the armature and the spring 64 are made sufficiently small so that they may follow the electrical and magnetic alternations and so that a vibration of these parts will be set up, having a frequency corresponding to that of the alternating current.

The vibration of the armature A is transmitted to the lever L, in the illustrative embodiment herein disclosed, by means of a slotted block 34, mounted on the leg 22 of the armature in any suitable or preferred manner, as for example by riveting it thereto, as shown in the drawing.

The lever L is shown as provided with pintles 36, 37 extending therefrom, and the outer end 38 of the lever extends into the shaving head H, as already mentioned, while its inner end 40 extends into the slotted portion of the block 34, whereby, as the armature vibrates, the lever will be caused to oscillate between the full and dotted line positions indicated respectively by L and L' in the drawing. The lever may be mounted within the casing in any suitable or preferred manner. By way of example I have shown the ends of the pintles 36 as journalled respectively in bushings 42 and 44 carried respectively by plates 46 and 48. The plates 46 and 48 are shown as held in spaced relation by bushings 50 through which are passed screws 52 that prevent separation of the plates and at the same time hold them in place within the casing.

By using a lever L separate and distinct from the armature and operated by the armature A, I attain a number of advantages one of which is that the movement of the armature can be made smaller than would be necessary if the shaver were operated directly from the magnet and without the interposition of the lever L, and in the drawing is shown an example in which this is accomplished by making one arm of the lever L longer than the other, and using this arm to actuate the shaver head. By thus reducing the movement of the armature there is considerable reduction in the wear, tear and noise of vibration incident to the operation of the magnet.

Mounted on the plate 48 is shown a member 54 provided with upstanding ears 56 and 58. The ear 56 is shown as carrying an adjusting screw 60 provided with a collar 62 near its projecting end that serves to support between it and the member 34 a coil spring 64, the latter being shown as seated in a recess 66 of the member 34. The spring 64 is so designed that it opposes the magnetic pull of the armature, whereby it causes the return of the armature into the position of Figure 1 whenever it is displaced therefrom. The tension of the spring 64 may be regulated by means of the screw 60, and to insure permanency of the setting a lock nut 68 is shown. It will be observed that besides causing movement of the armature in opposition to the magnetic pull, the spring 64 also limits the movement of the armature in response to the magnetic pull, whereby it serves to prevent contact between the armature A and the magnet M and cushions the end of the armature movement.

On the opposite side of the member 34 is shown an arrangement similar in many ways to the one just described but intended to serve as a cushion or buffer and to limit the movement of the armature A due to the action of spring 64. For this purpose I have provided a screw 70 mounted within the ear 58 and having a cup shaped terminal portion 72, within which is mounted so as to press against the member 34, a coil spring 74. Adjustment of the spring tension may be effected by manipulation of the screw 70 and a lock nut 76 may be provided to insure permanency of the setting.

The adjustment of the springs 64 and 74 is preferably such that the armature will tend to assume a position such as shown in Figure 1, in which the air gaps are near their maximum width.

It will be observed by reference to Figure 1 of the drawing that the pin 28 determining the pivot point of the armature A and the ends of lever L, when it is in its midposition, are in substantial alignment, and that the lever L engages the shaver head substantially at its midportion. Movement of the lever-engaging head 34 of the

armature and of the movable shaver head parts thereby are caused to take place substantially at right angles to the lever L and this movement is symmetrical and balanced about the midportion of said lever. By this disposition of the parts a smooth and highly efficient transmission of the movements and forces are secured.

I may profitably contrast this arrangement with arrangements in which the armature is carried by a flat spring which has one end fixed, and the movement of the spring about said fixed end is depended upon to obtain the vibratory movement. Such a spring must possess considerable mass in order to have the requisite strength, and the radius of gyration of the combined spring and armature is much greater than that of the pivoted armature and coil spring employed by me. Added to these factors is the relatively great stiffness of a flat spring of the requisite strength, so that it is difficult to get such a system having a natural period of vibration that will synchronize with the frequency of the alternating current used.

When the question of fatigue of the moving parts is considered, the coil spring construction used by me has a marked advantage over a flat spring, because of the very much greater strains present in the relatively thick material of the latter.

When a flat spring is used, if the center about which the vibration of the armature takes place is at one side, and the point at which the movement of the armature is transmitted to the shaving head is centrally positioned, then the arc in which the transmitting point of the armature moves will be directed at an angle to the direction of movement of the shaver head and the transmission will be unsymmetrical and unbalanced, resulting in irregularities of motion and of wear, among other disadvantages, which are not found in my construction.

The casing in which the mechanism I have just described as mounted is shown as of conventional type, having an upper section **31** and a lower section **32**, that are held together by screws **78**. The casing is preferably made of insulating material to avoid possibility of electric shocks to the user.

While I have described transmission of movement from the armature to the shaving head as effected through a pivoted lever, it is to be understood that such transmission may take place in other ways. For example, for certain purposes it may be found desirable to have the armature engage the shaving head directly. By having the line drawn through the point of transmission and the pivot of the armature directed so as to run at right angles to the direction of movement of the shaver parts, high efficiency of transmission will result, particularly where the point of transmission is located substantially at the midpoint of the movable part of the shaving head.

In order to secure contact between the relatively movable parts of the shaver head H, which is necessary for the proper functioning of most of the shaver head types at present in use, I have shown an arrangement comprising a pair of pins **80** mounted within passages **82** having an enlarged portion **84** so as to provide a shoulder **86** against which collars **88** on the pins **80** may abut, these parts are relatively so dimensioned that the pins may move laterally within the passages **82** and may also have a pivotal movement centered about the collars **88** thereof. The collars **88** are pressed against the shoulders **86** by coil springs **90**, held under pressure by a member **92** in the form of a plate provided with openings through which the inner ends of the pins **80** pass freely and with an opening through which the lever L passes freely. These openings are so dimensioned that the aforementioned lateral and pivotal movement of the pins will not be obstructed, and so that the lever L is free to vibrate.

I have also shown in the drawing an arrangement by which the shaving head H may be locked in place on the casing. This may comprise a member **94** having a nose portion **96** extending through a slot in the casing into a groove provided in the shaving head. The member **94** may be locked in this position by the screw **98**.

While I have herein disclosed an illustrative embodiment of my invention, it will be understood that the same may be embodied in many other forms without departing from the spirit thereof, as will be obvious to those skilled in the art, and that the disclosure herein is by way of illustration merely and is not to be interpreted in a limiting sense, and that I do not limit myself other than as called for by the prior art.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent, is:

1. Vibrator means comprising an electromagnet having a flux-carrying core consisting of a fixed portion, flux-carrying throughout, and a movable portion, also flux-carrying throughout, said portions being pivotally united to each other, a pivotally mounted straight power transmitting lever having one of its ends engaging the free end of the movable portion of said core, and said pivot of the magnet being substantially in alignment with the direction of the lever.

2. An electromagnetic vibrating device comprising a substantially F-shaped fixed electromagnet, having a straight main bar, a transverse bar extending outwardly from one end of said main bar and a second transverse bar extending outwardly from the mid-portion of said main bar, a field coil carried on said second transverse bar, a substantially C-shaped armature disposed to carry flux throughout its entire length and having one of its ends pivotally mounted on the end of said first-mentioned transverse bar of the fixed electromagnet and its other end movable into closely spaced adjacency to the lower portion of the fixed electromagnet, and means carried by the free end of said armature for transmitting movement therefrom.

GODFREY DALKOWITZ.