Nov. 25, 1969 J. H. CHURCH 3,480,848

ELECTRONIC RAZOR

Original Filed Jan. 4, 1966

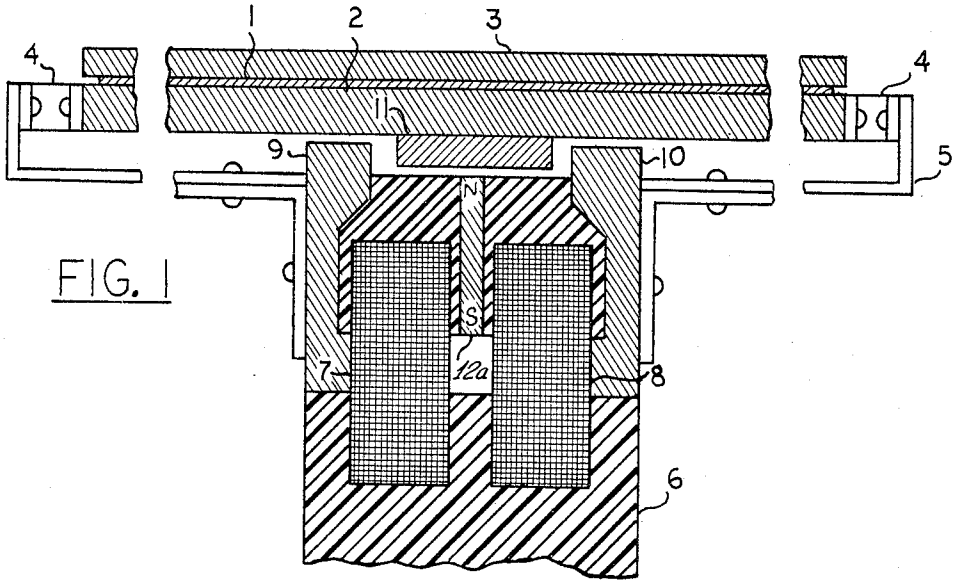


FIG. 1

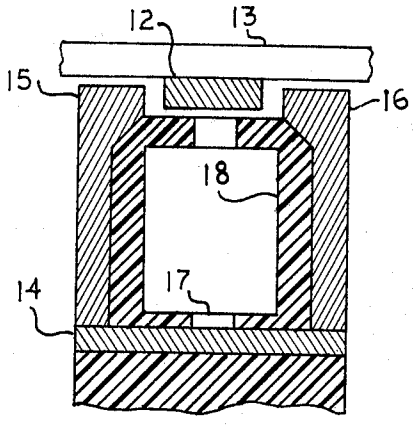


FIG. 2

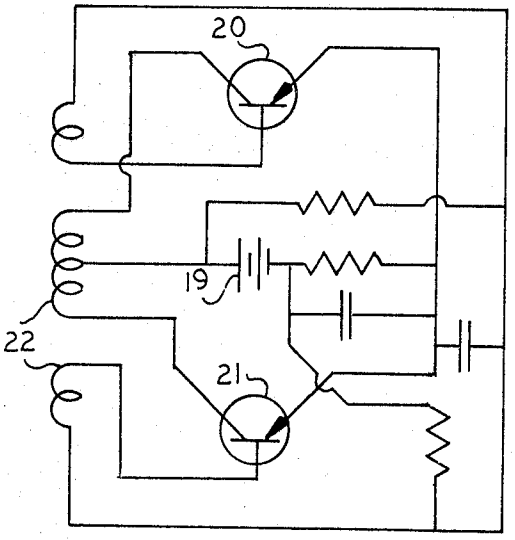


FIG. 3

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ELECTRONIC RAZOR

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Continuation of application Ser. No. 518,628, Jan. 4, 1966. This application Mar. 4, 1969, Ser. No. 804,388
Int. Cl. H02k 33/16
U.S. Cl. 318—128 2 Claims

ABSTRACT OF THE DISCLOSURE

An electric razor comprising a blade assembly including a cutting blade, a polarizable armature secured to the assembly, a permanent magnet adapted to polarize the armature, and electromagnet means adapted to have its polarity changed in an oscillating fashion whereby it oscillates the armature and blade assembly back and forth over a cutting path.

This case is a continuation of Ser. No. 518,628, filed Jan. 4, 1966, now abandoned.

This invention relates to an improved shaving instrument of the vibrating blade type which is energized by a self-contained battery and an oscillating electronic circuit which is encased within the plastic handle of the instrument.

It is well known in the prior art that if a razor blade while in use is caused to vibrate by means which give the blade a slight reciprocating motion in a direction parallel to the edge of the blade, a very significant improvement in the performance of the blade will be observed. The blade will glide over the skin more smoothly and with reduced resistance; the need for pressure will be eliminated, as will the necessity of going over any given area a second time. Dullness of the blade will be less noticeabe and effective blade life will be lengthened several fold.

Shaving instruments have been patented and have been manufactured and marketed in the past taking advantage of these observations. These instruments have not been entirely satisfactory for reasons mostly relating to the motive power available and to the lack of a satisfactory linkage between the motive power and the blade. A razor for wet shaving should be entirely impervious to water in order to facilitate cleaning. A mechanical connection between the blade and the handle, the use of an electromechanical vibrator, or the employment of a mechanism which must be supplied with high line voltage through a cord, all offer a number of practical difficulties with respect to the watertightness requirement. Vibrating blade instruments have also been marketed which use an eccentric rotating weight rotated by means of a spring and a gear train. In addition to the problem of watertightness, these instruments consume more power than is necessary to impart the required motion to the blade.

It is an object of this invention to describe an improved shaving instrument of the vibrating blade type in which the essential components are completely encased in plastic and impervious to water, and in which there is no mechanical linkage between the motive means and the blade.

Referring now to the drawings accompanying this application, FIGURE 1 shows a cross-section of the plastic handle near the head where the blade holder is attached, with the plastic cut away so the working parts may be viewed.

FIGURE 2 shows an alternative design of the electromagnetic assembly which provides the motive power to the blade.

FIGURE 3 shows the circuit diagram of one type of electronic oscillator circuit which may be encased in the plastic handle with all necessary components, to supply the necessary alternating current required to energize the electromagnetic assembly.

Referring again to FIGURE 1, the essential parts of the instrument comprise a conventional type of double edge razor blade **1** which is held compressed between a blade mount **2** and a blade clamp **3**. The blade mount is secured by rivets at each end to two leaf springs **4**. These springs are in turn secured to a bracket **5** which is secured to the handle by conventional means. The arrangement of the springs gives substantial rigidity to the assembly in a vertical direction, but permits a slight motion of the blade assembly in the direction of the blade edge with respect to the bracket and the handle. The head of the handle **6** is of molded resin.

Imbedded in the head of the handle is an electromagnetic assembly which comprises two windings **7** and **8** and two pole pieces **9** and **10** which project from the head of the handle in close proximity to the blade mount **2**. Between the two pole pieces is an armature of soft iron **11** which is secured to and made a part of the blade mount **2**. Also imbedded in the handle and extending from the center of the magnetic core which connects the two pole pieces **9** and **10** to a point proximate to the center of the armature **11** is a permanent polarizing magnet **12***a*.

The operation of the above described polarized electromagnetic driving assembly is as follows: The flux generated by the permanent magnet **12***a* passes through the armature **11** and is more or less equally divided between the pole pieces **9** and **10**. The direction of the flux causes the two ends of the armature to assume the same polarity, and the two pole pieces **9** and **10** also have the same polarity. When a current is passed through the windings **7** and **8** the magnetomotive force which is thus generated will cause an increase in the flux through one of the pole pieces **9** and **10** and a decrease in the flux through the other. The magnetic force thus generated will cause the armature **11** to move toward one of the two pole pieces. Should a current of opposite direction be applied to windings **7** and **8** the armature will be caused to move toward the opposite pole piece. It will be evident that with this arrangement when an alternating electric current is introduced into the windings **7** and **8** that the armature **11** will be caused to vibrate between the two poles and will impart a vibratory motion to the blade **1** in the direction of its edge.

An alternative electromagnetic assembly utilising a different polarization arrangement is shown in FIGURE 2. In this drawing only the electromagnetic driving assembly is shown, with the armature **12** secured to and made a part of the blade mount **13**. The armature is polarized by means of the flux induced from a permanent magnet **14** which is a part of the magnetic circuit connecting the two pole pieces **15** and **16**. The method of polarization causes the two pole pieces to assume opposite polarity, and the two ends of the soft iron armature **12** will also have opposite polarity. The current is supplied to a single winding on a soft iron core at the center of the assembly, so that the flux through the two pole pieces **15** and **16** will be strengthened or weakened depending on the direction of the flux generated through the core **17** by the winding **18**.

It will also be evident that the above arrangement may be employed by substituting a soft iron yoke for the permanent magnet **14** and by using a permanent magnet as the armature **12**.

FIGURE 3 shows one type of electronic oscillator circuit which may be encased in the handle of the instrument with all necessary components. The transistorized push-pull circuit provides an efficient means for generating the alternating current required to operate the razor. The cir-

cuit comprises a battery **19**, two transistors **20** and **21**, three resistors and two capacitors. The winding assembly **22** which provides the feedback to the transistors may be incorporated in the windings **7** and **8** and thus serve to drive the pole pieces directly. The circuit described is straightforward, and the operation of the circuit and the function of its components will be evident to those skilled in the art, and for this reason will not be described in detail.

What is claimed is:

1. A shaving instrument comprising

an edge blade,

a blade mount for carrying and maintaining the position of said blade,

a handle for manipulating said instrument,

means for securing said blade mount to said handle so that said mount shall be reciprocal with respect to said handle in a direction parallel to the edge of said blade,

a polarizable soft iron armature secured to said blade mount,

a generally U-shaped magnetic core including two pole pieces spaced apart with a gap between them and having said polarizable armature positioned in said gap,

a permanent magnet extending from the center of said magnetic core to a position near the center of said armature, whereby both ends of said soft iron armature are polarized to the same magnetic polarity, and

means coupled to said U-shaped magnetic core for generating and applying an alternating magnetic flux thereto and alternately changing the polarity of said pole pieces whereby said armature and said blade mount and said blade oscillate back and forth over a path of travel.

2. A shaving instrument as described in claim **1** wherein said means for generating said alternating magnetic flux comprises a plurality of windings mounted on said U-shaped magnetic core, said windings being coupled to and energized by a semi-conductor oscillator circuit mounted within the said handle for manipulating said instrument.

References Cited

UNITED STATES PATENTS

2,146,643	2/1939	Murphy	310—29 X
2,517,214	8/1950	Kent	310—28
2,530,759	11/1950	Collins et al.	310—29 XR
2,740,057	3/1956	Blumenstock et al.	310—29
2,759,114	8/1956	Rolli et al.	310—29
2,895,064	7/1959	Hoff et al.	310—29
3,268,786	8/1966	Reich	318—132 XR

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U.S. Cl. X.R.

30—45; 310—29