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B. ODSTRČIL

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ELECTRIC SHAVING APPARATUS

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Fig. 1

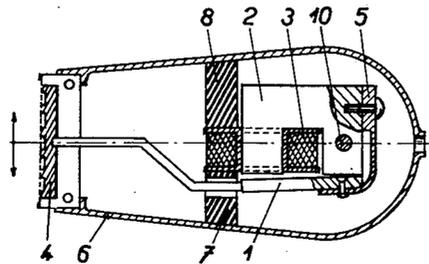


Fig. 2

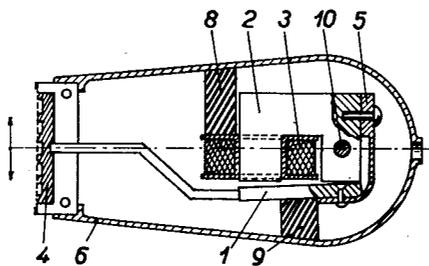
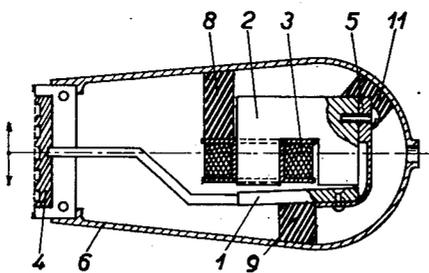


Fig. 3



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ELECTRIC SHAVING APPARATUS

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3 Claims. (Cl. 172—126)

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This invention relates to electric shaving apparatus of the type having an oscillatable cutting blade and, more particularly, to an improved vibration free mounting for the motor and oscillating arm of such apparatus.

Electric shaving devices generally include a cutting blade having an oscillating movement relative to a guard, and this blade is driven either from a geared electric motor or by an oscillatably mounted armature of an electromagnet. The electromagnet is generally an A. C. type, because this type of drive has advantages by reason of its simplicity and the elimination of any make-and-break contact mechanism. This elimination is effected by using the natural frequency of the alternating current to effect oscillation of the armature having the cutting blade attached thereto. However, electric razors incorporating electromagnetically oscillated armatures, and also those involving a geared motor driven oscillating blade, have a disadvantage in that the vibrations of the oscillating elements result in oscillations of the entire razor assembly. As the driving system for the oscillating blade has hitherto been rigidly mounted within the razor casing, the reaction of the driving system to the blade oscillations is transmitted to the casing, and thus to the operator's hand. Consequently, the vibration is felt by the operator during the shaving which is rather unpleasant as the vibration is of considerable amplitude due to the fact that the oscillating parts must have sufficient mass to effectively perform their function. The shocks caused by reaction of the oscillating members create an unpleasant noise and frequently impair the quality of the shave.

In accordance with the present invention, these disadvantages are eliminated by mounting the entire mechanism, including the oscillatable blade and its driving elements, in the casing of the apparatus by means of elastic or resilient shock absorbing members, or a combination of shock absorbing members and relatively rigid members. In either case, the drive and the driven elements, with the attached blade, are so mounted that they may move relative to the casing within the limits of elasticity of the shock absorbing members. With such mounting, the reaction of the driving members to the force of the oscillating system is cushioned in its transmission to the casing, so that the aforementioned vibrations of the casing are effectively dampened.

To accomplish this mounting, in the case of an electromagnet operated shaving device, the electromagnet may be pivotally mounted within the

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casing and have its free end engaged and supported in shock absorbing mounting means within the casing. Alternatively, the oscillating magnetic armature may have a shock absorbing member interposed between it and the casing and functioning as part of the shock absorbing mounting of the electromagnet. If desired, the rigid pivotal mounting may be replaced by a shock absorbing connection of the electromagnet to the casing, with such connection having the characteristic of providing for oscillation of the electromagnet.

With the foregoing in mind, it is an object of the present invention to provide an improved blade driving arrangement for electrically operable razors.

Another object is to provide, in an electrically operable razor, an improved mounting of the driving and driven elements within the razor casing.

A further object is to provide an electric shaver in which substantially no vibration is transmitted from the driving and driven mechanism to the casing of the razor.

These, and other objects, advantages and novel features of the invention will be apparent from the following description and the accompanying drawing.

In the drawing:

Fig. 1 is a longitudinal sectional view through an electric razor embodying the present invention.

Figs. 2 and 3 are longitudinal sectional views through other embodiments of the invention.

Referring to the drawing, the electric shaver therein is shown as including an oscillatable cutting blade structure 4 mounted on the free end of an armature 1 which is oscillatably mounted on an electromagnet structure 2 through the medium of a resilient member such as a spring 5. The illustrated razor is arranged to be operated by alternating current energization of electromagnet 2 through the medium of a magnetizing coil 3. When current flows through coil 3, armature 1 is vibrated in accordance with the cyclic variation of the alternating current flow in coil 3 to correspondingly oscillate blade structure 4 parallel to the face of the operator.

The parts so far described are all mounted within an enclosing casing 6 which may be designed for gripping by the hand of the operator and which includes a switch (not shown) in position for ready access to control the operation of the razor. Armature 1 has a mass sufficient to perform its intended function of effectively oscillating

lating blade structure 4 to save the hair. As this armature oscillates, a reaction is transmitted to the driving electromagnet 2, and this reaction has a fairly sizeable magnitude depending upon the mass of armature 1. In the usual form of razor, such reaction of electromagnet 2 is transmitted to casing 6 resulting in the aforementioned disadvantages insofar as comfort and quality of the shaving are concerned.

The present invention avoids these disadvantages in the following manner. Referring more particularly to Fig. 1, electromagnet 2 is pivotally mounted in casing 6 on a shaft 10, which preferably extends through the electromagnet at or near the point of least amplitude or reaction-induced oscillation of the electromagnet. The forward or free end of the electromagnet, such as the projecting portion of coil structure 3, is mounted in or between a cushion structure, such as indicated at 7 and 8, which preferably includes shock absorbing material such as springs or rubber cushions. The shock absorbing mounting, as illustrated, is apertured to provide for free movement of armature 1 which extends therethrough.

With the described construction, the reaction forces of electromagnet 2 are transmitted to cushions 7, 8, which absorb or dampen these forces so that substantially no vibration is transmitted to casing 6. Thus, the casing may be held in steadier relation to the face to obtain a more pleasant shave or higher quality.

Fig. 2 illustrates an alternative embodiment of the invention in which cushion 8 is retained between coil 3 and casing 6, while a cushion 9 replaces cushion 7. The latter is engaged with armature 1 at or near the portion thereto having the least amplitude of oscillation. As armature 1 and electromagnet 2, including coil 3, tend to move in opposite directions during each oscillation, cushion members 8 and 9 are simultaneously compressed or simultaneously expanded, the compressions and expansions of each cushion member being directed in opposed directions. As a result, no oscillations are transmitted to casing 6, so that the latter remains stationary.

Fig. 3 shows a further modification of the invention in which the pivot 10 is omitted, thus eliminating any direct mechanical connection between the driving and driven mechanism, and casing 6. A further cushion 11, which may be a spring or a block of rubber having shock absorbing characteristics, is placed between the connection of spring 5 to electromagnet 2 and the casing 6. The mechanism is thus supported on the cushions 8, 9 and 11, resulting in substantially full absorption of any oscillations by the shock absorbing elements, so that no vibration is transmitted to casing 6.

The described electric razor thus provides a unit with which a pleasant, high quality shave may be obtained as there is practically no vibration of the casing held in the hand of the operator. All of the vibrations, both those due to the oscillation of the armature and those due to the reaction of the driving electromagnet are absorbed by the shock absorbing mountings.

While specific embodiments of the invention have been shown and described in detail to illustrate the application of the principles thereto, it should be understood that the invention may be otherwise embodied without departing from such principles.

I claim:

1. In an electric razor of the dry shave type

including a casing, a blade structure mounted for oscillation relative to said casing and a member adapted to oscillate the blade structure; driving means operable to oscillate said member and having a reaction induced oscillation resulting from oscillation of said member, mounting means supporting said driving means for pivotal movement relative to the casing and engaging said driving means substantially at the portion thereof having the minimum amplitude of oscillation, first shock absorbing means engaged with said driving means substantially at the point of maximum amplitude of oscillation thereof, and second shock absorbing means engaged with said member substantially at the point of maximum amplitude of oscillation thereof, said shock absorbing means being so disposed as to be compressed simultaneously and expanded simultaneously by said driving means and said member and effective to minimize transmission of such reaction induced oscillations to the casing.

2. In an electric razor of the dry shave type including a casing, a blade structure mounted for oscillation relative to said casing and a member adapted to oscillate the blade structure including an armature; an electromagnet operable to oscillate said armature and having a reaction induced oscillation resulting from oscillation of said armature, mounting means supporting said electromagnet for pivotal movement relative to the casing and engaging said electromagnet and shock absorbing means engaged with said electromagnet substantially at the point of maximum amplitude of oscillation thereof and effective to minimize transmission of such reaction induced oscillations to the casing.

3. In an electric razor of the dry shave type including a casing, a blade structure mounted for oscillation relative to said casing and a member adapted to oscillate the blade structure including an armature; an electromagnet operable to oscillate said armature and having a reaction induced oscillation resulting from oscillation of said armature, mounting means supporting said electromagnet for pivotal movement relative to the casing and engaging said electromagnet substantially at the portion thereof having the minimum amplitude of oscillation, first shock absorbing means engaged with said electromagnet substantially at the point of maximum amplitude of oscillation thereof and second shock absorbing means engaged with said armature substantially at the point of maximum amplitude of oscillation thereof, said shock absorbing means being so disposed as to be compressed simultaneously and expanded simultaneously by said electromagnet and said armature and effective to minimize transmission of such reaction induced oscillations to the casing.

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