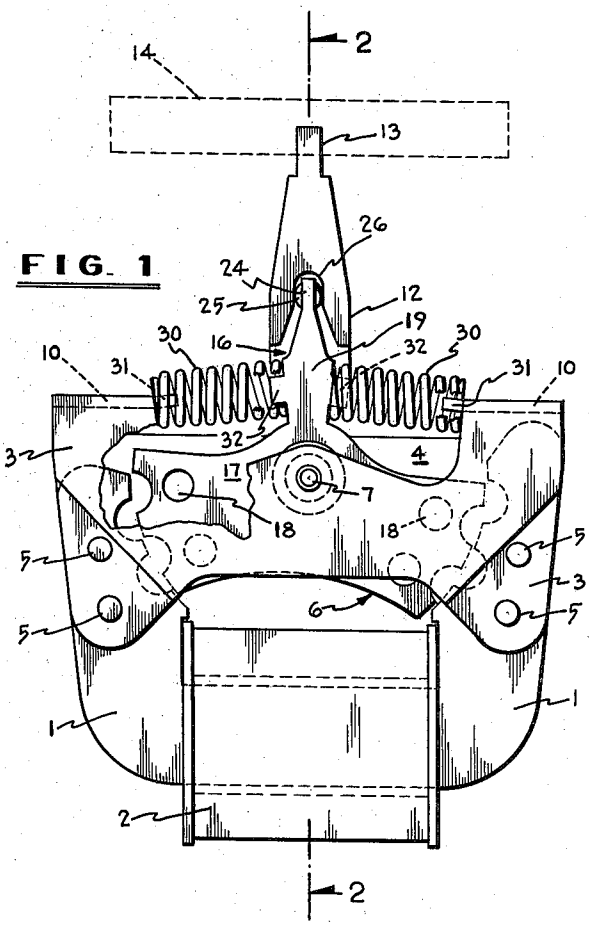
Sept. 24, 1963 W. W. CAMP 3,105,163

ELECTRIC SHAVER RECIPROCATING MOTOR-DRIVE UNIT

Filed March 31, 1961

FIG. 1



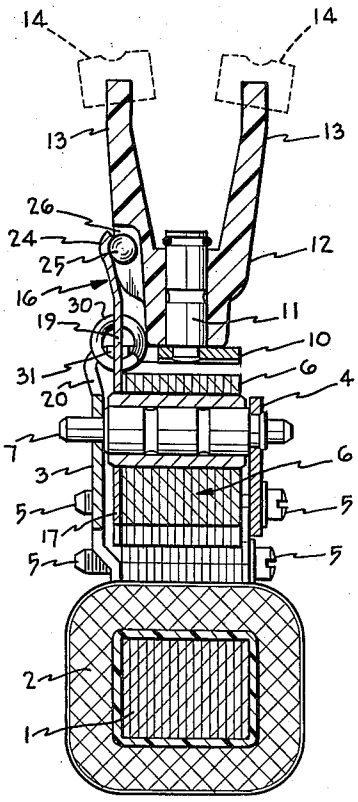


FIG. 2

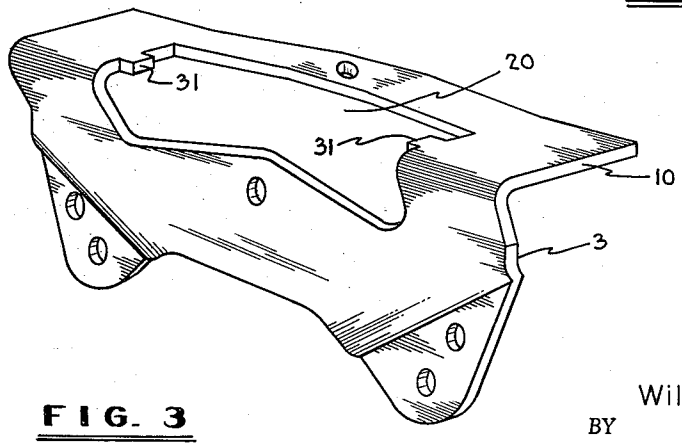


FIG. 3

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ELECTRIC SHAVER RECIPROCATING MOTOR-DRIVE UNIT

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4 Claims. (Cl. 310—29)

The invention relates to electric shavers of the kind incorporating a pair of outer cutters, each having a reciprocable inner cutter therein, and a motor for driving the two inner cutters.

The primary object of the invention is to simplify and hence reduce the cost of such shavers by providing a motor and drive mechanism adapted for preassembly as a combined motor-drive unit for the two inner cutters of the shaver. Other objects and advantages will be apparent.

The unit comprises a U-shaped field magner having upstanding pole arms, non-magnetic bridge pieces uniting said arms, an armature having a horizontally disposed shaft mounted in said bridge pieces, a laterally projecting flange connected with at least one of the bridge pieces and overlying the armature, a vertically disposed stub shaft mounted on the flange, a bifurcated drive member mounted on the stub shaft with its prongs upstanding on either side of the stub shaft axis and with freedom to oscillate about such axis, and an actuating lever coupled to the armature for oscillation thereby, the upper end of the lever engaged with the said drive member and adapted thereby to oscillate the prongs in opposite directions about the axis of the stub shaft.

It will be understood that, as used herein, the words "upstanding," "horizontally" and the like, have reference to the relative positions of the parts as shown in the accompanying drawings, in which:

FIG. 1 is an elevational view of the preferred form of motor-drive unit, partly broken out and with parts shown in phanton;

FIG. 2 is a sectional view on the line 2—2 of FIG. 1; and

FIG. 3 is a perspective view of one of the bridge pieces.

In this preferred form, the motor is of the vibrator type having a U-shaped field magnet 1 of the usual laminated construction and a field winding 2. The upstanding pole arms are united by a non-magnetic bridge, in this instance shown as consisting of two separate pieces 3, 4 secured to the magnet as by screws 5. The laminated armature 6 is journaled on a horizontally disposed shaft 7 mounted in the bridge pieces and adapted to oscillate about the shaft axis when the field winding is energized by alternating current.

The non-magnetic bridge includes a portion overlying the armature, such as flange 10, conveniently forming an integral part of piece 3; and this flange supports a vertically disposed stub shaft 11 (FIG. 2) which, preferably, is rigidly secured to the flange to provide a pivot or journal support for a bifurcated (that is, two-pronged) drive member 12, the prongs upstanding on either side of the stub shaft. The upper ends 13 of the prongs are designed to penetrate the usual bottom openings of the inner cutters of the shaver, such cutters being indicated at 14 in broken outline. An actuating lever, coupled to the armature for oscillation thereby, has its upper end connected to the drive member so that, as the lever oscillates, it oscillates the drive member about the stub shaft axis and causes the upper ends of the prongs to reciprocate the inner cutters in opposite directions.

In the preferred form illustrated, the actuating lever, generally designated 16, consists of a plate portion 17

secured to the armature, as by the lamination rivets 18, with a vertical extension 19 passing upwardly through an opening 20 in bridge piece 3. To the upper end 24 of extension 19 is welded a ball 25 which seats in a recess 26 formed in the drive member 12.

From the foregoing it will be apparent that when the field winding 2 is energized by alternating current and armature 6 thereby caused to oscillate about the axis of shaft 7, the vertical extension of plate 17, which is secured to the armature, will likewise be caused to oscillate. In turn, the ball 25 which is secured to extension 19 and seated in recess 26 of the bifurcated drive member 12, will cause the latter and its two upper prong portions 13 to oscillate about the axis of the stub shaft; and thus the two inner cutters 14, which are driven by the portions 13, are reciprocated simultaneously but in opposite directions. As will be recognized, the cutters thus balance one another and vibration is reduced to a minimum.

With the described construction, complete electrical separation of the motor and the cutters can be achieved readily by molding or otherwise fabricating the cutter drive member 12 from a suitable plastic or other appropriate insulating material.

It will also be apparent that, no matter what the optimum angular displacement or oscillatory stroke of the vibratory armature may be, it can be adapted readily to effect the desired limited stroke of the inner cutters, simply by positioning the ball 25 and the cooperating recess 26 closer to or farther away from the axis of stub shaft 11. It is thus possible to employ an armature partaking of substantial angular displacement without having to shorten the actuating lever to the point of having to crowd the motor close to the cutters.

As shown, the armature springs 30, disposed in the bridge piece opening, abut the bridge piece 3 at their outer ends, where they are located by ears 31, and abut the actuating lever at their inner ends, where they are located by lever ears 32.

It will be recognized, furthermore, that the components can be fabricated in volume at low cost, are adapted for ready assembly and that they provide a complete motor-drive unit—itself ready for insertion in a shaver casing of the usual type and for convenient removal for replacement or repair.

In the light of the foregoing exemplification of the principles of the invention, the following is claimed:

1. A motor-drive unit for an electric shaver comprising a U-shaped field magnet having upstanding pole arms, non-magnetic bridge pieces uniting said arms, an armature having a horizontally disposed shaft mounted in said bridge pieces, a laterally projecting flange connected with at least one of the bridge pieces and overlying the armature, the flange incorporating an opening, a vertically disposed stub shaft secured to the flange, a bifurcated drive member journaled on the stub shaft with its prongs upstanding on either side of the stub shaft axis and with a base portion overlying said flange opening, and an actuating lever coupled to the armature for oscillation thereby, the upper part of the lever protruding through the flange opening and terminating in a head, the said base portion of the drive member having a recess adapted to receive said actuating lever head.

2. A motor-drive unit for an electric shaver comprising a U-shaped field magnet having upstanding pole arms, non-magnetic bridge pieces uniting said arms, an armature having a horizontally disposed shaft mounted in said bridge pieces, a laterally projecting flange connected with at least one of the bridge pieces and overlying the armature, a vertically disposed stub shaft mounted on the flange, a bifurcated drive member mounted on the stub

shaft with its prongs upstanding on either side of the stub shaft axis and with freedom to oscillate about such axis, and an actuating lever coupled to the armature for oscillation thereby, the upper end of the lever engaged with the said drive member and adapted thereby to oscillate the prongs about the axis of the stub shaft.

3. A motor-drive unit for an electric shaver comprising a U-shaped field magnet having upstanding pole arms, non-magnetic bridge pieces uniting said arms, a vibratory armature having a horizontally disposed shaft mounted in said bridge pieces, a laterally projecting flange connected with at least one of the bridge pieces and overlying the armature, a vertically disposed stub shaft mounted on the flange, a bifurcated drive member mounted on the stub shaft with its prongs upstanding on either side of the stub shaft axis and with freedom to oscillate about such axis, and a plate secured to the vibratory armature, said plate having a vertical extension and the drive member

having a recess, the upper end of said vertical extension being seated in said recess and thereby adapted to impart oscillatory motion to the prongs of the drive member in response to oscillation of the armature.

4. A motor-drive unit as claimed in claim 2 in which the bifurcated drive member is composed of insulating material, for the purpose described.

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