April 15, 1941. J. A. HANLEY 2,238,641

VIBRATORY MOTOR

Filed Oct. 1, 1940

Fig. 2

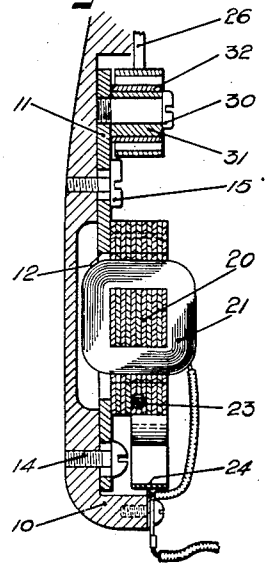


Fig. 1

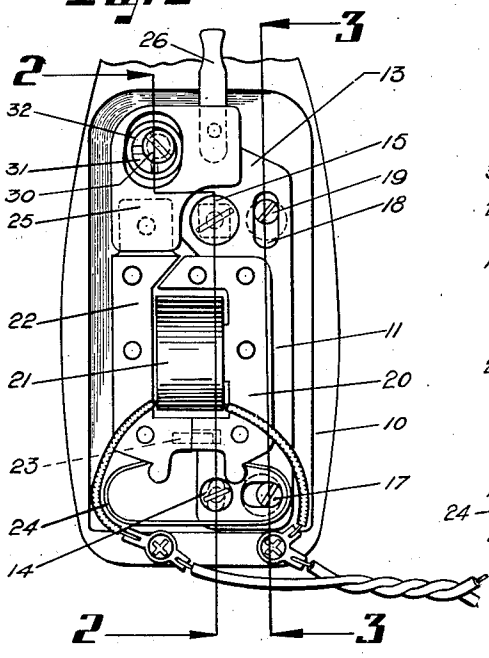
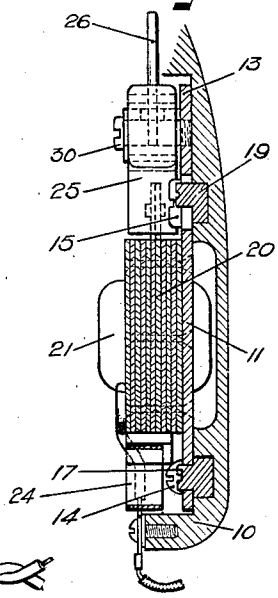


Fig. 3



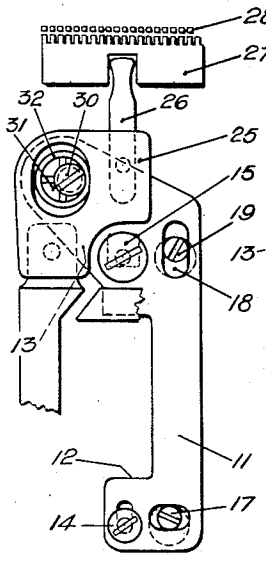


Fig. 4

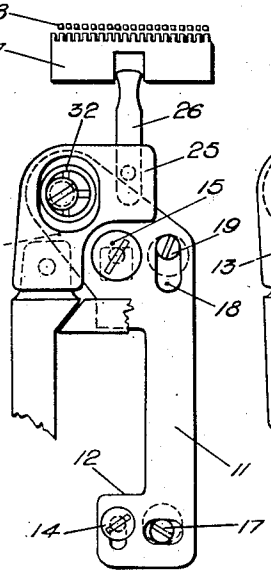


Fig. 5

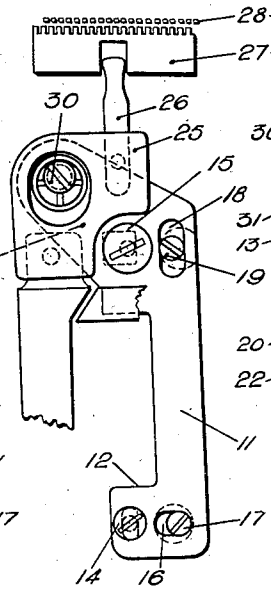


Fig. 6

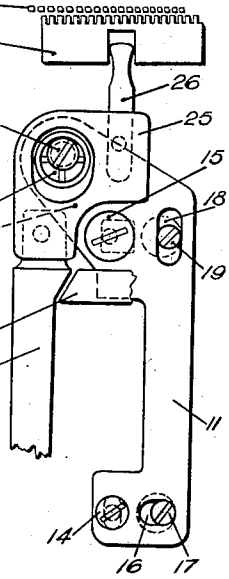


Fig. 7

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2,238,641

VIBRATORY MOTOR

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Application October 1, 1940, Serial No. 359,269

4 Claims. (Cl. 172—126)

This invention relates to small vibratory motors of the types adapted for operating dry shaving implements or similar devices.

In general the objects of my invention are to provide a motor of extremely compact construction, occupying a minimum amount of space for the power developed and having provision for various adjustments which facilitate the manufacturing and assembling operations, permit regulation of the armature gap and adjustment of the path and amplitude of the driving element. Such adjustments are of particular importance when the motor is employed to actuate a dry shaver where it is important to have the shearing teeth register at a definite point in the cycle of the implement or where the amplitude of reciprocation of the movable cutter must be regulated to a nicety in order to secure the desired timing of the shearing action.

These and other features of the invention will be best understood and appreciated from the following description of a preferred embodiment thereof, selected for purposes of illustration and shown in the accompanying drawing, in which:

Fig. 1 is a plan view of the motor shown with the covering-half of its casing removed;

Fig. 2 is a view in longitudinal section on the line 2—2 of Fig. 1;

Fig. 3 is a view in longitudinal section on the line 3—3 of Fig. 7; and

Figs. 4 to 7 are diagrammatic views showing the motor parts in various positions of adjustment.

The motor is herein shown in its application to a dry shaver of commercial construction, although it will be understood that the invention is not limited to that or to any particular dry shaving implement.

The motor is enclosed within a two-part casing of "Bakelite" or other thermo-setting plastic material, the casing being shaped to form an enclosure for the motor and also to serve as a handle for the implement. In the present drawing the lower section 10 of the casing only is shown. The section 10 is provided with a central depression in its bottom providing flat lands at each end and these serve as a seat for a non-metallic base plate 11. The base plate has a rectangular body portion provided with a rectangular notch 12 in its left-hand edge, as shown in Figs. 4–7, and merges in its upper portion into an oblique extension 13. The plate is adjustably held in place within the casing section 10 by two screws 14 and 15 located in the major axis of the plate and having large heads which cover clearance apertures in the plate 11. Accordingly, when the screws 14 and 15 are loosened, the apertures surrounding them afford clearance permitting a substantial adjusting movement of the plate in all directions.

The adjustment of the base plate 11 in the casing is regulated and controlled by a transverse slot 16 located near the lower edge of the plate and a longitudinal slot 18 located in the upper portion of the plate. A slotted stud 17 passes through the transverse slot 16 and is provided with an enlarged eccentric body portion rotatable in a circular socket formed for that purpose in the body of the casing 10, and a slotted stud 19 passes through the longitudinal slot 18 in the plate and similarly provided with an enlarged eccentric body which is rotatable in a circular socket, similarly provided for it in the body of the casing 10. It will be understood that when the screws 14 and 15 are loosened transverse adjustment of the upper end of the plate may be effected about the axis of the stud 17 by turning the stud 19 in the longitudinal slot 18. Similarly lengthwise adjustment of the plate 11 may be effected by turning the stud 17 and in this adjustment the slot 18 provides sufficient clearance for longitudinal movement of the plate with respect to the stud 19.

The motor includes in its structure an electromagnet having a laminated field core 20 which, as herein shown, may be riveted or otherwise fastened to the base plate 11. The field core is substantially E-shaped, having transverse arms at both ends and an intermediate arm upon which is wound the coil 21. The armature 22 is mounted at one end for rocking movement upon the edge of the lower arm of the field core. A transverse pin 23 is set in the end of the armature arm and received with clearance in a corresponding socket provided for that purpose in the lower arm of the field core to maintain the armature against displacement in any direction. The free end of the armature is separated from the upper branch of the field core by a bias gap which it is apparent may be less in width than the stroke of the armature. The field core 20 and the armature 22 are each provided with a downwardly extending ear which is located below the fulcrum point of the armature. These ears are engaged by a C-shaped spring 24 which thus tends at all times to swing the upper end of the armature outwardly, or toward the left as herein shown, and away from the upper arm of the field core to open the biased gap between the two.

Two or more of the armature laminations are

extended upwardly beyond the body of the armature to provide secure anchorage for a forked connector member or coupling 25 which may be moulded of "Bakelite" or other insulating material. One arm of the forked member 25 is disposed substantially in line with the major axis of the electro-magnet and carries the upwardly extending operating arm 26 by which the vibratory movement of the motor is transmitted to the driven member of the dry shaver. This is shown diagrammatically in Figs. 4–7 as a toothed cutter bar 27 and this cutter bar is arranged to co-operate with the shearing teeth 28 of the stationary member of the cutter head.

The outer arm of the forked member 25 is extended to embrace an eccentric assembly comprising a screw 30 threaded into the oblique arm 13 of the base plate and surrounded by an eccentric sleeve 31 which in turn is enclosed in a rubber sleeve 32. The latter limits and silently cushions the stroke of the armature 22. The optimum adjustment of the armature stroke is that in which the biased gap is substantially closed but without actual impact between the armature and core. Closing of the gap is desirable because magnetic loss is thereby reduced to the minimum in the motor and yet actual contact is undesirable because of noise. Accordingly, after the motor has been assembled the screw 30 may be loosened and the eccentric sleeve 31 may be turned to effect exactly the desired adjustment. Various adjustments are suggested in Figs. 4 and 5 in which it will be seen that the width of the biased gap has been very substantially reduced by rotating the eccentric sleeve 31 through substantially 180°. The stud is shown in intermediate position in Figs. 6 and 7 with a corresponding intermediate opening of the gap.

The transverse adjustment of the motor together with its operating arm 26 and the cutter 27 is suggested in Figs. 6 and 7 where the eccentric stud 19 is shown in two positions at 180° apart with respect to each other and the cutter 27 is shown in the corresponding relation to the stationary shearing teeth 28. The longitudinal adjustment of the motor and its operating arm 26 is suggested in Figs. 4 and 5 where the eccentric stud 17 is shown in two positions 180° apart and the variation in the relationship of the operating arm 26 to the cutter is correspondingly indicated.

It will be understood from the foregoing description that the base plate 10 has provision for two separate adjustments that may be effected singly or simultaneously and that these adjustments are in respect to the complete motor, including the eccentric assembly upon the screw 30. On the other hand the adjustment effected by the eccentric 31 is in respect to the armature alone and is carried out independently of the adjusted position of the motor as a whole.

Certain features, herein disclosed in order to facilitate a complete understanding of the invention, are not herein claimed since they are also disclosed in the motor of my prior application, Ser. No. 316,498, filed January 31, 1940, and are claimed in that application. Herein I claim as new and desire to secure by Letters Patent:

1. A motor for dry shavers or the like, comprising a casing, a base plate adjustably secured thereto, separate eccentric connections between said plate and casing whereby the plate may be shifted in directions at an angle to each other in the casing, a laminated field core secured to the plate, a movable armature mounted thereon and having a bias gap with respect to the field core, and means carried by said plate for adjustably limiting the path of movement of said armature and the opening of said gap.

2. A motor for dry shavers or the like, comprising a casing, an elongated base plate adjustably secured thereto and having a longitudinal slot and a transverse slot therein, a stud in each of said slots having an eccentric body portion rotatably seated in the casing, a field core fast to said base plate, and a vibratory armature mounted thereon and carrying the driven element of the motor.

3. A motor for dry shavers or the like, comprising a casing, an elongated base plate mounted therein and having an obliquely disposed arm at one end, an E-shaped field core fast to said plate, a vibratory armature mounted at one end on the lower arm of the field core, carrying at its other end a forked connector member and making a bias gap with the upper arm of the core, and an eccentric stud projecting from the obliquely disposed arm of the base plate into the embrace of said forked member in position adjustably to regulate the opening of said bias gap.

4. A motor for dry shavers or the like comprising a base plate, an electro-magnet having a core secured to said plate, a vibratory armature mounted at one end on said core and separated therefrom at the other by a bias gap, a forked member carried by the armature, and an eccentric stud adjustably mounted in the base plate and having a yielding portion disposed between the arms of said forked member to regulate and cushion the stroke of the armature.

JOHN A. HANLEY.