March 27, 1956 F. BLUMENSTOCK ET AL 2,740,057

ELECTROMAGNETIC PRIME MOVERS

Filed May 12, 1953

FIG. 1

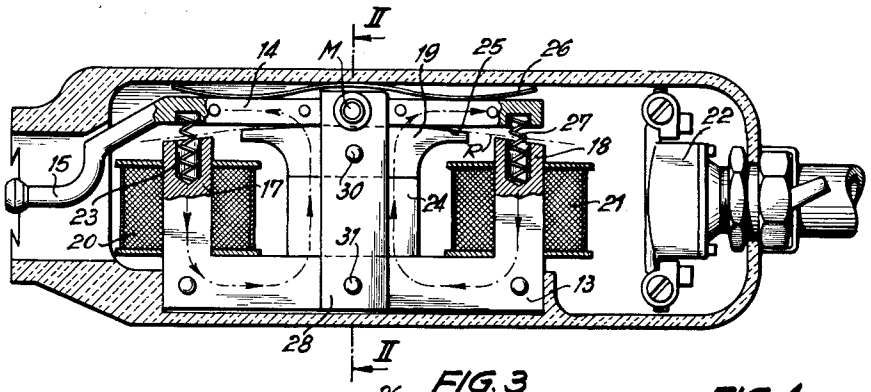


FIG. 2

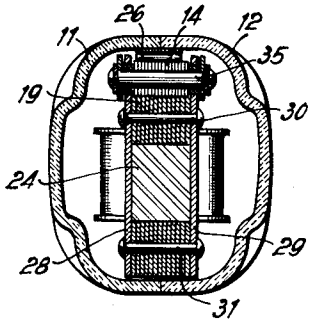


FIG. 3

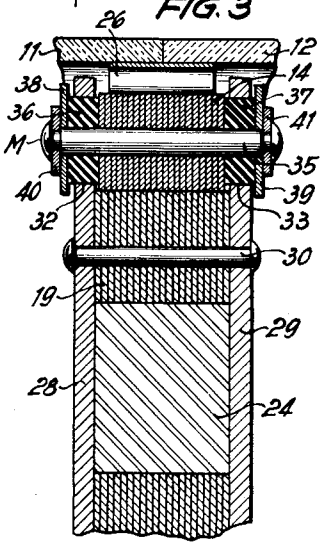


FIG. 4

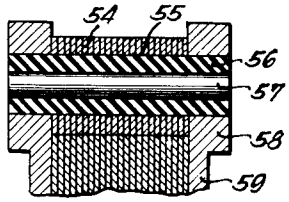


FIG. 5

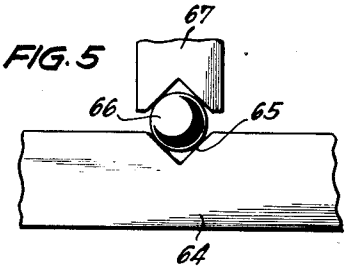
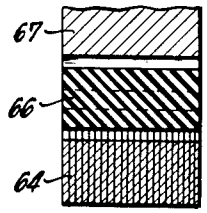


FIG. 6



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ELECTROMAGNETIC PRIME MOVERS

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10 Claims. (Cl. 310—29)

The invention relates to a double-barreled armature magnetic prime mover, which is particularly suitable for the driving of hair-cutting machines and the like.

Such electromagnetic drives usually consist of a magnet core provided with two exciter coils, at least substantially E-shaped, and an oscillating lever which is alternatively attracted by the two outer arms and in doing so rolls on a preferably slightly curved track above the middle arm of the magnet core. This rolling motion is effected, in the case of most arrangements of this kind, against the force of at least one spring engaging on the oscillating lever and which tends to press the barrel armature against its rolling track and to keep it in its middle position or to return it thereto.

A difficulty in such arrangements is that the oscillating lever, if no useful output is taken off from it, may rise from the rolling track and consequently flap and produce a loud disturbing noise, by reason of its taking up a large amplitude of movement. On the other hand, however, a mounting engaging in the middle of the roller track and armature must leave so much play that the centre point of the armature can, in swinging backwards and forwards, move sufficiently far towards the outer arm and, in the second component of the movement, remove itself sufficiently far from the centre point of the roller track.

According to the invention this disadvantage is avoided in that the armature is elastically secured to the iron core by the use of rubber as an intermediate layer.

The invention is further described with reference to the accompanying drawings showing various forms of construction by way of example.

In the drawings:

Fig. 1 shows an electric hair cutting machine with a double barreled armature magnet prime mover in longitudinal section, and

Fig. 2 a cross section on the line II—II of Fig. 1,

Fig. 3 the armature mounting as shown in Fig. 2 in partial section on an enlarged scale;

Figs. 4, 5 and 6 show two other types of mounting, likewise on an enlarged scale.

The drive of the hair cutting machines illustrated in Figs. 1 to 3 is accommodated in two halves of a handle 11 and 12 manufactured of plastic material, and consists substantially of a U-shaped iron core 13, a laminated swinging arm 14 and a driving arm 15 bent at right angles and secured to this armature, which can be engaged with a cutter head (not shown). On the outer arms 17 and 18 of the magnetic coil excitation coils 20 and 21 are mounted constructed with the same number of windings which magnetise the free ends of the outer arms always opposed to each other after being connected to alternating current mains and on the operation of a toggle switch 22.

The permanent magnet 24 extends through the two outer arms 17 and 18, when the armature 14 is in the middle position shown in Fig. 1, symmetrically with a magnetic direct flow, as indicated by arrows in Fig. 1. The alternating flow produced by the operating current in the excitation coils superimposes itself on this direct flow. By suitable choice of the number of windings for the excitation coils 20 and 21, the amplitude of the alternating flow is so adjusted to the most favourable working point that it lies within the extent of the direct flow. During the time when the alternating flow reaches its highest value, the magnetic force adds up in an outer arm to about twice the value, whilst in the other arm alternating flow and direct flow compensate each other and the armature 14 is moved with a tensile force corresponding to twice the value of the direct flow towards the more powerfully magnetised outer arm. The armature 14 in this process rolls on the face of the pole tube 19 constructed as a roller track 25 slightly curved with a large radius R. On reversing the excitation current during the following semi-wave the other outer arm reaches twice the magnetic power, so that an opposite swinging movement is imposed on the armature and the middle section of the armature rolls towards this arm over the arcuate track 25.

A doubly curved leaf spring 26 clipped between the armature 14 and the wall of the casing 11, 12, tends to press the armature against the roller track 25 keeping it in its middle position or returning it thereto. Two helical springs 23 and 27 inserted into the outer arms 17 and 18 are used for limiting the pivotal motion of the armature 14.

For mounting the armature, the transverse shaft M of which moves according to an epicycloid path upon its swinging movement, two brass rods 28 and 29 are used which are mounted on the middle arms of the magnet frame with rivets 30 and 31 passing through, and bores 32 and 33 on their ends projecting above the pole shoe 19 are used for sealing a bearing bolt 35 disposed in the transverse shaft M of the armature. Two rubber discs 36 and 37 disposed on the bearing bolt in the direct vicinity of the armature plates are tensioned in the bores 32 and 33 of the brass rods 28 and 29 and permit the necessary deflection of the bearing pin 35 upon the pivotal motion of the armature. The rubber discs 36 and 37 are gripped on both sides of the brass rods 28 and 29 from the outside with large discs 38 and 39 slipped loosely on the bolt 35 and are tensioned against the armature by a disc each, 40 and 41, riveted to the ends of the bearing bolt 35.

During the pivotal movement of the armature, the bearing bolt 35 can, therefore, move inside the bores 32 and 33 to the necessary extent, as the rubber discs 36 and 37 give elastically to such an extent and act simultaneously as noise dampers. Therefore, the bearing bolt 35 and the rubber discs 36 and 37 form a bearing made of inherently resilient material. By the term "inherently resilient material" it is meant to indicate that the material has a natural resiliency which is due to the material itself and not to any particular shape in which the material may be formed. The mounting of the armature as shown in Fig. 4 differs of that as described above by the feature that the armature 54 has a larger bore 55 into which the bearing pin 57 being covered with a small rubber tube 56 is glued or cemented; the ends of the rubber tube 56 projecting at both sides of the armature are inserted into the bosses 58 arranged at the ends of the brass rods 59.

Another modification needing somewhat more space is shown in Figs. 5 and 6. The armature 64 of this modification is provided with a notch 65 parallel to the cross axis of the armature, into this notch a piece of round rubber is inserted which rests in a similar notch of an abutment 67. It is possible to simplify this construction by using the wall of the housing as abutment, the housing wall being provided with a notch.

We claim:

1. In a hair cutting machine, in combination, a housing unit; an electromagnetic core unit arranged within said

housing unit, one of said units having a guide face; an elongated armature having a portion with a face thereof superimposed on said guide face, at least one of said faces being curved so that said elongated armature is adapted to carry out an oscillatory rolling movement on said guide face; and a bearing element consisting of inherently resilient material and interposed between another face of said portion of said elongated armature and one of said units and supporting said portion of said elongated armature for damped movement in directions required during oscillatory rolling movement of said armature on said guide face.

2. In a hair cutting machine, in combination, a housing member; an E-shaped magnetic core member arranged within said housing member, the center leg of said core member having a curved end face; an elongated armature having a central portion with a face thereof superimposed on said curved end face of said central leg of said core member so as to be adapted to carry out an oscillatory rolling movement on said curved end face; and a bearing element interposed between another face of said central portion of said elongated armature and one of said members, said bearing element consisting of inherently resilient material supporting said central portion of said elongated armature for damped movement in directions required during oscillation of said armature on said curved end face of said center leg.

3. In a hair cutting machine, in combination, a housing member; an E-shaped magnetic core member arranged within said housing member, the center leg of said core member having an end face; an elongated armature having a central portion with a face thereof superimposed on said end face of said central leg of said core member, at least one of said faces being curved so that said elongated armature is adapted to carry out an oscillatory rolling movement on said end face of said center leg of said core member; and a bearing element interposed between another face of said central portion of said elongated armature and one of said members, said bearing element consisting of inherently resilient material supporting said central portion of said elongated armature for damped movement in directions required during oscillation of said armature on said end face of said center leg.

4. In a hair cutting machine, in combination, a housing unit; an electromagnetic core unit arranged within said housing unit and having a guide face; an elongated armature having a portion with a face thereof superimposed on said guide face of the said electromagnetic core unit, at least one of said faces being curved so that said elongated armature is adapted to carry out an oscillatory rolling movement on said guide face; and a bearing element consisting of inherently resilient material and interposed between another face of said portion of said elongated armature and one of said units and supporting said portion of said elongated armature for damped movement in directions required during oscillatory rolling movement of said armature on said guide face.

5. In a hair cutting machine, in combination, a housing member; an E-shaped magnetic core member arranged within said housing member, the center leg of said core member being made of a permanent magnetic material and having a curved end face; an elongated armature having a central portion with a face thereof superimposed on said curved end face of said central leg of said core member so as to be adapted to carry out an oscillatory rolling movement on said curved end face; a pair of solenoid coils each wound on one outer leg of said magnetic core member; means for simultaneously supplying an A. C. voltage to said solenoid coils; and a bearing element interposed between another face of said central portion of said elongated armature and one of said members, said bearing element consisting of resilient material supporting said central portion of said elongated armature for damped movement in directions required during oscillation of said armature on said curved end face of said center leg.

6. In a hair cutting machine, in combination, a housing member; an E-shaped magnetic core member arranged within said housing member, the center leg of said core member being made of a permanent magnetic material and having a curved end face; and elongated armature having a central portion with a face thereof superimposed on said curved end face of said central leg of said core member so as to be adapted to carry out an oscillatory rolling movement on said curved end face; means for resiliently urging the end portions of said armature away from the outer legs of said magnetic core member; a spring urging said armature away from the wall of said housing member; a pair of solenoid coils each wound on one outer leg of said magnetic core member; means for simultaneously supplying an A. C. voltage to said solenoid coils; and a bearing element interposed between another face of said central portion of said elongated armature and one of said members, said bearing element consisting of resilient material supporting said central portion of said elongated armature for damped movement in directions required during oscillation of said armature on said curved end face of said center leg.

7. Apparatus as claimed in claim 2 wherein said bearing element includes rubber discs mounted between said central portion of said elongated armature and said center leg of said magnetic core member.

8. Apparatus as claimed in claim 2 wherein said bearing element includes a rubber tubular member interposed between said central portion of said elongated armature and said central leg of said magnetic core member.

9. Apparatus as claimed in claim 1 wherein said bearing element includes a rubber rod member and is interposed between the central portion of said elongated armature and said housing unit.

10. In a hair cutting machine, in combination, a housing unit; an electromagnetic core unit arranged within said housing unit, one of said units having a guide face; an elongated armature having a portion with a face thereof superimposed on said guide face, at least one of said faces being curved so that said elongated armature is adapted to carry out an oscillatory rolling movement on said guide face; a resilient bearing element interposed between another face of said portion of said elongated armature and one of said units and supporting said portion of said elongated armature for damped movement in directions required during oscillatory rolling movement of said armature on said guide face; and additional resilient means permanently urging said superimposed face of said elongated armature into contact with said guide face.

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