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ELECTROMAGNETIC MOTOR SWITCH

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This invention relates to electromagnetic motors, for example, the electromagnetic motor used for vibrating the diaphragm of an electric horn. In an electric horn, the movable armature of the electromagnetic motor is mounted upon the horn diaphragm and is attracted toward the poles of the electromagnet when the magnet is energized. During the movement of the armature toward the magnet poles, a circuit breaker is opened to disconnect the magnet coil from a current source. As flux decays in the magnet core, the armature continues to move toward the magnet poles until diaphragm stress balances flux pull. Then the stored energy in the diaphragm causes it to bend away from the magnet poles and to pass through neutral or non-stressed position and then to bend in a direction away from the magnet poles. As the diaphragm moves away from the magnet poles, the circuit breaker closes to reconnect the magnet coil with the current source. During motion of the diaphragm away from the core, flux in the core is increasing from residual to a value sufficient to cause the diaphragm to move toward the core again and the cycle is repeated as long as the terminals of the horn are in circuit with the current source.

In the normal "at rest" position of the diaphragm, the circuit breaker contacts are closed. A resilient blade carrying one of the contacts is insulatingly spaced from a metal part carried by the armature or diaphragm. It is therefore apparent that the operation of the horn is dependent upon the normal spacing between the metal part carried by the diaphragm and insulating member separating the metal part from the contact carrying blade. The current consumption of the horn will be greater when said normal spacing is large, and less when said normal spacing is small. The circuit breaker may be adjusted relative to the metal part carried by the diaphragm so as to give the desired normal spacing; but, as the contacts of the circuit breaker wear away this normal spacing will decrease and the volume of the sound of the horn will decrease.

It is an object of the present invention to provide for automatically compensating for the wear of the contacts in such manner that the normal spacing between the circuit breaker and the diaphragm actuated will remain substantially unaltered. In the disclosed embodiment of the present invention, this object is accomplished by providing for relative wear between the metal part carried by the diaphragm and a nonconduct-

ing part of the circuit breaker, which transmits motion from said metal part to the spring blade carrying the movable contact of the circuit breaker.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing wherein a preferred embodiment of the present invention is clearly shown.

In the drawing:

Fig. 1 is a plan view of an electromagnetic motor constructed in accordance with the present invention.

Fig. 2 is a sectional view on the line 2—2 of Fig. 1.

Fig. 3 is a sectional view on the line 3—3 of Fig. 1.

Fig. 4 is an enlarged fragmentary view of parts of the circuit breaker and the metal part carried by the diaphragm for actuating the movable contact of the circuit breaker.

The main frame member 20 of an electric horn is secured by screws 21 and nuts 22 to a diaphragm, 23, a gasket 24 and a collar 25 carrying a projector 26. Diaphragm 24 carries armature plates 27 and 28 secured by rivets one of which is the shank 29 of a stud 30 having a slightly rounded point 31. A central hole through the diaphragm and plates is threaded to receive a screw 32 cooperating with a nut 33 for securing a flat bell or tone disc 34 which is caused to vibrate with a clear ringing sound when the screw 32 strikes a core 35 of an electromagnet having a coil 36 surrounding the core. The shank 37 of core 35 provides a rivet for securing to the frame 20, a reinforcing washer 38 and a magnetizable yoke 39 having parallel branches 40 providing pole pieces 41 facing the armature plates 28, 27.

One end of coil 36 is connected with terminal 42. Terminal 43 is connected with plate 44 of circuit breaker assembly 45 which includes a flexible strip 46 secured at its ends by rivets 47 to shoulders 48 provided by frame 20. Rivets 49 attached to the strip 46, insulation 50, contact bracket 51, insulation 52, contact flexible blade 53, conducting plate 44, and insulation 54. Bracket 51 carries contact 55 normally engaged by contact 56 carried by blade 53 and extending through a hole in insulation 52.

Plate 44 (electrically connected with terminal 43) is in electrical contact with blade 43. Bracket 51 is connected with magnet coil 36. When terminals 42 and 43 are connected with a current source (by a suitable switch called a horn but-

ton), coil 36 is energized and armature 28, 27 moves toward the core 35 to flex the diaphragm 23 in one direction and to cause stud 30 to engage insulation 52 and to move blade 53 away from bracket 51 to separate contact 56 from contact 55, thereby interrupting the circuit of coil 36. The flux in core 35 decays and, finally, the diaphragm 23 moves away from core 35 and flexes in the opposite direction. During this movement, the contacts 56, 55 reclose, and the cycle of oscillations of the diaphragm is repeated as long as the horn button is closed.

Normally, when the diaphragm 23 is at rest, the contacts 55, 56 are closed and there is a space between the end 31 of stud 30 and the insulation 52. The amount of clearance which is required for the proper operation of the horn is regulated by a screw 60 threaded through the frame 20 and abutting an adjusting bracket 61 which is a part of circuit breaker assembly 45. Strip 46 is torsionally biased to urge the bracket 61 downward a distance greater than required for correct normal space of parts 30 and 52. By threading the screw 60 upwardly (Fig. 2) the bracket 61 is engaged and the circuit breaker assembly is rotated clockwise to decrease the distance between the parts 30 and 52. By threading the screw 60 downwardly (Fig. 2) this distance is increased. When the correct normal spacing of parts 30 and 52 is obtained, screw 60 is locked in adjusted position by nut 62.

Although the spacing between parts 30 and 52 may be correct at the outset, this spacing would decrease as the contacts 55 and 56 wear down. To compensate for contact wear, the parts 30 and 52 are so constructed and arranged that relative wear between them takes place at a rate commensurate with the rate of wear of the contacts 55 and 56. One way of providing for this compensating wear between parts 30 and 52 is to make part 52 of a relatively soft substance and provide part 30 with a point which will gradually form a depression 52a in part 52. In this way

the normal spacing between parts 30 and 52 remains substantially the same while the contacts 55 and 56 wear away. Contacts 55 and 56 are provided initially with spherical contact surfaces. The rate of contact surface wear is greater at the start than later. Similarly, the wear between parts 30 and 52 takes place more rapidly at the beginning than later.

Satisfactory compensation for contact wear has been effected, when the part 52 is made of bakelized linen about 0.35 inch thick and the point 31 of the steel stud 30 has a radius of .025 to .032 inch. Both the point 31 and insulation 52 wear away, but the wear of the insulation is the greater.

While the embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A circuit breaker comprising contacts one of which is movable relative to the other, an actuating member mounted for reciprocatory movement, means for moving the actuating member, a member operatively connected with the movable contact and engaged by the actuating member, one of said members being pointed and the member being made of such material that a depression is worn therein due to the repeated engagement of said members in order that the wear between said members tends to compensate for the wear of the contacts.

2. A circuit breaker according to claim 1 in which one of the members is a pointed metal member which wears a depression in the other member which is made of non-metallic material softer than the pointed member.

3. A circuit breaker according to claim 1 in which one of the members is a pointed steel member which wears a depression in the other member which is made of bakelized linen.

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