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2,165,582

ELECTROMAGNETIC MOTOR FOR WARNING SIGNALS AND THE LIKE

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FIG. 1.

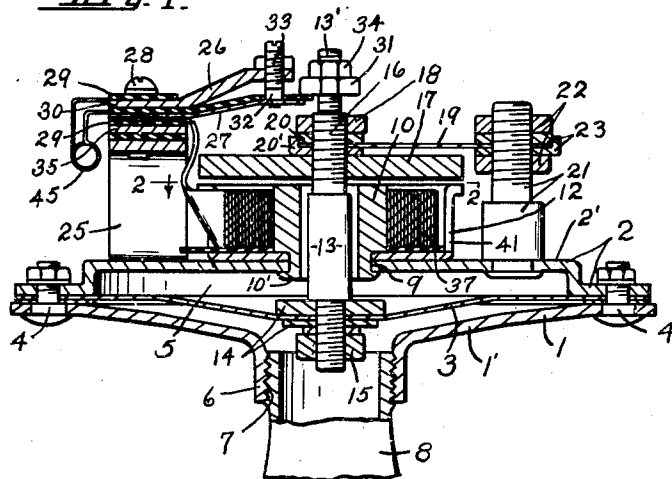


FIG. 2.

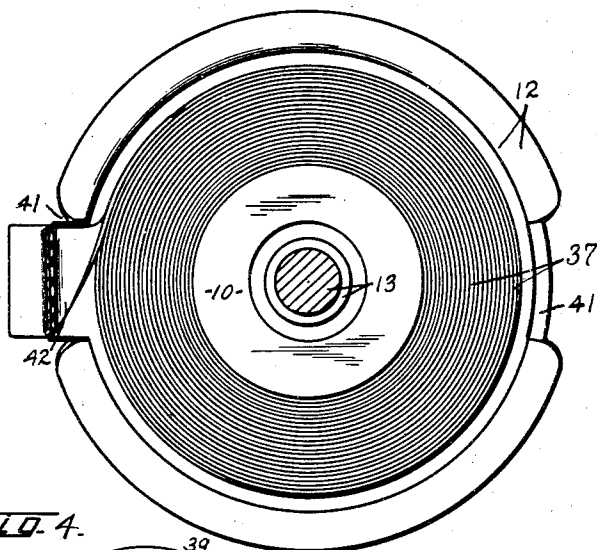


FIG. 3.

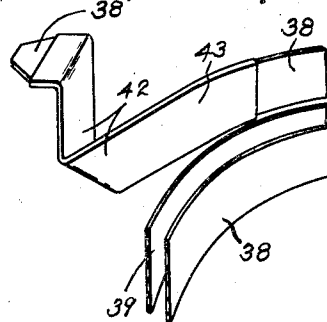


FIG. 4.

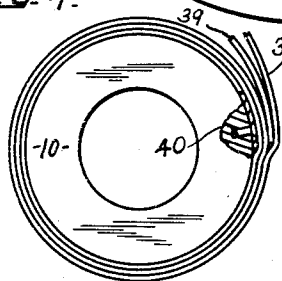
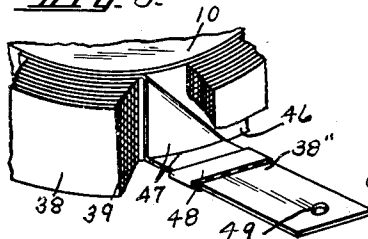


FIG. 5.



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ELECTROMAGNETIC MOTOR FOR WARNING
SIGNALS AND THE LIKETheodore J. Scofield, Jackson, Mich., assignor to
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Application July 19, 1937, Serial No. 154,429

1 Claim. (Cl. 172—126)

This invention relates to improvements in an electric motor of the magnetic type for operating a warning signal or the like. As is well known, horns or warning signals of this type usually comprise a vibratory diaphragm operatively connected to an armature associated with a magnet to be actuated thereby, and an automatic circuit breaker is provided to effect intermittent energizing and de-energizing of the magnet in synchronism with the vibratory movement of the diaphragm.

The primary object of this invention is to provide an electric motor of the magnetic type with an improved field coil whereby a saving both in material and labor is effected without impairing or decreasing the efficiency of the magnet.

Another object is to provide a field coil by which the speed of the collapse of the magnetic field is reduced to decrease or substantially eliminate arcing when the circuit of the coil is broken by the operation of the automatic circuit breaker or interrupter.

A further advantage obtained from my novel coil structure resides in the improved manner in which an end of the coil is connected to the automatic circuit breaker or interrupter.

I attain these objects and advantages by mechanism illustrated in the accompanying drawing, in which:

Figure 1 is a vertical sectional view through the central portion of a warning signal having a motor embodying the various features of this invention, the usual cover for the motor being omitted.

Figure 2 is a detail horizontal sectional view taken substantially in the plane of the line 2—2, Figure 1.

Figure 3 is a perspective view illustrating the detail construction of the outer end portion of my novel field coil.

Figure 4 is a detail plan view of the core shown in Figures 1 and 2 illustrating one arrangement of the inner end portion of my novel coil and means for electrically connecting the coil with the core, portions of the coil and core being shown broken away and in section.

Figure 5 is a fragmentary perspective view showing a modified arrangement of the inner end portion of the field coil, portions of said coil being broken away and in section.

The device shown in the drawing to illustrate my invention comprises a pair of diaphragm housing sections 1 and 2 arranged in opposed relation to receive a diaphragm 3 therebetween. The diaphragm 3 and housing sections 1 and 2 are se-

cured together by bolts 4 passing through aligned openings provided in the marginal portions of said diaphragm and housing sections.

The diaphragm housing sections 1 and 2 have the central portions 1' and 2' thereof pressed or formed to extend outwardly in opposite directions to provide a sound chamber 5 therebetween for the reception of the diaphragm 3. The front diaphragm housing section, as 1, is provided with a centrally disposed forwardly extending annular flange 6 to which is secured, in any suitable manner as by a screw-thread 7, one end of a horn proper or projector 8, as indicated in Figure 1. The rear diaphragm housing section 2 is provided with a central opening 9 for receiving the reduced end 10' of a hollow magnetic core 10, the inner end of said core being upset to cooperate with the shoulder formed on the core adjacent the reduced end thereof for securing the core to the housing section 2.

Surrounding the major or rear end portion of the core 10 is a cup-shaped metallic case 12 which has the bottom portion thereof arranged adjacent the rear side of the central portion 2' of the housing section 2 and is provided with a central opening adapted to align with the opening 9 in said housing section for receiving the reduced end 10' of the core 10 therethrough so as to be secured to the housing section by said core.

The diaphragm 3 is provided with a central opening in alignment with the opening 9 in the rear housing section 2 for the reception of one end of a stud 13 which is fixedly secured to said diaphragm in any suitable manner, as by washers 14 and a nut 15, mounted on said end of the stud in the manner illustrated in Figure 1.

The stud 13 extends rearwardly from the diaphragm through the interior of the core 10 and has the outer end portion thereof provided with screw-threads 16 for the reception of an armature 17 which is screw-threaded on said stud portion. The armature 17, in this instance, is a cylindrical disk of substantially the same diameter as the rear end of the case 12 and is adjustably secured to the stud 13 by a lock nut 18 screw-threaded on the outer or rear end of the stud portion 16. The armature 17 and the outer or rear end portion of stud 13 are maintained against lateral vibratory movement by a resilient support 19 which is in the form of a flat spring having one end adjustably clamped to the stud 13 by the nut 18, and armature 17, washers 20 and 20' may, as shown in Figure 1, be positioned at opposite sides of the support 19 between said support and the nut 18 and armature 17 respec-

tively. The other end of support 19 is adjustably clamped to a post 21 fixedly secured to the central portion 2' of the housing section 2, at one side of the case 12. The support 19 is clamped 5 to post 21 by means of nuts 22 screw threaded on the outer end of the post and arranged one at either side of the support. Washers 23 are shown positioned adjacent either side of the support intermediate said support and the nuts 22.

10 The automatic circuit breaker or interrupter, which is provided, as is usual with motors of this type, to effect intermittent energizing and de-energizing of the magnet in synchronism with the movement of the diaphragm away from and 15 toward the core 10, is of simplified or improved construction. This circuit breaker, as shown in Figure 1, is similar to the one shown in my copending application Serial No. 148,981, filed June 18, 1937, and comprises a supporting bracket or 20 frame 25 secured, in any suitable manner as by electric welding, to the housing section 2 at one side of the case 12. To the upper or rear portion of the frame 25 is secured a pair of contact arms 26 and 27 by means of screws 28. The contact 25 arms 26 and 27 are maintained in electrical insulated spaced relation to each other and to the frame 25 by any suitable means as by insulated plates or washers 29 and 30. The contact arms 26 and 27 extend outwardly from the support 25 30 over the armature 17 and terminate in spaced relation to the stud 13. The arm 26, in this instance, is a rigid member while the arm 27 is a flexible member in the form of a flat spring adapted to be actuated by the stud 13 through 35 the medium of a nut 31 screw-threaded on the outer reduced end portion 13' of the stud 13 to move a contact point 32 connected with the arm 27 out of engagement with the contact point 33 secured to the arm 26. The nut 31 is insulated 40 from the contact arm 27 by the insulating plate 30 which is extended outwardly over the outer or rear side of the arm. The nut 31 may be secured in an adjusted position on the stud 13 by a lock nut 34.

45 Numeral 35 represents a portion of a contact plate secured in the contact stack by screws 28 in insulated spaced relation to contact arms 26 and 27. This plate 35 may be extended at one side to support a relay switch in the manner shown 50 and described in my above mentioned copending application Serial No. 148,981. Inasmuch as this plate 35 forms no part of the instant invention further illustration or description thereof is deemed to be unnecessary.

55 My novel field coil 37 for the magnet is built up of a long, thin strip, band or ribbon 38 of copper or like conductive material and a similar strip, band or ribbon or paper 39 wound about 60 the core 10. The width of the copper and paper ribbons are substantially equal to each other and slightly less than the axial length of the main body portion of the core 10. In winding the copper and paper strips or ribbons on the core 10 the paper ribbon is always positioned at one side 65 of the copper ribbon so as to form alternate pieces of copper and paper whereby successive coils of the copper ribbon will be insulated from each other.

70 In the structure shown in Figures 1, 2 and 4 the copper and paper ribbons are preferably wound on the core 10 prior to the securing of the core to the case section 2, and the inner end of the copper ribbon is secured as by pin 40 to the core in direct contact therewith. In addition 75 to securing the copper ribbon directly to the core

the ribbon is wound one or more (possibly not more than four) turns around the core 10 before the insulating ribbon of paper is wound with the conductor ribbon of copper. It thus follows that such turn or turns of the conductor ribbon which 5 are not separated by the insulating ribbon will be in direct contact with each other and with the core and thereby provide a copper shield surrounding the core 10. This shield reduces the speed of collapse of the magnetic field when the circuit is broken by the spacing of contact points 10 32 and 33 of the interrupter or circuit breaker, thereby reducing the induced electromotive force passing through the coil and therefore cutting down arcing at the contact points.

15 After the copper and paper ribbons have been wound around the core 10 these members may be secured against being easily displaced with respect to each other by dipping the same into a bath of or otherwise treating them with glue or 20 varnish, or a coating of lacquer may be baked on the coil. After the coil 37 has been thus secured to the core 10, the coil and core may be assembled with the case 12 and then all three of these members may be fastened to the housing section 25 2 by upsetting the end 10' of the core in the manner hereinbefore described.

The case 12 as shown in the drawing is provided with two openings 41 in the side wall thereof, through one of which the outer end portion 30 33' of the copper ribbon is extended, after said ribbon has been folded upon itself as indicated at 42, Figure 3. The outer end portion 33' of the coil is preferably insulated by tape 43 wound thereon to within a relatively short distance of 35 the outer end thereof. This outer end portion 33' which is left bare is inserted in the contact stack between the lower or inner contact arm 27 and the adjacent insulating plate 29 in direct contact with the contact arm as shown in Figure 40 1. This end of the ribbon is inserted in the contact stack before the screws 28 are tightened so that upon tightening of the screws the contact arms, the coil ribbon 38 and the various insulating members are secured thereby to the support 45 25 in cooperative relation with each other.

In Figure 1 I have illustrated at 45 a suitable electrical resistance comprising a coil of wire positioned adjacent to the outer edge of the support 25, with one end of the coil clamped in the 50 contact stack between the upper or rear insulating plate 29 and the contact arm 26 in direct contact with said arm. The other end of the coil 45 is similarly secured in the contact stack in direct contact with the lower contact arm 27. 55 Although I have shown the resistance 45 shunting across the contact arms 26 and 27 in Figure 1 to reduce arcing at the contact points 32 and 33 during the operation of the circuit breaker in the usual manner, it will be understood that this resistance may be eliminated when the copper 60 ribbon 38 of the coil 37 has the inner end thereof secured to the core 10 and a portion thereof is wound upon itself to provide the hereinbefore mentioned copper shield. When this copper shield is provided for reducing arcing at the contact points, it may be necessary to provide a few 65 additional turns of the copper ribbon together with the paper ribbon in the coil over the number required when using the coil without this copper shield in order to create the desired magnetic field. When a coil is constructed without the copper shield the inner end portion of the paper ribbon is of course extended throughout 70 75

substantially the entire length of the copper ribbon.

I have so far described only a coil having its inner end connected to the core 10, and thus adapted for use in a so-called single wire system in which one side of the source of potential is grounded to the frame of the vehicle to which the warning signal is attached. My invention, however, is equally adapted for use in connection with a so-called two-wire system, and this modification is illustrated in Figure 5. In this figure, the inner end of the copper ribbon is insulated from the core 10, either by the paper ribbon or by an additional insulating means, as by a tape 46. The inner end portion 38'' of the copper ribbon 32 is bent upon itself as at 47, Figure 5, and is extended outwardly from the core 10 beneath the coil and through one of the openings 41 in the case 12. This end 38'' of the copper ribbon is insulated in any suitable manner from the field coil by means of tape 48, or the like, wound upon said end portion. The outer end of the portion 38'' may, as indicated in Figure 5, be provided with an opening 49 extending therethrough which is adapted to receive a terminal screw for securing the same to a terminal post, or the like, (not shown) when said end of the coil is to be connected with the source of potential by a wire or other electrical conductor.

It will now be observed that the coil 37 is of very simple construction and is connected to the contact stack without the use of specially provided fastening means such as a screw, a contact plate or solder. Furthermore, on forming a field coil with the copper ribbon 32, there is an appreciable saving in the amount of copper required because of a reduction in the length of the ribbon over that of the length of the round copper wire usually used when forming a similar coil in the conventional manner. For example, field coils for these electro-magnet motors as hereinbefore constructed have frequently consisted of forty-eight turns of number 17 round copper wire which has a cross-sectional area of 1608 square mils. By constructing a field coil of the same number of turns from a thin flat strip of copper four-tenths of an inch wide by four-thousandths of an inch thick, which has a cross-sectional area of 1600 square mils substantially equal to that of the copper wire, the length of the copper strip required for the forty-eight

turns is about fourteen inches less than that of the copper wire. It is thus seen that there is a saving in the amount of copper required to construct the field coil while maintaining the same standard of efficiency. There is a substantial saving in cost not only from this saving in the total amount of copper required, but also because copper strip of the character described is considerably cheaper than round copper wire, especially when the costs of the respective insulations are taken into account. Also, it will be understood that the field coil may be of round, oval, rectangular or any other suitable outer form or configuration when using the copper ribbon as well as when the coil is formed in the conventional manner from round wire.

While the form of embodiment of the present invention as herein disclosed constitutes a preferred form, it is understood that other forms may be adopted, all coming within the scope of the appended claim.

I claim:

In an electro-magnetic motor for a warning signal or the like, the combination with a core, an armature therefor and an automatic circuit breaker connected in the motor circuit and adapted to be actuated by the armature for effecting intermittent energizing and de-energizing of the core, of a field coil for the motor composed of a plurality of turns of a thin, flat strip of copper surrounding said core, and a plurality of turns of a thin, flat strip of insulating material arranged intermediate the turns of the copper strip for insulating successive turns of the copper strip from each other, the end of the copper strip at the outer end of the coil being electrically connected with the circuit breaker, the other end of said copper strip at the inner end of the coil being directly connected to the core of the motor in electrical contact therewith, said insulating strip being omitted for at least one turn of said copper strip at said inner end of the coil to provide the copper strip with an uninsulated portion and said portion being in direct electrical contact with the core to thereby form a copper shield surrounding the core whereby the speed of collapse of the magnetic field when the circuit is broken by said circuit breaker is reduced to cut down arcing.

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