Feb. 29, 1944. D. ELLIS ET AL 2,342,797

SHADING COIL

Filed July 31, 1942

Fig. 1.

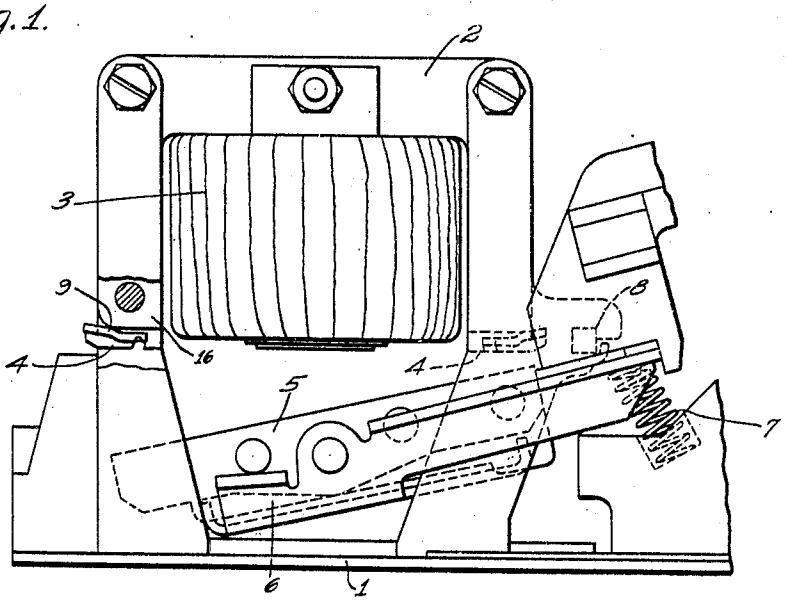


Fig. 2.

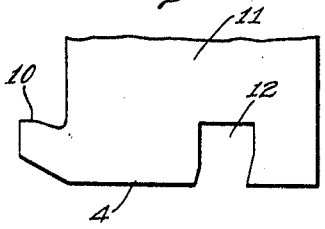


Fig. 3.

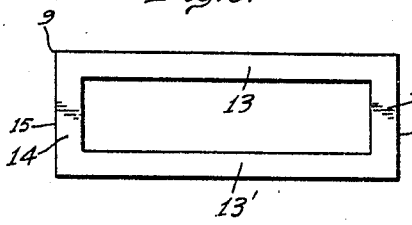


Fig. 4.

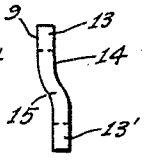


Fig. 5.

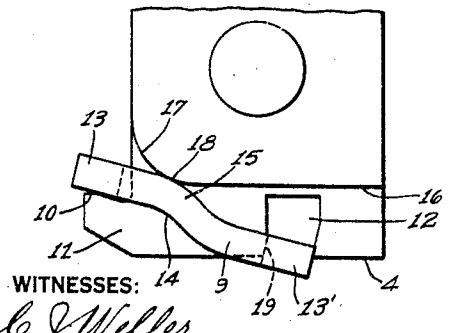
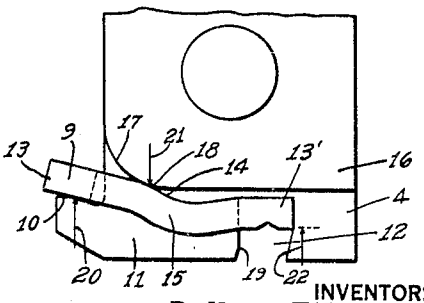


Fig. 6.



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Patented Feb. 29, 1944

2,342,797

UNITED STATES PATENT OFFICE

2,342,797

SHADING COIL

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Application July 31, 1942, Serial No. 453,061

5 Claims. (Cl. 175—338)

This invention relates to shading coils for alternating-current magnets, and more particularly to improved structure for mounting a shading coil in position on the pole piece of a magnet core.

The use of shading coils in connection with alternating-current magnets for preventing noise due to armature chattering is well known. However, one problem presented in such constructions has been that of providing a mounting for the shading coil which would not be loosened or rendered defective by the impact of the armature on the magnet core, and various arrangements for this purpose have been proposed.

One of the principal objects of this invention is to provide an improved arrangement for mounting a shading coil on a magnetic conductor which will be capable of withstanding vibrations due to armature closing shock and which will not increase the cost of manufacture.

A further object is to provide a shading coil mounting in which the coil is flexed as it is forced into position on the magnet to thereby provide resilient forces effective to prevent the coil from becoming loose on the magnet.

Other objects and advantages of this invention will become apparent from the following description taken in connection with the accompanying drawing, in which:

Figure 1 is a side elevational view, a part thereof being broken away, of an electromagnet having shading coils constructed in accordance with the principles of this invention;

Fig. 2 is a detail view in side elevation of a portion of one of the central laminations of the magnet core shown in Fig. 1 to which the shading coils is to be fastened;

Fig. 3 is a detail plan view of a shading coil constructed in accordance with the principles of this invention;

Fig. 4 is a side elevational view of the coil shown in Fig. 3;

Fig. 5 is an enlarged broken-away view in side elevation showing the position of the shading coil with respect to the magnet core just prior to the final assembly operation, and

Fig. 6 is a view similar to Fig. 5 showing the position of the shading coil with respect to the magnet core after the final assembly operation.

Referring to the drawing, the numeral 1 designates a support having an E-shaped magnet 2 mounted thereon. The magnet 2 is preferably formed of a stack of E-shaped laminated iron pieces and has an energizing coil 3 mounted on its central leg, and pole faces or pieces 4 at the ends of its outer legs for engagement with an armature 5. The armature 5 is mounted on a bracket 6 for pivotal movement into and out of engagement with the pole faces 4. A spring 7 is provided for maintaining the bracket 6 in pivotal engagement with a pivot bar 8 carried by the supporting structure 1. The parts thus far described form no part per se of this invention, and are shown in the copending application of J. D. Ellis and J. H. Alspach, Serial No. 458,386, filed September 15, 1942, to which reference may be made for a more detailed description.

This invention is limited to the structure of the shading coil 9 and the laminations at the ends of the magnet legs defining pole faces 4. As best shown in Fig. 2, the central iron laminations of the core 2 are each provided with a ledge 10 adjacent the pole face 4 and projecting outwardly from the body 11 of the lamination. The ledge 10 provides a surface facing in an opposite direction to that of the pole face 4 for a purpose to be described. The body 11 is provided with an undercut slot 12, which, when the laminations are assembled as shown in Fig. 1, will provide a slot extending transversely of the pole face 4.

As best shown in Figs. 3 and 4, the shading coil 9 comprises spaced parallel side portions 13—13' and spaced parallel end portions 14, and may be suitably blanked from sheet material or formed from a rectangular section of tubing. The end portions 14 are bent, as at 15, so that the side portions 13—13' will be offset with respect to each other as shown in Fig. 4. The outer lamination 16 on each side of the core 2 terminates inwardly of the central laminations 11 and is rounded as at 17 to provide a fulcrum point 18 intermediate the ledge 10 and slot 12 for a purpose to be described. The outer lamination 16 is preferably made from a blank having a thickness not less than and preferably greater than the same thickness as the width of the end portions 14.

The shading coil is secured in position by first hooking the side portion 13 over the ledge 10 and then swinging the coil 9 to a position with the curved portions 15 in engagement with the fulcrum point 18. This places the other side portion 13' at the mouth of the slot 12. Such other side portion 13' is then forced into the slot 12 under tension by a staking tool to its final position as shown in Fig. 6. The fulcrum point 18 engages with the end portions 14 intermediate the side portions 13—13' and the forcing of the end portion 13' into the slot 12 causes the end

portions 14 to flex about the fulcrum point 18. The flexing of the end portions 14 causes the side portion 13 to engage tightly with the upper surface of the ledge 10, and the end portions 14 to engage tightly with the pivot point 18. The swaging or staking of the other side portion 13' increases its width sufficiently to prevent movement out of the undercut slot 12 by causing its edges to engage with the side walls 19 of the slot 12.

The edges of the side portion 13' which engage with the side walls of the slot 12 due to the staking or swaging operation provides a means for preventing movement of such side portion out of the slot 12. Obviously, any other suitable means for preventing the exit of the side portion 13' from the slot 9 may be employed without departing from the principles of this invention, such as a key inserted in the slot 12 after flexing of the shading coil to enter the side portion 13' in such slot.

The shading coil 9 is preferably formed of resilient material and is deformed at 15 to offset the side portions 13—13' from each other so that it will be necessary to flex the end portions 14 in order to force the end portion 13' into the slot 12. The deformation at 15 is preferably designed so that a maximum flexing action of the end portions 14 will be had without imparting a permanent set to the material. After flexing the shading coil 9 as described, the resiliency of the side portions 14 will be effective to maintain the member 9 seated in position. The arrows at 20, 21 and 22 in Fig. 6 indicate the direction and location of the forces exerted by the magnet structure 2 for preventing unflexing of the shading coil 9. From these arrows it will be noted that the forces holding the shading coil in position will not be affected by shock due to the impact of the armature 5 on the pole faces 4.

Since certain changes may be made in the above construction and different embodiments of the invention may be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

We claim as our invention:

1. In combination, an electromagnet comprising an E-shaped laminated iron core, each of the outer legs of said core having a ledge projecting outwardly therefrom at a point adjacent its pole face, and an undercut slot parallel to said ledge formed in said pole face, the outer laminations of said core being respectively provided with parts positioned intermediate said ledge and slot, and a shading coil having spaced side portions and spaced end portions, said parts provided a fulcrum about which said end portions will be fixed upon movement of one of said side portions into said slot while the other of said side portions is seated on said ledge, and means engageable with the side walls of said slot to prevent subsequent movement of said one side portion out of said slot.

2. In combination, a magnetic conductor having a pole face, a ledge adjacent said pole face, an undercut slot formed in said pole face, and spaced parts positioned intermediate said ledge and slot, and a shading coil having spaced side portions and spaced end portions, said parts providing fulcrums about which said end portions will be flexed upon movement of one of said side portions into said slot while the other of said side portions is seated on said ledge.

3. In combination, an electromagnet having a pole piece, and a shading coil having spaced side portions and spaced end portions, said pole piece having spaced parts for engagement with said side portions, and intermediate parts engageable with said end portions substantially centrally thereof, said intermediate parts providing fulcrums about which said end portions will be flexed upon movement of one of said side portions into position for engagement with one of said spaced parts while the other of said side portions is in engagement with the other of said spaced parts.

4. In combination, a magnetic conductor having a pole face with an undercut slot formed therein, and a shading coil having spaced side portions and spaced end portions, said magnetic conductor further having a surface at one side thereof on which one of said side portions may seat, and a part intermediate said surface and slot respectively engageable with one of said end portions, said part providing a fulcrum about which said one end portion will be flexed upon movement of the other of said side portions into said slot while said one side portion is seated on said surface, said other side portion being staked to prevent its movement out of said slot.

5. In combination, a magnetic conductor having a pole face with a slot formed therein, and a shading coil having spaced side portions and spaced end portions, said magnetic conductor further having a surface at one side thereof on which one of said side portions may seat, and a part intermediate said surface and slot respectively engageable with one of said end portions, said part providing a fulcrum about which said one end portion will be flexed upon movement of the other of said side portions into said slot while said one side portion is seated on said surface, and means for preventing subsequent movement of said other side portion out of said slot.

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