Oct. 12, 1937. H. E. HODGSON ET AL 2,095,499

ELECTROMAGNET

Original Filed Sept. 22, 1930

Fig. 1

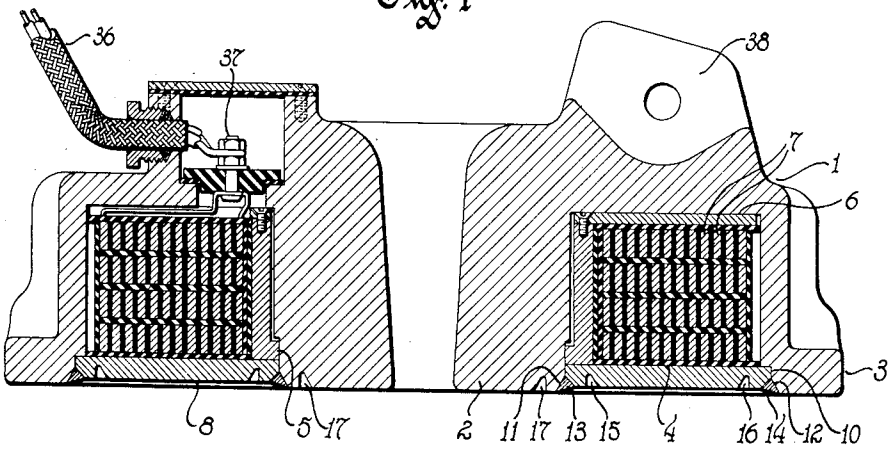


Fig. 2

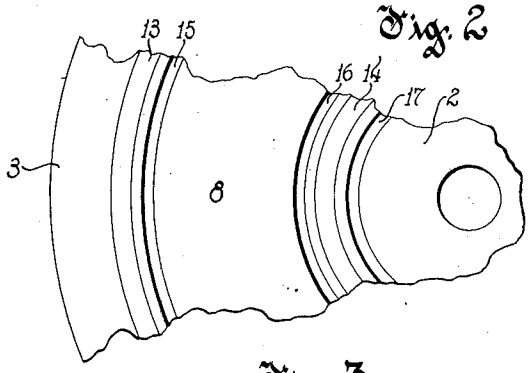
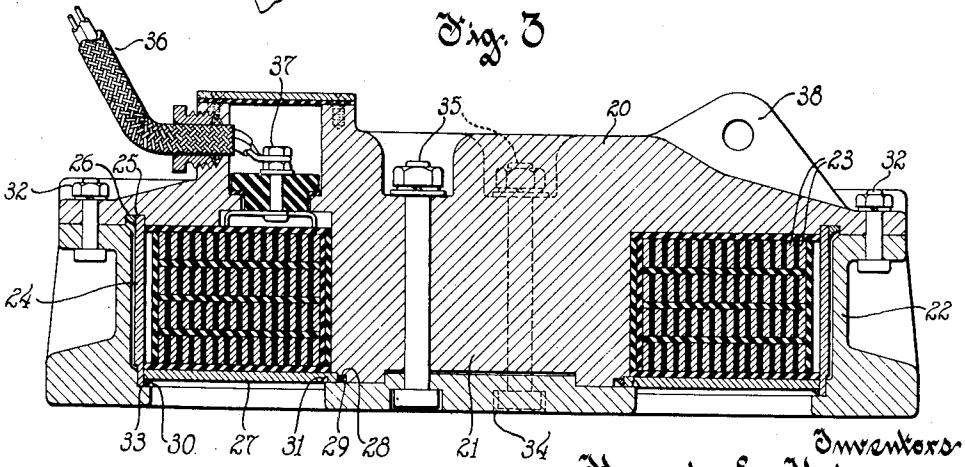


Fig. 3



Inventors
Howard E. Hodgson
Harry A. Sedgwick
By Faulkner Hubbard
Attorneys

Patented Oct. 12, 1937 2,095,499

UNITED STATES PATENT OFFICE

2,095,499

ELECTROMAGNET

Howard E. Hodgson, Wauwatosa, and Harry A. Sedgwick, Shorewood, Wis., assignors to Cutler-Hammer, Inc., Milwaukee, Wis., a corporation of Delaware

Application September 22, 1930, Serial No. 483,449
Renewed November 28, 1934

9 Claims. (Cl. 175—367)

This invention relates to improvements in electromagnets and while not limited thereto is particularly applicable to lifting magnets.

Lifting magnets are usually provided with a magnet frame having concentrically arranged inner and outer pole projections and a coil unit mounted in the space between such projections. The coil unit is usually held in place by a coil shield, which is secured to the inner and outer poles of the magnet frame and serves to hold the coil unit in place and to also prevent entry of foreign matter, and particularly moisture, to the coil unit. Considerable difficulty has been encountered in securing the coil shield to the magnet frame in a manner to prevent loosening thereof, and it has heretofore been proposed to overcome this difficulty by welding the coil shield to the inner and outer poles of the magnet frame. However, magnets of this construction have not proven satisfactory. In practice it was found that upon cooling of the magnet parts after the welding operation excessive strains were set up in the welded joints which often caused breaking thereof or the material adjacent thereto.

The present invention has among its objects to provide an electromagnet of the welded type which will overcome the aforementioned objection.

Another object is to provide an electromagnet having certain of its parts constructed in a manner which tends to reduce conduction of heat away from the welded joints during the welding operation.

Various other objects and advantages of the invention will hereinafter appear.

The accompanying drawing illustrates two embodiments of the invention which will now be described, it being understood that the embodiments illustrated are susceptible of modification without departing from the spirit and scope of the appended claims.

In the drawing,

Figure 1 is a sectional view of one form of lifting magnet embodying the invention;

Fig. 2 is a fragmentary bottom view of the lifting magnet shown in Fig. 1, and

Fig. 3 is a sectional view of a modified form of lifting magnet embodying the invention.

The lifting magnet illustrated in Fig. 1 is provided with a circular magnet frame 1, having a cylindrical center pole 2 and an annular outer pole 3. A coil unit 4 is mounted in the annular space between poles 2 and 3 which comprises a core member 5 bored to receive pole 2, an annular plate 6 fixed to the upper end of said core member, and a plurality of windings 7 mounted upon said core member, each of said windings being formed of strap material and being insulated in the usual manner.

A metal coil shield 8 is provided for holding the coil unit 4 within the space between poles 2 and 3 and for sealing the same therein. Said coil shield is preferably constructed of chrome nickel or manganese steel and is provided with a center opening for receiving center pole 2 and an outer edge which fits within a counterbore 10 in the lower end of outer pole 3. The inner edge of coil shield 8 and the lower end of pole 2 are provided with opposed beveled faces forming a V-shaped recess 11 while the outer edge of said coil shield and the lower end of pole projection 3 are provided with opposed beveled faces forming a recess 12. The inner edge of coil shield 8 is secured to pole 2 by a welded connection 13 which is fused into recess 11 while the outer edge of said coil shield is secured to the outer pole 3 by welded connection 14 which is fused into the recess 12. The welded connections 13 and 14 can be applied by various methods, as for example by arc welding.

During the welding operation there is considerable heating of the coil shield 8 and magnet frame 1, and in practice it has been found that contraction of these parts upon cooling thereof after the welding operation tends to subject the welded connections 13 and 14 to excessive strains. In order to minimize strains on the welded connections 13 and 14 the lower face of coil shield 8 is provided with a circular recess 15 adjacent the welded connection 13 and a circular recess 16 adjacent the welded connection 14. The recesses 15 and 16 permit flexing of the coil shield at the portions adjacent the bottom of said recesses to thereby relieve the welded connections from excessive strains. Also it has been found that recesses 15 and 16 act to effect a reduction in the heat conducted away from connections 13 and 14 during the welding operation, to thereby prevent excessive heating of the windings 7 of the coil unit and to also facilitate making of the welds by retention of the heat at the welds.

In the embodiment shown in Fig. 1 the lower face of pole 2 is provided with a circular recess 17 which prevents rapid conduction of heat away from the connection 13 during the welding operation, and as is apparent a similar groove can be provided in the lower face of outer pole 3 to reduce conduction of heat away from connection 14.

Referring now to Fig. 3, the same illustrates a lifting magnet including a magnet frame 20 hav-

ing a cylindrical center pole 21 and a removable outer pole 22. A plurality of magnet windings 23 are wound directly upon the center pole 21, each of which is formed from strap material and is insulated in the usual manner. The coils 23 are surrounded by a ring member 24 formed of magnetic material and having its upper end seated within a recess 25 in the lower face of frame 20. Recess 25 is of such diameter as to provide a channel around the outer face of ring member 24 and said ring member is secured to frame 20 by a welded connection 26 which is fused into said channel.

The coils 23 are held against axial movement upon center pole 21 by a coil shield 27 which is preferably constructed of chrome nickel or manganese steel. Coil shield 27 bears against a shoulder 28 formed on the lower end of center pole 21 and the outer edge of said coil shield fits within ring member 24 and is located slightly above the lower edge of said ring member. The inner edge of coil shield 27 is secured to pole 21 by a welded connection 29 which is fused into a channel formed by shoulder 28, while the outer edge of said coil shield is secured to ring member 24 by a welded connection 30 which is fused in the corner between the lower face of said coil shield and the lower edge of said ring member. The lower face of coil shield 27 is provided with a circular recess 31 adjacent the welded connection 29 to permit flexing of said shield at points adjacent said weld. If desired the lower face of coil shield 27 can be recessed adjacent the welded connection 30 to permit flexing thereof at points adjacent such weld, but in practice it has been found that where ring member 24 is relatively thin, as shown in the drawing, this is unnecessary.

The outer pole 22 is secured at points adjacent the outer edge of magnet frame 20 by a plurality of bolts 32 and the lower edge of said pole is provided with a shoulder 33 which is adapted to abut the lower end of ring 24 and protect the welded connection 30. The lower end of center pole 21 has a pole shoe 34 fixed thereto by bolts 35, and as shown said pole shoe overlaps the coil shield and protects the welded connection 29.

The lifting magnets shown in Figs. 1 and 3 are each provided with the usual leads 36 which are connected to a terminal unit 37 housed within a recess in the upper face of the magnet frame. Also each of the magnet frames 1 and 20 has its upper face provided with the usual suspension lugs 38, one of which is shown on each of said frames.

What we claim as new and desire to secure by Letters Patent is:

1. In an electromagnet, the combination with a magnet frame having a cylindrical center pole, a magnet winding mounted upon said pole, and means for enclosing said winding and for holding the same in position upon said pole, said means including an annular coil shield and a fused connection between the inner edge of said coil shield and said pole, said pole and said shield having channels in the faces thereof parallel to and adjacent said fused connection.

2. In a lifting magnet, in combination, a magnet frame having spaced inner and outer pole projections, an energizing coil mounted upon said inner pole and arranged within the space between said pole projections, a ring member located between said winding and said outer pole and having its upper edge welded to said frame, and an annular coil shield for holding said winding in position upon said inner pole, said coil shield having its inner edge welded to said inner pole projection and its outer edge welded to said ring member.

3. In a lifting magnet, in combination, a magnet frame having spaced inner and outer pole projections, an energizing coil arranged within the space between said pole projections and mounted upon said inner pole, a ring member surrounding said coil and having its upper edge welded to said frame, and an annular coil shield for holding said coil in position upon said inner pole, said coil shield having its outer edge welded to said ring member and its inner edge welded to said inner pole, and having a recess in the lower face thereof permitting flexing thereof at points adjacent said inner pole.

4. In an electromagnet, in combination, a magnet frame having spaced poles, a winding mounted in said frame between said poles, a continuous plate between the poles of said frame to shield said winding and to close the space between said poles of said frame, and welded connections between said frame and said plate, the latter being recessed adjacent said welded connections to provide relatively flexible marginal portions for strain relief of said welded connections.

5. In an electromagnet, the combination with a magnet frame having concentrically arranged inner and outer poles, an annular winding mounted between said poles, a continuous annular coil shield forming with said frame a complete enclosure for said winding, and fused connections between said magnet frame and marginal portions of said shield, said shield having portions of reduced thickness parallel to and immediately adjacent said fused connections to provide for strain relief of said fused connections.

6. In an electromagnet, in combination, a magnet frame having concentrically arranged inner and outer poles, an annular winding mounted upon said frame between said poles, an annular plate mounted between said poles and forming with said magnet frame a complete enclosure for said winding and continuous welded connections between said magnet frame and the edges of said plate, said plate having connecting means between its body and marginal portions affording strain relief for said welded connections.

7. In a lifting magnet, in combination, a circular magnet frame having concentrically arranged inner and outer pole projections, an annular winding mounted upon said frame between said pole projections, an annular plate mounted between said pole projections and forming with said frame a complete enclosure for said winding and continuous welded connections between said pole projections and the inner and outer edges of said plate, said plate being channeled adjacent its inner and outer edges to facilitate flexing thereof at points adjacent said welded connections.

8. In a lifting magnet, in combination, a circular magnet frame having concentrically arranged inner and outer pole projections on the under side thereof, an annular winding mounted upon said frame between said pole projections, an annular plate mounted between said pole projections and forming with said frame a complete enclosure for said winding and continuous welded connections between the lower ends of said pole projections and the inner and outer edges of said plate, said plate being channeled parallel to and immediately adjacent said welded connections to facilitate flexing of marginal

portions of said plate for strain relief of said welded connections.

9. In a lifting magnet, in combination, a circular magnet frame having concentrically arranged inner and outer pole projections, an annular winding mounted upon said frame between said pole projections, an annular plate mounted between said pole projections and forming with said frame a complete enclosure for said winding and continuous welded connections between said pole projections and the inner and outer edges of said plate, said plate being recessed to provide relatively flexible portions parallel to and immediately adjacent said welded connections which afford strain relief of said welded connections.

HOWARD E. HODGSON.
HARRY A. SEDGWICK.