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J. S. FRANKS

2,548,210

ELECTRICAL COIL

Filed Oct. 29, 1947

FIG. 1

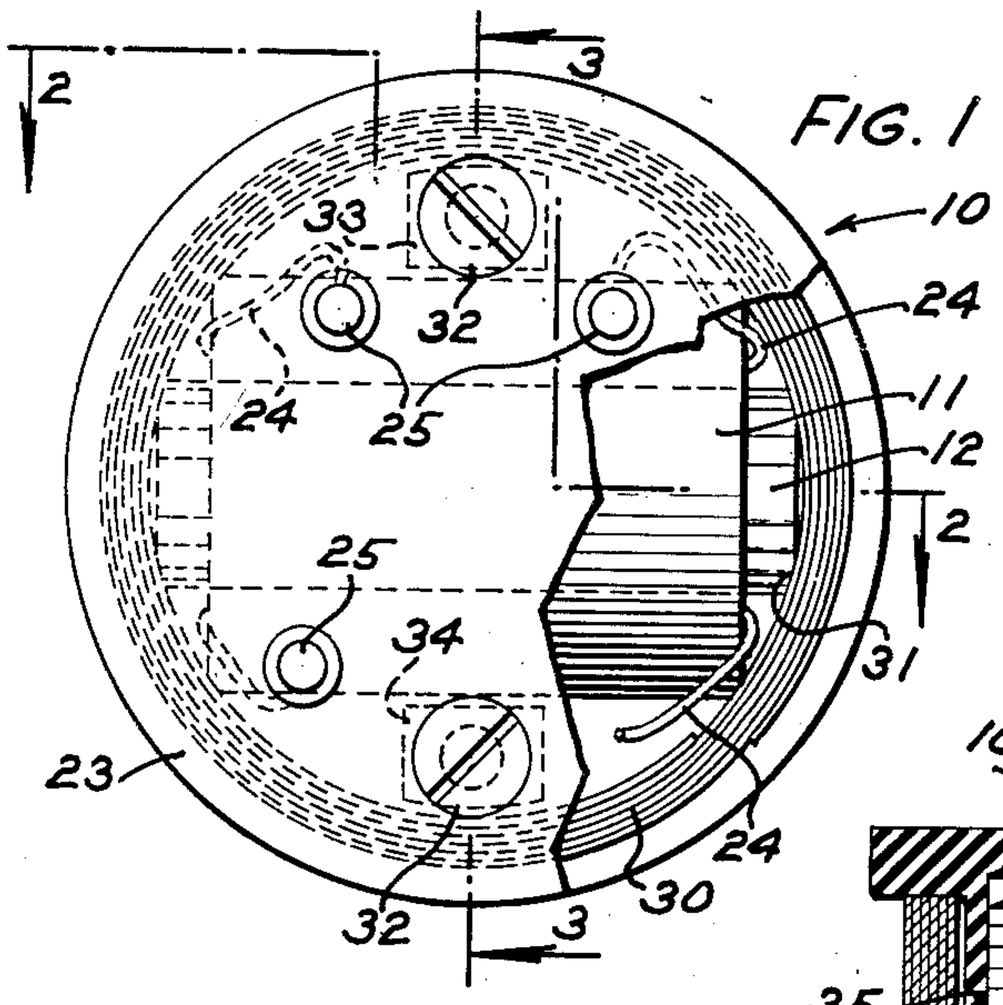


FIG. 4

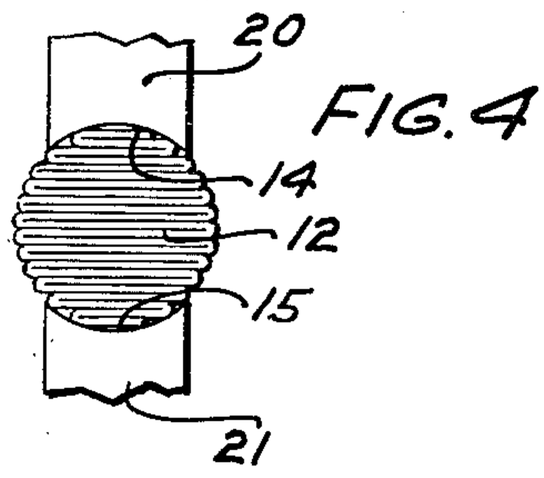


FIG. 3

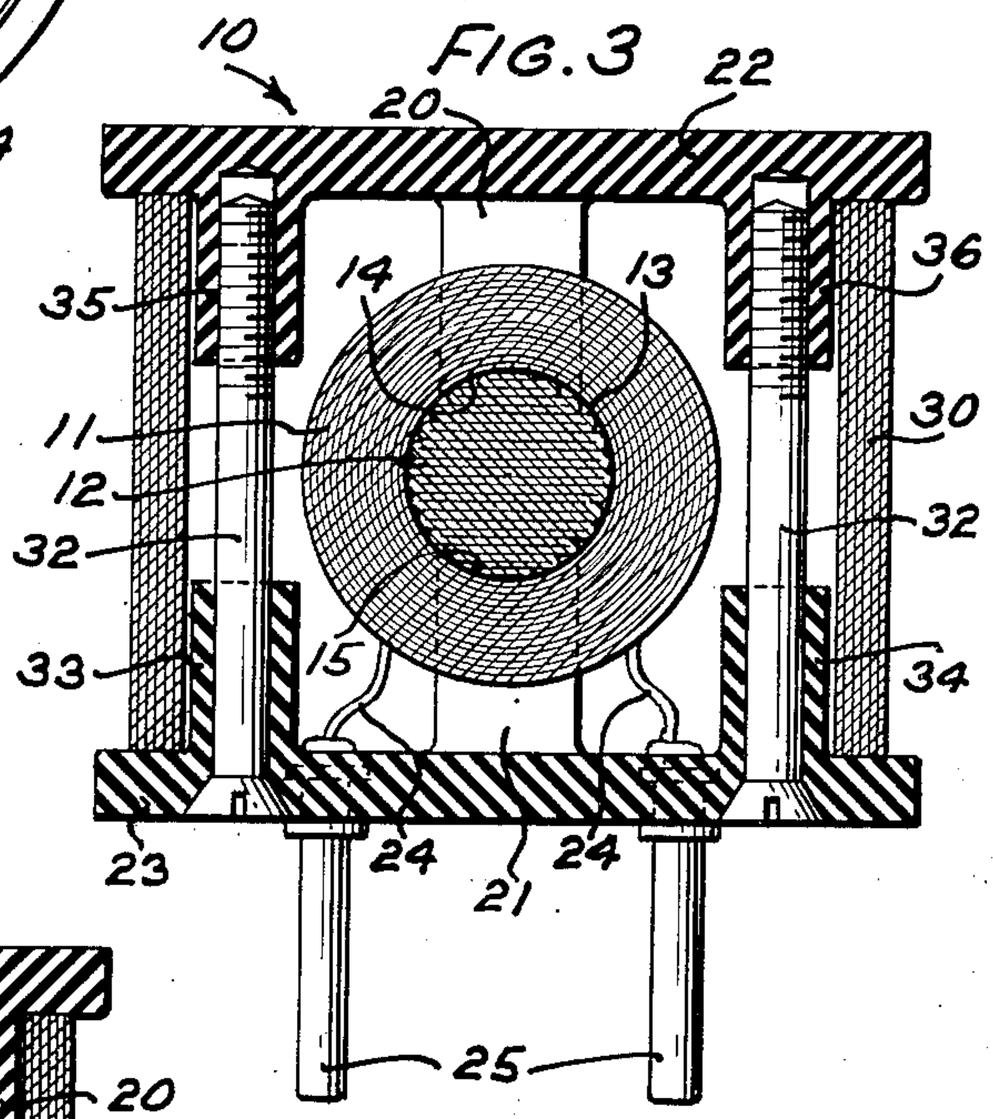
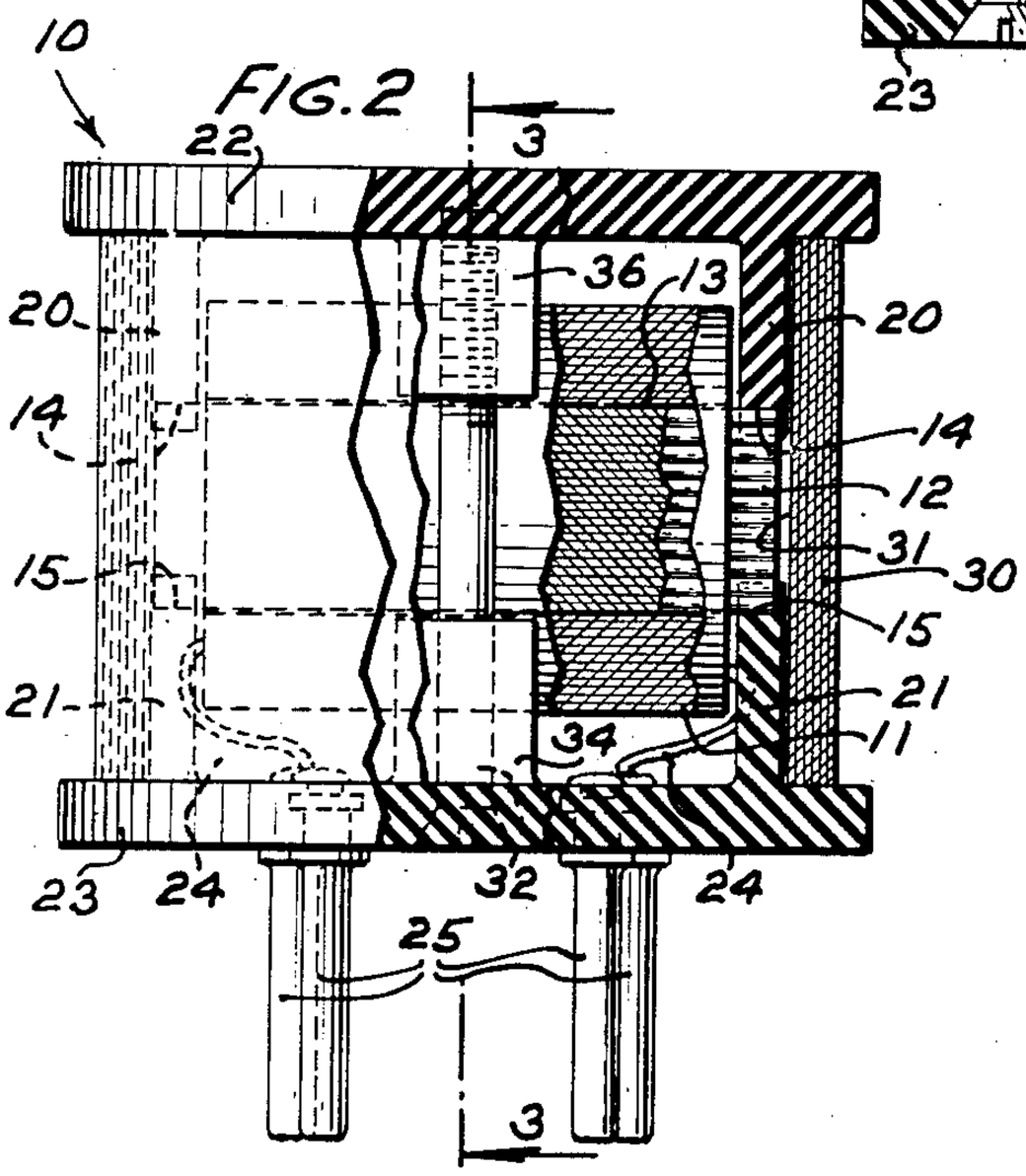


FIG. 2



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ELECTRICAL COIL

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4 Claims. (Cl. 175—356)

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This invention relates to electrical coils and more particularly to electrical coils having magnetic cores.

An object of this invention is to provide a new and efficient electrical coil with a magnetic core.

In accordance with one embodiment of this invention an induction coil is provided wherein windings of insulated wire are applied on an inner folded laminated core section of magnetic material which forms a central leg along a diameter of an outer cylindrical core portion comprising a coiled strip of magnetic material which protectively surrounds the coil as a container and also provides the proper magnetic path. The central core section is supported between concave surfaces formed on legs of cooperating plates which legs also serve to engage and position the outer cylindrical core portion, one of the plates carrying outwardly extending terminal plugs connected to the coil windings and adapted to connect and mount the assembly on associated apparatus.

A complete understanding of this invention will be had by referring to the following detailed description taken in conjunction with the accompanying drawing, in which

Fig. 1 is a partly broken away view from the bottom of an induction coil embodying the features of the invention;

Fig. 2 is a view partly in front elevation of the coil shown in Fig. 1 and partly in section taken on the lines 2—2 of Fig. 1;

Fig. 3 is a sectional view of the coil shown in Figs. 1 and 2 taken on the lines 3—3 of Figs. 1 and 2; and

Fig. 4 is a fragmentary view showing in detail the manner in which the ends of the inner core section are clamped by the projections extending from the top and bottom plates.

As will be seen in the drawing, a plug-in induction coil 10 may be formed in accordance with the present invention by mounting a coil unit 11 on an inner core section 12 made of any suitable magnetic material, for example, silicon steel which may be in strip form and folded in accordion fashion to form a laminated core with low hysteresis loss. The coil unit 11 may have one or more separate windings. Several layers of acetate sheet 13 may be interposed between the inner surface of the coil and the core section 12 which is supported at its ends between concave surfaces 14—14 and 15—15 formed on projections or legs 20—20 and 21—21 extending downwardly from a circular top plate 22 and upwardly from a similar bottom plate 23, respectively, which

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plates may be made of any suitable insulating material, for example, a thermoplastic or thermosetting moldable material.

The ends 24 of the windings of the coil unit 11 may be connected to prong-type terminals 25 fixed in the bottom plate 23 in spaced relation to each other to adapt the unit for mounting in a base having jacks to receive the terminal prongs 25.

An outer circular core portion or member 30 formed preferably from a ribbon of silicon steel wound in a tight cylindrical tube is positioned between the upper plate 22 and the lower plate 23 in such a manner that the extending portions 20—20 and 21—21 lie just inside the cylindrical outer core portion 30 and the ends of the core section 12 contact its inner surface 31 to form a closed magnetic circuit through the cylindrical core portion or member 30 and the inner core section 12. To prevent the spirally wound core portion 30 from springing open, the ends of the silicon ribbon may be tack welded or riveted to their adjacent layers of ribbon.

The assembled parts are clamped together by a pair of machine screws 32—32 which pass oppositely disposed tubular projections 33 and 34 extending upward from the lower plate 23 and are threaded into hollow tubular projections 35 and 36 which extend downward from the upper plate 22 and are in coaxial alignment with the tubular projections 33 and 34, respectively. Forcing the screws 32—32 into the threaded tubular portions 35 and 36 causes the ends of the inner core section 12 to be clamped between the concave surfaces 14—14 and 15—15 and also clamps the cylindrical outer core portion 30 between the plates 22 and 23.

The completed induction coil forms a compact fully enclosed unit, the outer core portion 30, providing not only a path for the magnetic circuit but also a protective housing for the coil windings.

What is claimed is:

1. An induction coil comprising a round accordion folded inner core section, a coil of insulated wire encircling said inner core section, a pair of substantially circular insulating plates disposed on opposite sides of said coil, each of said plates having a pair of spaced-apart extending legs having concave surfaces formed on their free ends to engage and support the ends of said inner core section, and a tubular outer core section around said inner core section and coil and disposed between said plates in such manner that each open end of said tubular outer

core section is covered by one of said plates and the inner core section and the coil are disposed within said tubular outer core section and transversely thereof, said tubular outer core section comprising a plurality of coaxial cylindrical laminations structurally defining a hollow cylinder.

2. An induction coil comprising a straight core, a coil encircling the intermediate portion of said straight core leaving end portions of the core projecting from said coil, a tubular core encircling said straight core and said coil with the straight core disposed intermediate the ends of said tubular core and transversely to the axis thereof and with the ends of the straight core member in abutting relation to the inner walls of said tubular core member, said tubular core having a length greater than the dimension of said coil axially of said tubular core member to form a partial housing therefor, insulating closure members engageable with the ends of said tubular core and cooperating therewith to form a housing fully enclosing said coil and said straight core, means for securing said closure members to said tubular core, and elements on said closure members engageable with the projecting end portions of said straight core for holding said straight core in a predetermined position relative to said tubular core.

3. An induction coil comprising a straight core, a coil encircling the intermediate portion of said straight core leaving end portions of the core projecting from said coil, a hollow cylindrical core encircling said straight core and said coil with the straight core disposed intermediate the ends thereof and transversely to the axis of said cylindrical core, said cylindrical core having a length greater than the dimension of said coil axially of said cylindrical core to form a partial housing therefor, closure members engageable with the ends of said tubular core and cooperating therewith to form a housing enclosing said coil and said straight core, means on said closure members forming shoulders engageable with said cylindrical core to prevent lateral displacement of said closure members, elements on said closure members engageable with the projecting end portions of said straight core, said coil and said cylindrical core being arranged to provide axially extending apertures

between said coil and the walls of said cylindrical core, means disposed in said axially extending apertures interconnecting said closure members for holding said closure members against said cores to clamp said core members between said closure members, and terminals on one of said closure members providing electrical connection to said coil.

4. An induction coil comprising an outer tubular core, a separate inner core disposed within said tubular core transversely to the axis thereof and having its ends in abutting relation to the inner walls of said tubular core, a coil encircling the intermediate portion of said inner core leaving the end portions thereof projecting from said coil, a pair of insulating members having portions engageable with the ends of said tubular core and having other portions disposed axially of said tubular core and in telescoping relation therewith forming shoulders engageable with the side walls of said tubular core to prevent lateral displacement of said members relative to the outer core, said axially extending portions of said insulating members having seats engageable with the projecting end portions of said inner core, and means for securing said insulating members to said outer core and in predetermined aligned relation relative to each other whereby the seat portions on the members engaging the inner core serve to support the inner core in predetermined relation to said outer core.

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