Aug. 2, 1966 J. D. COLE 3,264,593

MAGNETIC CORE WITH WINDING RETAINING PLATE

Filed April 29, 1963 2 Sheets-Sheet 1

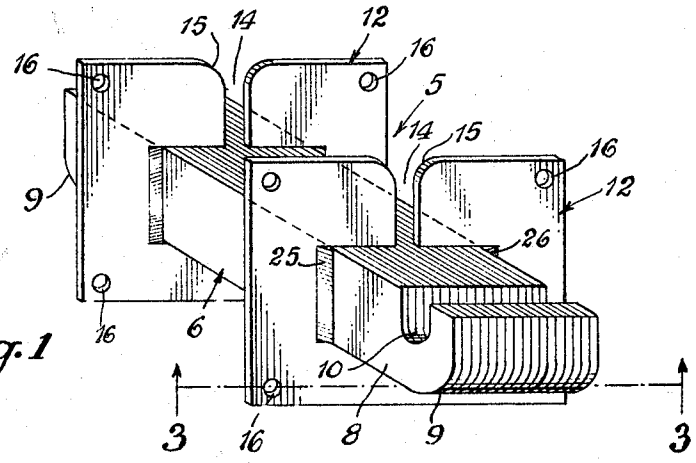


Fig. 1

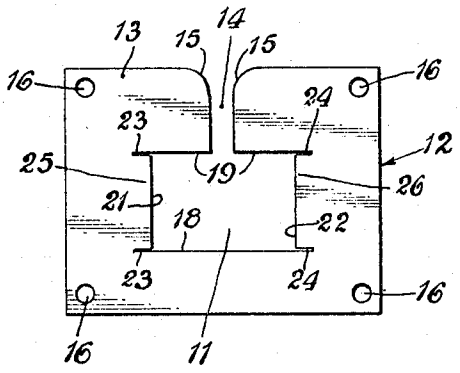


Fig. 2

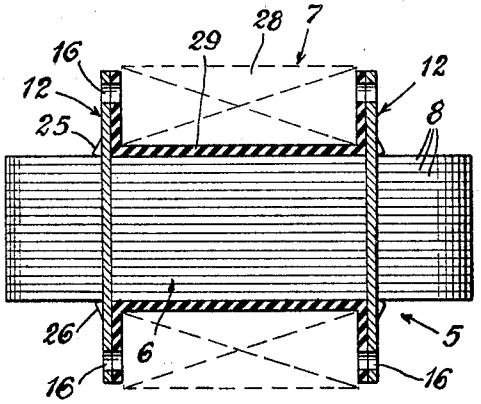


Fig. 3

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MAGNETIC CORE WITH WINDING RETAINING PLATE

Filed April 29, 1963 2 Sheets-Sheet 2

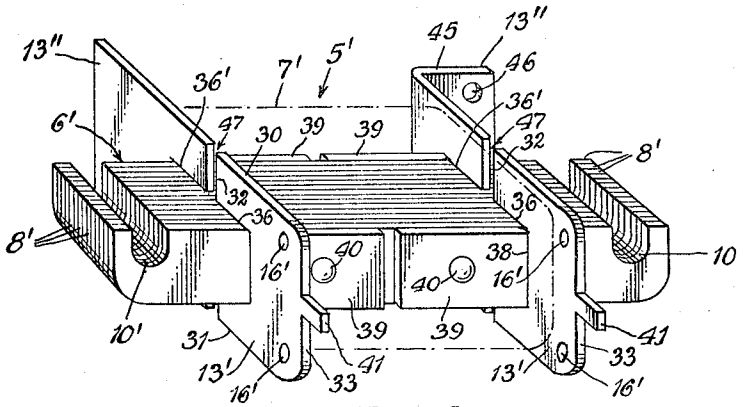


Fig. 4

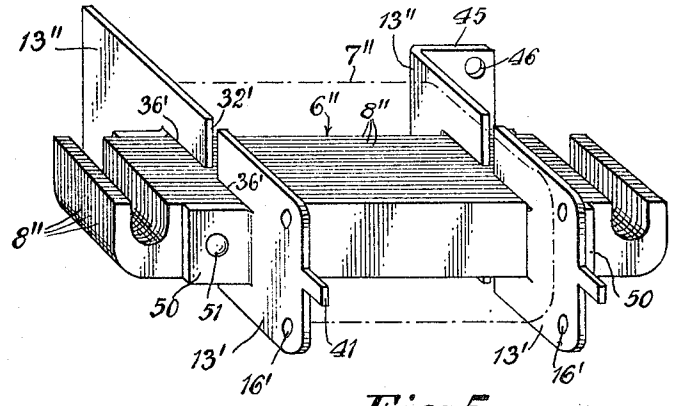


Fig. 5

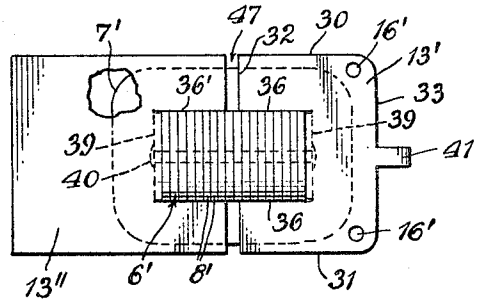


Fig. 6

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3,264,593

MAGNETIC CORE WITH WINDING RETAINING PLATE

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2 Claims. (Cl. 336—197)

The present invention relates to improvements in electro-magnetic induction devices, and more particularly to a magnetic core and coil form structure for use in connection with assymmetrical type shaded pole motors.

One object is to provide a metallic core structure having coil end members which are formed from identical stampings and are adapted to be secured to the core of the induction coil by punched out projections which frictionally engage the induction coil core and secure the coil ends in position.

Another object is to provide an induction coil for various uses in which the laminated core section is provided with coil retaining end walls constructed of two or more identical stampings which are blanked to provide upstruck tongue portions engageable with the laminated core section to prevent displacement of the coil sections after they have been assembled on the core.

Another object is to provide a core structure and coil end assembly in which a laminated core structure is received in an opening in the coil form end which is slightly less in one dimension so that tongues blanked from the coil form ends will yieldingly and frictionally engage the laminated core section and retain the coil form in place and hold the laminated core sections in their assembled relation.

Another object is to provide a coil form and core structure in which a pair of frame members of aluminum or the like are provided with openings corresponding in contour to the sectional shape of the core and to provide oppositely disposed tongue projections on at least two side edges of said frame structure to provide short biting edges adapted to frictionally and contactually engage opposed walls of said core structure to permit the frame members to be pressed into tight engagement with a coil form so that the springback will cause said biting edges to frictionally grip said opposed core wall portions.

Another object is to provide an induction coil structure in which coil form end plates are formed by a pair of identical stampings assembled in sets for each end of the coil with the stampings provided with struck up lug portions extending inwardly along the core section and adapted to be secured in place by suitable fastener means extending through the laminations of said core section.

Another object is to provide an induction coil form structure in which the coil retaining walls are formed by identical stampings blanked to provide lug portions adapted to be fastened in place by fastener means arranged external of the coil retaining area.

Another object is to provide an induction coil structure in which coil form ends are constructed of a pair of identical stampings arranged in spaced apart relation to eliminate eddy currents in assemblies having three or more coil sections.

Another object is to provide an induction coil assembly having a laminated core structure and coil retaining wall portions which are stamped to provide one of the wall portions with an elongated or enlarged section capable of being bent or otherwise shaped to form a mounting bracket for the coil.

Another object is to provide an electro-magnetic induction coil form in which the coil form end walls are formed of stamplings suitably blanked to provide lugs adapted to be received in a terminal strip and in corresponding openings therein.

Another object is to provide an induction coil form structure in which retaining walls for the coil sections are formed from metallic blanks which are identical and which are provided with struck up lugs which may be arranged to extend inwardly beneath the coil sections or can be reversed to extend externally thereof and held in place in either case by the fastener elements of the laminated core section.

Other objects and advantages of the invention will become apparent during the course of the following description of the accompanying drawings wherein:

FIGURE 1 is a perspective view of one form of the invention illustrating a core structure for an induction coil with the coil form retaining plates in position.

FIGURE 2 is a top elevational view showing one of the coil retaining wall members and illustrating the manner in which the same is blanked from sheet metal or the like to provide oppositely extending core engaging projections.

FIGURE 3 is a cross-sectional view taken on line 3—3 of FIGURE 1 and looking in the direction of the arrows to illustrate the manner in which the gripping lugs engage opposite faces of the laminated core structure to retain the same in place and hold the coil section on the core.

FIGURE 4 is a perspective view of another embodiment of the invention showing the manner in which the coil ends are provided with struck up lug portions which extend inwardly in opposed relation and are secured in place by suitable fastener elements which in addition retain the laminations of the magnetic core in assembled relation.

FIGURE 5 is a perspective view of another modified form of the invention in which the coil form end walls are provided with blanked portions bent to form upstruck lugs extending in opposite directions and affixed to the laminated core section at the end thereof by suitable fastener means, and

FIGURE 6 is an end elevational view of the core structure showing the shape of the coil ends to illustrate the manner in which the same are blanked to provide double gaps and prevent eddy currents.

In the drawings, and more in detail, attention is first directed to FIGURES 1 to 3 inclusive wherein the reference character **5** will generally be employed to designate an electro-magnetic coil having a core structure generally designated **6** and a coil winding generally designated **7** (FIG. 3).

The core **6** is formed of a plurality of ferrous metal laminations **8** which are shaped to provide curved end portions **9** and recesses at each end as at **10**. The ferrous metal laminations **8** are stacked together in any approved manner and coil retaining end plates are secured thereon and are generally designated **12**. The coil engaging end plates **12** are formed from a stamping shown in FIGURE 2 which is blanked to form a central opening **11** in the aluminum plate structure **13**. The plate structure is relatively thin and can be formed of aluminum or other relatively thin metals or sheets in the order of $\frac{1}{32}$ of an inch and of sufficient rigidity to retain the coil engaging end plate **12** in position. Extending into the central rectangular opening **11** is a slot **14** arranged to prevent eddy currents when the coil is electrically energized. The entrance portions of said slot **14** are curved as at **15** and the metallic plate **13** is blanked to provide corner openings **16**. The central opening **11** is substantially rectangular and includes a wall edge **18** disposed in opposed relation from an interrupted wall edge **19**. The wall edges **18** and **19** of the stamping **13** are spaced a distance substantially equal to the top and bottom edges of the ferrous metal core **6** so as to permit sliding movement thereover when the

coil and end plates are assembled. In addition to the lower and upper wall edges **18** and **19** of the opening **11** the stamping **13** is provided with opposed wall edges **21** and **22** which are spaced a smaller distance than the horizontal dimension of the core **6** or of the stack of metallic core laminations **8**.

When the metallic plate **13** is stamped from a piece of sheet stock of substantially rectangular shape the slot **14**, edges **15**, openings **16** and central opening **11** are blanked at the same time and in addition the sheet metal plate **13** is sheared or cut along the lines **23** and **24** to provide oppositely extending slotted portions directed parallel with one another and forming extensions **25** and **26**.

After the coil engaging metallic plates **12** are stamped and blanked from a rectangular sheet of metal **13**, they are assembled on the ends of the core **6** and a coil winding **28** (shown in dotted lines in FIG. 3) is then assembled on the core **8**. An insulating sheath may be provided for the coil **7** as at **29**. When the projections **25** and **26** are flexed as shown in FIG. 3 a corner of the edges **21** and **22** frictionally engages the flat sides of the outermost laminations **8**, and said sharp corners form biting edges which grip the side walls of the outermost laminations and frictionally hold the end walls **12** in place and in assembled relation with respect to the winding **28**.

In the form of the invention shown in FIGURE 4 the reference character **5'** will generally be employed to represent an electro-magnetic coil having a ferrous metal core generally designated **6'** and provided with a coil winding generally designated **7'**. As before, the core **6'** is formed of a series of ferrous metal laminations **8'** and each of the laminations are shaped to provide end grooves **10'**.

The end wall engaging plates are formed in pairs, that is a pair of end wall plates **13'** and **13** which are identical another pair of end wall plates **13''** which are also identical in construction. All of the end wall plates are blanked from sheet metal as pointed out in connection with the invention shown in FIGURE 1, and while aluminum is preferred due to its high rate of heat conductivity, obviously other metals and materials can be used in lieu thereof. The end plate stampings **13'** are blanked to provide substantially plate-like members having upper and lower parallel edges **30** and **31** and inner and outer edges **32** and **33**. When the pair of end plate members **13'** are blanked a slot is formed extending inwardly from the inner edge **32** as at **36**. During the blanking operation the plates **13'** are cut along the parallel lines **36** (FIG. 6) and the remaining metal is bent along a transverse area as at **38** to form lug members **39**. As shown in FIGURE 4 the lug members **39** are provided with openings adapted to register with corresponding openings in the metallic laminations **8'** for receiving a transversely extending set of rivets or other fasteners **40**.

When the end wall plates **13'** are stamped, they are also blanked with projections **41** which are adapted to be inserted in suitable openings on an insulated terminal strip of a motor or similar device.

The set of end plates **13''** are similar to the end plates **13'** and are provided with struck up lugs **39** by cutting the metal sheet **13''** along inwardly directed spaced lines **36'**. The remaining metal being bent to form an inwardly and oppositely directed lug which is provided with suitable openings for receiving the fastening element **40**. The pair of end plates **13''** may be bent along their outer end as at **45** and provided with openings **46** to permit the coil assembly to be mounted on suitable brackets and terminal plates.

In assembly the coil winding **7'** is arranged on the core **6'** and the stampings **13'** and **13''** are arranged in sets to provide one end wall member formed from a set of stampings **13'** and **13''** at one end of the coil, and another set of stampings **13'** and **13''** to form a wall at the other end of the coil. The sets of stampings forming the end walls are spaced as at **47** to provide eddy current gaps.

The longer pairs of stampings **13''** forming the end wall for a half of one end wall at each end of the coil provide relatively large surfaces for heat conducting and when the relatively large bent portion **45** is connected to a frame of a product or the like, heat generated by the induction coil when the coil winding **7'** is energized will be rapidly conducted therethrough to the product structure on which the motor is mounted.

In the form of the invention shown in FIG. 5 the ferrous metal core **6''** is substantially the same as shown in FIG. 4 and is formed by a series of ferrous metal laminations **8''**. The coil **7''** is mounted on the core **6''** and the stampings forming the end plates **13'** and **13''** are the same as described in FIG. 4 and are arranged in sets on the core **6''** to form the end walls for the coil **7''**. The stampings forming the end plates **13'** are slotted inwardly as at **36'** from their inner edges **32'** along spaced parallel lines to provide upstruck tongues **50** which extend outwardly in opposite directions and are secured to the stack of core laminations **8''** by means of a rivet or the like as at **51**.

In assembly the coil section or sections **7''** are assembled on the core **6''** and the sets of stampings forming the end walls are assembled on the cores so that the upstruck lugs **50** will be held in place by the rivet or other fastener **51** which extends through openings in the core laminations **8''**. Thus, the core laminations are held together and the end wall portions formed by the stampings **13'** and **13''** are secured simultaneously.

The electro-magnetic coil shown in FIGURE 5 can be mounted on a product frame or the like as described in connection with the form of the invention shown in FIGURE 4, and the corner openings **16'** in the pair of end wall forming stampings **13'** shown in FIGURES 4 and 5 can be used similar to the openings **16** shown in FIGURE 1 such as for receiving the electrical conductor of the coils **7'** and **7''**.

The coil windings **7**, **7'** and **7''** are energized by being connected to a source of electrical energy in the conventional manner. When the coils are then energized the magnetic flux flows in a circuitous path from one end on the core **6**, **6'** and **6''**.

The coil structure can thus be used for various electrical devices such as motors, control switches and similar electro-magnetic apparatus.

After the coil end metallic plates **12** are stamped from a rectangular sheet or strip of metal **13**, they are assembled to the ends of the core **6**. This assembly of plates **12** and core **6** is then sprayed on its inside surface with powdered epoxy resin sprayed on a preheated assembly. An alternate method is to use coil end plates **12** stamped from a metallic material in which insulating coating **29** has been applied prior to stamping. In this case the core **6** between plates **12** is wound with an insualting material **29**. The coil form ends **6** are pressed over coil core **6** thereby flexing projections **25** and **26** enough to hold tightly to coil form **6**. Subsequent spraying with insulating material **29** further holds plates **12** in place on core **6**. The combination of the sharp edges of projections **25** and **26** and the coating **29** produce a solid assembly of parts **6** and **12** into a form to receive winding **28** without distortion.

The forms of the invention herewith shown and described are to be taken as preferred embodiments of the invention and various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

What I claim is:

1. An electric coil structure, comprising a laminated core of rectangular section, a coil winding mounted on said core, stamped end plates for retaining said winding on said core, each of said end plates having an opening to provide a core receiving opening, friction gripping lugs on opposed edges of said openings extending obliquely at an angle to said plates and fastener elements extending

through said lugs in said plates and through corresponding openings in said core to hold said end plates in position on said core and to retain the laminations thereof in fixed relation, said end plates and lugs being arranged at the ends of the core with the lugs extending in opposite directions and away from said coil, each of said end plates being provided with a radial slot extending from the opening to the outer edge thereof.

2. An electric coil structure, comprising a core, end plates on said core adapted to retain a coil winding in place thereon, said end plates each having a core receiving opening, a lug on opposite edges of said opening extending at right angles to the end plate, said end plates being arranged at each end of the core with the lugs thereon extending inwardly in opposed relation, and fastener elements extending through openings in said lugs and

through corresponding openings in said core structure to retain said core and plates in an assembled position, each of said plates being slotted to prevent eddy currents.

References Cited by the Examiner

UNITED STATES PATENTS

1,236,357	8/1917	Reeve	336—208
1,690,154	11/1928	Alden	336—210
2,229,373	1/1941	Cole	336—198 X
2,587,097	2/1952	Berlart	336—210 X

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