

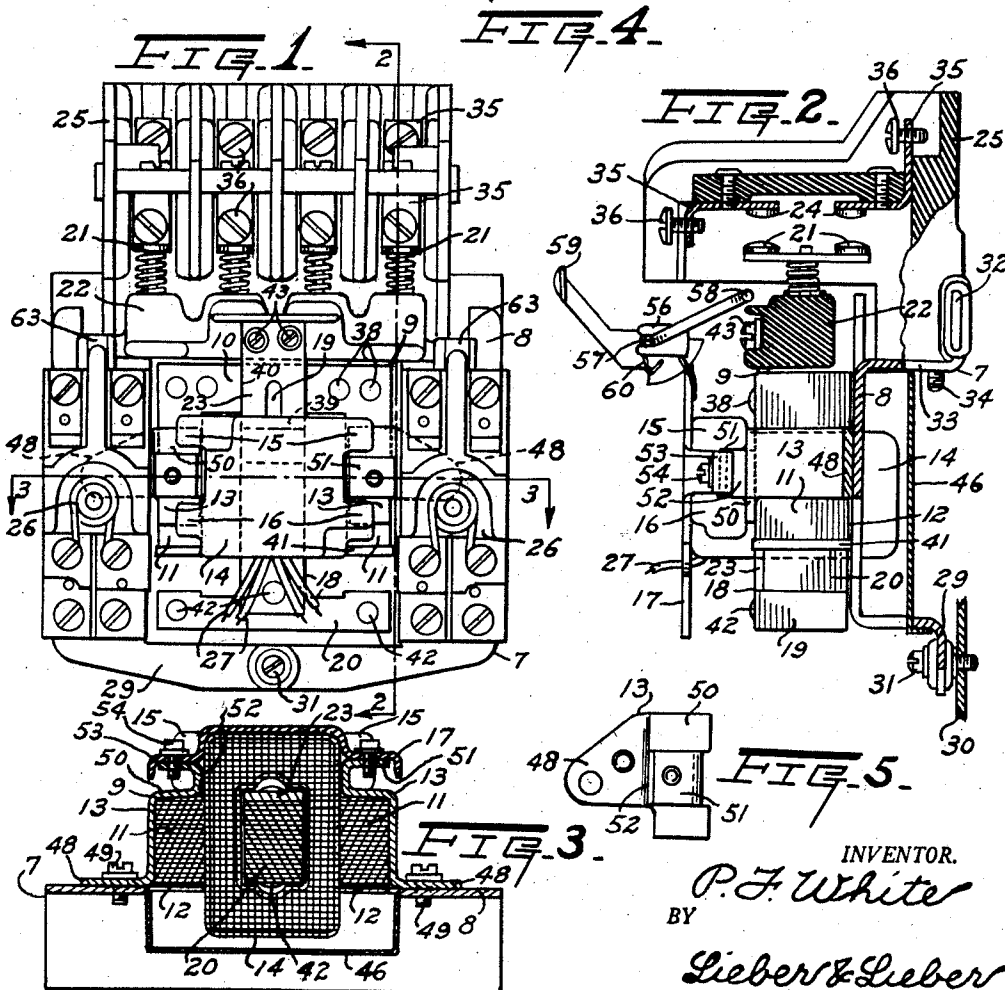
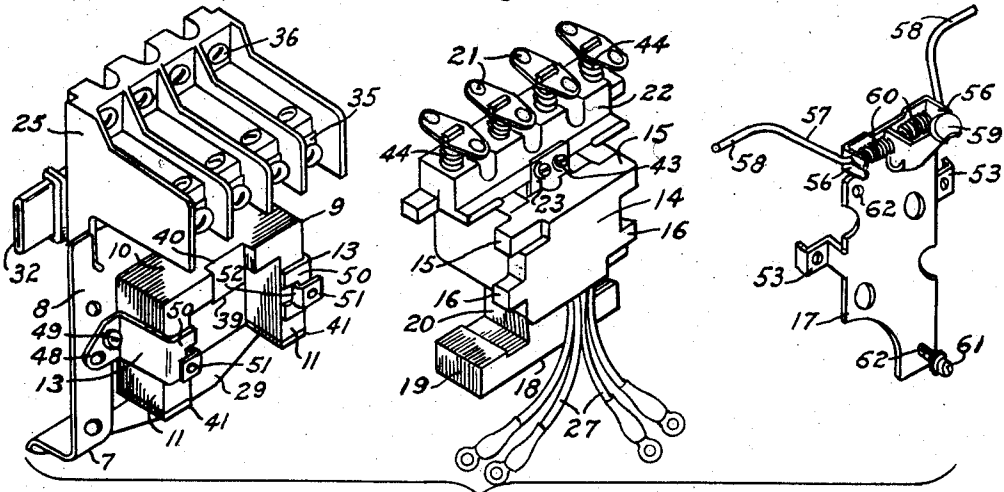
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MAGNETIC SWITCH ASSEMBLAGE

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1

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MAGNETIC SWITCH ASSEMBLAGE

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This invention relates in general to improvements in magnetic switch assemblies for controlling the functioning of various kinds of electrical equipment, and relates more specifically to improvements in the construction and operation of electro-magnets for such switches.

The primary object of the present invention is to provide an improved magnet assembly for electro-magnetically actuated switches, which is simple in structure and highly effective in operation.

An important more specific object of this invention is to provide an improved electro-magnet for vertical magnetic switches, which comprises fewer parts adapted to be more readily assembled and dismantled.

Another important object of the invention is to provide an improved electro-magnet assembly having a pole piece and armature adapted to be energized by a coil, and wherein the energizing coil may be conveniently changed without removing the entire switch assembly from the housing or support.

A further important object of my invention is to provide an improved energizing coil for an electro-magnet, wherein the movable armature is effectively guided directly within a plastic insulating compound in which the coil windings are embedded and sealed.

Still another important object of the present invention is to provide an improved clamping and retaining assembly for the coil and magnet core of an electro-magnet, wherein the energizing coil and the pole piece are normally held in position by means of common brackets while the coil may be independently applied or removed without disturbing the magnet core.

An additional important object of the invention is to provide an improved magnet coil which is extremely durable and well insulated, and cooperates with the core and armature of an electro-magnet to produce maximum efficiency of operation.

These and other more specific objects and advantages of the invention will be apparent from the following detailed description.

A clear conception of the several features constituting the present improvement, and of the construction and operation of a typical magnetic switch assembly embodying the invention, may be had by referring to the drawing accompanying and forming a part of this specification wherein like reference characters designate the same or similar parts in the various views.

Fig. 1 is a front elevation of a commercial magnetic switch of the vertical type adapted to be housed within a cup-shaped casing, but showing the front energizing coil retaining and clamping plate removed and the casing omitted;

Fig. 2 is a vertical section through the switch assembly of Fig. 1, taken along the line 2—2, but showing the coil retainer and clamping plate applied and also showing a fragment of the switch housing casing;

Fig. 3 is a transverse horizontal section through the same magnetic switch assembly, taken along the line 3—3 of Fig. 1;

2

Fig. 4 is an exploded perspective view of the essential parts of the same switch with the overload relays omitted; and

Fig. 5 is a front view of one of the magnet core retaining brackets alone.

While the invention has been shown and described herein as having been embodied in one particular type of commercial magnetic starter adapted to be normally vertically disposed and confined within a cup-shaped casing provided with a front cover, it is not desired or intended to unnecessarily restrict the use of the improved features to such a switch assembly; and it is also contemplated that specific descriptive terms employed herein be given the broadest possible interpretation consistent with the actual disclosure.

Referring to the drawing, the typical improved magnetic switch assembly shown therein, comprises in general a main switch suspension frame 7 having an upright front wall 8; an inverted U-shaped magnet core 9 having an upper bridge portion 10 and integral laterally spaced side poles 11 coacting rearwardly with the frame wall 8 through insulating pads 12; a clamping bracket 13 coacting with the front face of each of the poles 11; an energizing coil 14 normally snugly confined within the core 9 between the poles 11 and having an enclosure provided with opposite side lugs or projections 15, 16 forming intervening recesses engageable with the brackets 13; a clamping plate 17 spanning and coacting with the front face of the coil 14 and being attachable to the brackets 13; an inverted T-shaped armature 18 having a lower cross-bar 19 cooperable with the poles 11 and an integral central stem 20 slidably confined within the hollow interior of the coil 14; movable switch contacts 21 carried by a transverse bar 22 secured to a pusher plate 23 attached to the front of the armature stem 20; fixed contacts 24 mounted within a terminal board 25 secured to the main frame 7; and a pair of overload relays 26 also secured to the frame 7 on opposite sides of the magnet assembly and being connectible with the coil 14 by conductors 27.

The main switch suspension frame 7 may be formed of relatively stiff sheet metal with the aid of punches and dies, and is provided with an integral lower flange 29 adapted to be clamped to a housing casing 30 by means of a screw 31 as shown in Fig. 2, while its upper portion is provided with a pair of integral opposite side extensions 32 capable of being applied to hooks formed within the casing 30 in a well known manner so as to normally maintain the frame 7 in upright position when the switch is in use. The terminal board 25, which supports the fixed contacts 24, is formed of insulation and is firmly attached to a top wall 33 of the frame 7 by screws 34, and this terminal board is provided with contact carriers 35 to which the contacts 24 are firmly secured and to which conductors may also be secured with the aid of terminal screws 36.

The inverted U-shaped magnet core 9 is formed of ferrous laminations clamped together by rivets 38, and the bridge portion 10 of this core is provided with a central projection 39 adapted to extend downwardly into the coil 14 and the bridge portion 10 also has a recess 40 formed therein for guiding the pusher plate 23, see Figs. 1 and 4. The lower extremities of the core poles 11 are provided with shading coils 41, and the inverted T-shaped armature 18 is also formed primarily of ferrous laminations clamped together and to the heavier pusher plate 23 by rivets 42. The upper end of the pusher plate may be firmly but detachably secured to the contact carrier bar 22 by means of screws 43, and this bar is formed of insulation and resiliently supports the movable contacts 21 through springs 44 in a well known manner.

The magnet energizing coil 14 and its mounting con-

stitute an important part of the present improvement, and the windings of this coil are completely embedded and hermetically sealed as by moulding, within a durable plastic enclosure which is vibration resistant, impervious to dirt, acids and alkalis, and provides a smooth and wear resistant bearing surface for the reciprocating stem 20 and contact pusher plate 23 of the magnet armature 18. These plastic impregnated and insulated enclosures for the coils 14 may be obtained in various colors, and the opposite side projections 15, 16 are formed integral with the annular plastic bodies and are cooperable with the adjacent bracket portions 50 so as to properly position the armature 18 relative to the magnet core 9 when the assemblage has been completed as in Figs. 1, 2 and 3. When in normal position, the rear portion of the coil 14 may also be protected by a shield trough 46 secured to the main frame 7 as illustrated in Figs. 2 and 3, and the internal opening through the center of the coil 14 is formed to properly guide the armature during its reciprocation but is recessed as shown in Fig. 3 in order to clear the rivets 42.

The side brackets 13 and the clamping plate 17 likewise constitute an important part of the invention and these elements may also be formed of sheet metal with the aid of punches and dies. Each of the brackets 13 has a rear outwardly extending flange 48 adapted to be firmly but detachably secured to the front wall 8 of the main frame 7 by means of a screw 49, and each of these brackets 13 also has an inwardly extending medial portion 50 which is clampingly cooperable with the outer face of the adjacent magnet pole 11, see Figs. 1 to 5 inclusive. The front end of each bracket 13 is furthermore provided with an outwardly extending flange 51 connected with the adjacent bracket portion 50 by an outwardly projecting wall 52 adapted to snugly engage the adjacent side of the coil 14 between its lugs 15, 16, and the clamping plate 17 has opposite side flanges 53 adapted to be firmly but detachably secured to the flanges 51 by means of screws 54.

The clamping plate 17 as illustrated, is of the type which carries mechanism for resetting the thermal overload relays 26 secured to the main frame 7 on the opposite sides of the electro-magnet assemblage, but this plate 17 need not necessarily carry such mechanism. As shown, the clamping plate 17 has a pair of spaced forwardly extending bearing flanges 56 formed integral with its upper end, and a rod 57 having opposite end cranks 58 has its medial portion journaled in the flanges 56 and provided with a reset arm 59. The cranks 58 are adapted to engage reset plungers 63 embodied in the two relays 26 when the arm 59 is swung rearwardly, and a pair of coil springs 60 coact with the arm 59 and with the plate 17 to normally maintain the cranks 58 in inactive position, see Figs. 2 and 4. A device such as a pushbutton starting and stopping switch may also be mounted upon the front face of the plate 17 with the aid of screws 61 coacting with threaded openings 62 in the plate, in a well known manner.

When the various parts of the magnetic switch have been properly constructed as described, the inverted U-shaped core 9 may be firmly clamped against the upright front wall 8 of the main frame 7 with the aid of the two side brackets 13 and the attaching screws 49, and the terminal board 25 with the fixed contacts 24 mounted therein may be likewise clamped against the upper frame wall 33 by means of the screws 34. The plastic impregnated coil 14 may then be slipped rearwardly into place between the core poles 11 and beneath the bridge portion 10, after the transverse movable contact carrier bar 22 with the movable contacts 21 applied thereto has been loosely inserted within the terminal board 25. The clamping plate 13 may be subsequently applied to the front face of the coil 14 with its flanges 53 in engagement with the outer bracket flanges 51 whereupon the screws 54 may be applied to clamp the opposite side lugs 15, 16 of the coil 14 against the medial bracket

portions 50 on the opposite sides of the flanges 51. The armature stem 20 and guide plate 23 may then be inserted upwardly through the hollow interior of the coil 14, whereupon the cross-bar 22 may be firmly attached to the upper end of the plate 23 with the aid of the screws 43 to substantially complete the switch assemblage.

The conductors 27 may be connected to the thermal overload relays 26 and the entire assemblage may be mounted within a casing 30 with the aid of the side projections 32 of the frame 7 and of the screw 31 coacting with the lower frame flange 29, and in order to subsequently remove the coil 14 it is only necessary to release the conductors 27 from the relays 26, to remove the screws 54 and the clamping plate 17, and to release the screws 43, whereupon the armature 18 will drop out of the coil 14 and the latter may be freely withdrawn from the core 9 without releasing the clamping brackets 13 from the main frame 7 and without removing the major portions of the switch from the casing 30. The brackets 13 firmly but detachably hold the magnet core 9 against lateral displacement and the medial portions 50 of these brackets effectively clamp this core 9 against the pads 12 and frame wall 8, and the coil 14 is formed so that when the lugs 15, 16 are clamped against the bracket portions 50 the hollow interior of the coil will accurately guide the armature stem 20 and pusher plate 23 in a manner whereby the movable contacts 21 will most effectively coact with the fixed contacts 24.

It will thus be apparent that the present invention in fact provides an improved magnetic switch assemblage which besides being simple and durable in construction, functions with utmost precision and may be readily assembled or dismantled by merely manipulating a few screws. The impregnation and embedment of the magnet energizing coil 14 within wear and vibration resistant plastic which is impervious to liquid and other foreign matter, not only simplifies the assemblage but also provides an efficient and durable guide for the reciprocable armature 18 which will outlast metallic guides of far more complicated construction. The convenient removability of the coil 14 is an important factor in minimizing loss of time in case a coil must be replaced; and the improved coil 14, brackets 13 and clamping plate 17 are constructed so that they may be readily applied to existing magnetic switches of the same general type in the field. The invention has proven highly satisfactory and successful in actual commercial use and may be embodied in various types of vertical magnetic switches having gravity actuated armatures for opening the switch contacts.

It should be understood that it is not desired to limit this invention to the exact details of construction and operation of the magnet assemblage shown and described herein, since various modifications within the scope of the appended claims may occur to persons skilled in the art.

I claim:

1. In an electro-magnet, a frame having an upwardly directed wall, an inverted U-shaped magnet core having laterally spaced downwardly directed opposite side poles coacting with said frame wall, an independent clamping bracket located adjacent to each of said poles and each having inner and outer flanges directed away from the adjacent pole and also having an intermediate portion clampingly engaging the adjacent pole and connected by an outwardly projecting laterally offset wall with the adjacent outer flange, means attaching the inner bracket flanges to said frame wall, an annular energizing coil confined within said core between said poles and being directly engaged on its opposite sides by said bracket walls, a clamping plate spanning and coacting with said coil, means for detachably securing the opposite ends of said plate to said outer bracket flanges, and an inverted T-shaped armature having a lower cross bar cooperable

5

with the lower ends of said poles and also having a central stem slidable within said annular coil.

2. In an electro-magnet, a frame having an upwardly directed wall, an inverted U-shaped magnet core having a bridge portion and laterally spaced opposite side poles depending from said bridge portion and coacting with said frame wall, an independent clamping bracket located adjacent to each of said poles and each having inner and outer flanges directed away from the adjacent pole and also having an intermediate portion directed toward and clampingly engaging the adjacent pole and connected by an outwardly projecting laterally offset wall with the adjacent outer flange, means detachably securing the inner bracket flanges to said frame wall, an annular energizing coil confined within said core between said poles and beneath said bridge portion and being directly engaged on its opposite sides by said bracket walls, a clamping plate spanning and coacting with said coil, means for detachably securing the opposite ends of said plate to said outer bracket flanges, and an inverted T-shaped armature having a lower cross bar cooperable with the lower ends of said poles and also having a central stem slidable within said annular coil and guided for reciprocation upon said core bridge portion.

3. In an electro-magnet, a frame having an upwardly directed wall, an inverted U-shaped magnet core having laterally spaced downwardly directed opposite side poles coacting with said frame wall, an independent clamping bracket located adjacent to each of said poles and each having inner and outer flanges directed away from the adjacent pole and also having an intermediate portion directed toward and clampingly engaging the adjacent pole, means detachably securing the inner bracket flanges to said frame wall, an annular energizing coil confined within said core between said poles and having an enclosure provided with opposite side recesses coacting with said intermediate bracket portions, a clamping plate spanning and coacting with said coil, means for detachably securing the opposite ends of said plate to said outer bracket flanges, and an inverted T-shaped armature having a lower cross bar cooperable with the lower ends of said poles and also having a central stem slidable within said annular coil.

4. In an electro-magnet, a frame having an upwardly directed wall, an inverted U-shaped magnet core having laterally spaced downwardly directed opposite side poles coacting with said frame wall, an independent clamping bracket located adjacent to each of said poles and each having inner and outer flanges directed away from the adjacent pole and also having an intermediate portion clampingly engaging the adjacent pole, means detachably securing the inner bracket flanges to said frame wall, an annular energizing coil confined within said core between said poles and having an enclosure provided with opposite side projections cooperable with said intermediate bracket portions, a clamping plate spanning and coacting with said coil, means for detachably securing the opposite ends of said plate to said outer bracket flanges, and an inverted T-shaped armature having a lower cross bar cooperable with the lower ends of said poles and also having a central stem slidable within said annular coil.

5. In an electro-magnet, a frame having an upwardly directed wall, an inverted U-shaped magnet core having a bridge portion and integral laterally spaced opposite side poles depending from said bridge portion and coacting with said frame wall, a clamping bracket located adjacent to each of said poles and each having inner and outer flanges directed away from the adjacent pole and also having an intermediate portion directed toward and clampingly engaging the adjacent pole, detachable means for securing the inner bracket flanges to said frame wall, an

6

annular energizing coil confined within said core between said poles and having a plastic enclosure provided with opposite side recesses coacting with said intermediate bracket portions, a clamping plate spanning and coacting with said coil, detachable means for securing the opposite ends of said plate to said outer bracket flanges, and an inverted T-shaped armature having a lower cross bar cooperable with the lower ends of said poles and also having a central stem guided in said core bridge portion and slidable within said annular coil.

6. In an electro-magnet, a frame having an upwardly directed wall, an inverted U-shaped magnet core having an upper bridge portion and integral laterally spaced opposite side poles depending from said bridge portion and coacting with said frame wall, a clamping bracket located adjacent to each of said poles and each having inner and outer flanges directed away from the adjacent pole and also having an intermediate portion directed toward and clampingly engaging the adjacent pole, detachable means for securing the inner bracket flanges to said frame wall, an annular energizing coil confined within said core between said poles and having a plastic enclosure provided with opposite side projections cooperable with said intermediate bracket portions, a clamping plate spanning and coacting with said coil, detachable means for securing the opposite ends of said plate to said outer bracket flanges, and an inverted T-shaped armature having a lower cross bar cooperable with the lower ends of said poles and also having a central stem guided in said core bridge portion and slidable within said annular coil.

7. In an electro-magnet, an upright frame, a magnet having laterally spaced downwardly directed opposite side poles coacting with said frame, a clamping bracket adjacent to each of said poles and each having inner and outer flanges directed away from the adjacent pole and also having an intermediate portion clampingly engaging the adjacent pole and connected by an outwardly extending laterally offset wall with the adjacent outer flange, means attaching said inner bracket flanges to said frame, an energizing coil confined between said magnet poles and being directly engaged on its opposite sides by said bracket walls, a clamping plate coacting with said coil and being secured to said outer bracket flanges, and an armature slidable within said coil and having a cross-bar cooperable with said poles.

8. In an electro-magnet, an upright sheet metal frame, a magnet having laterally spaced downwardly directed opposite side poles coacting with said frame, a unitary sheet metal clamping bracket adjacent to each of said poles and each having inner and outer flanges directed away from the adjacent pole and also having an intermediate portion clampingly engaging the adjacent pole and connected by an integral outwardly extending laterally offset wall with the adjacent outer flange, means attaching said inner bracket flanges to said frame, an energizing coil confined between said magnet poles and having recesses on its opposite sides engaged by said bracket walls, a clamping plate spanning and coacting with said coil and being secured to said outer bracket flanges, and an armature slidable within said coil and having a cross-bar cooperable with said poles.

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