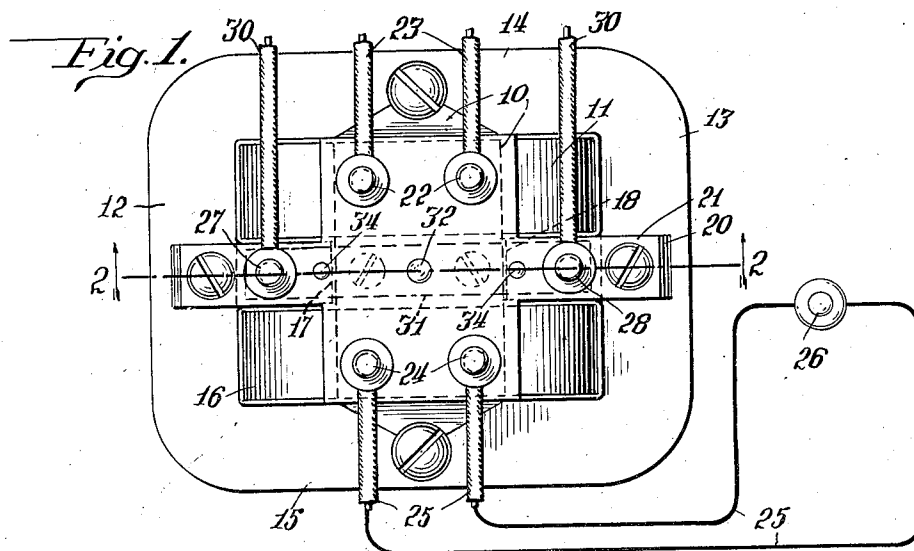
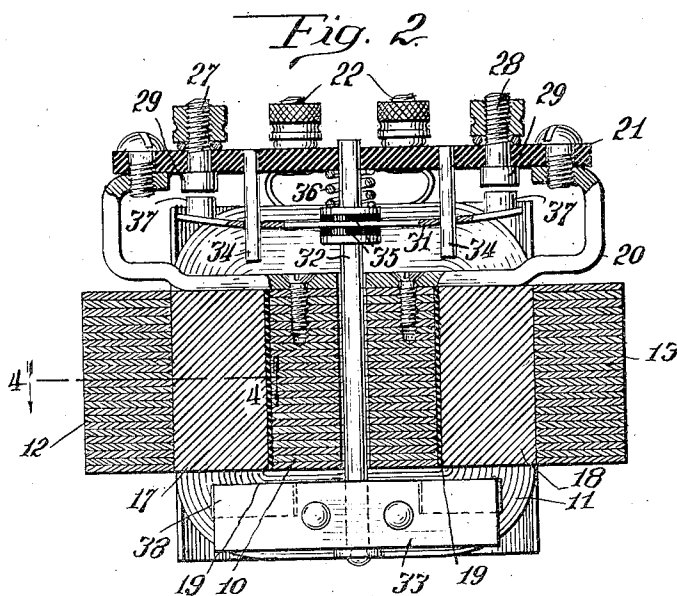
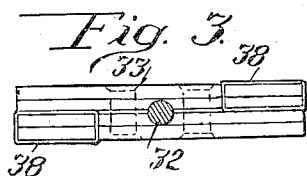
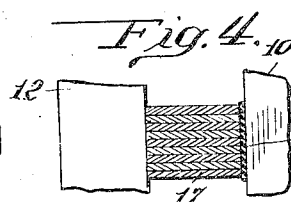


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ELECTRICALLY OPERATED SWITCH
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ELECTRICALLY OPERATED SWITCH

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7 Claims. (Cl. 200—102)

My invention relates to electrically operated switches and it has for its object the provision of a new and improved form and arrangement of parts whereby a minimum of apparatus shall be effective for obtaining the desired results. Heretofore it has been customary to employ a transformer to be connected with the usual commercial circuit lines carrying alternating current for producing current of low voltage suitable for energization of a separate relay for operating a switch and capable of being controlled safely by the use of an ordinary push button. It is the object of my invention to provide an improved combination of parts comprising a transformer adapted to be energized by an alternating current from any available source and arranged so as to have its action controlled so as to be made operative or inoperative at will by the manipulation of a push button or the like connected in a control circuit carrying a current of low voltage for actuating an armature adapted in turn to operate a switch. It is one of the objects of my invention to provide an arrangement of this type in which the armature is actuated by the magnetic field set up in the core of the transformer whereby the necessity for the use of a separate relay is obviated.

It is another object of my invention to improve devices of this type in sundry details hereinafter pointed out. The preferred means by which I have accomplished my several objects are illustrated in the drawing and are hereinafter specifically described. That which I believe to be new and desire to cover by Letters Patent is set forth in the claims.

In the drawing,—

Fig. 1 is a top plan view of my improved device, including a diagrammatic showing of a control circuit connected with the secondary coil of the device;

Fig. 2 is a central vertical sectional view, taken substantially at line 2—2 of Fig. 1 but with certain of the parts shown in elevation;

Fig. 3 is a top plan view of the switch armature as shown in Fig. 2, with the mounting rod shown in section; and

Fig. 4 is a fragmentary detail view, being a sectional view taken at line 4—4 of Fig. 2.

Referring now to the several figures of the drawing, in which corresponding parts are indicated by the same reference characters, 10 indicates a core bar upon which a primary coil 11 is mounted. In the arrangement shown, the ends of the core bar 10 are connected by means of auxiliary core means comprising core bars 12

and 13 in spaced relation to the bar 10 at opposite sides thereof, and end core bars 14 and 15. In the arrangement shown the core means as above set forth constitute a double loop arrangement, each of the side core bars 12 and 13 being connected in loop formation with the bar 10 so as to provide all-metal return paths for any magnetic flux set up in the bar 10.

Upon the core bar 10 is spaced relation to the coil 11, I have provided a secondary coil 16 in transformer relationship to the coil 11, such coil 16 being of the required number of turns for producing therethrough an induced current of the desired low voltage. Across the loop at opposite sides of the device between the coils 11 and 16, I have provided shunt core members 17 and 18 which in the arrangement shown are mounted flush against the faces of the side core bars 12 and 13 respectively but are provided with air gaps at their inner ends adjacent to the core bar 10, the air gaps in the arrangement shown having members 19 of fiber or other non-magnetic material mounted snugly therein so as to hold the shunts by a frictional grip in position in spaced relation to the bar 10.

Upon the face of the core, being the upper face in the arrangement shown in Fig. 2, I have mounted a bracket 20 upon the upper ends of which in turn is mounted a plate 21 of insulating material. Upon the plate 21 I have mounted binding posts 22 connected with the coil 11 for connection therewith of leads 23 from a source of electric power, such as the line wires of an ordinary commercial circuit furnishing alternating current. At the opposite end of the device, I have mounted binding posts 24 upon the insulating plate 21, such binding posts being connected with the coil 16 and serving to connect therewith leads 25 of an auxiliary circuit having an ordinary push button 26 connected therein.

As will be readily understood by those skilled in the art, when the circuit through the coil 16 is open, with the leads 23 connected with a suitable source of alternating current, only a small exciting current will flow through the coil 11 serving to establish a magnetic flux through the core. Under such circumstances, practically none of the flux passes through the shunts 17 and 18. When, however, the circuit through the coil 16 is closed, a part of the flux threading the primary coil 11 is diverted through the shunts 17 and 18 and across the air gaps. In the arrangement shown, the parts are so arranged as to provide a current of low voltage through the coil 16 as compared with the voltage and amperage of the cur-

rent available through the leads 23. Under these circumstances, it is perfectly safe to open and close the circuit 25 by the use of a push button, the push button thus controlling the flow of work current through the coil 11.

Upon the insulating plate 21 I have mounted additional binding posts 27 and 28 which are provided upon their lower ends with contact members 29, the binding posts serving for the connection of leads 30 for delivery of current in series therethrough to any desired work devices. For connecting the contacts 29, I have provided a resilient switch member 31 of conductor material which is disposed below the contacts 29 so as to be movable into engagement therewith for completing the circuit from one lead 30 to the other. In the arrangement shown, the resilient switch member 31 is mounted upon and supported by an operating arm 32 in the form of a rod extending upwardly through an opening in the core bar 10 and provided upon its lower end with an armature 33 of magnetic material in bridging relation with respect to the air gaps between the shunts and said core bar 10. The switch member 31 is held movably in position by means of guide pins 34 depending from the plate 21 and extending through openings in the switch member. As is clearly shown in Fig. 2, the switch member 31 is effectively insulated with respect to the operating arm 32 by the use of insulating members 35 of any approved form. The operating arm 32 and armature 33 are normally held in their lowermost position as shown in Fig. 2, with the armature spaced downwardly away from the core means by the use of a spring 36 interposed between the plate 21 and the means for mounting the switch member 31 in position on said arm.

In operation, with the parts in the condition and position as shown in the drawing, when the push button 26 is operated for closing the circuit through the coil 16, a current of low voltage is induced in the coil 16 and the circuit 25, a work current of corresponding volt-amperes strength being caused to flow through the coil 11 whereby a magnetic field is produced within the shunts 17 and 18. The armature 33 is then drawn upwardly against the action of the spring 36 serving to bring contacts 37 carried by the switch member 31 into engagement with the contacts 29 so as to electrically connect said contacts 29. In the arrangement shown, the resilient switch member 31 is bowed downwardly at its intermediate portion and the arrangement is such that the continued upward movement of the armature 33 and rod 32 after engagement is established between the contacts 37 and 29 serves to partially straighten the switch member so as to give the contacts 37 a wiping engagement with the contacts 29. In the arrangement shown, the armature 33 is provided with loops or coils 38 preferably of copper about portions of the armature, which is preferably made of iron, whereby a shading coil effect is obtained for holding the armature in engagement with the face of the core without vibration during the period when an alternating flux is being produced in the shunts 17 and 18. This effect is produced by the reaction of magnetic fields set up by currents traversing the loops 38 with the field in the core means and the field in the armature, all as is well understood by those skilled in the art.

By the use of my improved arrangement, I am enabled to control a switch adapted to handle a heavy current by the use of a push button in a circuit carrying at a maximum a current of low

voltage. This is accomplished in my arrangement by the use of a minimum of apparatus combined in a novel manner for producing an improved cooperative effect.

I claim:—

1. In a device of the type described, the combination of a core in the form of a closed loop comprising a core bar and auxiliary core means connecting the ends of the bar providing a return path for magnetic flux set up in said bar, a coil 10 on said core loop adapted when energized by an alternating current to produce an alternating magnetic flux in said loop, shunt core connections across said loop adjacent to said coil and including an air gap therein, a second coil on said core loop on the opposite side of said shunt core connections from that at which said first named coil is located adapted when connected in a closed circuit to carry an induced current which in turn causes a portion of the flux to be diverted to said shunt core connections from that part of the loop upon which said second coil is mounted, an armature yieldingly mounted in position to bridge said air gap and capable of having a magnetic field established therein so as to be attracted toward said shunt core connections when the circuit is closed through said second coil, and means adapted by reaction with the field in said armature and the field in said core to prevent vibratory movement of said armature as the flux is successively reversed in said core.

2. In a device of the type described, the combination of a core in the form of a closed loop comprising a core bar and auxiliary core means connecting the ends of the bar providing a return path for magnetic flux set up in said bar, a coil on said core loop adapted when energized by an alternating current to produce an alternating magnetic flux in said loop, shunt core connections across said loop adjacent to said coil and including an air gap therein, a second coil on said core loop on the opposite side of said shunt core connections from that at which said first named coil is located adapted when connected in a closed circuit to carry an induced current which in turn causes a portion of the flux to be diverted to said shunt core connections from that part of the loop upon which said second coil is mounted, an armature of magnetic material yieldingly mounted in position to bridge said air gap so as to be attracted toward said shunt core connections when the circuit is closed through said second coil, and shading coil means carried by said armature for preventing vibratory movement of the armature as the flux is successively reversed in said core.

3. In a device of the type described, the combination of a core in the form of a closed loop comprising a core bar and auxiliary core means connecting the ends of the bar providing a return path for magnetic flux set up in said bar, a coil on said core loop adapted when energized by an alternating current to produce an alternating magnetic flux in said loop, shunt core connections across said loop adjacent to said coil and including an air gap therein, a second coil on said core loop on the opposite side of said shunt core connections from that at which said first named coil is located adapted when connected in a closed circuit to carry an induced current which in turn causes a portion of the flux to be diverted to said shunt core connections from that part of the loop upon which said second coil is mounted, an armature yieldingly mounted in position to bridge said air gap

and capable of having a magnetic field established therein so as to be attracted toward said shunt core connections when the circuit is closed through said second coil, means located in the magnetic field adapted by reaction therewith to prevent vibratory movement of the armature as the flux is reversed successively in said core, line contacts carried by said core means, switching means for operatively connecting said line contacts, and means for moving said switching means by power from said armature for closing the switching means when said armature is given an operative movement with respect to the core.

4. In a device of the type described, the combination of a core in the form of a closed loop comprising a core bar and auxiliary core means connecting the ends of the bar providing a return path for magnetic flux set up in said bar, a coil on said core loop adapted when energized by an alternating current to produce an alternating magnetic flux in said loop, shunt core connections across said loop adjacent to said coil and including an air gap therein, a second coil on said core loop on the opposite side of said shunt core connections from that at which said first named coil is located adapted when connected in a closed circuit to carry an induced current which in turn causes a portion of the flux to be diverted to said shunt core connections from that part of the loop upon which said second coil is mounted, an armature movably mounted in position to bridge said air gap and capable of having a magnetic field established therein so as to be attracted toward said shunt core connections when the circuit is closed through said second coil, means carried by said armature and located in the field of the flux diverted through said shunt connections adapted by reaction therewith to prevent vibratory movement of the armature as the flux is reversed successively in said core, an operating arm connected with said armature so as to be moved thereby, yielding means for holding said armature normally in spaced relation to said core, a switch member carried by said operating arm, and line contacts carried by said core means in position to be electrically connected by said switch member when said armature is moved toward said core.

5. In a device of the type described, the combination of a core in the form of a closed loop comprising a core bar and auxiliary core means connecting the ends of the bar providing a return path for magnetic flux set up in said bar, a coil on said core loop adapted when energized by an alternating current to produce an alternating magnetic flux in said loop, shunt core connections across said loop adjacent to said coil and including an air gap therein, a second coil on said core loop on the opposite side of said shunt core connections from that at which said first named coil is located adapted when connected in a closed circuit to carry an induced current which in turn causes a portion of the flux to be diverted to said shunt core connections from that part of the loop upon which said second coil is mounted, an armature movably mounted in position to bridge said air gap and capable of having a magnetic field established therein so as to be attracted toward said shunt core connections when the circuit is closed through said second coil, means carried by said armature and located in the field of the flux diverted through said shunt connections adapted

by reaction therewith to prevent vibratory movement of the armature as the flux is reversed successively in said core, a bracket mounted on the face of said core means opposite the face at which said armature is mounted, line contacts carried by said bracket, an operating arm connected with said armature and extending into position between said line contacts, yielding means for holding said armature normally in spaced relation to said core, and a switch member carried by said operating arm in position for electrically connecting said line contacts when said armature is moved toward said core.

6. In a device of the type described, the combination of a core in the form of a closed loop comprising a core bar and auxiliary core means connecting the ends of the bar providing a return path for magnetic flux set up in said bar, a coil on said core loop adapted when energized by an alternating current to produce an alternating magnetic flux in said loop, shunt core connections across said loop adjacent to said coil and including an air gap therein, a second coil on said core loop on the opposite side of said shunt core connections from that at which said first named coil is located adapted when connected in a closed circuit to carry an induced current which in turn causes a portion of the flux to be diverted to said shunt core connections from that part of the loop upon which said second coil is mounted, an armature movably mounted in position to bridge said air gap and capable of having a magnetic field established therein so as to be attracted toward said shunt core connections when the circuit is closed through said second coil, means carried by said armature and located in the field of the flux diverted through said shunt connections adapted by reaction therewith to prevent vibratory movement of the armature as the flux is reversed successively in said core, a bracket mounted on the face of said core means opposite the face at which said armature is mounted, a plate of insulating material mounted on said bracket across the face of the core, line contacts mounted on said insulating plate, an operating rod connected with said armature and extending through an opening in the core into position between said line contacts, yielding means for holding said armature normally in spaced relation to said core, and a resilient switch member of conductor material carried by said operating rod and insulated from said core and bowed downwardly at its intermediate portion in position for electrically connecting said line contacts when said armature is moved toward said core and adapted to have a wiping engagement with said line contacts as said armature moves to the limit of its motion toward the core.

7. In a device of the type described, the combination of a core in the form of a closed loop comprising a core bar and auxiliary core means connecting the ends of the bar providing a return path for magnetic flux set up in said bar, a coil on said core loop adapted when energized by an alternating current to produce an alternating magnetic flux in said loop, a second coil on said core loop in spaced transformer relationship to said first named coil, means comprising an armature movable toward and from said loop and normally standing in spaced relation to the loop adapted in cooperation with the loop to provide a shunt connection about said first named coil independently of said second coil and adapted normally to include an air gap in the connection so as to cause the flux normally to be carried

by the loop independently of the shunt connection, the arrangement being such that said second coil when the circuit is closed therethrough carries an induced current which causes a portion of the flux to pass through the armature whereby the armature is moved by magnetic at-

traction toward the loop, an electric switch connected with said armature and operated thereby, and means for preventing vibratory movement of said armature as the flux is successively reversed in said core.

JOSEPH G. SOLA.