

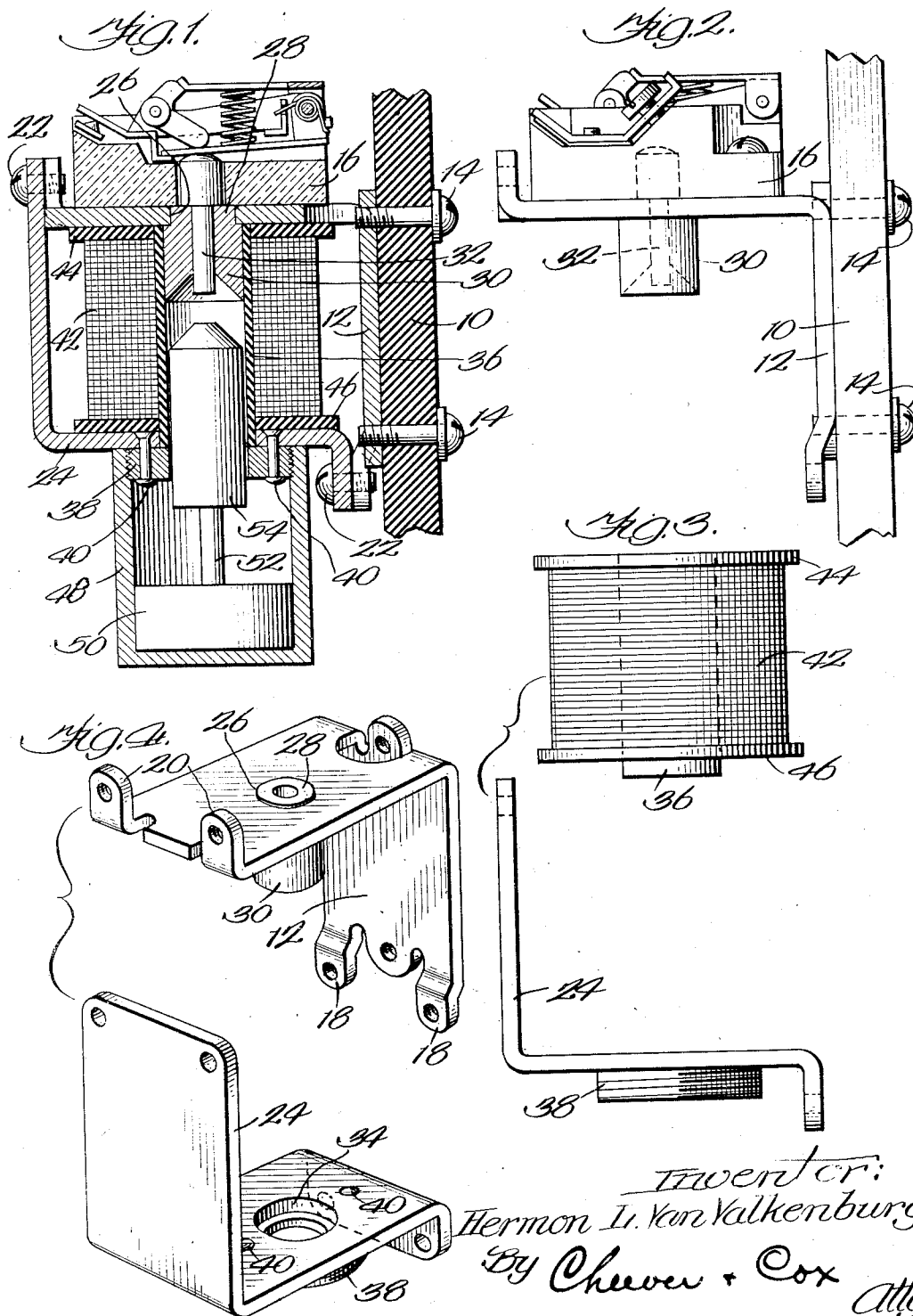
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SOLENOID

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UNITED STATES PATENT OFFICE.

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SOLENOID.

Application filed May 27, 1925. Serial No. 33,095.

My invention relates to solenoids and mountings therefor, especially solenoids for operating switches and similar electrical devices. My solenoid is especially useful, among other things, for time limit relays in which the electro-magnetic coils are subject at times to excessive current values, which sometimes ruin the insulation on the conductor and therefore necessitate replacement. One of the objects of my invention is to provide means by which the coils may be readily replaced. It will be understood that coils sometimes burn out or otherwise become damaged and need to be replaced. Also it is sometimes desirable to change a motor starter from one rating to another, and frequently the only change necessary is in the size of the overload relay coils. Also it is sometimes necessary to make such changes during the course of manufacture. Again by making the coils readily interchangeable different capacities may be kept in stock and inserted on order. My purpose is to provide a construction by which these things may be readily accomplished. Another object is to provide a construction such that when a coil is to be replaced it may be done without detaching the main frame from the supporting panel nor disturbing the contact mechanism or leads connecting thereto. In this connection it is also my purpose to provide a device of this character in which by the aid of a screw driver and the removal of a few screws (for example, four) the elements may all be taken apart. More specific objects relating to details of construction will become apparent as the description proceeds.

I have illustrated the present invention as applied to a time limit relay and have shown a self-closing switch and associated mechanism which forms the subject matter of a separate application filed by me May 16th, 1925, Serial No. 30,707.

I do not herein claim the two part main frame as this forms the subject of an application filed by me May 29, 1925, Serial No. 33,457.

I accomplish my objects by the mechanism illustrated in the accompanying drawings in which—

Figure 1 is a side elevation of a time limit relay embodying my present invention and also an invention described and claimed in my aforesaid copending application. The view is taken chiefly in axial section.

Figure 2 is a side elevation of some of the parts shown in Fig. 1, the lower portions being removed to better show the construction.

Figure 3 is a side view showing the lower or outer bracket and the solenoid with its spool. These parts are separated to illustrate the manner in which they fit together.

Figure 4 is a separated view of the two brackets, the same being separated to better show the manner in which they fit together.

Like numerals denote like parts throughout the several views.

Referring to the drawings, the parts are designed to be mounted upon a supporting panel 10 of slate or other insulating material. One of the elements of my device is a bracket 12 which is L shaped, one of its arms forming a back having threaded apertures for cooperating with studs 14 by which it may be secured to the panel 10. The upper arm extends horizontally from the panel and forms a support for the block or body 16 of insulating material on which are mounted the coacting parts of the resetting switch above mentioned. As these latter elements are not any part of my present invention it will not be necessary to describe them here. The bracket member 12, which may be referred to as the "inner" bracket, has two lugs 18 at the bottom and two upstanding lugs 20 at the top, the same having internally threaded apertures for receiving studs 22. These studs serve to detachably attach an outer bracket 24. The outer bracket is similar, but not necessarily the same in size and shape as the inner bracket, and when these parts are assembled in proper relation they form substantially a rectangle as shown in Figure 1. The width of the brackets is approximately equal to the length of the arms, the results being that when assembled they form an open-ended box. This forms a container for the solenoid presently to be described. The inner bracket has a central circular opening 26 at the top for receiving the reduced cylindrical portion 28 of the centrally bored guide cylinder 30. This cylinder serves as a guide for the trip pin 32 which operates the switch mechanism previously mentioned.

The horizontal arm of the outer bracket has a central aperture 34 for accommodating the projecting lower end of the center sleeve 36. A socket is formed at this point by association with a ring 38 which is of some-

what smaller diameter than aperture 34, and thus forms a stop or support for the center sleeve 36. Said ring is externally threaded and held in place on the under side of the bracket by rivets 40 or other appropriate means.

The solenoid, which is housed within the brackets 12, 24, includes a coil or winding 42 which has a cylindrical space in the center which enables it to slip over the center sleeve 36. At the upper end of the coil is an upper plate 44 preferably in the form of a disc of insulating material which is centrally apertured to slip over the upper end of the center sleeve as illustrated in Figure 1. Said upper plate rests upon the coil immediately beneath the horizontal arm of the inner bracket 12. The guide cylinder 30 fits slidably within the center sleeve, and as a result of the assembly described the coil is held securely in its position within the enclosure formed by the brackets. At the bottom the coil rests upon a bottom plate 46 which is also preferably an insulating disc and is centrally apertured to slip over the lower end of the center sleeve 36. This lower disc rests upon the lower arm of the outer bracket and is held in place by the center sleeve 36 which projects below it in the manner illustrated in Figures 1 and 3.

When used as a time limit relay of the design illustrated a dash pot 48 is screwed onto the ring 38 and hangs from it. A piston 50 works within the dash pot and is connected by a rod 52 to the movable core or plunger 54 which travels within the center sleeve 36 and rises or falls in accordance with the electrical conditions in the coil 42. The core is retarded in its upward movement by the piston 50. The function of the core is to rise when the coil is subjected to an excessive current value for a certain length of time and elevate the trip pin 32 for operating the switch mechanism mounted on block 16. The operation of the latter, however, is not particularly concerned with my present invention.

In practice, let it be assumed that the parts are assembled as shown in Figure 1. If now the coil becomes burned out or otherwise damaged it may be readily removed in the following manner: The studs 22 are first removed. This permits the lowering away of the outer bracket 24 together with all the parts supported thereon. These supported parts include the dash pot and its contents, and also the coil and the spool elements 36, 44, 46. When the outer bracket and associated parts have been thus removed from the inner bracket the upper disc 44 may be readily lifted off after which the winding may be lifted off, or these two parts may be lifted off simultaneously. The lower plate 46 and center sleeve 36 remain in place on the removable bracket. A new coil may

now be slipped into the place of the old one, after which the upper plate 44 may be replaced. The assembly may thereupon be completed again by merely raising the bracket 24 and supported parts into the normal position illustrated, after which the studs 22 may be reinserted.

It will be evident that as a result of my construction the renewal of a damaged coil is an extremely simple matter. Only four short studs need to be unscrewed, after which the other parts may be merely lifted apart. It will also be evident that the device may be entirely taken apart without removing the bracket 12 from the panel 10 and that the connections leading to the contact mechanism on the top of bracket 12 do not have to be disturbed when the coils are removed.

It will also be noted that the construction of the parts is very simple and adapted largely for fabrication in a punch press. The device is therefore not only simple to assemble, but is also simple to manufacture. Another advantage of my construction is that while the ends of the box-like brackets are open so that air may have free access to the coil for keeping it cool, the coil is otherwise encased, thus protecting it from damage, especially at the front.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. A solenoid frame having two L shaped brackets adapted to engage each other at diagonally opposite ends to form an enclosed rectangle in which the solenoid may be mounted.

2. A solenoid frame having an inner and an outer L shaped bracket arranged oppositely to form an enclosed rectangle in which the solenoid may be mounted, means for supporting the inner bracket, and means whereby the outer bracket may be removably secured to the inner one.

3. A solenoid frame having two cooperating bracket members, means for fastening one of said bracket members to a suitable support, and means for detachably attaching the second bracket member to the first bracket member to be supported thereby, one of the bracket members having a vertical and a horizontal leg, and the other having a horizontal leg spaced from the first mentioned horizontal leg for enclosing the solenoid between them.

4. A solenoid frame having two L shaped brackets, stationary means for supporting one of said brackets, and means for detachably attaching the second bracket to the first in opposite relation to thereby form a rectangle, said brackets having a width approximately equal to the length of the arms whereby said brackets when assembled form an open-ended box.

5. In a device of the class described the combination of an electro-magnetic coil, a spool for said coil, said spool having a center sleeve and an upper and lower plate, two L shaped brackets adapted to be detachably fastened together at diametrically opposite ends to thereby form a rectangle, the brackets being of a width approximately equal to the length of the arms of the brackets, and the distance between the two opposite surfaces of the bracket being substantially equal to the length of the spool whereby the spool may be mounted within the rectangle formed by the two brackets.
6. A device of the class described having an electromagnetic coil, a spool for said coil comprising a center sleeve and upper and lower plates, the sleeve projecting beyond one of the plates, an L shaped bracket, one arm of which forms a back by which it may be supported, a second L shaped bracket approximately of the same size as the first, and means for detachably attaching said brackets together at opposite ends to form a rectangle, one of said brackets being apertured to accommodate the projecting end of the center sleeve to prevent transverse shifting of the spool.
7. A device of the class described having a solenoid, a solenoid frame having two cooperating bracket members, means for fastening one of said bracket members to a suitable support, and means for detachably detaching the second bracket member to the first bracket member to be supported thereby, one of the bracket members having a vertical and a horizontal leg, and the other having a horizontal leg spaced from the first mentioned horizontal leg for enclosing the solenoid between them, the horizontal legs being wide enough to substantially cover the solenoid laterally and the solenoid being supported on the horizontal leg of one of said bracket members.
- In witness whereof, I have hereunto subscribed my name.

HERMON L. VAN VALKENBURG.