July 27, 1943. C. H. LARSON 2,325,186

MERCURY SWITCH RELAY

Filed May 29, 1941

Fig. 1

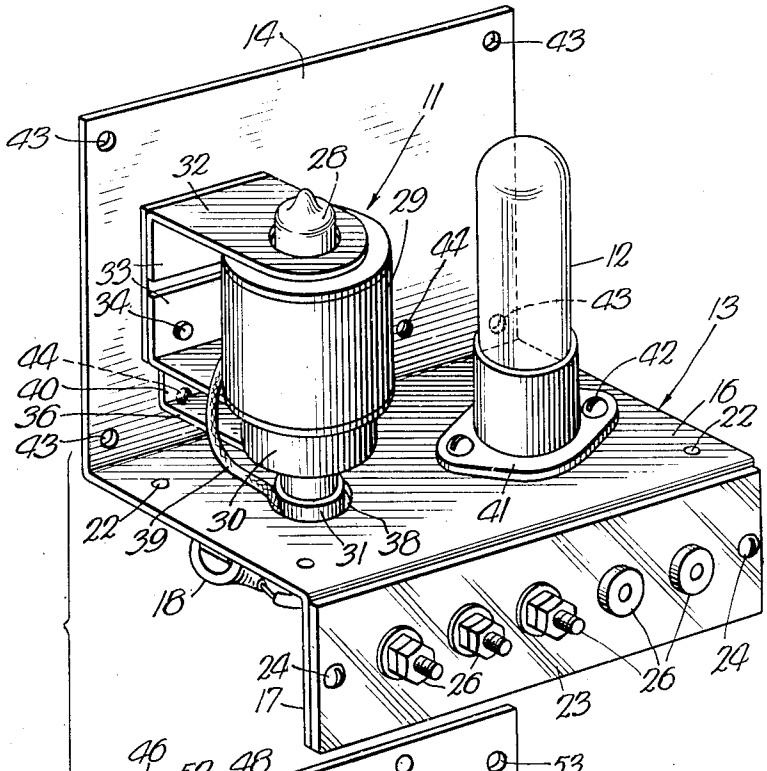
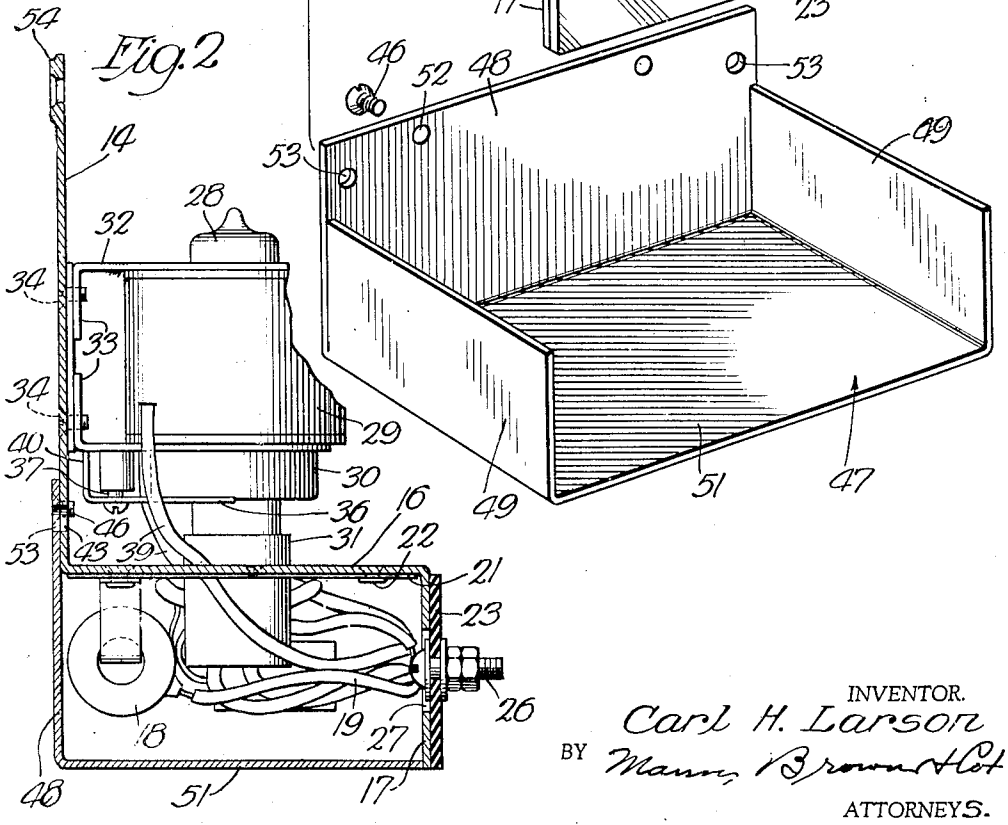


Fig. 2



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MERCURY SWITCH RELAY

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4 Claims. (Cl. 175—307)

The principal object of my invention is to provide a compact and inexpensive mounting for mercury switch relays and accessory apparatus. Other objects are to provide a mounting of the type described which may be easily formed by ordinary shop equipment from sheet material, encloses the electric wiring and some of the electrical equipment, may be easily dismounted for inspection and repair and which affords a maximum degree of accessibility to the mounted elements.

The attainment of these and other objects and advantages will become apparent from the following disclosure and from the drawing, in which

Fig. 1 is a perspective view of my mounting with the cover removed; and

Fig. 2 is a transverse end section of my assembled mounting.

In the embodiment illustrated and subsequently described, I have shown a mercury switch of the displacer type controlled by an external relay coil, which is energized by a circuit including an amplifying tube to attain high sensitivity to small fluctuations in the energizing current, all of the above elements being disposed on my improved mounting, but it is to be understood that other types of relays and associated controlling means may be substituted for the above elements, or other controlling means and switches added without departing from the scope and spirit of my invention.

Referring to the drawing, in Fig. 1 I have shown a mounting particularly adapted for use in instances where a mercury switch relay 11 must respond to small fluctuations or impulses in the relay energizing current, as where the relay controls the heating elements in a constant temperature bath and must respond to the low current transmitted by a thermostat. Sensitivity to these small currents may be obtained by using an amplifier tube 12, such as tube No. 70L7GT manufactured by the Ken-Rad Tube and Lamp Corporation of Owensboro, Kentucky, to amplify the relay control current.

Both the tube 12 and the mercury switch relay 11 may be conveniently mounted upon a Z section, generally designated 13, comprising a relatively high back panel 14, a floor panel 16, and a terminal panel 17. The terminal panel 17 and the back panel 14 extend laterally from the ends of the floor panel 16 in opposite directions and perpendicularly thereto. The Z section may be formed of any desired sheet material by joining together three plates along their edges at right angles to each other or by bending a rectangular sheet metal plate upon an ordinary brake, but due to economy, the latter method of construction is preferred. In forming the Z section 13 the terminal panel 17 is preferably made somewhat shorter than the back panel 14, but should extend downwardly beyond the accessory electrical apparatus 18 and wiring 19 disposed on, or adjacent to the under side of the floor panel 16.

The under side of the floor panel 16 is preferably covered with a thin sheet of insulating material 21, such as varnished cloth or fiber, which may be held in position by adhesive or by rivets 22 extending through the insulation and the floor panel. A panel 23 of rigid insulating material, such as "Bakelite," hard rubber, or the like, is attached to the front of the terminal panel 17 by screws 24. Binding posts 26 are mounted on and extend through the panel 23, the panel 17 being cut away, as indicated at 27, to permit the passage of the binding posts without contact therewith.

The mercury switch relay 11 is of the displacer type and includes an envelope 28 containing a quantity of mercury, spaced contacts within the envelope, and a magnetically responsive displacer within the envelope adapted to shift the level of the mercury fill to bridge and unbridge the contacts in response to external magnetic force. The envelope 28 may be supported within a relay coil 29 by a rubber sleeve 30 telescoped over the envelope 28 and having firm but resilient frictional engagement therewith. The lower end of the envelope 28 is preferably provided with a protective sleeve 31, which may be formed of fiber or other suitable material and serves to protect the envelope and switch terminals which are sealed through the base of the switch. The coil 29 is provided with a U-shaped external iron circuit 32 rigid with the coil 29 and having a leg 33 substantially parallel to the axis of the coil, the leg 33 being provided with tapped openings to receive mounting screws 34. A web 36 having a laterally extending end flange 40 is adjustably attached to the lower leg of the iron circuit 32 by a screw 37. The leg 40 extends upwardly into abutment with the iron circuit and the end of the web 36 opposite the leg 40 is cut away to at least partially encircle the switch envelope 28 adjacent the bottom surface of the rubber sleeve 31. The web 36 supports the rubber sleeve 30 and, if desired, may be employed to force the sleeve against the iron circuit 32, thereby distorting the sleeve

30 and increasing the firmness of its engagement with the envelope 28.

In the type of relay illustrated, the iron circuit and hence the relay is attached to the back panel 14 by screws 34, but the relay may be attached to the floor panel 16 if the type selected is adapted to be mounted on a horizontal panel. In either instance, an opening 38 is formed in the floor panel 16 to receive the lower end of the switch envelope 28 or switch terminals and coil wires 39. A tube base 41, adapted to receive the tube 11, is attached to the floor panel 16 by screws 42 over an opening in the floor panel through which contacts may extend to the under side of the panel. These contacts are connected to the relay coil 29 by wires, generally designated 19, and through accessory electrical apparatus, including condensers and resistors, generally designated 18, as well as to terminal posts 26.

The back panel 14 is provided with holes 43 to receive mounting screws by means of which the mounting may be attached to a vertical wall or other rigid upright support and is also provided with a plurality of tapped holes 44 adjacent the floor panel 16 to receive cover attachment screws 46.

A cover, generally designated 47, is provided to enclose the wiring, the shape of the cover resembling a rectangular box having an open top and front. The cover may conveniently be formed from sheet metal on a brake or from other desired material in a manner similar to that described in connection with the Z section, and includes a back 48 which extends upwardly beyond two end walls 49 and has a height greater than the depth of the terminal plate 23. The back 48 and end walls 49 define a cover bottom 51 having a length and width substantially equal to the length and width of the floor panel 16, the height of the end walls 49 being such that when brought into abutment with the lower surface of the floor panel 16, the bottom 51 of the cover will be flush with the lower edge of the terminal panel 17. If the cover 47 is formed from a relatively heavy gauge metal it has not been found necessary to provide any form of attachment between the end walls 49 and the back 48, but if light metal is used, the joint may be welded or otherwise strengthened. Spaced openings 52 are provided in the back 48 adjacent its upper edge and positioned to aline with threaded openings 44 in the back panel 14 to receive attaching screws 46.

The dimensions of the cover are such that the cover fits over the wiring 19 and the accessory apparatus 18, as well as the portion of the envelope 28 projecting below the floor panel 16, with the outer surfaces of the end walls 49 and the bottom 51 flush with the edges of the Z section 13. The back 48 extends upwardly in contact with the rear surface of the back panel 14 of the Z section and is attached thereto by screws 46 passing through holes 52 in the back 48 and engaging threads within the openings 44 formed in the back panel.

Openings 53 are also formed in the back 48 to aline with the lower pair of attaching openings 43. Washers 54 having a thickness equal to the thickness of the back 48 may be attached to the back surface of the back panel 14 in alinement with the attaching openings 43 so that the mounting will rest evenly against a flat support.

In the type of mounting illustrated it will be noted that it is impossible to remove the cover from the Z section without dismounting the assembly as the cover attaching screws are inserted from the rear. This is often advantageous, as it prevents tampering or accidental removal of the cover. If desired, however, the cover attaching screws 46 may be inserted from the front of the back panel 14, thereby permitting removal of the cover 47 without removing the Z section from its support. In the latter instance, the openings 52 in the back of the cover are threaded, instead of the openings 44 in the back panel 14.

From the foregoing description it is apparent that due to the simplicity of my improved mounting, it may be formed from common materials by semi-skilled labor on ordinary shop equipment, which allows production of the mounting at low cost. Dimensional changes necessary to accommodate larger or smaller elements may also be made without the necessity of retooling or even changing the adjustments of the forming machine.

Another outstanding advantage of my structure is the remarkable ease of accessibility afforded to the wiring and other apparatus by removal of the cover. The resistors, condensers and the like are ordinarily quite small and employ soldered connections, requiring delicate work with relatively clumsy tools. The absence of back and end walls allows free manipulation of tools, does not block out light, and greatly reduces the time required for assembly. The mounting and other assembly work may be completed prior to attachment of the cover, as there is no interconnection between the cover and wiring or other mounted elements.

In compliance with Section 4888 of the Revised Statutes I have described my invention in detail, but I do not wish to be limited to the precise forms and embodiments set forth, as they are obviously capable of addition and modification without departure from the true scope and spirit of my invention.

I claim:

1. In a mercury switch relay, a Z section including a floor panel, a back panel, and a terminal panel, a mercury switch relay and control circuit modifying means entirely supported by the Z section above the floor panel, means below the floor panel interconnecting the relay and the control circuit modifying means, and a cover comprising a back, two end walls and a bottom adapted for removable attachment to the Z section, means for removably attaching the cover to the Z section and separate means for attaching the Z section to a support, the cover being so constructed and arranged that only the interconnecting means below the floor panel is completely enclosed when the cover is attached to the section, and easily accessible when the cover is removed.

2. In a mercury switch relay, a Z section including a floor panel, a back panel, and a terminal panel, a mercury switch relay and control circuit modifying means attached to the Z section above the floor panel, means interconnecting the relay and the control circuit modifying means below the floor panel, and a cover including a back, two end walls and a bottom adapted for removable attachment to the back panel, the height of the back of the cover being greater than the depth of the terminal panel, the cover being so constructed and arranged that interconnecting means are completely enclosed when

the cover is attached to the Z section, and easily accessible when the cover is removed.

3. In a mercury switch relay, a Z section including a floor panel, a back panel, and a terminal panel, a mercury switch relay and control circuit modifying means attached to the circuit above the floor panel, means below the floor panel interconnecting the relay and the control circuit modifying means, a cover including a back having a height greater than the depth of the terminal panel, two end walls having equal heights slightly less than the depth of the terminal panel, and a bottom having a length and width substantially equal to the length and width of the floor panel, and means for attaching the back of the cover to the back panel of the Z section whereby the intercommunicating means are completely enclosed but readily accessible when the cover is removed.

4. In a mercury switch relay, a Z section including three connected panels, a relay including a relay coil and means controlling energization of the coil, said relay and controlling means being supported exclusively by the Z section, a box-shaped cover having four walls defining an open side and front, said cover being so constructed and arranged that the open top and front of the cover are closed by the Z section, and means for removably attaching the cover to the section, said means being independent of said relay and relay controlling means.

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