Inventor:
George J. Reisch,
by Leonard Platt
His Attorney.
This invention relates to an electric heater and more particularly, to an improved arrangement for mounting the heater controls and providing electrical terminal connections therefor.

In electric heater, it has been common practice to provide a thermostat for controlling energization of the heater in response to changes in ambient temperature, and a mercury safety tip-over switch in electrical series connection with the thermostat to interrupt the supply of current to the heater when it is not in a normal upright position. An arrangement is especially desirable for securely mounting these thermostat and mercury switch controls, and providing readily accessible electrical terminal connections therefor using a minimum number of parts which may be easily manufactured and assembled.

Accordingly, it is an object of this invention to provide an improved low-cost control assembly for a fan heater having a minimum number of parts which may be easily manufactured and assembled.

In accordance with one aspect of this invention, a sheet of rigid insulating material is provided for mounting a mercury tip-over switch. Two generally parallel slots are formed in the sheet and a unique U-shaped terminal strip having two side arms and a base is slidably mounted in the slots by engagement of surfaces of the sheet adjacent to the slots with the base of the terminal strip. The mercury switch is provided with two terminals, one of which is fastened to one of the arms of the U-shaped terminal strip. By this arrangement, a very simple yet effective means for easily mounting a mercury switch and providing an electrical terminal connection therefor is achieved.

Other objects and attendant advantages of this invention will be apparent from the following description taken in connection with the accompanying drawing in which:

Fig. 1 is a front elevational view of the improved electric heater control assembly mounted on a fan heater housing, only a portion of the fan heater housing being shown;
Fig. 2 is a bottom perspective view of the improved electric heater control assembly;
Fig. 3 is a bottom plan view of the improved insulated sheet;
Fig. 4 is a side elevational view of the improved terminal strip;
Fig. 5 is a top plan view of the improved electric heater control assembly;
Fig. 6 is a side elevational view of the improved electric heater control assembly.

Referring now to Fig. 1 of the drawing, there is illustrated an electric fan heater having a sheet metal housing 1, a thermostat switch mechanism generally indicated by reference numeral 2 and a mercury safety tip-over switch generally indicated by reference numeral 3. In a manner known in the art, thermostat 2 controls energization of the heater in response to changes in ambient temperature, and mercury switch 3 is provided for interrupting the supply of electric current to the heater when the heater is not in a normal upright position.

The details of the thermostat and the mercury tip-over switch controls do not form a part of this invention; however, it is believed that a general description of these elements to illustrate the improved arrangement for connecting them to each other and to an electric fan heater is desirable. As shown in Fig. 2, thermostat 2 comprises a plurality of spaced blades 5 separated by disks 4. A tubular rivet 6 having a centrally located bore 7 and an end flange 8 is provided for assembling disks 5 and blades 4. As shown in Fig. 6 the body portion of tubular rivet 6 may extend upwardly through the disks and blades and may be riveted over at the upper side of one of the blades at 9. Thus, the various parts of the switch are firmly secured in the desired stacked relationship between the shoulder or flange portion 8 of member 6 and the riveted opposite end portion 9. A threaded mounting nozzle 10 is attached to the thermostat to provide a suitable means for connecting the thermostat to a supporting plate or housing. In a manner known in the art, a rotatable adjusting shaft 11 extends through screw threaded mounting nozzle 10 for providing a manual means for adjusting the temperature setting of the thermostat. As viewed in Figs. 2 and 6, in order to permit suitable electrical circuit connection to be made with thermostat 2, disk 12 and 13 having downwardly extending terminal prongs 14 and 15, respectively, formed thereon are approximately sandwiched between blades 4 and disks 5.

Mercury tip-over switch 3 comprises a mercury button 16 and a pair of ring-like members 17 fitted over the button 16. Socket type terminal ends 18 are integrally formed with each of the ring-like members 17 for permitting electric circuit connection to be made to the mercury switch. While not shown here, the details of a mercury button generally similar to the one here disclosed, may be found in United States Patent 2,191,539, February 20, 1940, assigned to the same assignee as the present invention.

A uniquely designed arrangement is provided for mounting mercury switch 3 and providing a readily accessible terminal connection therefor. As best seen in Figs. 2 and 6, this arrangement comprises a flat sheet of rigid insulating material 19 having two generally parallel slots 20 formed therein for receiving a U-shaped terminal strip 21. Terminal strip 21 includes a side arm 22 for connection with a terminal end 18 of mercury switch 3, a side arm 23 for connection with a suitable electrical circuit terminal end (not shown), and a base arm 24. As shown more particularly in Fig. 4, base arm 24 is provided with inwardly bent ends 25 and 26 for uniquely mounting terminal strip 21 in slots 20 using a minimum number of parts. Ends 25 and 26 include portions 27 and 28 whose length is approximately as great as the thickness of sheet 19 to enable these portions 27 and 28 to extend through slots 20. Ends 25 and 26 also include portions 29 having outer surfaces 30 displaced laterally from a central inner surface 31 of base arm 24. By this arrangement, as viewed in Fig. 6 outer surfaces 30 may engage the surfaces 32 of insulated sheet 19 adjacent to slots 20, while central inner surface 31 engages an upper surface 33 of insulated sheet 19 between slots 20 to securely hold terminal strip 21 to insulated sheet 19.

In order to enable surfaces 30 of base arm 24 of U-shaped terminal strip 21 to slidably engage bottom surfaces 32 of insulated sheet 19 adjacent to slots 20, a pair of outwardly directed enlarged openings 34 and 35 are provided at one end of slots 20, respectively. With this
arrangement, as shown in Figs. 5 and 6 side arms 22 and 23 of U-shaped member 21 may be slipped through enlarged openings 34 and 35, respectively, until inner surface 31 of bottom arm 24 engages an upper surface 36 of lower sheet 19 between enlarged openings 34 and 35. Arms 22 and 23 of U-shaped member 21 therein may be bent slightly toward each other to thereby move end portions 29 of bottom arm 24 below the surfaces 32 of insulated sheet 19. With arms 22 and 23 held in this bent position, terminal strip 21 may be slid axially along slots 20 from enlarged openings 34 and 35 to the position shown in Fig. 5. When arms 22 and 23 are released, the outer surfaces 30 of end portions 29 engage the lower surfaces 32 of insulated sheet 19 adjacent to slots 20 and the inner surface 31 of bottom arm 24 engages the upper surface 33 of insulated sheet 19 between slots 20 and 21, as previously mentioned. Thus, terminal strip 21 is simply and easily connected to insulated sheet 19, thereby permitting elimination of additional elements, such as rivets and screws, which generally would be considered necessary to connect terminal strip 21 to sheet.

A unique easily formed detent means may be provided for preventing terminal strip 21 from accidentally sliding along slots 20 toward enlarged openings 34 and 35. As shown in Figs. 5, 6 and 7, this detent comprises an inwardly directed detent 37 which may be conveniently standing tang 41 are formed of U-shaped member 21. A relatively small aperture 38 may be formed in the insulated sheet 19 between slots 20 for receiving detent 37. It can be seen that when detent 37 is positioned within aperture 38 as shown in Figs. 2 and 6, terminal strip 21 will be prevented from moving axially along slots 20.

With the unique insulated sheet 19 and terminal strip 21 described above, mercury switch 3, thermostat 2, insulating sheet 19, and terminal strip 21 may be readily connected to each other. To achieve this, an opening 39 is provided in insulated sheet 19 for suitably receiving threaded mounting nozzle 10 of thermostat 2. With threaded nozzle 10 positioned in opening 39, it can be seen that thermostat 2, mercury switch 3, and insulated sheet 19 may be readily sub-assembled to each other by inserting terminal prongs 14 of thermostat 2 into one of the terminal end sockets 18 of mercury switch 3 and inserting arm 22 of U-shaped terminal strip 21 into the other terminal end socket 18 of mercury switch 3.

The control assembly including thermostat 2, mercury switch 3, insulated sheet 19 and terminal strip 21 may also be readily connected to sheet metal housing 1. As shown in Fig. 1, an opening 40 and a downwardly extending tang 41 are formed in the top wall of sheet metal housing I for suitably locating the control assembly with respect to the housing. In order to fix the assembly to housing 1, it is merely necessary to pass threaded mounting nozzle 10 upwardly through opening 40, and at the same time permit downwardly extending tang 41 to pass through a relatively small aperture 42 which is provided in sheet 19 and into bore 7 of tubular rivet 6. A nut 43 may then be threaded on mounting nozzle 10 to securely hold the control assembly up against the bottom surface of the top wall of housing 1 as shown in Fig. 1. Also, a sheet of insulating material 44 having suitable holes formed therein for allowing through nozzle 10 and tank 41 to be passed therethrough may be provided between insulated sheet 19 and the top wall of housing 1, to electrically insulate base 24 of terminal strip 21 from sheet metal housing 1. With this arrangement, suitable electrical circuit connection may be made with the thermostat and mercury button assembly by merely slipping socket type connectors (not shown) over downwardly extending terminal end 14 of thermostat 2 and arm 23 of terminal strip 21.

From the foregoing description, it will be appreciated that the improved arrangement for mounting a mercury switch and a thermostat switch to a fan heater and providing electrical terminal connections therefor comprises only two parts, a simple apertured insulated sheet 19 and a unique easily formed U-shaped terminal strip 21. It is further obvious that no forming whatsoever of sheet 19 is necessary and that the only requirement lies in the stamping of the terminal openings therein. Thus, an exceedingly simple, yet effective, assembly is obtained.

While there has been shown and described a particular embodiment of this invention, it will be obvious to those skilled in the art that various changes and modifications can be made therein without departing from the invention, and therefore, it is to be understood that the appended claims are to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An electric heater comprising a mercury tip-over switch having two terminal ends; a flat sheet of rigid insulating material; two generally parallel slots formed in said sheet; and a generally U-shaped terminal and supporting strip having two side arms extending generally parallel to each other and a base, said U-shaped strip being slidably mounted in said slots by engagement of the surfaces of said sheet adjacent to said slots with the base of said U-shaped terminal strip, and one of the terminal ends of said mercury tip-over switch being connected to one of the arms of said U-shaped terminal strip for supporting said mercury switch on said flat sheet of rigid insulating material.

2. An electric heater comprising a sheet metal housing, a flat sheet of rigid insulating material fixed to said housing; two generally parallel slots formed in said sheet; a generally U-shaped terminal strip having two side arms extending generally parallel to each other and a base; a pair of outwardly directed enlarged openings extending from one end of each of said slots to permit said U-shaped terminal strip to be slidably mounted in said slots by engagement of the surfaces of said sheet adjacent to said slots with the base of said U-shaped terminal strip; and a detent means formed on the base of said U-shaped terminal strip for cooperation with said sheet to prevent accidental removal of said U-shaped terminal strip from said sheet.

3. In an electric heater comprising a sheet metal housing and a mercury tip-over switch having two terminal ends, the improved arrangement for mounting a mercury switch and a thermostat switch to a fan heater and providing electrical terminal connections therefor comprises only two parts, a simple apertured insulated sheet and a unique easily formed U-shaped terminal strip.
5. An electric heater comprising a sheet metal housing; a thermostat switch including electrical terminal prongs, screw threaded mounting means, and a tubular rivet having a bore formed therein; a mercury switch including two electric terminals, one of which is connected to one of the terminal prongs of said thermostat switch; a flat sheet of rigid insulating material, two generally parallel slots formed in said sheet, and a pair of outwardly directed enlarged openings extending from one end of each of said slots; a generally U-shaped terminal strip having a base and two side arms, said base having end surfaces laterally displaced from a central inner surface thereof, said U-shaped terminal strip being slidably mounted in said slots by engagement of the surfaces of said sheet adjacent to said slots with the end surfaces of said base; the other one of said mercury switch terminals being connected to one of the side arms of said terminal strip; openings formed in said insulated sheet and said sheet metal housing for receiving said screw threaded mounting means; a downwardly extending tang formed in said housing, said insulated sheet further having a relatively small opening formed therein, said tang extending into said relatively small opening and the bore in said tubular rivet; and a nut threaded to said screw threaded mounting means for connecting said thermostat switch, mercury switch, and insulated sheet to said housing.

References Cited in the file of this patent

UNITED STATES PATENTS

1,362,553 Bagge December 14, 1920
2,142,153 Sambleson January 3, 1939