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3,426,316

ELECTRIC LEAD TERMINAL

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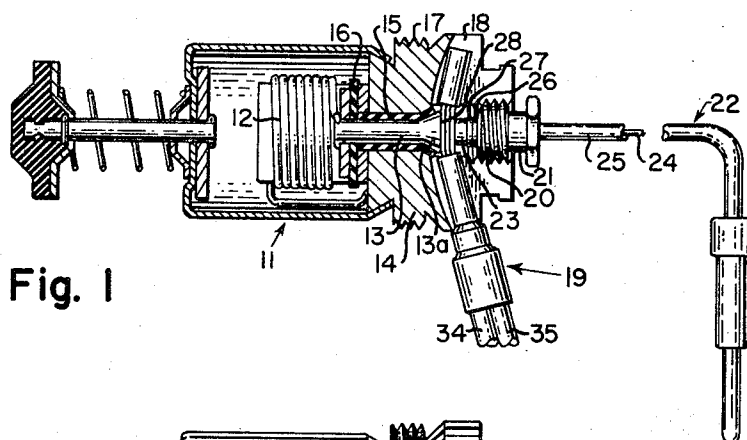


Fig. 1

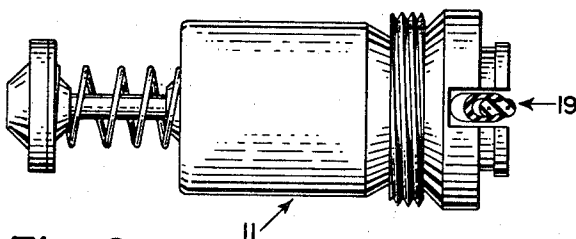


Fig. 2

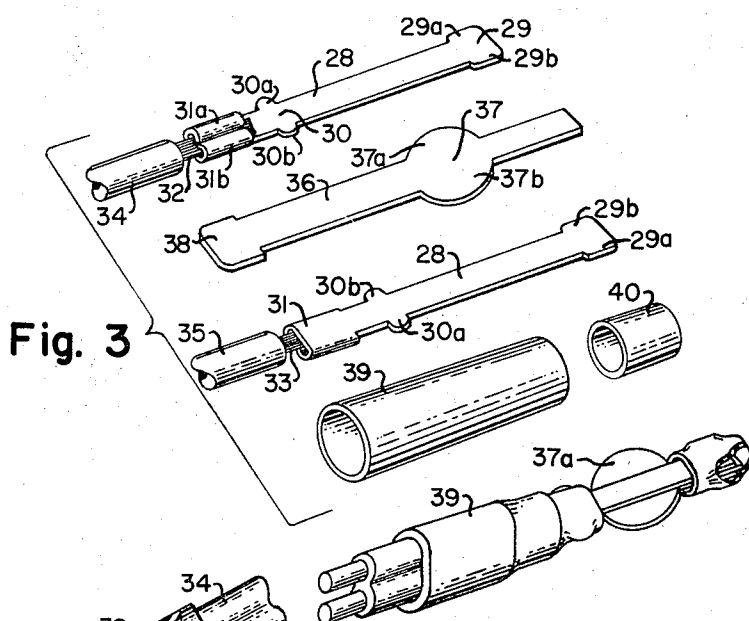


Fig. 3

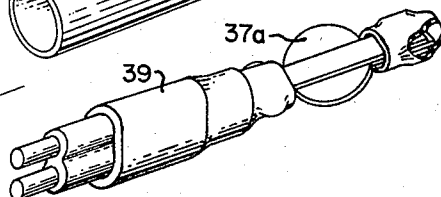


Fig. 4

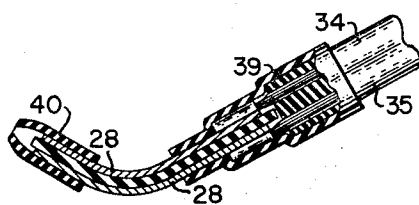


Fig. 5

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ELECTRIC LEAD TERMINAL

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3 Claims

ABSTRACT OF THE DISCLOSURE

An electric lead terminal embodying a pair of metal strips having axially spaced projections on each side thereof, a strip of insulating material of greater width than the metal strips but not as wide as the combined width of a metal strip and each pair of projections on opposite sides thereof, and a heat shrunk sleeve around each pair of projections and adjacent portions of all three strips, for centering, interlocking and insulating the assembly.

This invention relates to an electrical connector including a terminal unit for connecting a limit switch into the circuit of a thermocouple energized power unit of a control valve for a gas heating unit. Such a valve is illustrated in the C. B. Currie et al. Patent No. 3,020,921, which is adapted to be connected to a gas burner and to a concentric lead type of thermocouple, heated by a pilot burner for the above-mentioned burner, as mentioned in the specification of the Currie et al. patent. The invention to be described herein is adapted, with some modification of the Currie et al. power unit, to be inserted between the power unit and the concentric leads of the thermocouple attached thereto when installed in a heating system. Another patent, Koch Patent No. 2,353,042, shows a socket and terminal member combination somewhat similar in function to this invention but connecting a timer switch into the circuit between the thermocouple and the power unit of the gas valve.

It is the purpose of this invention to provide a much less expensive and simpler connector for insertion between a thermocouple and a safety valve controlled thereby. The gas heating controls industry is constantly trying to reduce the cost and size of the controls used in gas heating installations while simultaneously maintaining or improving the quality of performance thereof, so it was with this in mind that the present invention was developed.

FIGURE 1 is a sectional view of the invention showing a slotted power unit terminal and its cooperating limit switch terminal unit positioned therein with a conventional thermocouple concentric lead unit holding them in assembled relationship;

FIGURE 2 is an elevational view of the invention taken at right angles to the view of FIGURE 1 and showing the leads to the limit switch in cross-section and the thermocouple unit removed;

FIGURE 3 is an enlarged exploded view of the elements of the terminal unit prior to their being assembled;

FIGURE 4 is an enlarged assembled view of the elements with portions thereof broken away; and

FIGURE 5 is a sectional view of a modified assembly of the invention.

The power unit, generally designated by the reference numeral 11, consists of an electromagnet 12 having a coil connected to a center terminal 13 and to an outer socket terminal 14, with an insulating sleeve 15 and insulating disc 16 therebetween. The outer terminal is threaded at 17 for threading into a valve unit (not shown) and has a transverse slot 18 through the socket portion thereof to receive the terminal unit 19. The socket portion is threaded at 20 to receive a threaded connector 21 of the

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thermocouple unit, generally designated by the reference numeral 22. The outer end of the terminal 13 has a head 13a which is coaxial with a head 23 on the inner lead 24 of the thermocouple unit. The connector 21 is swivelly mounted on the outer lead 25 of the thermocouple unit and bears against a flange 26 on the end of the outer lead 25. An insulation washer 27 and an insulation sleeve (not shown) between the leads 24 and 25, electrically separate the head 23 and the flange 26 and the leads, respectively. The thermocouple unit is shown as clamping the limit switch terminal unit 19 against the head 13a of the center terminal of the power unit.

Referring to FIGURE 3 of the drawing, the terminal unit consists of two ribbon-like brass strips 28 having an enlarged or head portion 29 including projections 29a and 29b, an enlarged width portion 30 including projections 30a and 30b, and a crimped-over inner end portion 31 including clamping arms 31a and 31b engaging the bared lead wires 32 and 33 leading to and from a limit switch or other type of switch (not shown). The lead wires 32 and 33 are covered by insulation 34 and 35 and are preferably soldered to the end portions 31. The brass strips 28 are .016 inch thick and .07 inch wide and are .55 inch long between the projections. The projections 30a and 30b are preferably half-round and have a radius of .025 inch, while the projections 29a and 29b are .10 inch in length with rounded corners. The fiber insulator strip 36 is at least as long as the brass strips and is .026 inch thick, .100 inch wide at one end thereof and .070 inch wide at the other end thereof, with an enlarged portion 37 intermediate its ends. The enlarged portion is generally round including projections 37a and 37b, with a diameter of .300 inch. The insulator strip also has a head portion 38 at the wider end thereof with a width of .130 inch. It is preferred that the surfaces of the brass strips be tin plated to improve electrical contact with mating parts.

When assembled, the insulator strip is positioned between the two brass strips 28 so that the outer end or righthand end, as viewed in FIGURE 3, preferably extends beyond the ends of the brass strips and the inner end of the insulator strip head portion 38 is positioned between the portions 31 of the brass strips, to provide insulation between the brass strips the full length thereof. It preferably extends beyond the inner ends of the brass strips to provide insulation between the leads connected thereto. A plastic sleeve 39, having an internal diameter just large enough to slide freely over the assembled inner ends of the terminal member just described, including the insulation 34 and 35 of the leads, is heat shrunk around the assembly, with one end thereof bearing against the enlarged diameter portion 37 of the insulator strip and the other end thereof lapping over the insulation 34 and 35 which preferably abuts the end of the insulation strip. With the shrinking of the tubing around the assembly, the plastic flows into the spaces provided between the projections 30a, 30b, 31a and 31b to securely lock these elements in assembled relationship. A similar but smaller length of tubing 40 is likewise positioned around the ends 29 and a portion of the strips 28 with one end thereof bearing against the enlarged diameter portion 37 of the insulator and the other end thereof extending at least to and preferably beyond the ends of the brass strips and insulating strip. With the heat shrinking of this length of tubing against the enlarged insulator portion and around the head 29, preferably at the same time the other tubing is shrunk, it will be noted that this too securely locks these elements in assembled relationship.

In making the assembly described above, the larger of the two pieces of tubing is positioned around the insulation 34 and 35 before or after the leads are clamped and soldered to the brass strips and prior to positioning the

insulator 36 between the brass strips 28. The smaller diameter tubing 40 is then positioned over the outer ends of the brass strips and insulator, followed by the positioning of the tubing 39 (by sliding the tubing lengthwise of the insulation 34 and 35) over the inner ends of the brass strips and insulator and into abutting relationship with the large round portion 37 of the insulator. The assembly is then heated by suitable means to cause the shrinking of the tubing around the enclosed elements.

The thus assembled terminal unit provides a disc-shaped insulator for centering the unit in the slotted socket of the power unit with the slots of the power unit accommodating the plastic covered portions of the brass strips and insulator. It is thus seen that when the assembled terminal unit is clamped in the power unit as shown in FIGURE 1, current will flow from the outer element of the thermocouple through the outer lead 25, through the connector 21 to the outer terminal 14 of the power unit, through the coil of the magnet 12 to the center terminal 13 of the power unit, through the adjacent brass strip 28, through lead 34 to the control switch, back through lead 35 to the other brass strip 28 to head 23, and back through center lead 24 to the other element of the thermocouple. Should it be desired to remove the switch from the circuit and have the thermocouple directly connected to the power unit, the thermocouple connector 21 is unscrewed therefrom and the connector unit 19 axially removed from the power unit and the connector 21 again screwed back into the power unit with the center terminal 23 engaging the center terminal 13a of the power unit.

From the above description of the invention it can be readily seen that the invention includes a terminal unit made of a minimum of inexpensive parts yet provides a very rugged, small and reliable terminal construction. It will also be noted that the unit enables the socket of the cooperating or associated power unit to have a minimum depth for selective use. It will also be obvious that minor changes may be made in the design without departing from the spirit of the invention. Therefore, the scope of the invention should be determined from the appended claims.

I claim:

1. An electric lead terminal comprising a pair of ribbon-like metal strips, each of said strips having a first projection on each side thereof at one end thereof and a second projection on each strip at each side thereof at the other end of each strip and axially spaced from said first projections, a ribbon-like insulator wider than and positioned between said strips to electrically separate them and having side projections thereon intermediate its ends and intermediate said first and second projections, a first sleeve of insulation material molded around said one ends of said strips and around said first projections and the insulator portion therebetween, said first insulation material extending from said side projections on said insulator to said one ends of said strips, and a second sleeve of insulation material molded around said other ends of said strips, said second projections and the insulator portion therebetween, said second insulation material extending from said side projections to said other ends of said strips, said first and second projections providing an interlock between the sleeves, insulator and metal strips and a centering of said strips on said insulator.

2. The combination of claim 1 wherein said first and second sleeves of insulation material are separate heat-shrunk plastic sleeves.

3. A lead terminal as defined in claim 2 wherein the side projections of said insulator form a round disc with the portion of said insulator therebetween.

References Cited

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