

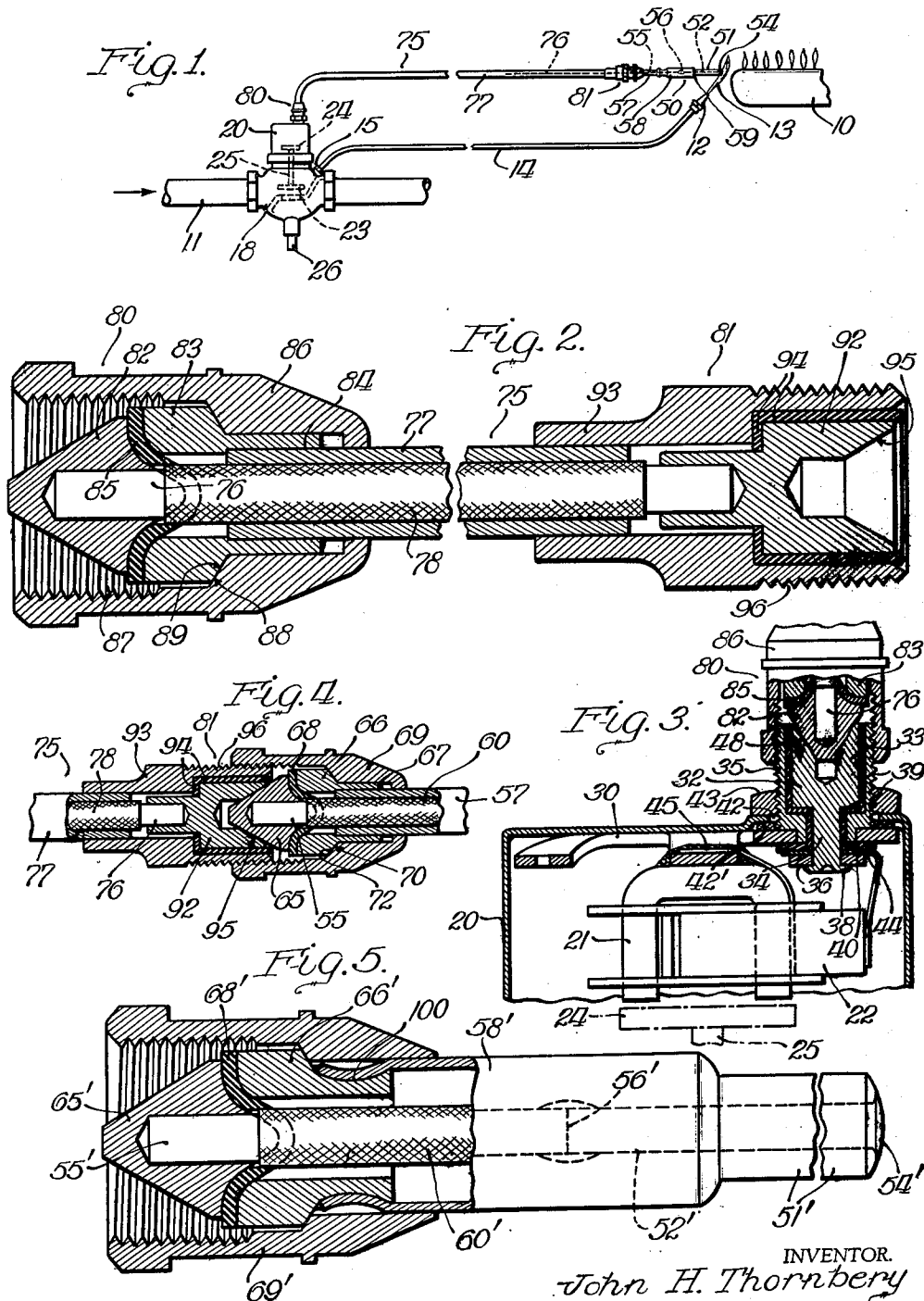
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LEAD EXTENSION

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LEAD EXTENSION

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This invention relates to a lead extension and has particular relation to an improved thermocouple lead extension for connecting a thermocouple to a thermoelectric safety device for heating and other apparatus.

One of the main objects of the present invention is to provide an improved lead extension which is adapted for quick detachable connection at its opposite ends with the devices which it is desired to connect and, more particularly, an improved lead extension having at one end terminal connector means for quick detachable connection with cooperating terminal connector means on a thermocouple or on the leads therefor, and having at its opposite end terminal connector means for quick detachable connection with the connector terminals of a thermoelectric safety device or the like.

Another object of the invention is to provide an improved lead extension having complementary quick detachable connector means at its opposite ends to provide not only for quick detachable connection at its opposite ends with the thermocouple and thermoelectric safety device or other devices which it is desired to connect, but providing, in addition, for quick detachable connection of each end of the lead extension with the complementary ends of a similar lead extension to provide, by means of a plurality of connected lead extensions, a lead connection of any desired length.

It is also an object of the invention to provide a lead extension of relatively simple and inexpensive construction and which is composed of few parts adapted for convenient assembly; also an improved lead extension adapted to permit quick and convenient connection with and disconnection from the devices with which the lead extension is employed, and also adapted, when connected, to provide a good connection, and particularly a good thermoelectric connection between the connected devices.

The chief advantage of the lead extension of the present invention is its ability to permit the lead conductors not only to be quickly and conveniently disconnected from and connected to, for instance, the thermoelectric safety device, but also to be quickly and conveniently disconnected from and connected to the thermocouple or other device; also, its ability to be quickly and conveniently connected to and disconnected from similar lead extensions to provide a lead connection of any desired length.

The lead extension with the quick detachable connector means at its opposite ends permits, for

instance, not only the thermoelectric safety device but also, if desired, the thermocouple to be disconnected and shipped separately from the lead connection, and it permits replacement of the lead extension, the thermocouple, or the thermoelectric safety device separately and without returning the entire combination.

Further objects and advantages of the invention will be apparent from the following detailed description, taken in connection with the accompanying drawing in which:

Figure 1 is a diagrammatic view showing applied to heating apparatus a thermoelectric safety device and connected thermocouple having a lead extension embodying the present invention;

Figure 2 is a longitudinal section through the lead extension;

Figure 3 is a fragmentary view of the thermoelectric safety device, showing the connector means at one end of the lead extension connected with the connector terminals of the thermoelectric safety device;

Figure 4 is a view showing one form of thermocouple lead with the connector means thereof connected with the connector means at the opposite end of the lead extension; and

Figure 5 is a view showing the connector means at one end of the lead extension connected directly with the thermocouple elements, instead of with leads therefor as in Figure 4.

Referring first to Figure 1, the burner 10 is any suitable or preferred main burner—by way of example, the main burner for an oven or for a room heater, or for a water heater, or it may be one of the main top burners of a gas range, or any other main burner.

A pipe 11 supplies gaseous or any other suitable fuel to the burner 10, and disposed in juxtaposition to the burner 10 is a pilot burner 12 which maintains a pilot light 13 for igniting the main burner. The pilot burner 12 is supplied with fuel by a tube 14 connected, for example, at 15 to the interior of the body of the thermoelectric control valve 18 which is adapted to bypass fuel for the pilot burner when the thermoelectric safety valve is in closed position shutting off the supply of fuel to the main burner. The tube 14 may, of course, be connected to the fuel supply pipe 11 anterior to the control valve 18 or otherwise as desired within the scope of the present invention.

Suffice it for purposes of the present description to set forth that the thermoelectric safety valve 18 has a hood 20 enclosing an electromagnet which comprises a magnet frame 21 and an

electromagnet coil 22. The valve member is shown in dotted lines (Figure 1) at 23, the armature for the electromagnet is shown at 24, and the stem connecting the armature 24 and the valve member 23 is shown at 25. Reset means for resetting the armature to attracted position and the valve member to open position is shown at 26.

While the particular thermoelectric safety device which I have shown in the drawing is in the form of a thermoelectric safety valve, it is to be understood that this device may be a thermoelectric safety switch or any other suitable or preferred device. The particular device shown in the drawing is for purposes of illustration and not by way of limitation.

In the particular thermoelectric safety device selected for illustration, the magnet frame 21 is secured to and supported by a metallic plate 30. A metallic terminal stud 32 having an enlarged enter end 33 and a reduced stem 34 extending inwardly therefrom fits in a correspondingly formed metallic bushing 35. A metallic washer 36 underlies the plate 30 and is secured with the plate 30 to the bushing 35 by extending the reduced inner end of the stud 32 through the washer 36 and heading the inner end of the stud over as indicated at 38, or otherwise as desired. The stud 32 is insulated from the bushing 35 by insulation indicated at 39, and the washer 36 is insulated from the plate 30 and bushing 35 by insulation indicated at 40.

The bushing 35, with the stud 32 secured therein as set forth, extends outwardly through an opening 42 in the outer end of the hood 20. The bushing 35 is externally threaded, and a nut 43 threaded thereon clamps the bushing 35 in place in the opening 42. Screws or other means may be employed for additionally securing the plate 30 to the outer end of the hood 20. Packing may, if desired, be interposed between the plate 30 and the outer end wall of the hood 20, as indicated at 42', or, if desired, the bushing 35 may be grounded to the hood 20. One terminal of the coil 22 is connected at 44 to the terminal stud 32. The other terminal of the coil 22 is connected at 45 to the plate 30 and through the plate 30 to the bushing 35.

Where the bushing 35 is insulated from the hood 20, one terminal of the coil 22 is connected in circuit with one side of the thermocouple through the bushing 35, and where the bushing 35 is grounded to the hood, one side of the thermoelectric circuit is completed by grounding one side of the thermocouple and one of the terminals of the coil 22, for instance, to the hood 20. The enlarged outer end of the stud 32 has a conical recess 48.

The thermocouple, except for the improvements which the present invention provides in the lead connector means therefor, is shown by way of illustration and not by way of limitation as of the general character disclosed and claimed in Oscar J. Leins Patent No. 2,126,564, granted August 9, 1938. The thermocouple 50 comprises an outer tubular metallic thermocouple member 51 and an inner metallic thermocouple member 52 joined at one end to the end of the outer thermocouple member to form the thermal junction 54 which is placed in position to be heated by the pilot light 13 or any other desired flame. An inner lead conductor 55 is joined to the inner thermocouple member to form an internal thermal junction 56, and an outer tubular lead con-

ductor 57 is connected to the outer thermocouple member 51, for instance through a sleeve 58, to form a third thermal junction 59. The outer lead conductor 57 encloses the inner lead conductor 55 and, with the outer thermocouple member, constitutes an enclosure about the inner thermocouple member and the inner lead conductor and the inner thermocouple junction 56. The inner lead conductor 55 is insulated from the outer lead conductor, for instance, by a wrapping of insulation on the inner lead conductor as indicated at 60.

The thermocouple lead as thus described constitutes a permanent part of the thermocouple 50 and may be relatively short.

The free end of the inner lead 55 extends from the adjacent end of the outer lead conductor 57 and has fixed thereon and in good conducting contact therewith a wedge member or metallic connector cone 65. The outer lead conductor 57 has fixed thereon a metallic connector sleeve 66 in good conducting contact therewith at 67. The sleeve 66 is insulated from the cone 65 and thereby from the inner lead 55 by insulation indicated at 68. A couple lead connector nut is provided at 69, this nut having an internal shoulder 70 which cooperates with a shoulder 72 on the sleeve 66.

The lead extension indicated in its entirety at 75 comprises an inner lead conductor 76 and an outer tubular lead conductor 77 which encloses the inner lead conductor. The inner lead conductor 76 is insulated from the outer lead conductor 77, for instance, by a wrapping of insulation on the inner lead conductor as indicated at 78. The conductors 76 and 77 are preferably of a character that will permit bending as desired to permit disposing the thermocouple and the connected thermoelectric safety device in any desired relative positions. At the same time, the lead extension may be of a character to support the thermocouple in any desired position, although supporting brackets or other means may be employed for supporting the thermocouple and lead connection.

The lead extension 75 has at one end terminal connector means 80 for quick detachable connection with the connector terminal means on the thermoelectric safety device. The opposite end of the lead extension has terminal connector means 81 for quick detachable connection with the terminal connector means on the thermocouple leads.

The terminal connector means 80 comprises a metallic connector cone 82 fixed on one extending end of the inner lead 76 and in good conducting contact therewith. The adjacent end of the outer lead 77 has fixed thereon a metallic connector sleeve 83 in good conducting contact therewith at 84. The sleeve 83 is insulated from the cone 82 and thereby from the inner lead 76 by insulation indicated at 85. A lead extension connector nut is provided at 86, this nut being internally threaded at 87 for threaded engagement with the externally threaded outer end of the bushing 35 on the thermoelectric safety device. The nut 86 has an internal shoulder 88 which cooperates with a shoulder 89 on the sleeve 83.

By applying the connector means 80 to the connector terminal means on the device 18, with the cone 82 positioned in the recess 48 in the stud 32, and threading the nut 86 upon the bushing 35, the cone 82 is wedged into the recess 48 and consequently makes good positive contact with the stud 32, thereby connecting the lead 76

with one terminal of the coil 22. At the same time, the threaded engagement between the nut 86 and the bushing 35 forms a good positive connection between the adjacent end of the lead 77 and the bushing 35, thereby connecting the lead 77 to the other terminal of the coil 22.

The terminal connector means 81 at the opposite end of the extension 75 comprises a metallic connector bushing 92 fixed on the extending end of the inner lead 76 and in good conducting contact therewith. The adjacent end of the outer lead 77 has fixed thereon a metallic connector sleeve 93 in good conducting contact therewith and enclosing the bushing 92. The sleeve 93 is insulated from the bushing 92 and thereby from the inner lead 76 by insulation indicated at 94. The bushing 92 has a conical recess 95 for co-operation with the connector cone 65 on the thermocouple lead, and the sleeve 93 is externally threaded at 96 for engagement with the thermocouple connector sleeve 69.

By applying the connector means 81 to the connector means on the thermocouple with the cone 65 positioned in the recess 95 and threading the nut 69 upon the sleeve 93, the cone 65 is wedged into the recess 95, and consequently makes good positive contact with the bushing 92, thereby connecting the inner thermocouple lead 55 to one terminal of the coil 22. At the same time, the threaded engagement between the nut 69 and the sleeve 93 forms a good positive connection between the adjacent end of the other thermocouple lead 57 and the sleeve 93, thereby connecting the outer thermocouple lead to the other terminal of the coil.

In the preferred embodiment of the invention, the threads 87 in the nut 86 correspond not only with the threads on the bushing 35 but also with the threads 96 on the sleeve 93, and the cone 82 is shaped not only to fit the recess 48 but also to fit the recess 95. The recess 95 is not only shaped to fit the cone 65, but also to fit the cone 82, and the threads 96 correspond not only with the threads 87 but also with the threads in the thermocouple connector nut 69.

As a result, the connector means 80 and 81 at opposite ends of the lead extension are complementary, thereby providing not only for quick detachable connection of the ends of the extension with the connector terminal means on the device 18 and with the connector terminal means on the thermocouple leads, but also providing for quick detachable connection of each end of the lead extension with the complementary end of a similar lead extension to provide, by means of a plurality of connected lead extensions, a lead connection of any desired length.

The lead extensions may be made up in different lengths as suitable and desired, and a number of such extensions of the same or different lengths may be connected together between the thermocouple and the connected device, as suitable and desired.

The operation of the apparatus, shown more or less diagrammatically in Figure 1, is generally as follows:

When the pilot light 13 is burning, the heat thereof upon the thermal junction 54 produces a thermoelectric current in the coil 22. The magnet frame and armature are preferably formed of an alloy of relatively low magnetic reluctance and, as a result, the relatively weak thermoelectric current produces a magnetic field of sufficient strength so that when the armature 24 is placed in contact with the pole ends of the

magnet frame by pushing the reset button 26, the magnetic attraction holds the armature in attracted position against the magnet frame and the valve 23 in open position as long as the pilot flame is burning.

If the pilot flame is extinguished, the holding action of the electromagnet ceases to be sufficient to hold the armature 24 in attracted position and the valve member 23 in open position, and the valve member is moved to closed position to shut off the supply of fuel to the main burner 10, for instance by means of suitable spring means as well understood in the art.

When it is desired to reset the device, the reset button 26 is engaged with the hand and pressed inwardly. The accompanying inward movement of the reset means moves the armature to attracted position and the valve member 23 to open position. Flow interrupter means (not shown) may be provided for shutting off the flow of fuel through the pipe 11 to the burner 10 during the resetting operation.

If the pilot burner 12 is lighted and sets up a thermoelectric current to hold the armature in attracted position, the valve 24 will remain open, and when the resetting button 26 is released, it is returned to outwardly projected position as shown.

If, on the other hand, the pilot burner is not lighted to produce the thermoelectric current for holding the valve 23 open, this valve will move to closed position upon release of the reset button 26.

The alternative form of thermocouple connector shown in Figure 5 comprises the connector cone 65' fixed upon the inner thermocouple lead 55' and a connector sleeve 66' fixed at 100 in the end of the sleeve 58' which corresponds with the sleeve 58 in Figure 1. The inner lead 55' is joined to the inner thermocouple member 52' to form the internal thermal junction 56'. The outer end of the inner thermocouple member 52' is joined to the outer tubular thermocouple member 51' to form the thermal junction 54'. The sleeve 66' is insulated from the cone 65' by insulation 68', and the couple lead connector nut is shown at 69'. The manner in which this thermocouple connector cooperates with the connector means at one end of the lead extension is the same as described in connection with the previous embodiment of the invention.

I do not intend to be limited to the precise details shown or described.

I claim:

1. In connector means adapted for connecting by two conductor leads the terminals of a thermoelectric generator to the terminals of an electromagnet coil of a burner safety control device so as to provide a circuit of minimum resistance to the flow of the thermoelectric current, in combination, terminal means comprising a metallic terminal sleeve, a metallic terminal stud fitting in said sleeve, a lead extension comprising an outer tubular conductor, an inner conductor disposed within said outer conductor and insulated therefrom, terminal means on said inner conductor, a connector nut adapted for quick detachable screw connection with said metallic terminal sleeve and adapted when connected to said sleeve to complete one side of an electric circuit through said outer tubular conductor, said connector nut and said terminal sleeve and, by said screwing action, to clamp the terminal means on said inner conductor in pressure contact with the

metallic terminal stud for completion of the other side of the electric circuit through said inner conductor and said terminal stud, an outwardly extending generally radial internal shoulder in said outer terminal sleeve, an outwardly extending generally radial external shoulder on said terminal stud for cooperation with said last mentioned shoulder longitudinally to position and to maintain the longitudinal position of said stud in said sleeve, and insulation between said shoulders.

2. In connector means adapted for connecting by two conductor leads the terminals of a thermoelectric generator to the terminals of an electromagnet coil of a burner safety control device so as to provide a circuit of minimum resistance to the flow of the thermoelectric current, in combination, terminal means comprising a metallic terminal sleeve, a metallic terminal stud fitting in said sleeve and having an oblique engaging surface, a lead extension comprising an outer tubular conductor, an inner conductor disposed within said outer conductor and insulated therefrom, terminal means on said inner conductor and having an oblique engaging surface, a connector nut adapted for quick detachable connection with said metallic terminal sleeve and adapted when connected to said sleeve to complete one side of an electric circuit through said outer tubular conductor, said connector nut and said terminal sleeve and to clamp the terminal means on said inner conductor in wedging contact with the metallic terminal stud for completion of the other side of the electric circuit through said inner conductor and said terminal stud, an outwardly extending generally radial internal shoulder in said outer terminal sleeve, an outwardly extending generally radial external shoulder on said terminal stud for cooperation with said last mentioned shoulder longitudinally to position and to maintain the longitudinal position of said stud in said sleeve, insulation between said shoulders, a generally radial external shoulder on said terminal sleeve, a conducting connector having an opening through which said sleeve is adapted to pass inwardly of said last mentioned shoulder, means on said terminal stud inwardly of said conducting connector for clamping said connector to said terminal sleeve and into cooperation with the external shoulder thereon, and insulation between said conducting connector and said clamping means.

3. In connector means adapted for connecting by two conductor leads the terminals of a thermoelectric generator to the terminals of an electromagnet coil of a burner safety control device so as to provide a circuit of minimum resistance to the flow of the thermoelectric current, in combination, a conducting connector having an opening therein, a terminal sleeve having a reduced end passing through said opening and forming a shoulder abutting said connector, a generally radial internal shoulder in said sleeve, a metallic terminal stud fitting in said sleeve and insulated therefrom and having an oblique engaging surface and also a generally radial external shoulder insulated from the internal shoulder in said sleeve and cooperable therewith longitudinally to position and to maintain the longitudinal position of said stud in said sleeve, means on said stud inwardly of said conducting connector for clamping said connector to said sleeve and into cooperation with the external shoulder on said sleeve, insulating means between the connector and said clamping means, a lead extension com-

prising an outer tubular conductor, an inner conductor disposed within said outer conductor and insulated therefrom, terminal means on said inner conductor and having an oblique engaging surface, and a connector nut rotatable on said outer conductor and adapted for quick detachable rotatable connection with said terminal sleeve and to clamp the terminal means on the inner conductor in wedging contact with said terminal stud.

4. In connector means adapted for connecting by two conductor leads the terminals of a thermoelectric generator to the terminals of an electromagnet coil of a burner safety control device so as to provide a circuit of minimum resistance to the flow of the thermoelectric current, a lead extension comprising an outer tubular conductor, an inner conductor disposed within said outer tubular conductor and insulated therefrom, a terminal member fixed on one end of said inner conductor beyond the adjacent end of the outer conductor and having a generally radial shoulder, an intermediate connector sleeve fixed on the end of said outer tubular conductor in proximity to said terminal member and having a shoulder for cooperation with the shoulder on said terminal member by overlaying the same, and a portion surrounding said terminal member, insulation between said shoulders, and a connector nut on the outer conductor and in circuit with said outer conductor for quick detachable rotatable connection with a cooperating tubular terminal member and cooperating with said intermediate connector sleeve by rotation to clamp said first mentioned terminal member in pressure contact with a cooperating member through the intermediate connector sleeve.

5. In connector means adapted for connecting by two conductor leads the terminals of a thermoelectric generator to the terminals of an electromagnet coil of a burner safety control device so as to provide a circuit of minimum resistance to the flow of the thermoelectric current, a lead extension comprising an outer tubular conductor, an inner conductor disposed within and insulated from said outer conductor and extending from the end of said outer conductor, a terminal member fixed on the extending end of said inner conductor and having a shoulder, an intermediate connector sleeve fixed on the end of said outer conductor in proximity to said terminal member and having a shoulder for cooperation with the shoulder on said terminal member by overlaying the same, insulation between said shoulders, a second shoulder on said intermediate connector sleeve, and a connector nut on the outer conductor for screw connection with a cooperating member and having a shoulder which, when said nut is connected to said cooperating member, cooperates by screwing action with the second shoulder on said intermediate connector sleeve to clamp said terminal member in pressure contact with a cooperating member through said sleeve, said connector sleeve serving, when connected to said cooperating member, to complete an electric circuit through said outer tubular conductor.

6. In connector means adapted for connecting by two conductor leads the terminals of a thermoelectric generator to the terminals of an electromagnet coil of a burner safety control device so as to provide a circuit of minimum resistance to the flow of the thermoelectric current, a lead extension comprising an outer tubular conductor, an inner conductor disposed within and insulated

from said outer conductor and extending from the end of said outer conductor, a terminal sleeve fixed on the end of said outer conductor and having a generally radial internal shoulder, and a metallic terminal stud fixed on the adjacent extending end of said inner conductor and having an outwardly extending generally radial external shoulder on said last mentioned sleeve and overlaying the same so as to be cooperable with said shoulder longitudinally to position and to maintain the longitudinal position of said stud in said sleeve.

7. In connector means adapted for connecting by two conductor leads the terminals of a thermoelectric generator to the terminals of an electromagnet coil of a burner safety control device so as to provide a circuit of minimum resistance to the flow of the thermoelectric current, a lead extension comprising an outer tubular conductor, an inner conductor disposed within and insulated from said outer conductor and extending from the end of said outer conductor, a one-piece terminal sleeve having a reduced bore opening from one end thereof for fixing the sleeve on the end of said outer conductor, said terminal sleeve having an enlarged bore opening from the opposite end thereof, a generally radial internal shoulder within said sleeve at the adjacent ends of said reduced and enlarged bores, a metallic terminal stud having a reduced portion fixed on the adjacent extending end of said inner conductor, said stud having an enlarged outer end disposed within the enlarged bore in said sleeve and insulated from said sleeve, said stud also having a generally radial external shoulder at the adjacent ends of the reduced and enlarged portions of said stud, said generally radial external shoulder be-

ing insulated from the internal shoulder within said sleeve and cooperable with said internal shoulder longitudinally to position and maintain the longitudinal position of said stud in said sleeve.

8. In connector means adapted for connecting by two conductor leads the terminals of a thermoelectric generator to the terminals of an electromagnet coil of a burner safety control device so as to provide a circuit of minimum resistance to the flow of the thermoelectric current, a lead extension comprising an outer tubular conductor, an inner conductor disposed within and insulated from said outer conductor and extending from the end of said outer conductor, a one-piece terminal sleeve having a reduced bore opening from one end thereof for fixing the sleeve on the end of said outer conductor, said terminal sleeve having an enlarged bore opening from the opposite end thereof, a generally radial internal shoulder within said sleeve at the adjacent ends of said reduced and enlarged bores, a metallic terminal stud having a reduced portion fixed on the adjacent extending end of said inner conductor, said stud having an enlarged outer end disposed within the enlarged bore in said sleeve and insulated from said sleeve, said stud also having a generally radial external shoulder at the adjacent ends of the reduced and enlarged portions of said stud, said generally radial external shoulder being insulated from the internal shoulder within said sleeve and cooperable with said internal shoulder longitudinally to position and maintain the longitudinal position of said stud in said sleeve, and a generally conical recess opening from the end of the enlarged portion of said stud.

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Disclaimer

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Hereby enters this disclaimer to claims 1, 2, 3, 4, and 5 of said patent.
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