March 27, 1945. H. A. MANTZ 2,372,506

THERMOELECTRIC SAFETY DEVICE

Original Filed June 24, 1939

Fig. 1.

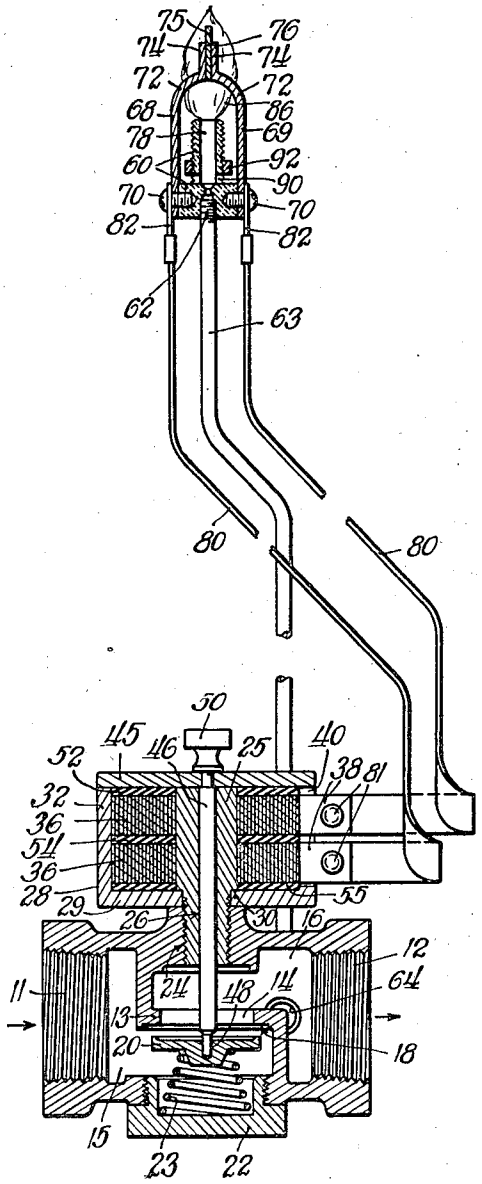
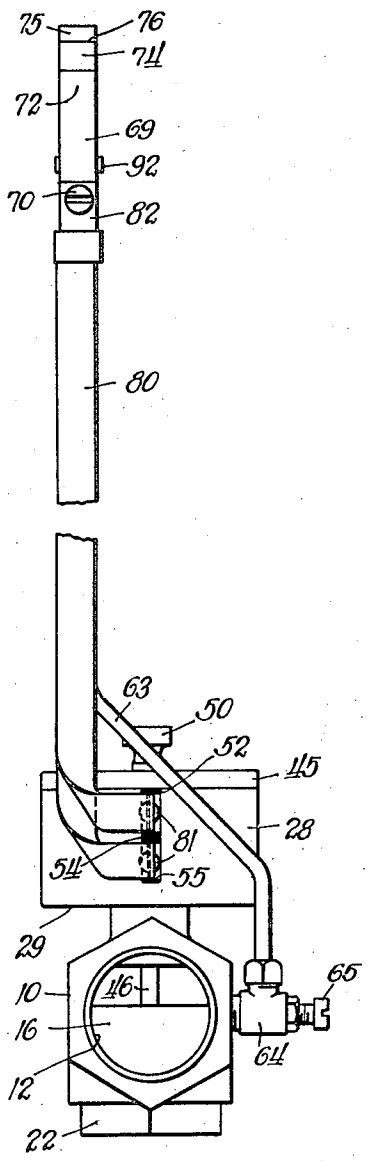


Fig. 2.



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THERMOELECTRIC SAFETY DEVICE

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8 Claims. (Cl. 136—4)

This invention relates to thermoelectric safety devices for heating and other apparatus, and has particular relation to an improved thermocouple or thermoelectric generator and pilot burner for devices of the character set forth.

The present application is a division of my copending application Serial No. 280,921, filed June 24, 1939.

One of the main objects of the present invention is to provide an improved form of combined thermocouple or thermoelectric generator and pilot burner which is effective and reliable in operation and, at the same time, is simple and compact in construction and relatively inexpensive to build, assemble, and install; also an improved lead connection arrangement for the thermocouple.

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 an axial section through a thermoelectric valve showing a thermocouple and pilot burner embodying the present invention applied thereto; and

Figure 2 is a side view of the thermoelectric valve and thermocouple and pilot burner shown in Figure 1.

Referring to the drawing, the device selected for illustration comprises a valve body 10 having a fuel inlet 11 and a fuel outlet 12 which are tapped internally to receive the inlet and outlet pipe sections of the fuel supply pipe leading to the main burner (not shown). The valve body 10 has an internal wall or partition 13 which has a valve opening 14 through which communication is adapted to be effected between the inlet chamber 15 which is in communication with the inlet 11, and the outlet chamber 16 which is in communication with the outlet 12. The valve opening 14 is surrounded by a valve seat 18.

Communication between the inlet chamber 15 and the outlet chamber 16 through the valve opening 14 is controlled by a valve disc 20. The valve disc 20 is adapted to seat against the valve seat 18 to close communication between chambers 15 and 16 and thereby to shut off the fuel supply to the main burner. Movement of the valve disc 20 away from the valve seat 18 to open position, as shown, sets up the desired supply of fuel to the burner. The valve disc 20 may have a valve disc gasket or yielding seating member (not shown) suitably secured thereto for yielding seating engagement with the seat 18, although this may vary. A plug or cap member 22 is detachably secured, for example, by threaded engagement, as shown, to the valve body 10 in alignment with the valve 20, and a valve closing and armature retracting spring 23 is interposed between the valve disc 20 and the cap member 22.

The side of the valve body 10 opposite the plug or cap member 22 has an opening 24 extending therethrough also in alignment with the axis of the valve 20, and secured in this opening 24, for example, by threaded engagement therein, as shown, is a post 25 formed of metal or other suitable material, which post 25 has an opening 26 extending axially therethrough. A frame 28, formed of metal or other suitable material, has an inner wall 29 disposed radially of the post 25 and clamped in place to the valve body 10, for example, by engagement of the shoulder 30 on the plug 25 therewith, as shown. The frame 28 has an annular wall 32 integral with the wall 29.

Either the outer end of the post 25 or the annular wall 32, or both, and preferably at least the outer end of the post 25, constitutes a magnet frame or core for the electromagnet. The electromagnet coil means is shown in the form of a pair of ribbon-like conductors surrounding or coiled at 36 about the post 25 and disposed within the frame 28. The turns or convolutions of the coils 36 will, of course, be insulated from each other by suitable insulation interposed therebetween. The particular form of the coil may vary.

In the illustrated embodiment of the invention, the outer terminals 38 of the coils 36 extend out through an opening 40 in the wall 32. Suitable insulation may be provided for insulating the terminals 38 from the frame 28 adjacent the opening 40, and the inner terminals of the coils 36 are connected together by suitable conductor means or grounded, for example, through the post 25 to connect the coils 36 in series circuit relation.

The armature 45 is disposed externally of the valve body and on the side of the electromagnet opposite the side on which the valve or control member 20 is disposed. The armature, which is shown as of disc-like form and as secured to the outer end of a reciprocatory armature and valve stem 46, is adapted to be held attracted to the magnet frame of the electromagnet when the electromagnet is energized by the heat of the pilot burner on the thermocouple. The attachment of the armature to the stem 46 may, if desired, be of a character to permit some self-accommodation of the armature to the pole means of the magnet frame when the armature is in attracted position.

The stem 46 extends inwardly for reciprocatory movement through the opening 26 in the post 25, and its inner end engages at 48 axially in a recess in the valve disc 20. A reset button 50 may be secured upon the outer end of the stem 46. The opening 26 may, of course, be sealed, as suitable or desired, against leakage of the gas or other fuel out through the opening 26 along the stem

46. Insulation is preferably provided at 52 between the outer coil 36 and the armature 45; also at 54 between the coils 36, and at 55 between the inner coil and the wall 29 of the frame 28.

The pilot tip or pilot head 60, which is preferably formed of a refractory insulating material, is mounted, for instance, by threaded engagement at 62 upon the outer end of the tube 63 which supplies fuel to the pilot burner. The opposite end of the pilot supply tube 63 is connected to the fuel supply line, for example, through connection at 64 to the outlet chamber of the valve body 10. A metering screw may be provided at 65 for metering the supply of fuel for the pilot burner.

If, because of the greater amount of fuel outlet opening at the main burner, the pilot supply connection to the tube 63, at 64, does not supply the desired pilot supply of fuel to the pilot burner from the outlet chamber 16 when the valve 20 is open, the pilot supply tube may be connected to the fuel supply line in any other suitable or preferred manner to secure the desired pilot supply of fuel to the pilot burner when the valve 20 is open. For example, the tube 63 may be connected to the fuel supply line anterior of the valve body 10, or it may be connected to the valve body in communication with the inlet chamber 15, or any other suitable connection may be provided for supplying fuel to the pilot supply tube 63.

The thermocouple comprises a pair of thermocouple elements 68 and 69 formed of any desired dissimilar metallic materials. In the illustrated embodiment of the invention, the thermocouple elements 68 and 69 are in the form of flat strips secured by screws 70 to the insulating base of the pilot burner 60. The outer ends of the thermocouple elements 68 and 69 are bowed inwardly at 72, and terminate in parallel tips 74 joined, for example, through a suitable intervening element 75 to form a "hot" junction at 76 in alignment with the opening or port 78 through the pilot head 60. The intervening element 75 is preferably of good heat conveying or heat conducting characteristics adapted for picking up and conveying the heat to the junction 76 when the pilot light is burning, and for dissipating the heat to cool the junction 76 when the pilot flame is extinguished.

Metallic lead conductors 80 shown in the form of flat strips or of ribbon-like form, although this may vary within the scope of the present invention, are connected at their inner ends at 81 to the terminals 30 of the respective coil portions 36. The outer ends of the lead conductors 80 are connected through terminals 82 to the inner ends of the respective thermocouple elements 68 and 69, "cold" thermocouple junctions being provided in juxtaposition to the connections between the conductors 80 and the respective thermocouple elements.

Where the fuel is of a character, such as gas, requiring admixture of air therewith, the air necessary to provide the desired gaseous mixture is supplied in any suitable or preferred manner. When the valve 20 is open or, where the pilot burner connection is anterior to this valve, then when the valve is open or closed, the pilot supply of the resulting gaseous mixture or other fuel passes outwardly through the tube 63 to the pilot head 60 and issues outwardly through the port 78, and when ignited, forms the pilot flame 86 which impinges upon the thermal junction 76 and heats the same to set up a thermoelectric current.

The pilot head 60 has openings 90 for the admission of air. Means, for example, in the form of a nut 92 is adjustable on the tip of the pilot head for adjusting the air inlets 90. The air adjusting member 92 is shown as threaded upon the tip of the pilot head for this purpose, but this may vary.

The operation of the device is as follows:

When the pilot burner or other flame to the heat of which the thermal junction 76 is subject is extinguished, the electromagnet is deenergized, or at least the holding action thereof ceases to be sufficient to hold the armature 45 attracted to the magnet frame, as shown, and the spring 23 compels the valve 20 to closed position, thereby shutting off the supply of fuel to the main burner through the valve opening 14. In the movement of the valve 20 to closed position, the outer end of the stem 46, by its attachment to the armature 45, moves the armature 45 to retracted position. In the illustrated embodiment of the invention, closing of the valve 20 also shuts off the supply of fuel to the pilot burner. The particular showing in this respect is more or less diagrammatic and only for purposes of illustration.

When it is desired to reset the device, the reset button 50 is pressed inwardly. This presses the armature to attracted position and simultaneously presses the valve 20 to open position against the tension of the spring 23. A pilot supply of fuel is thereupon set up to the pilot burner which is then lighted, and the heat of the pilot flame upon the thermal junction 76 of the thermocouple creates a thermoelectric current in the coil means 36. This energizes the electromagnet and causes the armature 45 to be held positively against the magnet frame or in attracted position and the valve 20 in open position.

Upon extinguishment of the pilot flame the electromagnet is deenergized, or at least the holding action thereof ceases to be sufficient to hold the armature in attracted position and, as previously pointed out, the spring 23 compels the valve 20 to closed position, thereby shutting off the supply of fuel and, at the same time, the armature is actuated to retracted position.

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

I claim:

1. A thermocouple and pilot device comprising an insulating pilot head having a base and a tip extending from said base, said pilot head having an opening extending through said tip through which fuel is discharged to maintain a pilot flame, said pilot head having an opening for the admission of air, means adjustable on the tip of said head for adjusting the air inlet, and a pair of thermocouple elements secured in spaced relation to the base of said head and extending externally along the outer sides of said adjusting means and constituting guard means therefor, said thermocouple elements being bowed toward each other outwardly of said head and joined at their outer ends to form a thermal junction substantially in alignment with said port.

2. A thermocouple and pilot burner comprising a refractory insulating pilot head having an enlarged base portion and provided with a port through which fuel is adapted to be discharged to maintain a pilot flame, said pilot head being adapted for attachment to a fuel supply pipe with said port in communication therewith, said pilot head having a reduced tip part in communication with said port and provided with port means adjacent the base portion of the pilot head for the

admission of air, a nut adjustable on said tip part for adjusting said air admission port means, and a pair of thermocouple elements secured in spaced relation to opposite sides of said base portion and brought substantially together and joined at their outer ends to form a thermojunction positioned outwardly of said tip part to be heated by the pilot flame maintained at said tip part, said thermocouple elements extending externally along outer sides of said air adjusting nut and constituting guard means therefor.

3. A thermocouple and pilot burner comprising a refractory insulating pilot head having an enlarged base portion and provided with a port through which fuel is adapted to be discharged to maintain a pilot flame, said pilot head being adapted for attachment to a fuel supply pipe with said port in communication therewith, said pilot head having a reduced tip part in communication with said port and provided with port means adjacent the base portion of the pilot head for the admission of air, a nut adjustable on said tip part for adjusting said air admission port means, and a pair of thermocouple elements secured in spaced relation to opposite sides of said base portion and brought substantially together and joined at their outer ends to form a thermojunction positioned outwardly of said tip part to be heated by the pilot flame maintained at said tip part, the reduced size of said tip part being sufficient to permit adjustment of said nut between said thermocouple elements, said thermocouple elements extending externally along outer sides of said air adjusting nut and constituting guard means therefor.

4. A thermocouple and pilot burner comprising a refractory insulating pilot head having an enlarged base portion and provided with a port through which fuel is adapted to be discharged to maintain a pilot flame, said pilot head being adapted for attachment to a fuel supply pipe with said port in communication therewith, said pilot head having a reduced tip part in communication with said port and provided with port means adjacent the base portion of the pilot head for the admission of air, a nut adjustable on said tip part for adjusting said air admission port means, a pair of thermocouple elements secured in spaced relation to opposite sides of said base portion and brought substantially together and joined at their outer ends to form a thermojunction positioned outwardly of said tip part to be heated by the pilot flame maintained at said tip part, and a pair of lead conductors secured to opposite sides of said pilot head, one in contact with each of said thermocouple elements, said thermocouple elements extending externally along outer sides of said air adjusting nut and constituting guard means therefor.

5. A thermocouple and pilot burner comprising a refractory insulating pilot head having an enlarged base portion and provided with a port through which fuel is adapted to be discharged to maintain a pilot flame, said pilot head being adapted for attachment to a fuel supply pipe with said port in communication therewith, said pilot head having a reduced tip part in communication with said port and provided with port means adjacent the base portion of the pilot head for the admission of air, a nut adjustable on said tip part for adjusting said air admission port means, a pair of thermocouple elements secured in spaced relation to opposite sides of said base portion and brought substantially together and joined at their outer ends to form a thermojunction positioned outwardly of said tip part to be heated by the pilot flame maintained at said tip part, the reduced size of said tip part being sufficient to permit adjustment of said nut between said thermocouple elements, a pair of lead conductors secured to opposite sides of said pilot head, one in contact with each of said thermocouple elements, and an intervening element secured between the joined ends of said thermocouple elements at the thermojunction heated by the pilot flame, said thermocouple elements extending externally along outer sides of said air adjusting nut and constituting guard means therefor.

6. A thermocouple and pilot burner comprising a refractory insulating pilot head having an enlarged base portion and provided with a port through which fuel is adapted to be discharged to maintain a pilot flame, said pilot head being adapted for attachment to a fuel supply pipe with said port in communication therewith, said pilot head having a reduced tip part in communication with said port and provided with port means adjacent the base portion of the pilot head for the admission of air, a nut threaded on said tip part for adjusting said air admission part means and a pair of thermocouple elements secured to opposite sides of said base portion spaced apart and insulated from each other thereby and brought substantially together and joined at their outer ends to form a thermojunction positioned outwardly of said tip part to be heated by the pilot flame maintained at said tip part, the reduced size of said tip part being sufficient to permit adjustment of said nut between said thermocouple elements.

7. A thermocouple and pilot burner comprising a refractory insulating pilot head having an enlarged base portion and provided with a port through which fuel is adapted to be discharged to maintain a pilot flame, said pilot head being adapted for attachment to a fuel supply pipe with said port in communication therewith, said pilot head having a reduced tip part in communication with said port and provided with port means adjacent the base portion of the pilot head for the admission of air, a pair of thermocouple elements secured to opposite sides of said base portion spaced apart and insulated from each other thereby and brought substantially together and joined at their outer ends to form a thermojunction positioned outwardly of said tip part to be heated by the pilot flame maintained at said tip part, a nut threaded on said tip part for adjusting said air admission port means, the reduced size of said tip part being sufficient to permit adjustment of said nut between said thermocouple elements, a pair of lead conductors secured to opposite sides of said pilot head, one in contact with each of said thermocouple elements, and an intervening element secured between the joined ends of said thermocouple elements at the thermojunction heated by the pilot flame.

8. A thermocouple and pilot device comprising a pair of thermocouple elements each of flat ribbon-like form having angular tips joined to form a thermojunction, said thermocouple elements being bowed apart inwardly of said tips to form a space therebetween, an insulating pilot tip positioned between the spaced apart ends of said thermocouple elements and having an outlet directed toward said thermojunction, and means passing laterally through the spaced apart ends of said thermocouple elements and into the base of the tip for securing said tip in place between said thermocouple elements.

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