Jan. 1, 1957 F. H. HUNTLEY 2,775,966

OIL BURNER IGNITION SYSTEM

Filed May 21, 1953 4 Sheets-Sheet 1

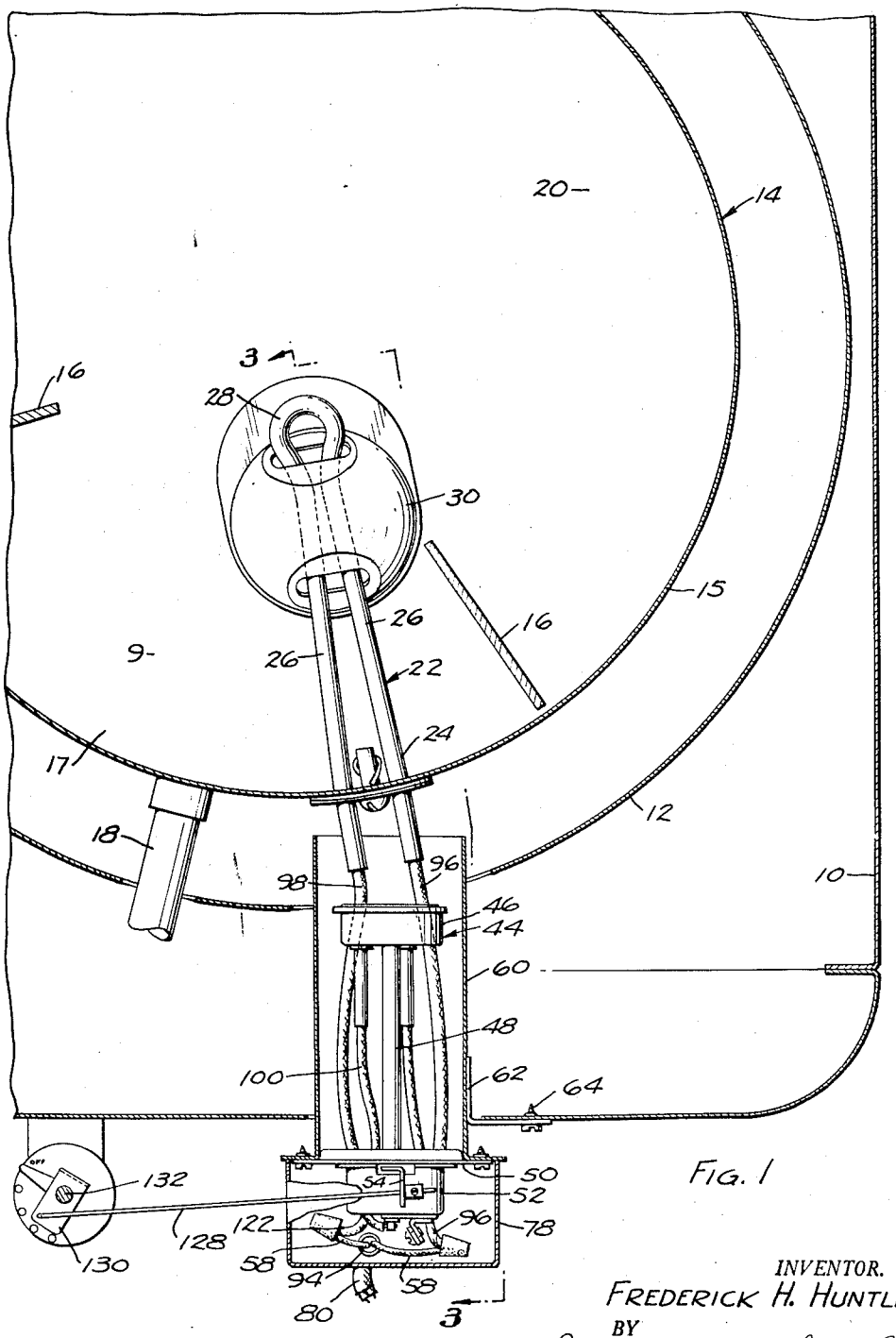


FIG. 1

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OIL BURNER IGNITION SYSTEM

Filed May 21, 1953 4 Sheets-Sheet 2

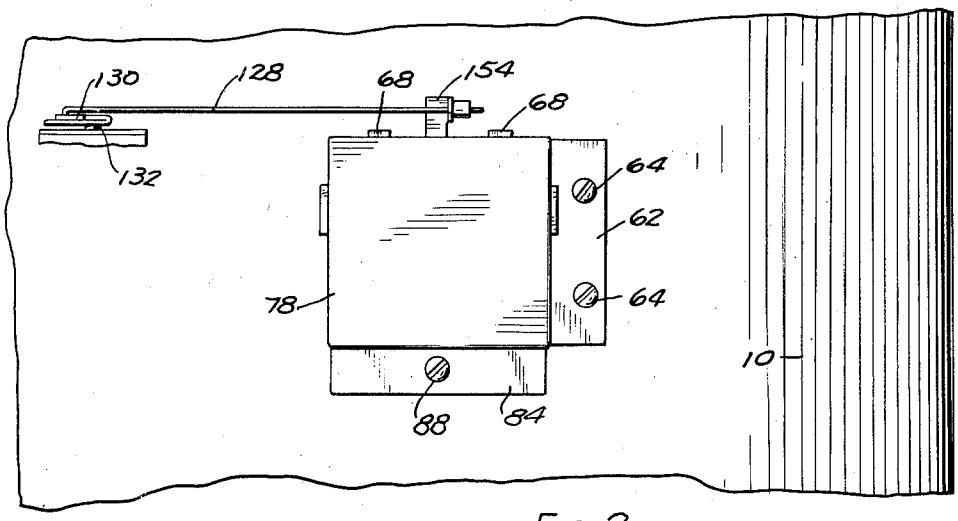


FIG. 2

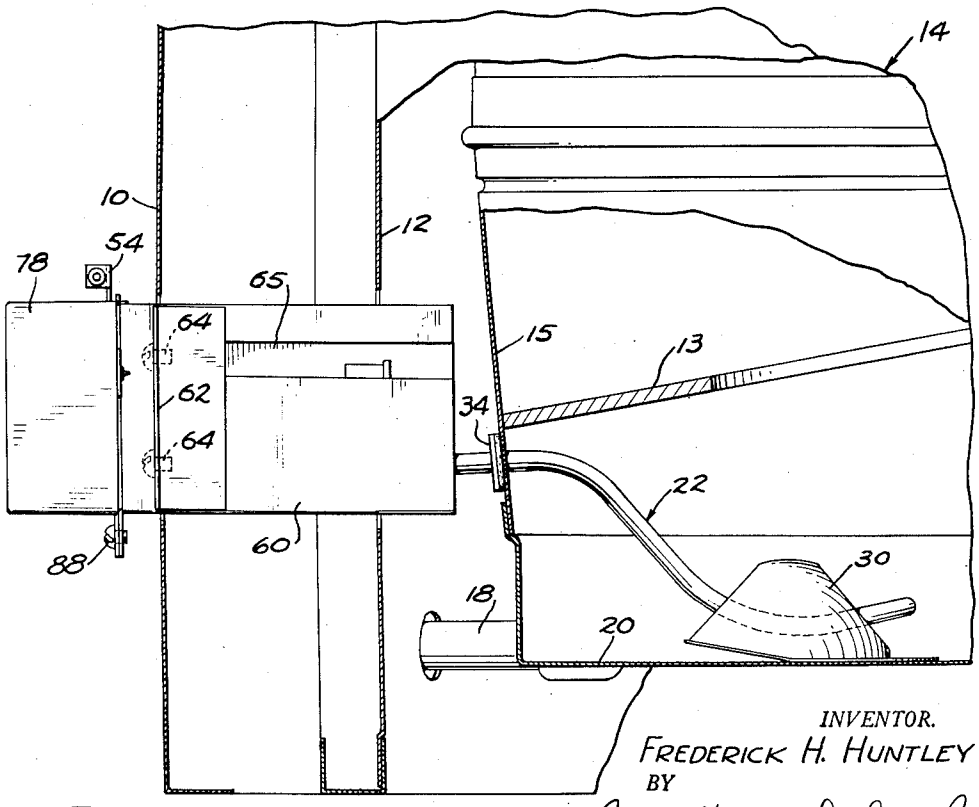


FIG. 3

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OIL BURNER IGNITION SYSTEM

Filed May 21, 1953 4 Sheets-Sheet 3

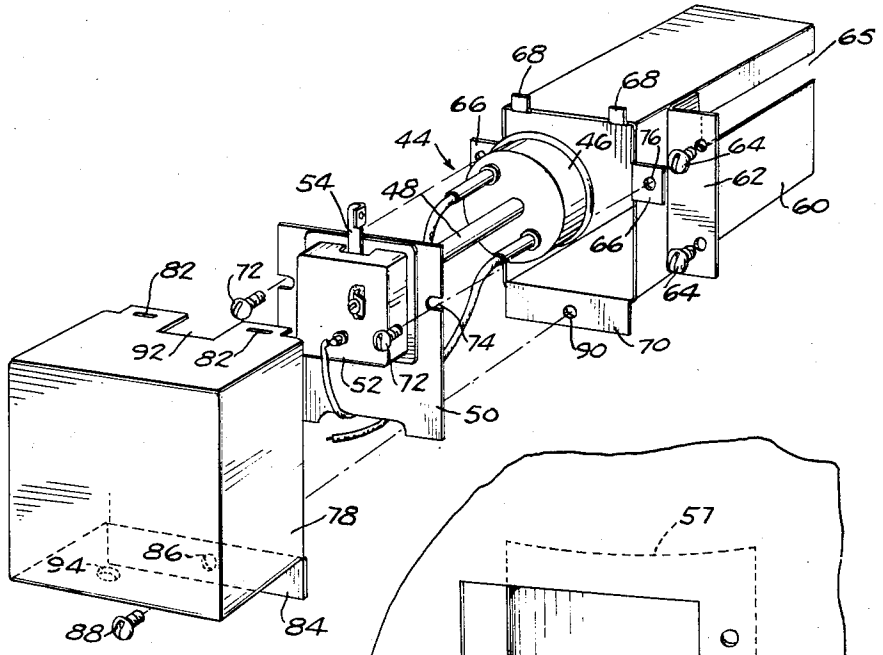


FIG. 4

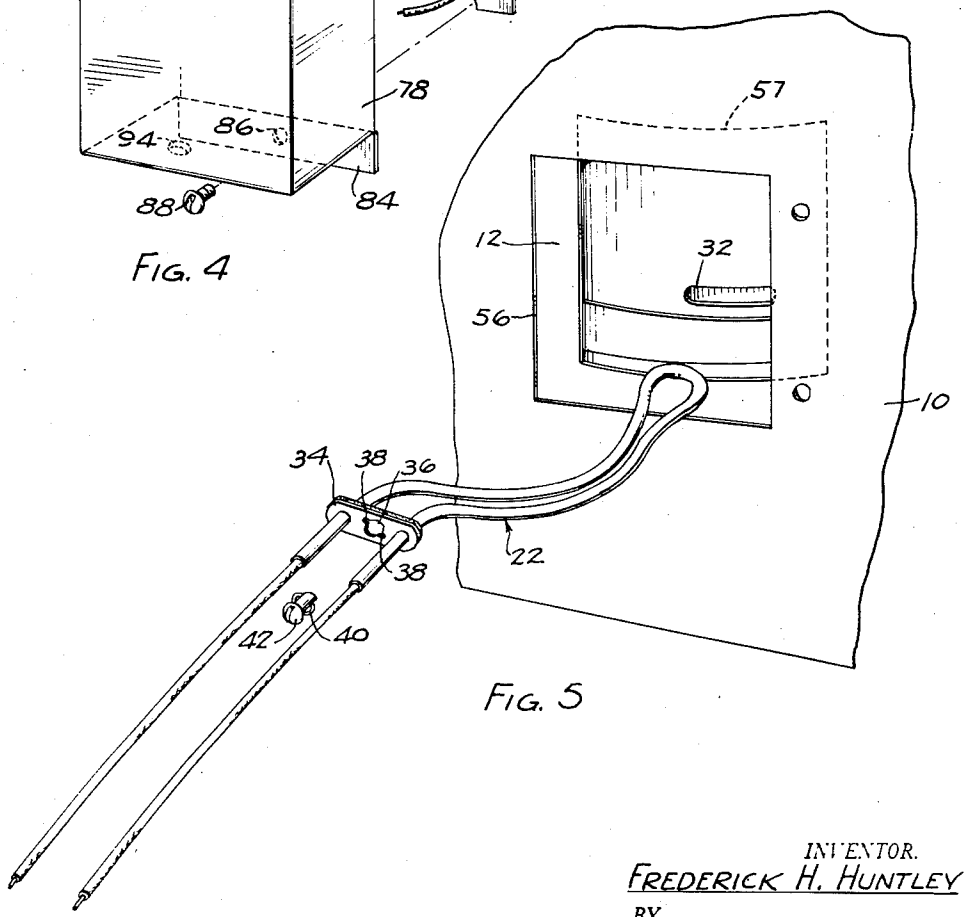


FIG. 5

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OIL BURNER IGNITION SYSTEM

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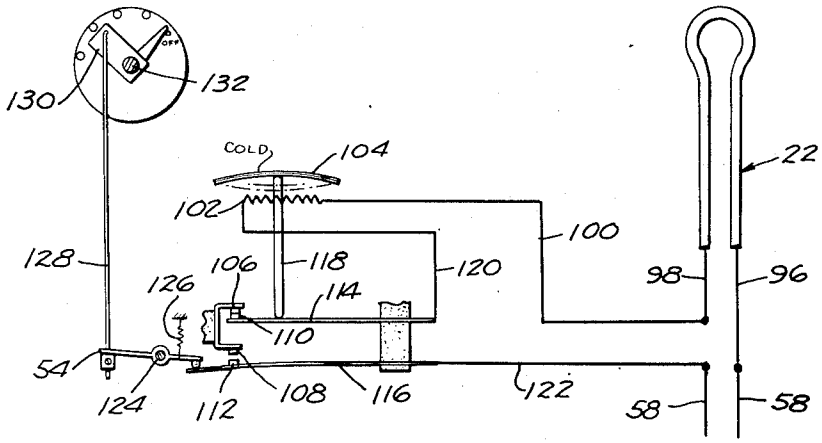
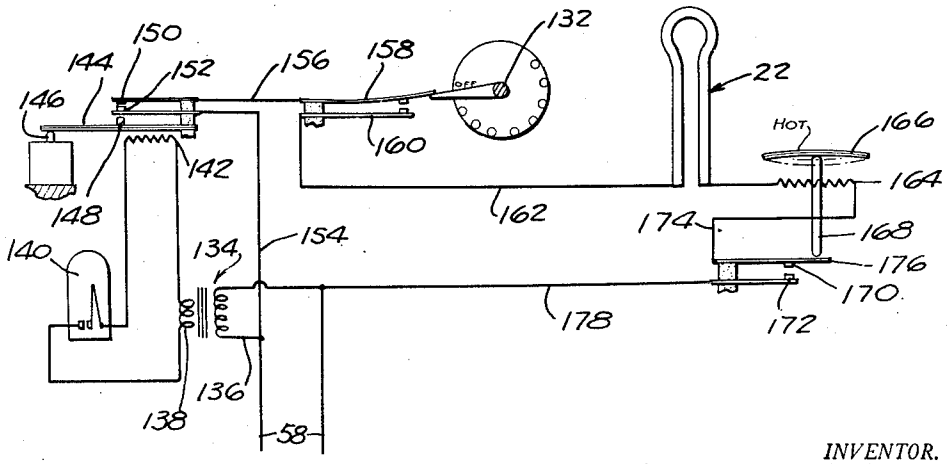


FIG. 6

FIG. 7



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2,775,966

OIL BURNER IGNITION SYSTEM

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Application May 21, 1953, Serial No. 356,558

12 Claims. (Cl. 126—93)

This invention relates to an oil ignition arrangement for an oil heater having a vaporizing pot type burner.

An object of this invention is to provide an electrical ignition system for an oil heater of this type which is of compact economical construction and which is very easy to operate.

Another object of the invention resides in the provision of an electrical ignition system for an oil heater of this type which is constructed such as to be readily accessible and removable for servicing.

A further object of the invention resides in the provision of an electrical ignition arrangement for a vaporizing oil burner which will automatically turn off or hold off the igniter when the conditions of the burner render it unsafe or undesirable to energize the igniter and to automatically re-energize the igniter when the conditions of the burner again make it safe or desirable to again energize the igniter.

It has been found that it is not safe to feed oil to a hot vaporizing type burner and then light it. This is due to the fact that a hot burner will instantly vaporize the oil. The vaporized oil mixes with air and forms an explosive mixture which cannot ordinarily be safely ignited. When oil is added to a cool burner this action does not take place and it is safe to ignite the burner. Hence, there is a temperature below which a burner can be safely lighted. On the other hand, if a burner is burning there is no occasion to light it and under this condition, as well as when the burner is not lighted and is above a temperature where it is safe to add oil and light, the ignition circuit should be held open. The ignition arrangement of this invention provides this necessary control of the operation of the igniter.

In the drawings:

Fig. 1 is a sectional view taken along a horizontal plane through an oil heater provided with the eelctrical ignition system of this invention.

Fig. 2 is a fragmentary back elevational view of the heater.

Fig. 3 is a sectional view taken along the line 3—3 in Fig. 1.

Fig. 4 is a perspective exploded view of the thermo-switch unit and the housing therefor employed for controlling the operation of the igniter.

Fig. 5 is a perspective view showing the manner in which the igniter element is mounted in the burner.

Fig. 6 shows one electrical circuit that may be employed in the ignition system of this invention when it is desired to control the flow of oil manually.

Fig. 7 shows an electrical circuit for the ignition system of this invention wherein the flow of oil is controlled thermostatically.

In Figs. 1 and 3 there is shown a space heater provided with an outer casing 10 and an inner casing 12 in which is positioned a burner 14 having a side wall 15. Within the burner 14 there is arranged an inclined, centrally apertured baffle 13 and a pair of upright baffles 16 which

define a pilot stabilizer 17. An inlet conduit 18 is arranged to admit fuel oil to the floor 20 of the burner. For igniting the oil on the floor of the burner, there is provided an igniter unit 22. Igniter unit 22 may be in the form of an electrical resistance heating element, preferably of the sheathed or composite type, wherein a resistance wire is incased within a metal tube 24 and insulated therefrom by any suitable insulating material such as magnesium oxide. Unit 22 is shaped with a pair of legs 26 connected by a return bent portion 28. Unit 22 is mounted on the side wall 15 of burner 14 so that the return bent portion 28 extends downwardly preferably to within about one-half inch of the floor 20 of the burner. An intensifier hood 30 is positioned over the lower end of the igniter unit 22 so as to define a relatively small area over a portion of the floor 20 of the burner in which heat may be concentrated to facilitate the ignition of fuel. The construction and operation of hood 30 is described in detail in the copending application of Frederick H. Huntley and Clinton W. Fraim, Serial No. 335,936, filed February 9, 1953, assigned to the assignor of the present application, and a more elaborate description of this hood need not be undertaken here.

In order to accommodate unit 22 the side wall 15 of burner 14 is fashioned with an elongate, horizontally extending opening 32. Adjacent the outer ends of legs 26 there is fixed on unit 22 a plate 34 which, when the unit 22 is inserted through the opening 32 in the wall 15 of the burner, overlaps the edges of opening 32. Plate 34 is provided with a central opening 36 having diametrically opposite notches 38 to accommodate the spring legs 40 of a fastener 42. When unit 22 is inserted through opening 32 and arranged so that plate 34 overlies opening 32, fastener 42 may be inserted through opening 36 and rotated so that the ends of the spring legs 40 engage the inner face of wall 15, as shown in Fig. 1.

For controlling the operation of the igniter unit 22, there is provided a heat-responsive switch which is generally designated 44. Switch unit 44 is connected in circuit with unit 22 in a manner described hereinafter. The switch includes a cylindrical housing 46 from one face of which projects a tubular casing 48. Housing 46 and casing 48 are supported by a plate 50 on which a switch mechanism is mounted and enclosed by a cover 52. A switch arm 54 extends outwardly through cover 52. Within housing 46 there is arranged a heat-responsive unit which acts through a rod enclosed within tubular casing 48 to actuate the mechanical switch within cover 52. For the proper operation of unit 44 it is necessary to mount the unit on the heater such that the heat-responsive unit in housing 46 is influenced quite readily by the heat within burner 14. Accordingly, outer casing 10 and inner casing 12 are formed with registering openings 56 and 57 which correspond in position with the opening 32 in wall 15 as shown in Fig. 5. A generally rectangular tube or casing 60 is projected through these openings and secured in this position by a bracket 62 which is arranged to be connected with the outer casing 10 as by a pair of screws 64. Along one side casing 60 is provided with a ventilating slot 65 (Fig. 4).

Referring to Fig. 4, it will be observed that at its outer end tube 60 is formed with lugs 66 along its side edges, a pair of spaced apart tabs 68 along its upper edge, and with a downwardly turned flange 70 along its lower edge. Switch unit 44 is supported on tube 60 by a pair of screws 72 which pass through notches 74 in the side edges of plate 50 and thread into openings 76 in lugs 66. A cover 78 is arranged to enclose the outer end of switch unit 44 and the electrical connections between switch unit 44, ignition unit 22 and the leads 58 of service cord 80 which supplies current to the unit. Cover 78 is fashioned on its upper side with a pair of slots 82

arranged to engage over tabs 68, and along its lower side cover 78 is provided with a flange 84 having an aperture 86 therein to accommodate a screw 88 which threads into an opening 90 in flange 70 to lock cover 78 in place. On its top side cover 78 is formed with a notch 92 to accommodate switch arm 54, and on its bottom side cover 78 is formed with an opening 94 through which cord 80 extends.

Referring now to Figs. 6 and 7 there are shown several circuits that may be employed for connecting igniter unit 22 and switch unit 44 with a source of current. In Fig. 6 the electrical circuit for manual operation of the burner is illustrated. In this circuit one side of the supply line 58 is connected directly with one lead 96 of igniter unit 22. The other lead 98 of igniter unit 22 is connected as by a conductor 100 with one end of a resistance heating element 102. Adjacent element 102 there is arranged a bimetal disc 104 which, in response to an increase in temperature, is arranged to flex from the position shown in solid lines to that shown in broken lines. Heating element 102 and disc 104 are enclosed within the cylindrical housing 46 of switch unit 44.

Within cover 52 and mounted on plate 50 there is arranged a switch which includes a pair of stationary contacts 106 and 108 arranged to close with contacts 110 and 112 mounted adjacent the free ends of spring arms 114 and 116, respectively. Springs 114 and 116 normally tend to flex to a position which closes the circuit between contacts 106 and 110 and contacts 108 and 112. A rod member 118 which is enclosed within the tubular member 48 of switch unit 44 contacts disc 104 at one end and spring 114 at the other end. A conductor 120 connects the other end of heating element 102 with spring conductor 114, and a conductor 122 connects the other spring conductor 116 with the other side of line 58. Switch arm 54 is pivotally supported as at 124 and has the free end thereof overlying the free end of spring arm 116 so that when the spring arm 54 is pivoted in a clockwise direction as viewed in Fig. 6, it engages the end of arm 116 and causes contacts 108 and 112 to break. A spring 126 normally urges spring arm 54 in a counterclockwise direction. The end portion of switch arm 54 which projects upwardly out of cover 78 has connected thereto one end of a wire or rod member 128, the other end of which is connected with a plate 130 mounted on the control rod 132 of the oil control device (not shown) for supplying oil to the burner through inlet pipe 18.

With the switch unit 44 connected into the circuit as shown in Fig. 6, it will be observed that, when the oil control rod 132 is rotated counterclockwise from the off position shown, spring 126 will cause switch arm 54 to pivot in a counterclockwise direction thereby closing the circuit through contacts 108 and 112, provided that bimetal disc 104 is in the solid line position. Disc 104 is designed to flex from the solid to the broken line position under the influence of heat from heating element 102. If therefore the oil control rod 132 is rotated to admit oil to the burner and close the circuit through contacts 108 and 112 when the bimetal disc 104 is relatively cool, a current will flow through ignition unit 22 thereby raising the temperature thereof sufficiently to ignite the oil on the floor 20 of the burner.

It will be observed, however, that heater 102 is connected in series with ignition unit 22. Thus, while a current is flowing through unit 22 the resistance heating element 102 is also being heated. Element 102 is designed such that after current flows through this element for an interval of time which corresponds to the time normally necessary for unit 22 to ignite the oil, it raises the temperature of bimeal disc 104 sufficiently to cause the bimetal to flex from the solid to the broken line position and thereby open the circuit through the ignition unit 22 and heating element 102 through the contacts 106 and 110. Heater 102 then cools. If the oil is the

burner is ignited, the temperature of the side wall 15 of the burner will be sufficiently high to maintain disc 104 in the broken line position. If, however, the oil is not ignited, then disc 104 will cool and flex from the broken line to the solid line position. Relatively rapid cooling of disc 104 is insured by the slot 65 which allows circulation of air in casing 60. Thus, as long as ignition does not take place the unit will recycle until the circuit is opened either at the line 58 or by turning oil control rod 132 clockwise to the off position which will open contacts 108, 112.

Normally ignition occurs within two minutes; but to insure ignition under abnormal condition, such as an extremely cold burner or cold oil, it is preferred to maintain the ignition circuit closed for intervals of four minutes. It has been found that, under conditions where disc 104 is spaced one inch from the burner side wall 15, good results are obtained with contacts 106, 110 opening at 230° F. and closing at 105° F.

The arrangement shown in Fig. 7 is arranged for thermostatic operation of the circuits including ignition unit 22. Thus, in the arrangement shown a transformer 134 has its primary 136 connected across line 58 and its secondary 138 connected in series with a room thermostat 140 and a resistance heating element 142. Element 142 is positioned adjacent a bimetal spring arm 144 the outer end of which contacts the upper end of a valve stem 146 which moves upwardly to open a valve port in the oil control device (not shown) from which oil is supplied to the burner. Bimetal arm 144 normally holds valve stem 146 in its lowermost position thereby shutting off the flow of oil to the burner. Arm 144 is provided with a boss 148 which, when the bimetallic arm flexes upwardly, closes a pair of spring contacts 150 and 152 which are normally spaced apart.

Contact 152 is connected to one side of line 58 by a conductor 154 and contact 150 is connected as by a conductor 156 with a spring contact arm 158 which, when the oil control rod 132 is rotated from the off to the on position, closes with the spring contact arm 160. Spring arm 160 is connected as by a conductor 162 with one end of the resistance wire in igniter unit 22. The other end of the resistance wire in unit 22 is connected with one end of a resistance heating element 164 positioned adjacent a bimetal disc 166 which, in response to a decrease in temperature below a predetermined value, flexes from the solid to the broken line position and acts through rod 168 to close contacts 170 and 172. A conductor 174 connects heater 164 with the spring arm 176 on which contact 170 is supported. Contact 172 is connected as by a conductor 178 with the other side of line 58.

With the arrangement shown in Fig. 7 the circuit through the secondary 138 of transformer 134, room thermostat 140 and heater 142 is closed whenever the thermostat contacts are closed and the line 58 is connected with a source of electricity such as by the conventional plug-in socket. However, valve stem 146 is ineffective to admit oil from the oil control mechanism to the burner unless oil control rod 132 is rotated from the off position counterclockwise to an on position. Thus, when control rod 132 is turned to an on position a circuit through ignition unit 22 is either closed or not closed, depending upon whether the circuit is closed both at contacts 150 and 152 and at contacts 170 and 172.

If the burner wall 15 is relatively cool, the disc 166 will also be relatively cool and assume the position shown in broken lines, thus closing contacts 170 and 172. If at this time the room thermostat 140 calls for heat, thereby closing a circuit through heating element 142, arm 144 will be flexed upwardly to close the circuit at contacts 150 and 152. When these conditions obtain, control rod 132 being turned to the "on" position thus closing contacts 158, 160, stem 146 of the oil control will be raised to admit oil to the burner and ignition unit 22 will become heated to ignite the oil on the floor of the burner.

After a predetermined interval of time has elapsed heater element **164**, being connected in series with ignition unit **22**, will become heated and cause disc **166** to flex from the broken to the solid line position thereby acting through rod **168** to open the circuit at contacts **170** and **172**. Thus, as long as room thermostat **140** calls for heat, the ignition system will recycle intermittently until the circuit is broken either at line **58** or by rotating control rod **132** clockwise to the "off" position shown in Fig. 7.

The arrangements described herein possess several distinct advantages. From the electrical standpoint, it will be observed that the ignition unit will recycle at regular intervals until the oil is ignited or the circuit is opened either by disconnecting the service cord **80** or by turning the oil control rod **132** to the "off" position. In addition, it will be observed that the heating coil for the bimetallic disc is in series circuit with the ignition unit **22**. Thus, this heating coil operates at a much lower voltage and can be made of a very sturdy construction.

From the mechanical standpoint, the arrangement is designed to render the ignition unit and the temperature responsive switch unit very accessible. For example, when it is desired to service either the switch unit **44** or the ignition unit **22**, it is only necessary to remove screw **88** and thereby enable removal of cover **78** which exposes the electrical connections between the leads of the service cord **80**, the switch unit **44** and the igniter unit **22**. The switch unit **44** may be removed by simply removing screws **72**, and this permits access to the ignition unit **22** which may be removed from the burner by simply turning fastener **42** to a position wherein the legs **40** are aligned with the notches **38** in plate **34** so that the igniter as a whole can be withdrawn from the burner through the opening **32**.

It will be recognized that the turn-off point of the ignition, while it is made effective at a given temperature, occurs in a regulated period of time after the igniter circuit is energized. Normally the burner temperature at this turn-off point is not sufficiently high to accomplish a turn off, but when the burner lights or has been lighted and extinguished and the temperature has not receded to a temperature where it is safe to light the burner, the burner temperature will be high enough to hold the igniter circuit open.

I claim:

1. In a heater of the type including a vaporizing pot type oil burner, an electrical ignition system comprising an electrical resistance heating element positioned in the burner and a temperature responsive switch in circuit with said heating element, said temperature responsive switch including a housing, a bimetallic member in said housing, an electrical resistance heating element positioned adjacent said bimetallic member in said housing, a tubular extension on said housing, a rod axially movable in said tubular extension and having one end engaging said bimetallic member, a support mounted at the end of said tubular extension opposite said housing, a switch mechanism on said support, said rod having its other end operatively connected with said switch mechanism to open and close said switch mechanism in response to flexing of said bimetallic member, said switch mechanism and said first and second mentioned electrical resistance heating elements being connected in circuit whereby said bimetallic member flexes at given temperatures to close and open the circuit through said first mentioned electrical resistance heating element, and means on the heater spaced from the burner and supporting said support with said housing positioned adjacent the burner so that said bimetallic member will respond to a temperature of the burner to close and to a temperature of said second mentioned electrical resistance heating element to open said switch mechanism at predetermined times.

2. The combination set forth in claim 1 wherein said switch mechanism and said first and second mentioned electrical resistance heating elements are connected in series.

3. The combination set forth in claim 2 including means for rendering said rod ineffective to close said switch mechanism.

4. The combination set forth in claim 3 wherein said last mentioned means comprise a member movable in one direction to admit oil to the burner and movable in another direction to stop the supply of oil to the burner, and means operatively connecting said last mentioned member with said switch mechanism to open said switch mechanism independently of said rod when said last mentioned member is moved in a direction to stop the supply of oil to said burner.

5. In combination with a heater having an outer casing, an inner casing and a vaporizing pot type oil burner positioned within said inner casing, an electrical ignition unit removably supported on the side wall of the burner and projecting into the burner, said inner and outer casings having openings through the side walls thereof which are aligned in position with said ignition unit and through which the ignition unit is accessible from exteriorly of said outer casing, a tubular housing mounted on said outer casing and extending through said aligned openings, a temperature responsive switch mounted on said tubular housing and extending axially therein, said switch having a temperature responsive element positioned adjacent the inner end of said tubular housing in heat responsive relation to the side wall of the burner and having a switch mechanism adjacent the outer end of said tubular housing, and a cover removably mounted at the outer end of said tubular housing, said electrical ignition unit and said temperature responsive switch having electrical leads connected together in circuit within said cover.

6. The combination set forth in claim 5 wherein said temperature responsive switch includes a tubular element extending from said temperature responsive element to said switch mechanism and a rod in said tubular element contacting said temperature responsive element and responsive to the flexing of said temperature responsive element to move axially in said tubular member to thereby actuate said switch mechanism.

7. The combination set forth in claim 5 wherein said switch mechanism and said cover are positioned exteriorly of said outer casing.

8. The combination set forth in claim 1 wherein said heater includes a casing surrounding said burner and spaced from the side wall of the burner, said last mentioned means comprising the side wall of the casing.

9. The combination with a heater having a vaporizing pot type oil burner and a casing surrounding said burner and spaced therefrom, an electrical ignition unit within the burner, said casing having an opening in the side wall thereof adjacent the burner, a temperature responsive switch including a support projecting through said opening with its inner end terminating adjacent the side wall of the burner, said support being mounted on the wall of said casing adjacent its outer end, a temperature responsive element mounted on said support adjacent its inner end and adjacent the side wall of the burner, a switch mechanism on said support adjacent its outer end and accessible from exteriorly of the casing and means on said support extending between and operatively connecting said temperature responsive member and said switch mechanism.

10. The combination set forth in claim 9 wherein said support includes a housing in which said temperature responsive element is enclosed, said housing having a tubular extension thereon which projects in a direction away from the burner and towards said opening, a switch mechanism mounting plate supported at the end of said extension, said switch mechanism being mounted on said mounting plate, said last mentioned means comprising a rod extending axially through said tubular extension and having its opposite ends operatively connected with said

temperature responsive member and said switch mechanism.

11. The combination set forth in claim 9 wherein said ignition unit is removably mounted on the wall of said burner in a position aligned with said opening and accessible from exteriorly of said casing through said opening.

12. In combination with a heater having a vaporizing pot type oil burner and a casing surrounding said oil burner with the side wall of the casing spaced from the side wall of the burner, an electrical ignition unit removably supported on the side wall of the burner and projecting into said burner, said casing having an opening through the side wall thereof which is aligned in position with said ignition unit and through which the ignition unit is accessible from exteriorly of said casing, a tubular housing mounted on said casing and extending through said opening towards said burner, a temperature responsive switch mounted on said tubular housing and extending axially therein, said switch having a temperature responsive element positioned adjacent the inner end of said tubular housing in heat responsive relation to the side wall of the burner and having a switch mechanism adjacent the outer end of said tubular housing, and a cover removably mounted at the outer end of said tubular housing, said electrical ignition unit and said temperature responsive switch having electrical leads connected together in circuit within said cover.

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