Nov. 24, 1959 K. E. GANSKE ET AL 2,914,647

RADIANT HEATER

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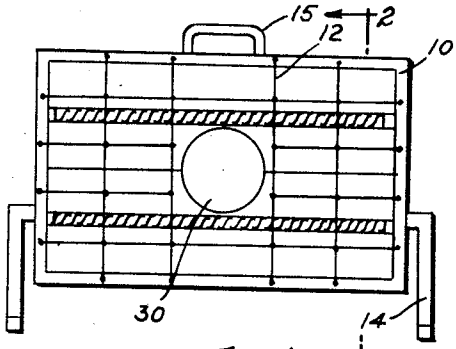

FIG. 1

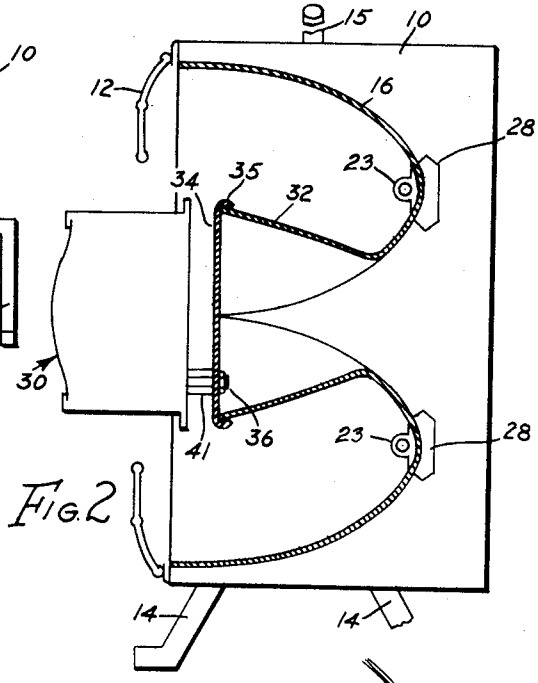

FIG. 2

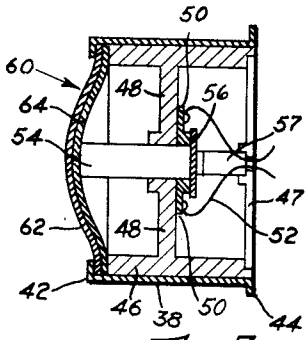

FIG. 3

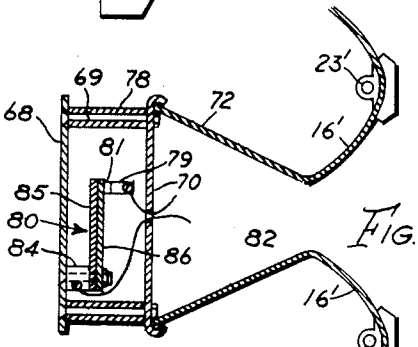

FIG. 4

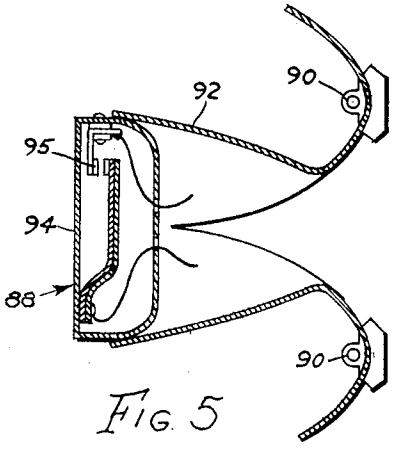

FIG. 5

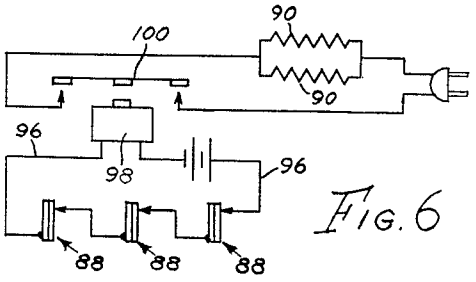

FIG. 6

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RADIANT HEATER

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11 Claims. (Cl. 219—34)

This invention relates to a radiant heater, and more particularly to a radiant heater having a controllable heat output.

It has heretofore been the practice in making high intensity radiant heaters to construct such heaters with a heavily screened or chocked output to prevent overheating an object disposed close to the heater in the emitted heat-beam. This results in an efficient heater which fails to utilize much of the energy generated by the radiant heat source.

It is the general object of our invention to provide a radiant heater which will overcome the difficulties and disadvantages described above by providing safety with increased radiant heat output. More specifically, it is the object of our invention to provide a radiant heater whose radiant heat output will be controlled in response to variations in radiant heat reflected back to said heater.

In carrying out our invention in the preferred form, there is provided a housing having an open forwardly presented face. A radiant heat source is mounted within the housing and provided with a suitable reflector adapted to reflect and direct the radiant heat outwardly from the heater through the open face of the housing. Conveniently, the heater output is controlled by a thermostat operable for opening and closing the electric circuit to the heat source. The thermostat is mounted at the front of the heater and insulated therefrom, with its forwardly presented face of relatively large extent sensing variations in the amount of radiant energy reflected back toward the heater. Thus, when an object placed in front of the heater reflects a predetermined amount of radiant energy back to the thermostat, the thermostat will be actuated to open the circuit to the heat source to reduce the heat output and prevent burning the object.

The accompanying drawings illustrate our invention. In such drawings:

Fig. 1 is a front view of a radiant heater embodying our invention;

Fig. 2 is a vertical section taken on the line 2—2 of Fig. 1;

Fig. 3 is an enlarged horizontal section of the thermostat shown in Figs. 1 and 2;

Fig. 4 is a fragmental vertical section of a modified form of our invention;

Fig. 5 is a fragmental vertical section of another modified form of our invention; and

Fig. 6 is a wiring diagram of a heater employing the heat responsive control means shown in Fig. 5.

As illustrated in the drawings, our heater may be mounted in any suitable housing **10** having an open forwardly presented face provided with a protective grill **12**. For purposes of convenience, the housing **10** is tiltably supported at each of its ends on floor-engaging legs **14**, and is provided with a handle **15** for carrying the heater from one location to another.

Disposed within the housing **10** is a pair of reflectors **16** extending the length of the housing and having a generally parabolic cross-section. Desirably, the reflectors

16 are formed from sheets of highly reflective metal for reflecting and directing radiant heat outwardly from the heater through the open face of the housing **10**. The reflectors may be mounted in the housing **10** in any convenient manner.

Any suitable source of radiant heat, such as a "Calrod" heating element, a resistance winding on a ceramic core, or the like, may be employed in our heater. As shown, we employ a pair of radiant heating elements **23** formed from coils of nichrome wire enclosed in glass tubes. Each of the heating elements **23** extends the length of one of the reflectors **16** and is mounted adjacent the focus thereof through blocks **19** of heat and electrical insulating material.

The output of the heating elements **23** is controlled by a radiant heat-responsive thermostat **30** desirably centered in the forwardly presented face of the heater. The thermostat **30** is mounted on a reflective cover **32** extending rearwardly over the adjacent forward edges of the reflectors **16** toward the heating elements **23**. The cover **32**, which is conveniently formed from the same reflective material as the reflectors **16**, diverges outwardly from the heating elements **23** to shield the thermostat **30** from the direct and reflected radiation of the elements **23**. A face plate **34** is mounted on the cover **32** by a roll seam **35** which bindingly retains the plate **34** on the cover **32**.

The thermostat **30** is mounted on the face plate **34** by bolts **36** received in a thermostat housing **38** and retained in the plate **34**. Preferably, a heat insulating spacer **41** is received on each of the bolts **36** to dispose the thermostat out of contact with the plate **34** and the cover **32** and thereby insulate the thermostat from any heat that may be conducted away from the cover **32** and plate **34**.

Any suitable type of thermostat actuated by reflected radiant heat may be used in our heater. One type of such a thermostat is shown in Fig. 3, and comprises an outer metal housing **38** having a generally cylindrical configuration with an inwardly directed lip **42** provided at one of its ends. A radially extending flange **44** is disposed at the opposite end of the housing **38** which receives the bolts **36** retaining the thermostat on the cover plate **34**. Press fit within the housing **38** is a base **46** formed of a heat resistant phenolic material and having an end plate **47** disposed substantially coplanar with the housing flange **44**. A pair of inwardly directed arms **48** are formed integrally with the side walls of the base **46** for supporting a pair of contacts **50** connected in the electrical circuit of the heating elements **23** by wires **52**. Fixedly mounted on one end of a plunger **54** movable within the base between the ends of the arms **48** is a metal bridge **56** normally disposed against the contacts **50** for closing the electrical circuit to the heating elements **23**. The plunger **54** is urged in this normally closed-circuit position by a leaf spring **57** secured to the bridge **56** and bearing against the base end plate **47**.

Plunger movement for opening and closing the circuit to elements **23** is accomplished by a slightly convex bimetal disc **60** comprising a forwardly presented sheet of metal **62** having a relatively low coefficient of expansion and a rearwardly disposed sheet of metal **64** having a relatively high coefficient of expansion. The disc **60** is held in the thermostat **30** by having its margins bindingly received between the forward end of the base **46** and the housing lip **42**, thereby permitting the central portion of the disc to flex with a snap-action, or oil can effect, in response to temperature variations in the disc.

Preferably, the thermostat is disposed at the front of the heater in a position so that the wires forming the grill **12** do not shield or block the disc **60** from the heat reflected back toward the heater and thereby reduce its sensitivity. The sensitivity of the disc may be further

increased by roughening and darkening the forwardly presented face of the disc metal sheet **62** to render it more absorptive to reflected radiant heat.

In operation, the thermostat **30** is actuated to open the electrical circuit to the heating elements **23** by radiant heat reflected back toward the heater from an object or objects disposed in front of the heater. When the amount of reflected heat is sufficient to actuate the thermostat, the metal **64** comprising the rearwardly presented face of the disc **60** expands, flexing the disc to snap its center portion rearwardly and moving the plunger **54** in a like direction. As the plunger moves rearwardly, the bridge **56** is displaced away from the contacts **50** opening the electrical circuit to the heating elements **23** and reducing their output. When the radiant heat reflected back to the disc **60** has been reduced because of the reduced output of the heating elements **23** or by the removal of the reflecting object, the metal sheet **64** cools and contracts to its normally convex position, and the plunger **54** under the influence of the spring **57** moves forwardly with the bridge **56** engaging the contacts **50** to close the electrical circuit to the heating elements **23**.

A modified form of our invention is shown in Fig. 4. In this modification, the heat responsive means comprises an elongated metal plate **68** extending longitudinally across the open forwardly presented face of the heater for sensing variations in the amount of heat reflected back to the heater by an object or objects disposed in front of the heater. Desirably, the plate **68** is formed from a metal strip having a high coefficient of thermoconductivity with its forwardly presented face darkened to absorb radiant heat reflected back toward the heater. The plate **68** is secured by bolts **69** to a face plate **70** of a shielding cover **72** mounted on the adjacent faces of a pair of reflectors **16'** and extending the length of the heater to shield the plate **68** from the heating elements **23'** disposed in front of the apexes of the reflectors **16'**. An insulating spacer sleeve **78** is disposed on each of the bolts **69** for displacing the plate **68** away from the plate **70** to insulate the plate **68** from the cover and plate **72** and **70** respectively.

Desirably centered on the back face of the plate **68** is a heat responsive switch including a contact **79** and a switch arm **80** having a contact point **81** at one of its ends normally engaging said contact for closing a circuit through wires **82** to the heating elements **23'**. The arm **80** is secured to the plate **68** by a heat conductive mounting block **84** adapted to conduct heat away from the plate **68** to the arm **80** for actuating said arm to open and close the contacts **79** and **81**. Conveniently, the arm **80** is a bimetallic strip comprising a metal strip **85** with a relatively low coefficient of expansion disposed against the mounting block **84**, and a metal strip **86** with a relatively high coefficient of expansion which carries the contact point **81** in normally circuit-closed position against the contact **79**. Thus, when the heater is in operation and a heat reflecting object is placed in front of the heater, the object will reflect radiant heat back toward the heater to raise the temperature of the plate **68**. This increase in temperature will be transmitted to the arm **80** through the mounting block **84** causing the strip **86** to expand and bend the arm toward the plate **68** opening the contacts **79** and **81** to open the circuit to the heating elements **23'**. When the radiant heat reflected to the plate **68** has been reduced because of the reduced output of the heating elements **23'** or by removing the reflecting object, both the plate **68** and the arm **80** cool, causing the strip **86** to contract and dispose the contact point **81** in its normally closed position against the contact **79**.

By employing the thermostatic control mechanism illustrated in Fig. 4 it is possible to sense variations in the amount of heat reflected back toward the heater which can not be sensed by the control mechanism shown in Fig. 1. The elongated sensing strip **68** extending transversely across the face of the heater can sense the heat reflected from a small object disposed in front of the heater near one end of the emitted heat beam which would not be reflected back to, and sensed by, the centrally positioned thermostat **30** embodied in the heater illustrated in Fig. 5.

Still another modification of our invention is shown in Figs. 5 and 6. In this modification a plurality of small thermostats **88** are mounted in the forwardly presented face of the heater and are insulated from a radiant heat source **90** by means of any suitable shielding **92**. Desirably, each of the thermostats **88** is provided with a face plate **94** adapted for absorbing and transmitting to said thermostat heat that is reflected back toward the heater from an object disposed in front of said heater. The several thermostats **88** and their respective contacts **95** are connected in series by wires **96** to a relay **98** operable for actuating a switch **100** to open and close the circuit to the radiant heat source **90**. Thus, if a heat reflecting object is positioned in front of the heater to reflect heat back to any one of the thermostats **88**, said thermostat will be actuated to disengage its contact for actuating the relay **98** to open the switch **100**, thereby opening the circuit to the heat source **90** to reduce the output of the heater and prevent igniting of the reflecting object.

We claim as our invention:

1. In a radiant heater, a housing for said heater having an open forwardly presented face, a radiant heat source disposed within said housing, reflectors mounted rearwardly of said heat source for directing heat outwardly from said heater through its open face, heat responsive means mounted in said housing forwardly of said reflectors and radiant heat source and operable for controlling the output of said heat source, and an insulating shield mounted on said reflectors for supporting said heat responsive means in a position insulated from heat directed away from said heater and disposing said heat responsive means in the forwardly presented face of said housing for actuation by heat directed back toward said heater.

2. In a radiant heater, a housing for said heater having an open forwardly presented face, a pair of spaced radiant heating elements disposed within said housing, a reflector mounted behind each of said pair of heating elements and extending forwardly therefrom for directing heat outwardly from said heater through its open face, and heat-responsive means mounted on the forward edge of the reflectors in the forwardly presented heater face forwardly of and between said pair of heating elements, said heat-responsive means being insulated from said pair of heating elements for selective actuation by heat reflected back to said heater to control the output of said pair of heating elements.

3. In a radiant heater, a housing for said heater having an open forwardly presented face, a radiant heat source disposed within said housing, a reflector mounted rearwardly of said heat source for directing heat outwardly from said heater through its open face, and heat responsive means supported on the reflector forwardly of said radiant-heat source at the open forwardly presented heater face for controlling the output of said heat source, said heat responsive means being insulated from said radiant-heat source for selective actuation by heat reflected back toward the heater.

4. A radiant heater as set forth in claim 3 in which said heat responsive means comprises a heat absorbent disc adapted to be actuated by heat reflected back toward said heater for operating a switch to open and close the circuit to said radiant-heat source.

5. A radiant heater as set forth in claim 3 in which said heat responsive means comprises a bimetallic disc substantially centered in the open face of said heater, said disc being flexed by heat reflected back toward the

heater to operate a switch for opening and closing the circuit to said radiant-heat source.

6. A radiant heater as set forth in claim 3 in which said heat responsive means comprises a plate of heat-conductive metal adapted to absorb radiant heat reflected back to the heater for actuating a bimetallic strip mounted thereon to open and close the circuit to said heating elements.

7. A radiant heater as set forth in claim 3 in which said heat responsive means comprises an elongated heat conductive plate extending across the open face of said heater, and a bimetallic strip connected to the rearward face of said plate, said strip being movable in response to temperature variations of said plate for opening and closing the circuit to said heating elements.

8. A radiant heater as set forth in claim 3 in which said heat responsive means comprises an elongated heat conductive plate extending transversely across the open face of said heater, and a bimetallic strip connected to the rearward face of said plate at substantially the center thereof, said strip being movable in response to temperature variations of said plate for opening and closing the circuit to said heating elements.

9. A radiant heater as set forth in claim 3 in which said heat responsive means comprises a sensing element responsive to heat reflected back to the heater for actuating a relay controlling a switch to open and close the circuit to said heating elements.

10. A radiant heater as set forth in claim 3 in which said heat responsive means comprises a plurality of sensing elements responsive to heat reflected back to the heater for actuating a relay for controlling a switch to open and close the circuit to said heating elements.

11. A radiant heater as set forth in claim 3 in which said heat responsive means comprises a plurality of sensing elements responsive to heat reflected back to the heater for actuating a relay for controlling a switch to open and close the circuit to said heating elements, said sensing elements being connected in series to said relay for actuating said relay in response to actuation of any of said sensing elements.

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