Sept. 8, 1964 W. S. PLUMMER 3,148,270

HEATING UNIT

Filed April 27, 1962

Fig 1

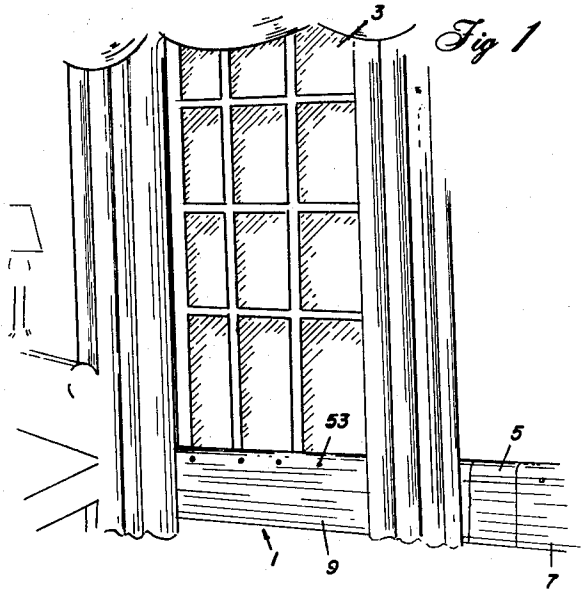


Fig 4

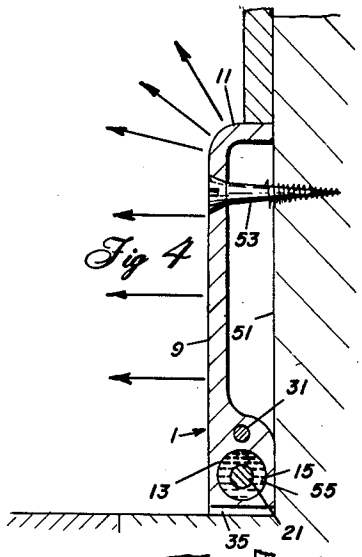


Fig 2

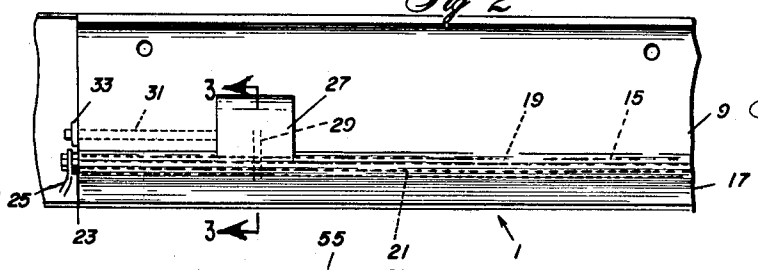


Fig 3

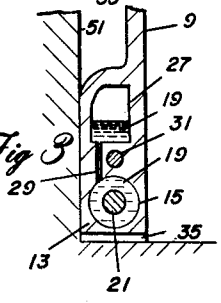


Fig 5

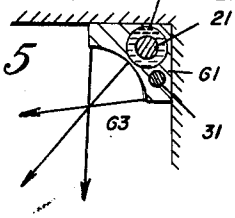


Fig 6

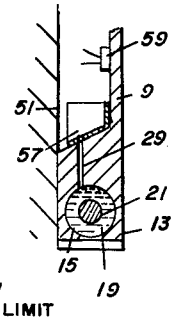


Fig 7

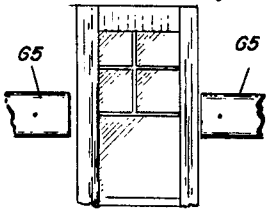
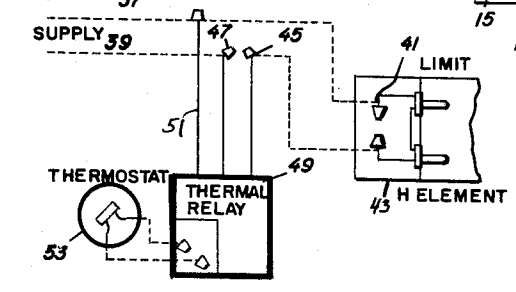


Fig 8



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HEATING UNIT

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This invention relates broadly to the heating art and in its more specific aspects it relates to hot water or liquid heaters wherein electrical energy supplies the heating power; and the nature and objects of the invention will be readily recognized and understood by those skilled in the art to which it relates in the light of the following explanation and detailed description of the accompanying drawings illustrating what I at present believe to be the preferred embodiment or mechanical expressions of my invention from among various other forms, arrangements, combinations and constructions, of which the invention is capable within the spirit and scope thereof.

With the advent of, and continuing popularity and construction of all electric homes, buildings and the like which require heating, there is an increasing need for a satisfactory, efficient and economical electric heating system.

I am aware that hot water systems have been introduced and used which use electrical energy for the source of heating power. It has been my experience, however, that such prior systems have inherent faults and objectionable features which have substantially limited their appeal and practicability for the architect, builder and the home or building owner. Hence, as far as I am aware, there is no electrical water or liquid heater now known which eliminates the objectionable characteristics of such heaters and embodies the advantages and desirable features which are combined in the heater of this invention.

This invention provides a unitary heating apparatus comprising an independent, fully self-contained electric water or liquid heating unit. One of my heaters may be used in a particular space to be heated, or any number may be used, dependent, of course, upon the area of the space, the exposure, etc.

Because of the unique construction of my electric water or liquid heater, I provide a sealed, self-contained unit which eliminates the need for any connections, fittings and the like with the exception of electric lines to supply the source of power for the unit.

Thus, an installation involving one or more of my electric heating units does not require the usual connecting line to city water service, a separate expansion tank with connecting lines from each unit to it, nor are relief, fill and reducing valves required. It will, therefore, be appreciated that the costs of parts and installation are materially reduced, and as this description of my invention proceeds, it will be apparent that I have not sacrificed efficient operation and heating or maintenance in order to effect installation and parts economies.

While most heaters of the type with which I am primarily concerned are metallic castings and operate partially as heat convectors as well as radiant heaters so that they must provide special heat convection means, I have designed my unit as an extruded unit operating substantially solely on a heat radiation principle, thereby eliminating special shapes to accommodate convection currents. This is of substantial advantage in areas of construction or production, as well as in use, as will be pointed out hereinafter.

I produce each of my units as an aluminum extrusion which provides production economies and results in a heater having greater heating efficiency than the conventional cast heater. The extruded unit operates on

the heat radiation principle and puts the heat where it is needed in the space being heated. Aluminum is a good conductor of heat and by using this material I produce substantial and highly desirable heat radiation.

As I have stated above, a system involving one or more of my units does not require a separate, remote liquid expansion chamber as do prior art systems. Instead each unit is provided with an integral or built-in expansion chamber, or it is within my contemplation to affix to each unit an expansion chamber. In either case no connecting water lines exteriorly disposed relative to the radiator unit are employed. Furthermore, the water is introduced into the heat generating chamber and then sealed in so that no water lines to this chamber are necessary.

In producing each of my heater units by an extrusion method and by using an alloy, such as aluminum alloy, I have realized certain very substantial economies in production which could not be realized by those producing the former metallic castings. By using aluminum extrusions I am enabled, for instance, to reduce the size of each unit while obtaining the same results as obtained by the prior art larger metallic castings, while at the same time obtaining better and more efficient heat transfer.

My heater generally involves an extruded aluminum radiator which is especially adapted to be fixed to the baseboard of the space to be heated, although, as will become apparent, it may be positioned in other locations in the space to be heated, and the heater is formed with a chamber which receives the liquid into which an electric immersion heater element is introduced and maintained. It is desirable to keep the radiator operating at relatively low temperatures and this is accomplished since the liquid acts not only as a heat transfer medium, but also as a coolant for the electric immersion heating element, so that there is a lag transfer of heat from the electric immersion element to the metal of the radiator.

It is also within my contemplation and within the spirit and scope of this invention to use a solution in the radiator instead of water. Such solution may be a silicone composition having the same coefficient of expansion as the metal of the radiator, to thereby eliminate the necessity for expansion chambers as in the case where water is used as the liquid.

This electric liquid heating system also involves a simple electric control network which incorporates control elements to control the temperature in the space being heated and also a contact type high temperature control means for each heater unit.

While I mention the use of aluminum as the metal from which the radiator is formed, any other extrudable metal may be used which has generally the same desirable characteristics for this use as does aluminum.

With the foregoing general objects, features and results in view, as well as certain others which will be apparent from the following explanation, the invention consists in certain novel features in design, construction, mounting and combination of elements, as will be more fully and particularly referred to and specified hereinafter.

Referring to the accompanying drawings:

FIG. 1 is a fragmentary view of a space to be heated illustrating my heater unit mounted on the baseboard beneath a window.

FIG. 2 is a front elevational view of a heater unit.

FIG. 3 is a sectional view taken on line 3—3 of FIG. 2.

FIG. 4 is a vertical sectional view of another form of heater unit.

FIG. 5 is a sectional view of a modified form of my invention.

FIG. 6 is a sectional view of a further form of my invention.

FIG. 7 is a view in elevation of a different installation of my invention.

FIG. 8 is a schematic view of an electric circuit I may use in an installation.

In the accompanying drawings, I have used the numeral 1 to designate in its entirety one of my extruded aluminum heaters or heating panels mounted on the baseboard of a wall below a window 3 in a space to be heated. While I have illustrated one of my radiators or heating units mounted beneath a window in FIG. 1, it is to be understood that the heating unit or any desired and necessary number of units may be mounted at various locations in a space to be heated, and not necessarily beneath a window. In FIG. 1 I disclose an end cover 5 fixed at one end to a unit 1, and a dummy 7 mounted adjacent an end of the end cover 5. The purpose of the end cover and the dummy will be described hereinafter.

Each radiator or electric heating unit 1 is composed of an extruded aluminum shape comprising a facing or panel section 9 from the upper end of which rearwardly projects a flange 11 (FIG. 4) and from the lower end of which extends a thickened portion or base 13. Each radiator or electric heating unit 1 may be, within limits, of any suitable and desirable length dependent upon the particular installation. While the radiators may be economically formed in approximately 30' lengths by extrusion, these lengths may be cut to suitable size for any particular installation.

The radiators are formed with an elongated, preferably cylindrical duct of chamber 15 in the base 13 thereof, the diameter of such chamber being on the order of 1" in diameter, while the base section 13 is on the order of 1½" in transverse thickness, and the height of the entire radiator unit is on the order of 6". The dimensions given are merely by way of example, and may be varied with the resultant radiator still falling within the spirit and scope of this invention. The chamber 15, which as will be explained, is the sealed liquid chamber, is closed at one end in any suitable manner, as at 17. The chamber 15, when the radiator is in operating condition, is substantially filled with a liquid 19, which may be water. As the source of heating energy I provide an electric immersion heater element 21, of elongated rod-like form which is inserted into chamber 15 in the body of water 19 contained therein. The diameter of the immersion heater 21 is less than that of the chamber 15, say ½", and is concentrically positioned therein, so that it is fully immersed in the liquid within the chamber. The electric immersion heater element 21 is inserted into the chamber 15 at the end thereof opposite the sealed end 17 and, as will be explained, the element seals that end of the chamber to seal the water or other liquid therein. The immersion element carries a head 23 of greater diameter than the opening into the chamber and this head is cemented to the end of the radiator and forms not only a support for the element, but also a closure seal for the open end of chamber 15. It is also within my concept to form the head 23 in the form of a threaded plug for threaded sealing and locking engagement with the open end of the radiator. A pair of electric lead lines 25 may be fixed to terminals on the end of the immersion element in any suitable manner. The electric immersion heating element 21 may be of any suitable and conventional type; for instance, it may comprise resistance type heating elements which are embedded in any insulating material which is surrounded by a metal water sealing jacket which transmits heat to the water or other liquid in which the element is immersed within the chamber 15.

In conventional electric water heaters of the general type with which I am concerned, it has been necessary to provide a fill system for the water in the chamber of the radiator which also is often used as the means to carry off water expanded by heating to an expansion tank.

Thus, in such prior systems a separate expansion tank is required and also copper tubing fittings and connections as well as a connection to a service line. My heating unit, in contrast, completely eliminates all of these extra required parts and members for I have devised a compact water radiator wherein the water is sealed into the radiator and, I have provided an expansion means formed into and forming an integral part of the radiator unit itself. Hence, tubing, fittings and the like are not required and, therefore, form no part of my invention.

With reference particularly to FIGS. 2 and 3 I have shown a form of my invention in which an expansion chamber 27 is formed in the upper part of the base 13 of the radiator, and this expansion chamber is in communication with the sealed water chamber 15 by means of a duct 29 so that the heated water 19 may expand and flow into the expansion chamber. I also form an opening into the radiator preferably above chamber 15 into which is inserted and maintained a high temperature limit control device in contact with the metal of the radiator. This high temperature control device is designated by reference numeral 31 and comprises any suitable and conventional heat sensing elements which are enclosed in a casing to extend therefrom as at 33.

Each radiator unit 1 can be mounted on a spacer element 35 which is supported on the floor and is designed to elevate the unit above flooring, carpeting, etc. Because of the low operating temperatures there is no danger of fire or blistering of paint, etc.

In FIG. 8 I have illustrated diagrammatically an electric control system for a heating unit. Lead 37 connects at 41 to one side of the high limit temperature control device 43. The other side of the high limit temperature control is connected to one side of the heating element 45. The other side 47 of the heating element is connected to a thermal relay 49 which is in turn connected to lead 37 by conductor 51. The action of the thermal relay is controlled by a thermostat 53.

The end cover 5 may comprise a junction box type member for housing the electric lines and their connections to the radiator and may have a front cover or panel simulating panel 9 of the radiator. For decorative purposes a dummy radiator 7 may be affixed to the baseboard in those areas where no radiator 1 is used. This dummy is formed to give the appearance of the actual radiator 1.

The radiators 1 may be fixed at the baseboard location 51 by screws 53, or in any other suitable manner.

In FIG. 4 I have illustrated a modified form of heater and have used the same reference numerals as used above to designate similar parts. This radiator has been designed for use with a liquid other than water, such liquid comprising a silicone composition having the same coefficient of expansion as the metal from which the radiator is made so that no expansion chamber is necessary. Thus, the structure of the radiator of FIG. 4 is substantially the same as that shown in FIGS. 2 and 3 with the exception that the chamber 27 and duct 29 are eliminated. In the form of FIG. 4 the liquid composition 55 is sealed in the chamber 15 so that the same advantages are realized as outlined above. While silicone compositions have been mentioned, it should be understood that other solutions may be used which have the same coefficient of expansion as the metal from which the radiator is made.

Since the heating with the radiator of this invention is accomplished by means of radiant heat, the radiator requires no ducts, spaces or the like for the flow of convection currents. Hence, the end of the flange 11 is in contact throughout its length with the wall of the space so that dust and other foreign matter may not accumulate behind the radiator. Also, the radiator without air flow means is simpler and more economical to produce. The shaping or confiuration of my radiator lends itself to radiant heating and directs the heat into the space where it is needed to produce comfort efficiency.

In FIG. 6 of the drawings I have disclosed a further form of radiator and have used the same reference numerals as used above to designate similar parts. This radiator provides a separate expansion chamber **57** which is cemented to the base **13** of the radiator where the base joins and merges into panel section **9**. The expansion chamber **57** is in communication with chamber **15** by the duct **29**. A further feature of this form of my invention resides in the cementing or otherwise securing of the high temperature control means **59** to the exterior of the rear panel.

In certain installations it is desirable to place the radiator or radiators in the angle between the ceiling and the wall and in FIG. 5 I have disclosed a radiator particularly designed for this use. In this form of my invention I have used the same reference numerals as hereinbefore used for parts which are the same. The radiator constitutes an aluminum extrusion **61** of generally triangular shape with the exterior leg thereof of concave shape as at **63** to properly direct the heat rays into the space to be heated. The particular radiator disclosed is adapted to have the aforementioned silicone composition or similar liquid sealed in chamber **15**, which liquid has the same coefficient of expansion as the metal of the radiator. Any suitable means may be employed for affixing the radiator in place.

The heating of certain spaces, such as house trailers, has, before my invention, posed many problems. Since conventional house trailers do not have baseboards, the radiators of my invention may be fixed to the walls as shown at **65** in FIG. 7.

It will now be recognized that I have devised a compact radiator of the electric liquid heating type wherein many advantages are obtained over prior radiators of this general character.

I claim:

1. An electric liquid heater, including in combination, a metallic radiator having a heat radiating panel section and a base section extending from an end thereof, said base section having a closed chamber therein adapted to contain a liquid and said base section having an expansion chamber formed therein in spaced relation to said first named chamber, and a duct formed in said base section and in communication with each of said chambers, and an electric heating means positioned in said first named chamber and adapted to be immersed in said liquid, and a source of electrical energy electrically connected to said electric heating means.

2. An electric liquid heater, including in combination, an extruded metallic radiator having a liquid containing chamber and an expansion chamber therein, said expansion chamber being spaced from and in communication with the liquid containing chamber, and said liquid containing chamber being permanently closed at one end and the other end thereof having solely one opening therein, and an electric resistance heating element positioned in said liquid containing chamber and extending through the one opening in the other end of said chamber closing and sealing said one opening, and a source of electrical energy connected to the electric resistance heating element.

3. An electric liquid heater, including in combination, an extruded metallic radiator having a radiant heating panel from the lower end of which extends a thickened base section, a liquid containing chamber and an expansion chamber formed within said thickened base portion and said expansion chamber being spaced from and in communication with the liquid containing chamber, said liquid containing chamber being permanently closed at one end and the other end thereof having solely one opening therein, and an electric resistance heating element positioned in said liquid containing chamber and extending through the one opening in the other end of said chamber closing and sealing said one opening, and a source of electrical energy connected to the electric heating element.

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