June 6, 1950 W. G. KÖGEL 2,510,235

PORTABLE RADIATOR

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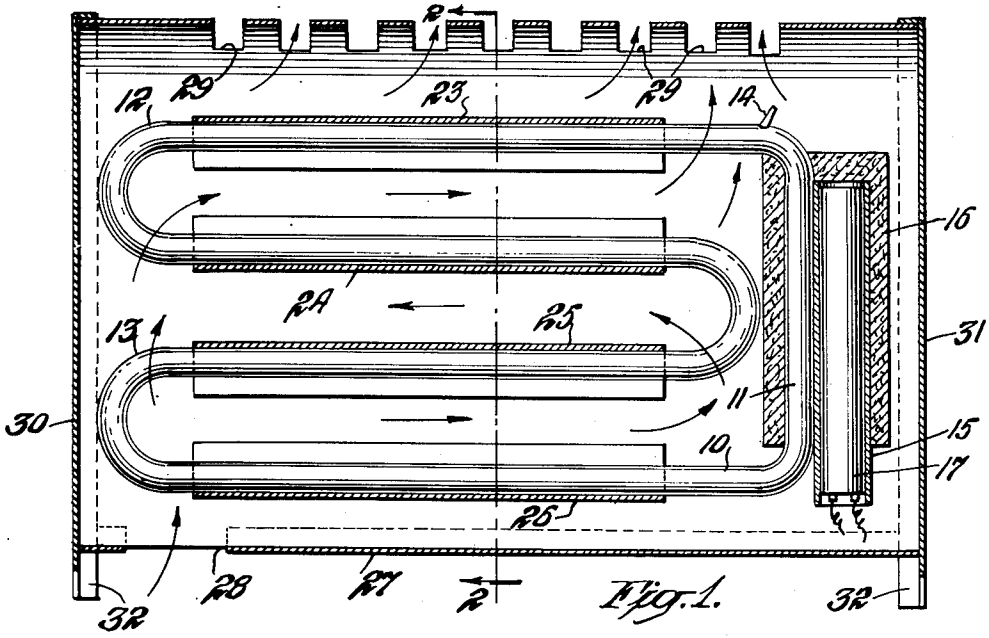
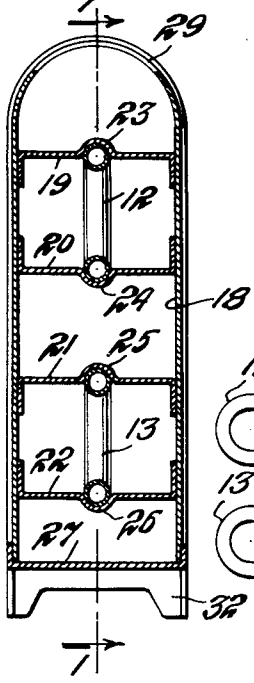


Fig. 1.

Fig. 2.



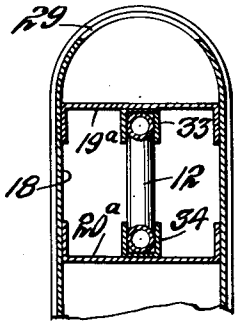
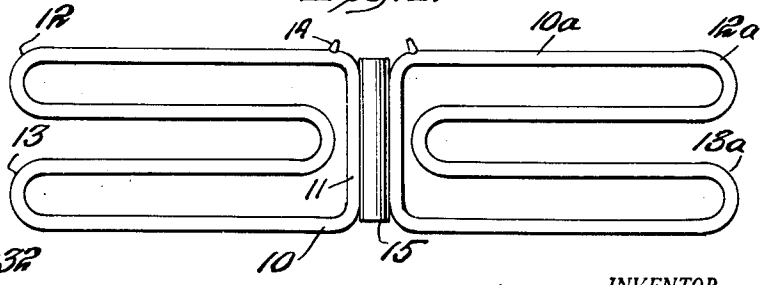


Fig. 3.

Fig. 4.



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Fig. 5.

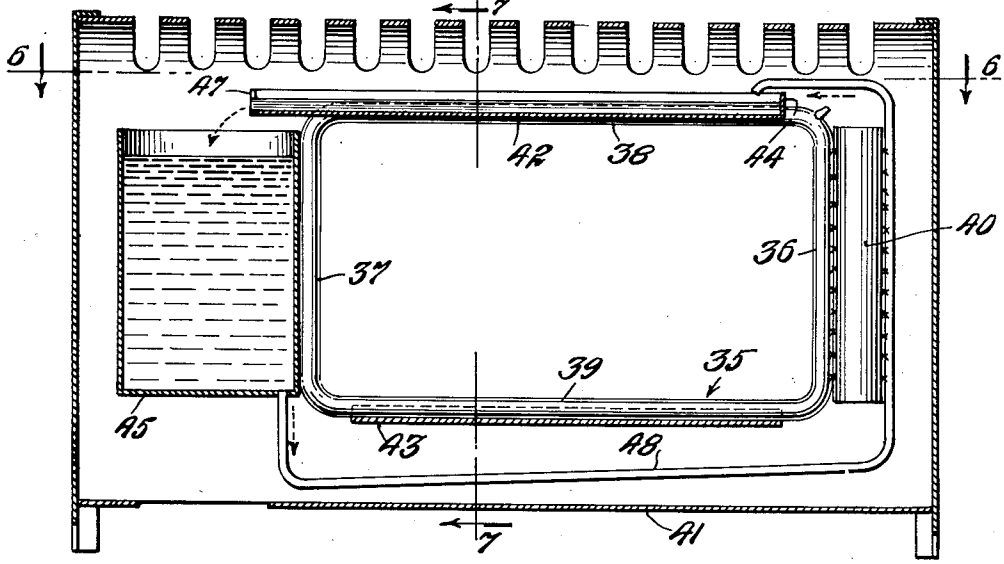
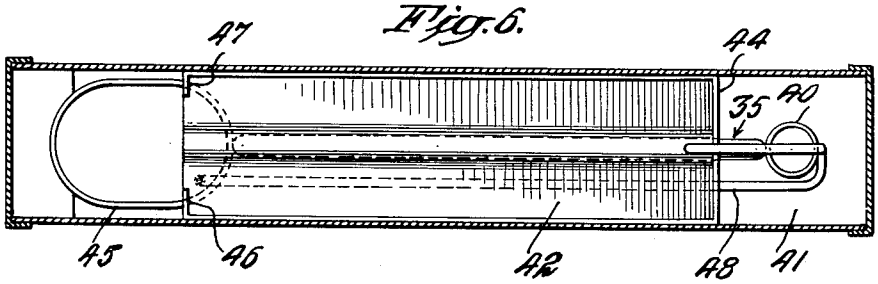


Fig. 6.



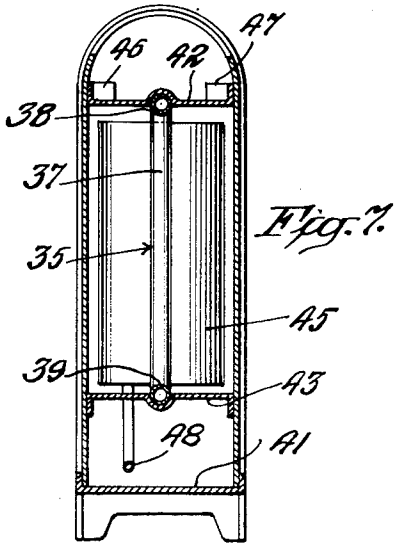


Fig. 7.

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PORTABLE RADIATOR

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16 Claims. (Cl. 219—38)

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My invention relates to a heater and more particularly a portable radiator.

It is desirable that a heater of this type produce warmth quickly, present no burn hazard, and be simple and inexpensive. I achieved all of these desirable factors by utilizing low temperature radiation. The radiant is also a casing. The source of heat is an ordinary electric heating cartridge. Heat is transferred from the cartridge to the radiant by a rapid starting sealed fluid heat transfer circuit. The cartridge and the circuit are enclosed within the casing, and the cartridge is enclosed by thermal insulation. The circuit is formed by an endless tube containing a suitable liquid; the cartridge is removably associated with one part of the tube; and the casing and the tube are simply associated in telescopic relation.

The invention is set forth in greater detail with reference to the accompanying drawings of which:

Fig. 1 is a vertical section on line 1—1 in Fig. 2 showing a heater embodying the invention;

Fig. 2 is a vertical section on line 2—2 in Fig. 1;

Fig. 3 is a sectional view like Fig. 2 illustrating a slight structure modification;

Fig. 4 is a side elevation illustrating a modification of the heat transfer circuit only;

Fig. 5 is a view like Fig. 1 illustrating an embodiment of the invention provided with a humidifier;

Fig. 6 is a horizontal section on line 6—6 in Fig. 5; and

Fig. 7 is a vertical section on line 7—7 in Fig. 5.

Referring to Figs. 1 and 2 of the drawings, a pipe 10 is formed into an endless coil having a vertical straight section 11 and two laterally projecting loops 12 and 13. The pipe coil 10 is provided with a filling opening formed by a short piece of tubing 14. A metal cylinder 15 is attached in good thermal contact with the straight section 11 of the pipe coil.

The cylinder 15 and the straight coil section 11 are enclosed by thermal insulation 16, except at the lower end of the cylinder 15, to permit the insertion of an electric heating cartridge 17. The latter should fit well within the cylinder 15, but not with a force fit. This is so the cartridge can be removed for repair or replacement. Any suitable means, not illustrated, may be provided to removably support the heating cartridge 17 within the cylinder 15.

Through the connection provided by the stub tube 14, the pipe coil 10 is evacuated and filled

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with a suitable liquid to a level about at the upper end of the straight pipe section 11. Then the coil is hermetically sealed as by welding off the charging tube 14. The heat transfer liquid should preferably have a vapor pressure close to that of the atmospheric pressure at the highest temperature of the heater 17. This liquid may be, by way of example, toluol or xylene.

The principal part of the casing for the heater is formed by a sheet of metal 18 in the shape of an inverted-U. An upper pair of horizontal walls or partitions 19 and 20, and a lower pair of partitions 21 and 22 are joined in good thermal contact to the casing 18. The partitions 19 and 20 are formed with opposite longitudinal channels 23 and 24 respectively. The lower partitions 21 and 22 are formed with opposite channels 25 and 26 respectively. The partitions are so spaced that when the casing is telescoped over the previously described heat transfer coil 10, the pipe loop 12 fits snugly in the grooves 23 and 24, and the lower loop 13 fits snugly in the grooves 25 and 26.

The bottom of the casing is formed by a closure plate 27 which has an opening 28. The top of the casing 18 is provided with a plurality of openings such as the slots 29. The ends of the casing are closed by end plates 30 and 31 which are formed to provide legs 32 projecting below the bottom of the plate 27 to support the heater.

In Fig. 3 the partitions 19a and 20a are shown provided with channel members 33 and 34 respectively to serve the same purpose as the grooves 23 and 24 previously described. In Fig. 3 the casing is shown telescoped on the pipe coil with the pipe loop 12 snugly engaged in the channel members 33 and 34.

For a larger heater, a second pipe coil 10a may be provided. This pipe coil is like the previously described pipe coil 10 and is thermally attached to the opposite side of the cylinder 15. In this modification, the casing, not shown, would be made in two parts each similar to the casing described above and telescoped over the pipe coils 10 and 10a from opposite directions and then joined in the center.

Referring again to Figs. 1 and 2, the cylinder 15, the pipe coil 10, the partitions 19, 20, 21 and 22, and the casing 18 should be of good thermal conductive material. The several described joints should be made so as to have good thermal conductivity. The outer surface of the casing 18 should have the best black body characteristics possible so as to produce the maximum amount of radiation for the surface area provided. When a source of electricity is connected to the heating

cartridge 17, heat from the cartridge 17 is transmitted through the cylinder 15 and the vertical straight 11 of the pipe coil to the xylene contained therein. This liquid is heated and vapor that is formed rises in the straight 11 of the pipe coil and causes an up-flow of heated liquid in this part of the coil. The result is a rapid circulation of liquid through the entire pipe coil 10. Heat transmitted to the fluid in the rising part of the pipe coil 10 is transmitted by the circulating fluid to the partitions and the casing. Objects of lower temperature which can see the casing 18 receive heat from the latter by radiation. The casing and the internal partitions also cause heating of air which enters the casing through the bottom opening 28 and emerges from the top of the casing through the slots 29.

Referring to Figs. 5, 6, and 7 of the drawings, there is illustrated a heater like that previously described except that, as shown, the endless pipe coil 35 has but a single loop with two vertical straights 36 and 37, and two horizontal straights 38 and 39. The vertical straight 36 is thermally connected to a cylinder 40 for a heating cartridge as previously described. The casing 41 is like that described in connection with Fig. 1 but has only two partitions 42 and 43. The horizontal straights 38 and 39 of the pipe coil 35 are engaged in grooves in the partitions 42 and 43 respectively. At one end of the top partition 42 there is provided a ledge 44, and the other end of the partition 42 projects somewhat beyond the coil, thus forming a trough or flume.

Attached to the vertical straight 37 of the pipe coil there is a receptacle 45 which is open at the top and located beneath the projecting end of the trough-forming partition 42, this end being provided with lips 46 and 47 to direct liquid from the trough to the receptacle 45. One end of a pipe 48 is connected to the bottom of the receptacle 45 and the other end of the pipe 48 is located so as to discharge into the end of the trough-forming partition 42 near the heating cylinder 40. A riser section of the pipe 48 is thermally attached to the heating cylinder 40. The pipe coil 35 is evacuated and charged with, for instance, xylene, in the manner previously described.

The receptacle 45 is filled with water when it is desired to humidify the air being heated inside the casing 41. The water is heated in that part of pipe 48 connected to the heating cylinder 40 and rises by thermo-siphon action into the trough 42. The water flows along the trough 42 and that which remains unevaporated drains back into the receptacle 45. The dry bulb temperature of the air inside the casing 41 is increased while the heater is in operation. Accordingly, the relative humidity is decreased, permitting evaporation of the water with a resulting increase in the absolute amount of water vapor in the air issuing from the top of the heater. This air mixing with other air in the vicinity causes an increase in the mean humidity of the whole.

The heater previously described is a low temperature radiator characterized by rapid transfer of heat from a localized source to an extended surface radiant. The radiant is the casing of this heater. The casing is not merely a shield, it is an essential part of the heater itself.

Various changes may be made within the scope of the invention as set forth in the following claims.

I claim:

1. A heater comprising a closed liquid container forming a circuitous and endless conduit, a heating element arranged to apply heat to a portion of said conduit, and a casing enclosing said container and said element, said casing providing a heat radiating surface large relative to the surface of said container, and arranged in thermal contact with the latter.

2. A heater as set forth in claim 1 in which said casing and said container are so constructed that said thermal contact therebetween is effected upon telescoping said casing over said container.

3. A heater as set forth in claim 1 in which said casing is provided with top and bottom openings to permit flow of air therethrough.

4. A heater as set forth in claim 1 in which said casing is formed in principal part by a sheet of metal in the shape of an inverted-U.

5. A heater as set forth in claim 1 in which said casing is formed in principal part by a sheet of metal in the shape of an inverted-U, and is provided with internal partitions which engage said container in said thermal contact.

6. A heater as set forth in claim 1 in which said casing is formed in principal part by a sheet of metal in the shape of an inverted-U, and has end plates formed to provide legs for supporting the heater with a space therebeneath, said casing being provided with top and bottom openings to permit flow of air therethrough.

7. A heater as set forth in claim 1 in which said container is so constructed and arranged with respect to said heating element that rapid circulation of liquid occurs in said conduit upon the application of heat.

8. A heater as set forth in claim 1 in which said container comprises an endless tube.

9. A heater as set forth in claim 1 in which said container comprises an endless tube having an upright straight portion to which heat is applied by said heating element, and a laterally projecting loop.

10. A heater as set forth in claim 1 in which said liquid container comprises an endless pipe coil having a vertical straight portion, and said heating element is an electric heating cartridge supported in thermal conductive relation to said straight portion.

11. A heater as set forth in claim 1 in which said heating element is an electric heating cartridge, said cartridge and the part of said container to which it applies heat being substantially enclosed by thermal insulation.

12. A heater as set forth in claim 1 in which said container is an endless pipe coil located in a substantially vertical plane, and said casing comprises in principal part a sheet of metal in the shape of an inverted-U, said casing having interior plates arranged to support said coil in thermal contact therewith in the casing by telescoping over said coil.

13. A heater as set forth in claim 1 in which said liquid container is an endless pipe coil located in a substantially vertical plane, said casing comprises in principal part a sheet of metal in the shape of an inverted-U, and said casing has internal plates adapted to direct air laterally and support said coil in thermal contact therewith when said casing is telescoped over said coil, and end plates thereafter attached to said casing and providing legs for supporting the heater above the floor, said casing having top and bottom openings to permit upward flow of air therethrough.

14. A heater as set forth in claim 1 in which

said casing has openings to permit flow of air therethrough, and a humidifier also within said casing and including a water circulator of a thermosiphon or vapor lift type operated by heat from said element.

15. A heater as set forth in claim 1 which further comprises a humidifier within said casing and including a water trough, a receptacle to receive water from said trough, and a thermosiphon or vapor lift connected to deliver water from said receptacle to said trough, said lift being operated by heat from said element.

16. A heater as set forth in claim 1 in which said liquid container is an endless pipe coil located in a substantially vertical plane, and there is a humidifier including a tray mounted on the top of said coil, a receptacle mounted on one end of said coil and arranged to receive water from said tray, and a thermosiphon or vapor lift connected to deliver water from said receptacle to said tray and operated by heat from said element.

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