# United States Patent [19]

**Pepin**

[11] **3,868,494**

[45] **Feb. 25, 1975**


[54] **ELECTRIC SPACE HEATING SYSTEM**


[76] Inventor: **Armand Pepin,** 14 Tutras Blvd., East Victoriaville, Canada



[22] Filed: **Dec. 4, 1973**

[21] Appl. No.: **421,677**

[52] **U.S. Cl.**..... **219/341,** 126/101, 165/107, 219/306, 219/314, 219/320, 219/365, 237/16

[51] **Int. Cl.**..... **H05b 1/00,** F24h 3/06, F24h 1/22

[58] **Field of Search** ..... 165/106, 107; 126/101; 237/16–19, 63; 219/341, 365, 297–299, 306, 320, 321, 314



[56] **References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 1,467,381 | 9/1923 | Hulbert | 219/314 |
| 1,509,207 | 9/1924 | Hudson | 219/341 UX |
| 1,511,553 | 10/1924 | Willson | 219/341 UX |
| 2,344,812 | 3/1944 | Gill | 219/341 |
| 2,563,345 | 8/1951 | Limerick | 219/298 X |
| 2,689,905 | 9/1954 | Harris | 219/320 X |
| 2,745,941 | 5/1956 | McElhaney | 219/341 |
| 2,894,108 | 7/1959 | Brand et al. | 219/365 X |
| 3,148,270 | 9/1964 | Plummer | 237/16 X |
| 3,353,000 | 11/1967 | Tomlinson | 219/306 X |
| 3,681,567 | 8/1972 | Boecher | 219/365 |

FOREIGN PATENTS OR APPLICATIONS

| | | | |
|---|---|---|---|
| 1,118,579 | 3/1956 | France | 237/16 |



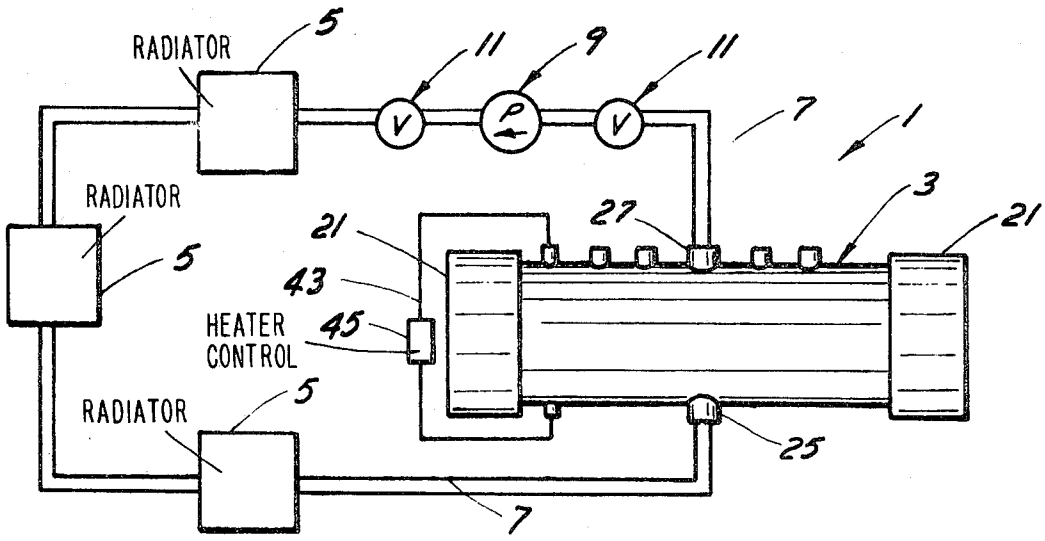
*Primary Examiner*— Anthony Bartis



[57] **ABSTRACT**

A closed circuit heating system employing a liquid heated by electrical resistance elements and circulated between the tank and radiators. The liquid employed has a lower coefficient of expansion than water and also a lower freezing point than water. The tank is of cylindrical shape and horizontally disposed. The liquid inlet and outlet are located at the bottom and top of the tank respectively, midway between the ends of the tank and are in vertical register. At least one pair of electrical resistance elements extend within the tank substantially horizontally from the ends of the tank towards each other at substantially the same level above the bottom of the tank and terminating within the tank at substantially equal distance from the ends of the tank. Baffles are located in the tank opposite and spaced from the inlet and outlet, respectively, and located intermediate the same and the electrical resistance elements. The baffle located over the inlet directs the liquid towards the ends of the tank and the baffle located opposite the outlet prevents the liquid in the center zone of the tank from flowing directly towards the outlet. Thus, the liquid is caused to circulate in substantially two sets of symmetrical paths on both sides of the central zone of the tank between the inlet and the outlet without any preferential path in each set. The liquid comes in contact with the electrical elements at substantially uniform velocity over the entire length of said elements. Thus, the liquid is heated substantially uniformly during its passage in the tank.


**2 Claims, 3 Drawing Figures**



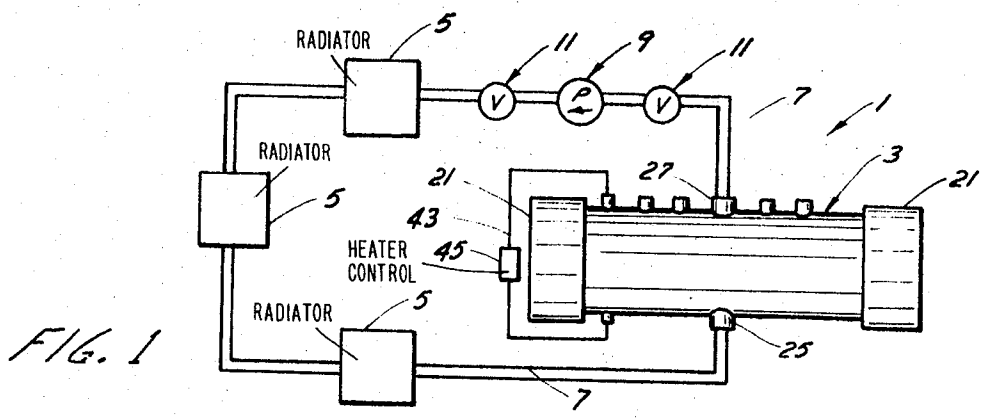



FIG. 1

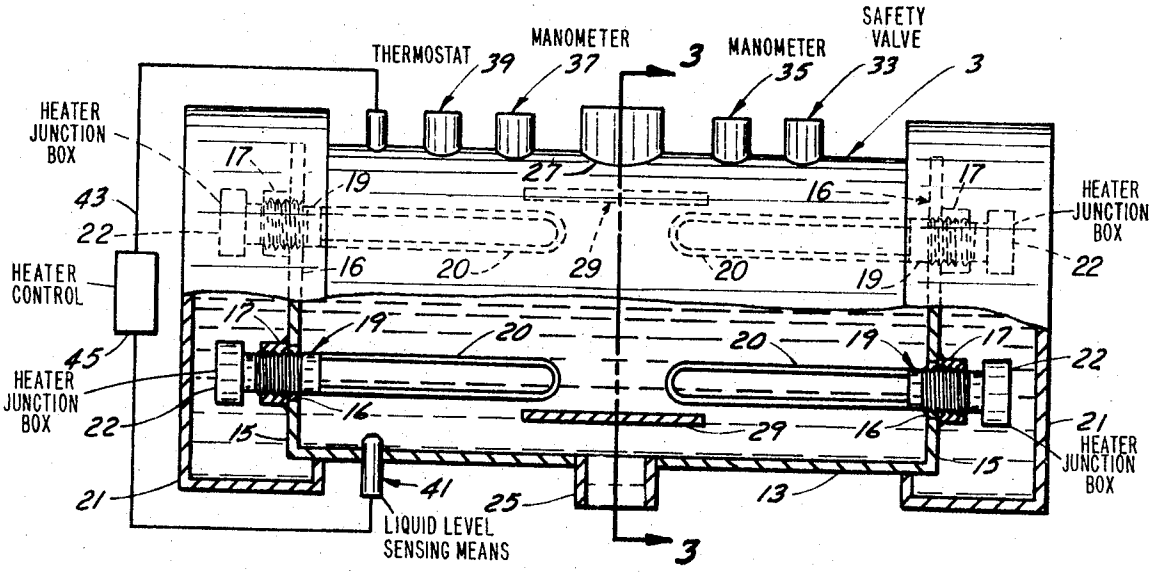



FIG. 2

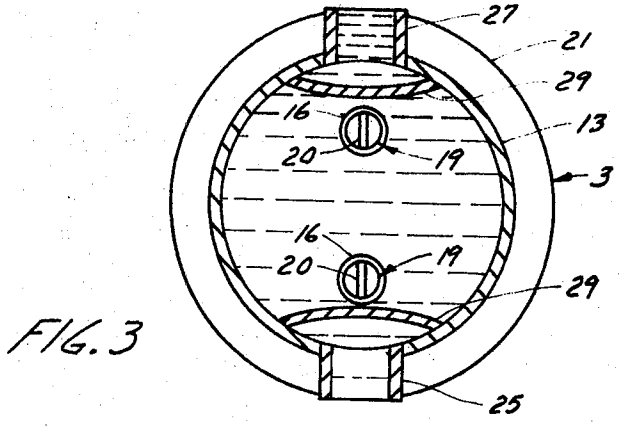



FIG. 3

# ELECTRIC SPACE HEATING SYSTEM

This invention is directed towards a heating system.

The invention is more particularly directed towards a heating system which employs a liquid, circulated in a closed system, as the heat transfer medium. And which is heated electrically in a tank.

Heating systems employing water as the circulating fluid are well known. However, hot water heating systems have disadvantages. Water has a relatively high coefficient of expansion. Therefore, suitable expansion means, such as an expansion, or overflow tank, must be provided to accommodate the overflow of water when it is heated. Usually, the expansion means is open to the atmosphere. Thus, water can be lost from the system due to evaporation. Therefore, make-up means must be provided to add water to the system to make up the evaporation loss. Hot water heating systems can also freeze if not used, or drained, in the winter, causing considerable damage.

Various types of electric heating tanks are known. However, their operating cost is high because the liquid does not circulate uniformly over the electrical resistance elements, resulting in localized overheating of the liquid.

It is the purpose of the present invention to provide a compact, inexpensive, yet efficient heating system employing a liquid as a heat transfer medium which minimizes or avoids the disadvantages of hot water heating systems. It is a further purpose of the present invention to utilize the advantages derived from the use of electric heat while effecting energy savings as compared to known systems of similar type by preventing localized overheating of the liquid.

In the present invention, a closed heating system is provided. A closed system can be provided because the liquid employed in the heating system, as the heat transfer medium, has a very low coefficient of expansion, as compared with water. Thus, because the fluid is relatively stable compared to water, no open expansion means are required, and no make-up system is needed.

The liquid employed in the system also has a very low freezing point as compared with water. Thus, the system can be more readily employed in situations where freezing presents a problem, than can hot water heating systems.

The system requires less liquid as a heat transfer medium than hot water heating systems. It has been found that approximately three gallons of liquid only are needed in the system to heat a small house.

In one accordance with the invention the heating system comprises a heating tank, at least one radiator, and conduit means connecting the tank and radiator or radiators in a closed system. The system contains heat transfer fluid. A pump in the system circulates the fluid through the closed system. Means are provided in the tank for heating the fluid.

The tank is elongated horizontally. At least one pair of elongated electrical resistance elements extend within the tank substantially horizontally from the ends of the tank towards each other at substantially the same level above the bottom of the tank and terminate within the tank at substantially equal distances from the ends of the tank. The tank has a liquid inlet and a liquid outlet located at the bottom and top of the tank, respectively, in vertical register substantially midway between



the ends of the tank. First and second baffles are located in the tank opposite and spaced from the inlet and outlet means, respectively, intermediate the same and the electrical resistance elements. The first baffle directs the liquid towards the ends of the tank and the second baffle prevents the liquid in the center zone of the tank from flowing directly towards the outlet. The arrangement is such that the liquid circulates within the tank is substantially two sets of symmetrical paths on both sides of the central zone of the tank and without any preferential path in each set, so that the liquid comes in contact with the electrical elements at substantially uniform velocity over the entire length of the electrical resistance elements.

The invention will now be described in detail having reference to the accompanying drawings, in which:

FIG. 1 is a schematic illustration of the heating system of the present invention;

FIG. 2 is a partial cross-sectional view of the heating tank employed in the heating system; and

FIG. 3 is a cross-sectional view of the tank taken along line 3—3 of FIG. 2.

The heating system **1**, as shown in FIG. 1 comprises a heating tank **3** and one or more radiators **5** connected together in a closed system by conduit **7**. Liquid as the heat transfer medium in the closed system, is circulated from the tank to the radiators and back to the tank by a suitable circulating pump **9** in the conduit **7**. Suitable valves **11** in the conduit **7** on the inlet and outlet side of the pump **9** can be adjusted to control the rate of liquid flow through the system. Alternatively, the pump can be used to control the rate of liquid flow.

The heating tank **3**, as shown more clearly in FIGS. **2** and **3**, comprises an elongated, horizontal tubular member **13** with vertical end walls **15**. In each end wall **15**, there is a pair of apertures **16** and a mounting collar **17** at each aperture. An electrical heating element **19** is inserted through each aperture **16** and threadably fixed in the respective collar **17**. The coils **20** extend horizontally towards each other in the interior of the member **13** and terminate close to each other at substantially equal distances from end walls **15**. The ends of the member **13** are each enclosed by a housing **21** which protects the juction boxes **22** of heating elements **19**. The housings **21** can have a panel (not shown) which provides access within the housing for maintenance.

Located at the bottom of the member **13** is a liquid inlet **25** which connects to conduit **7**. Located at the top of the member **13** is a liquid outlet **27** which connects to conduit **7**. Inlet **25** and outlet **27** are located substantially mid-way between the end walls **15** of the member **13** and are in substantially vertical registor. Located directly over the inlet **25** and also the outlet **27**, but spaced from each, is a baffle **29**.

These baffles are plates of substantially the same size and terminate at substantially equal distances from the end walls **15**. The bottom baffle **29** serves to direct the entering liquid towards end walls **15** and the top baffle **29** prevents the liquid in the center zone of the tank from flowing directly towards the outlet **27**. The arrangement of the centrally located inlet **25** and outlet **27** with the respective baffles **29** causes the liquid to circulate in substantially two sets of symmetrical paths on both sides of the central zone of the tank between the inlet and the outlet and without any preferential path in each set, so that the liquid comes in contact

with the electrical resistance elements **19** at substantially uniform velocity over the entire length of said elements **19.** Thus, localized overheating of the liquid is prevented and more efficient heating of the liquid is obtained.

The heating tank may be equipped with a suitable safety valve **33,** a thermometer **35,** an manometer **37** and a thermostat **39** connected to the control means **22** for the heating coils **20.**

In addition, the tank may be provided with suitable means **41** for sensing the level of the liquid in the tank. The sensing means **41** is connected in a circuit **43** having heater control means **45** which can be made operable, when the level of liquid, for any reason, falls below a predetermined level, to shut off the system to avoid damage.

In operation, liquid enters into the member **13** through inlet **25** and is directed towards the ends of the member by the baffle **29** where it is heated by the heating coils **20.** The temperature to which it is heated will depend on the type of liquid which is used. The temperature is controlled by thermostat **39** and control means **22** for the heaters. The heated liquid then passes through the outlet **27,** to the radiators **5,** via the pump **9.** At the radiators, heat is given up and the liquid is then recirculated back to the tank for re-heating. It will be noted that the system is a closed system, as compared with a hot water system where make-up water is periodically required. No make-up liquid line is needed in the present system.

The liquid employed in the system preferably is one which has a low coefficient of expansion, as compared with water. Therefore, no overflow or relief tank is required an thus the system can be maintained closed in comparison to a hot water heating system.

In addition, the liquid is preferable one which has a very low freezing point as compared with water. Thus, the system may be used in cottages where the heating system is used infrequently, or not at all, in the winter. The heating system need not be drained to prevent damage by freezing.

The liquid used in the system preferably is a suitable antifreeze type liquid such as Prestone (a trade mark), or it can be vegetable or mineral oil. The liquid could also be a mixture of any of above three types of fluid.

I claim:

**1.** In a heating system including a heating tank, at least one radiator, conduit means connecting the tank and the radiator in a closed circuit, heat transfer liquid within the system, a pump in the conduit means to circulate the liquid through the closed circuit, said tank being elongated horizontally, at least one pair of elongated electrical resistance elements extending within the tank substantially at the same level above the bottom of the tank and terminating within the tank at substantially equal distances from the ends of the tank, the latter having a liquid inlet means at the bottom and a liquid outlet means at the top connected to the conduit means, the inlet and outlet means being located substantially midway between the ends of the tank and being substantially in vertical register, and first and second baffles located in the tank opposite and spaced from said inlet and outlet means, respectively, intermediate the same and said electrical resistance elements, said first baffle directing the liquid towards the ends of the tank and the second baffle preventing the liquid in the center zone of the tank from flowing directly towards said outlet means, said first and second baffles consisting of elongated plates terminating at substantially equal distances from the ends of the tank, whereby said liquid is caused to circulate in substantially two sets of symmetrical paths on both sides of the central zone of said tank between said inlet and said outlet means and at substantially uniform velocity over the length of said electrical resistance elements, thus preventing localized overheating of the liquid.

**2.** In a heating system as claimed in claim **1,** wherein said tank is of cylindrical shape and there are two pairs of vertically spaced electrical resistance elements located in a vertically diametrical plane of said tank.

* * * * *