April 20, 1965 E. J. UHLIG 3,179,788

LIQUID CIRCULATION TYPE ELECTRIC BASEBOARD SPACE HEATER

Filed Aug. 6, 1963

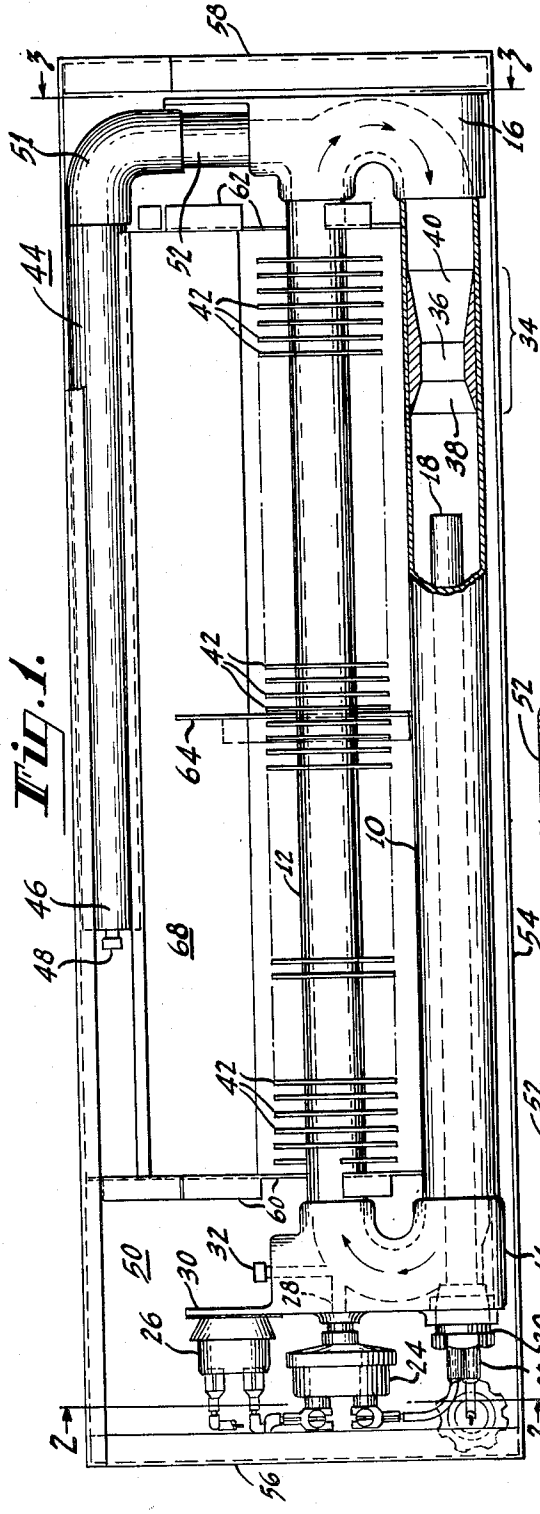


Fig. 1.

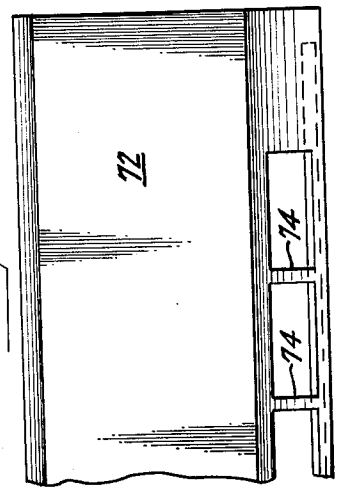


Fig. 4.

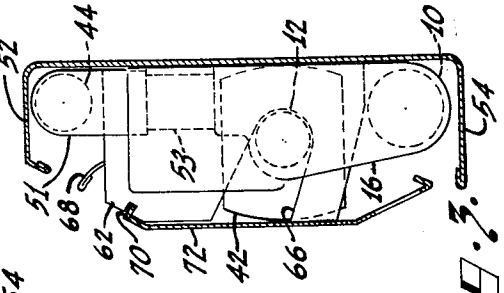


Fig. 3.

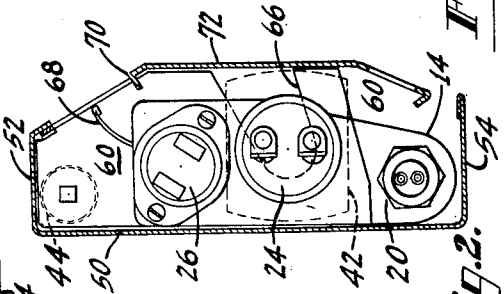


Fig. 2.

INVENTOR.
ERICH J. UHLIG
BY
Carl V. Olson
Attorney

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LIQUID CIRCULATION TYPE ELECTRIC BASEBOARD SPACE HEATER

Erich J. Uhlig, 14 Indian King Drive, Old Charleston Woods, Cherry Hill, N.J.

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This invention relates to electric heaters, and particularly to fluid circulation type electric baseboard space heaters.

It is an object of this invention to provide an improved electric heater for providing a smooth controlled flow of heat to a room.

It is another object to provide a fluid circulation type electric heater which is free of knocking and other fluid noises.

It is a further object to provide a fluid circulation type electric heater having improved characteristics in the conversion of electric energy to room warmth that is particularly comfortable and free of burning and other undesirable odors.

It is yet another object to provide a fluid circulation type electric heater characterized in an improved unidirectional circulation of the fluid in a loop from an electric heater element to a heat radiator section and back to the electric heater element.

It is a still further object to provide a fluid type electric heater of compact elongated construction for unobtrusive and effective use as a baseboard heater in a room.

In accordance with an example or aspect of the invention there is provided a heater having a lower horizontal pipe, an upper horizontal pipe, and first and second header castings connecting the ends of said lower and upper pipes to provide a closed fluid circulating loop. An elongated electrical heating element extends through said first header and extends axially through a major portion of the length of the lower pipe. A venturi section is located in the lower pipe between the end of the heating element and the second header, the venturi section having a central portion of uniformly reduced inner diameter and end portions tapered from the inner diameter of the center portion to the inner diameter of the lower pipe. Heat radiating fins extend transversely from the upper pipe. An uppermost horizontal expansion chamber pipe is provided which is closed at one end and is in communication with the fluid circulating loop at the other end through a connection to the second header. The described elements are mounted in a sheet metal enclosure having: a unitary formed back, top and bottom; pipe hanger brackets extending from the back to receive and support the upper pipe; and a sheet meutal front member also supported by the brackets so as to leave air circulation openings below and above said front member.

These and other objects and aspects of the invention will be apparent to those skilled in the art from the following more detailed description taken in conjunction with the appended drawings, wherein:

FIG. 1 is an elevation, with the front cover removed, of a heater constructed according to the teachings of the invention;

FIG. 2 is a sectional view taken on the line 2—2 looking in the direction of the arrows;

FIG. 3 is a sectional view taken on the line 3—3 looking in the direction of the arrows; and

FIG. 4 is a fragmentary elevation of a front cover omitted from FIG. 1 but included in FIGS. 2 and 3.

Referring now in greater detail to the drawings, the heater includes a lower horizontal fluid pipe **10**, an upper horizontal fluid pipe **12**, a left-hand header casting **14** and a right-hand header casting **16**. The four elements provide a fluid circulation loop. The lower pipe is provided with an electric heating element **18** of the fluid immersion type which extends axially through a major portion of the length of the lower pipe **10**, and which extends through the header **14** to a pressure-tight threaded connection **20** in the header **14**. Two electrical leads **22** connect the heater element **18** through a pressure switch **24** and a thermostat **26** to a source of electric power such as that provided by a household electrical outlet.

The pressure switch **24** is mounted on the header **14** in pressure actuating communication with the fluid circulation loop through a passageway **28** in the header casting. The thermostatic switch **26** is mounted on a flange **30** of the header casting. The thermostatic switch operates in response to the temperature of the header casting, which has a temperature closely following that of the fluid in the header casting. The pressure switch **24** and the thermostatic switch **26** are safety devices designed to interrupt the electricity supplied to the heater element **18** in the event that the fluid pressure or temperature exceeds safe levels. Electricity normally supplied through the pressure switch **24** and the thermostatic switch **26** to the heater element **18** under the control of a room thermostat (not shown). A fluid filter plug **32** is located in the header casting **14**.

A venturi section is located in the lower pipe **10** at a point between the end of heating element **18** and the header casting **16**. The venturi section **34** includes a central portion **36** of uniformly reduced inner diameter, a steeply tapered end portion **38** and a more gradually tapered end portion **40**. The central portion **36** preferably has an inner diameter equal to about one-half the inner diameter of pipe **10**. The end portions **38** and **40** are tapered from the reduced inner diameter of the central portion **36** to the inner diameter of the lower pipe **10**. The venturi **36, 38, 40** is preferably constructed of an appropriately shaped sleeve which has an axial length of about twice the diameter of pipe **10** and which is inserted and clamped in the lower pipe **10**.

The upper pipe **12** is provided with metal heat radiating fins **42** uniformly spaced along its length.

A third uppermost horizontal expansion chamber pipe **44** is closed at one end **46**, and the closed end is provided with a petcock or plug **48** for the purpose of permitting the escape of air when the circulation loop is initially filled with fluid. The other end of the expansion chamber pipe **44** is connected by means of an elbow **51** and a nipple **53** to the header casting **16** so that the expansion chamber pipe is in communication with the fluid circulation loop formed by elements **10, 12, 14** and **16**. The fluid circulation loop is filled with a liquid, such as water, through the filler plug **32** with the air vent plug **48** open. The height of the filler plug determines the level of liquid in the system. The plugs **32** and **48** are then securely closed and need not be opened again after the heater is put into use. The system is pressure tight and none of the liquid can escape and be lost during use of the heater.

The pipes **10, 12** and **42**, together with the headers **14** and **16** constitute a rigid mechanical structure which is removably supported in a sheet metal enclosure. The enclosure includes a unitary formed back **50**, top **52** and bottom **54**. The ends of the enclosure are constituted by end caps **56** and **58**. End shield hanger brackets **60** and **62** are fastened to the back **50** of the enclosure by any suitable method such as spot welding. A central hanger bracket **64** is also fastened to the back **50**. The brackets **60, 62** and **64** extend forwardly from the back **50** and are provided with aligned downwardly sloping slots **66** adapted to removably receive and support the

upper pipe 12. The entire pipe assembly is thus snugly supported in the sheet metal enclosure. The end shield hanger brackets 60 and 62 are extensive enough to conceal the header castings and associated parts from view.

At least one of the hanger brackets is slotted or otherwise constructed to support a formed air convection current baffle 68. All of the hanger brackets 60, 62 and 64 are slotted at 70 to removably receive and support a decorative and convection air channeling front cover 72. As shown in FIG. 4, the front cover 72 is provided with openings 74 near the bottom through which cold room air enters the enclosure to be heated by the heat radiating fins 42. The heated air rises and is directed by the baffle 68 out the opening above the front cover 72.

The operation of the heater in translating electric energy to pleasant comfortable room warmth will now be described. Electricity supplied to the heater element 18 causes the generation of intense heat in the heater element which is conducted to the surrounding fluid. The heated fluid tends to expand and rise. The flow of fluid in the lower pipe 10 toward the header 16 is impeded by the reduced inner diameter of the venturi section 34. The heated fluid freely rises through the header 14 to the upper pipe 12. At the same time, cool fluid in the upper pipe 12 moves down through header 16 to replace the volume of fluid that rises in header 14. The circulation, once started, increases in speed until an equilibrium speed is reached when the heat energy supplied to the liquid from the heater element 18 equals the heat radiated from the fins 42 on the upper plate 12. The different rates of taper of the end portions 38 and 40 of the venturi section 34 are believed to contribute to the desired directionality and vigor of the fluid circulation.

The fluid in flowing through the venturi section 34 experiences an increased velocity in proportion as the venturi section reduces the cross sectional area of the fluid stream compared with the cross sectional area of the lower pipe 10. It is believed that the increased fluid speed in the venturi section establishes an inertia which improves the fluid circulation, which in turn increases the amount of warmth radiated from the fins 42. The improved circulation also tends to prevent the formation of hot spots or steam pockets in the liquid. As a result, the usual annoying knocking and other fluid sounds are substantially eliminated.

It is thus apparent that according to the invention there is provided a fluid-type electric heater having improved operation characteristics, together with a pleasing appearance and relative ease and economy of manufacture and use.

What is claimed is:

1. A liquid circulation type baseboard space heater comprising a lower horizontal pipe and an upper horizontal pipe connected together to form a closed fluid circulation loop, an elongated electrical heating element extending through a portion of the length of said lower pipe, and a venturi section located in said lower pipe at a point removed from said heating element.

2. A liquid circulation type baseboard space heater comprising a lower horizontal pipe, an upper horizontal pipe, first and second headers connecting the ends of said lower and upper pipes to provide a closed fluid circulation loop, an elongated electrical heating element extending through said first header and extending axially through a major portion of the length of said lower pipe, a venturi section located in said lower pipe between the end of said heating element and said second header, and heat radiating fins extending transversely from said upper pipe.

3. A liquid circulation type baseboard space heater comprising a lower horizontal pipe, an upper horizontal pipe, first and second headers connecting the ends of said lower and upper pipes to provide a closed fluid circulation loop, an elongated electrical heating element extending through said first header and extending axially through

a major portion of the length of said lower pipe, and a venturi section located in said lower pipe between the end of said heating element and said second header, said venturi section having a central portion of uniformly reduced inner diameter and end portions tapered from the inner diameter of the center portion to the inner diameter of said lower pipe.

4. A liquid circulation type baseboard space heater comprising a lower horizontal pipe, an upper horizontal pipe, first and second headers connecting the ends of said lower and upper pipes to provide a closed fluid circulation loop, an elongated electrical heating element extending through said first header and extending axially through a major portion of the length of said lower pipe, a venturi section located in said lower pipe between the end of said heating element and said second header, said venturi section having a central portion of uniformly reduced inner diameter and end portions tapered from the inner diameter of the center portion to the inner diameter of said lower pipe, heating radiating fins extending transversely from said upper pipe, and an uppermost horizontal expansion chamber pipe closed at one end and in communication with said fluid circulating loop at the other end through a connection to said second header.

5. A liquid circulation type baseboard space heater comprising a lower horizontal pipe, an upper horizontal pipe, first and second headers connecting the ends of said lower and upper pipes to provide a closed fluid circulation loop, an elongated electrical heating element extending through said first header and extending axially through a major portion of the length of said lower pipe, a venturi section located in said lower pipe between the end of said heating element and said second header, said venturi section having a central portion of uniformly reduced inner diameter and end portions tapered from the inner diameter of the center portion to the inner diameter of said lower pipe, heat radiating fins extending transversely from said upper pipe, an uppermost horizontal expansion chamber pipe closed at one end and in communication with said fluid circulating loop at the other end through a connection to said second header, and a sheet metal enclosure having a unitary formed back, top and bottom, pipe hanger brackets extending from said back to receive and support said upper pipe, and a sheet metal front cover also supported by said brackets so as to leave air circulation openings below and above said front member.

6. A liquid circulation type baseboard space heater comprising a lower horizontal pipe, an upper horizontal pipe, first and second header castings connecting the ends of said lower and upper pipes to provide a closed fluid circulation loop, an elongated electrical heating element extending through said first header and extending axially through a major portion of the length of said lower pipe, a venturi section located in said lower pipe between the end of said heating element and said second header, said venturi section having a central portion of uniformly reduced inner diameter and end portions tapered from the inner diameter of the center portion to the inner diameter of said lower pipe, heat radiating fins extending transversely from said upper pipe, and a thermostatic switch mounted in temperature sensing contact with said first header.

7. A liquid circulation type baseboard space heater comprising a lower horizontal pipe, an upper horizontal pipe, first and second header castings connecting the ends of said lower and upper pipes to provide a closed fluid circulation loop, an elongated electrical heating element extending through said first header and extending axially through a major portion of the length of said lower pipe, a venturi section located in said lower pipe between the end of said heating element and said second header, said venturi section having a central portion of uniformly reduced inner diameter and end portions tapered from the inner diameter of the center portion to

to the inner diameter of said lower pipe, heat radiating fins extending transversely from said upper pipe, a pressure switch mounted on said first header and having a pressure sensing element in communication with the interior of said header, an uppermost horizontal expansion chamber pipe closed at one end and in communication with said fluid circulating loop at the other end through a connection to said second header, and a sheet metal enclosure having a unitary formed back, top and bottom, pipe hanger brackets extending from said back to receive and support said upper pipe, and a sheet metal front cover also supported by said brackets so as to leave air circulation openings below and above said front member.

References Cited by the Examiner

UNITED STATES PATENTS

2,063,152	12/36	Davidson	219—341
2,096,635	10/37	Goodwin	219—341 X
2,432,917	12/47	Maurer	219—341
2,772,342	11/56	Reynolds et al.	219—341

FOREIGN PATENTS

455,482	5/13	France.

RICHARD M. WOOD, *Primary Examiner.*

ANTHONY BARTIS, *Examiner.*