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[72] Inventor **John F. Finger**
Beresford, South Dakota

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[73] Assignee **Sioux Steam Cleaner Corporation**
Beresford, South Dakota
a corporation of South Dakota

[54] **STEAM CLEANER CONSTRUCTION**
8 Claims, 5 Drawing Figs.

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126/271.2, 239/136
[51] **Int. Cl.** **F22b 21/26,**
B05b 1/24
[50] **Field of Search** 126/271.2,
271.1, 350; 122/250; 239/136, 137

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Primary Examiner—Charles J. Myhre
Attorney—Merchant and Gould

ABSTRACT: A device having a base and housing means carried by the base. First and second tubular elements are mounted on the base within the housing means and cooperate therewith to define a combustion chamber, dead air space, and a circulating chamber. The top wall of the housing means defines vent means which communicate with the combustion chamber and atmosphere and the circulating chamber and atmosphere. Coil means, connected to a source of fluid under pressure, are mounted in the combustion chamber and heating means communicate with the combustion chamber for heating the coil means. The first and second tubular elements further include insulating means on the outer surfaces thereof which cooperates with dead air space and circulating chamber, to reduce the external temperature of the housing means.

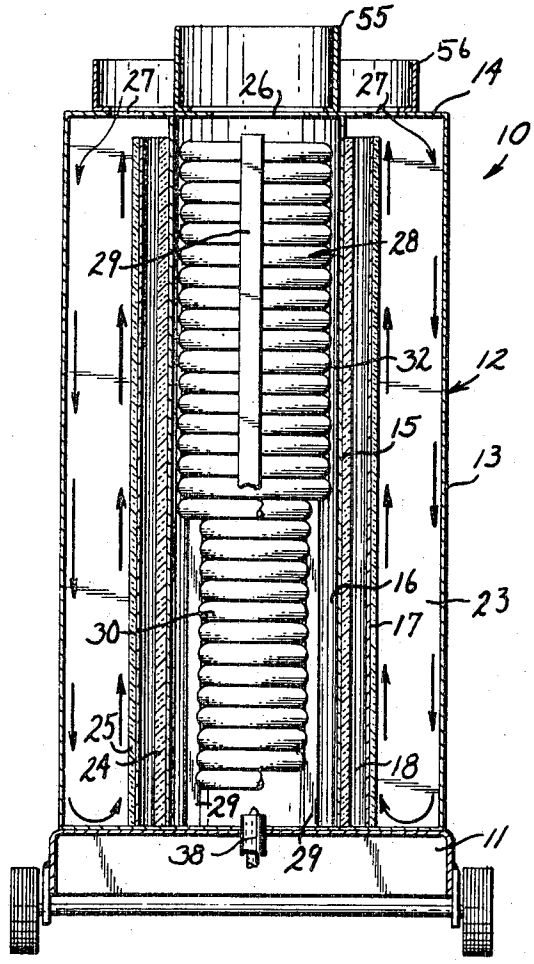
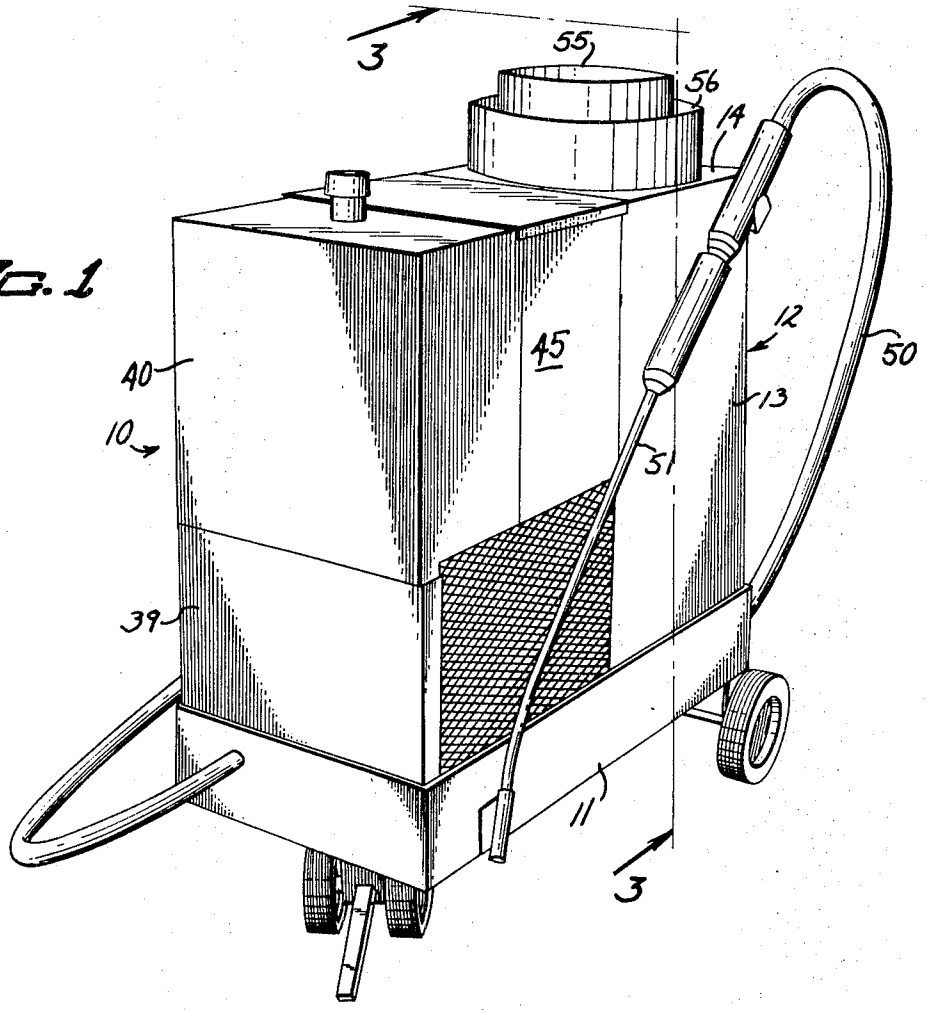


FIG. 1



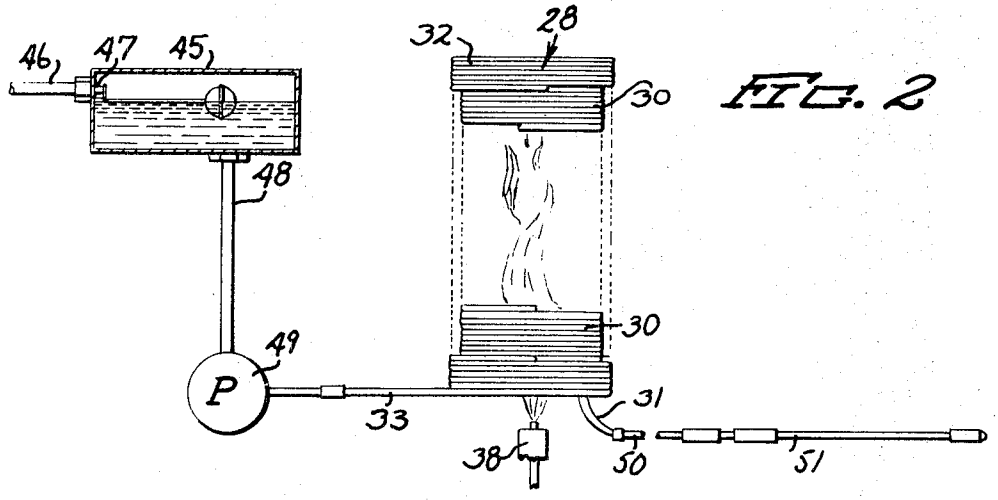


FIG. 2

INVENTOR.
John F. Finger
BY
Merchant & Gould
ATTORNEYS

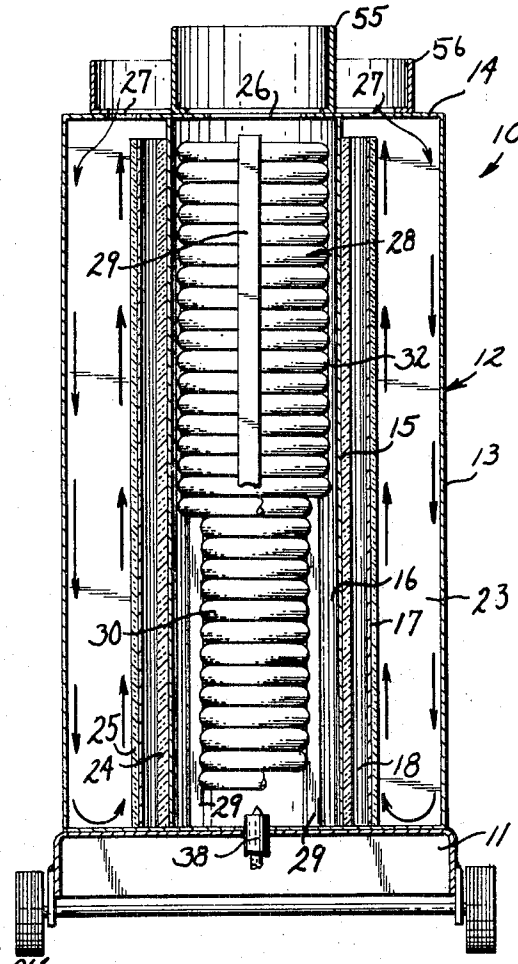


FIG. 3

FIG. 5

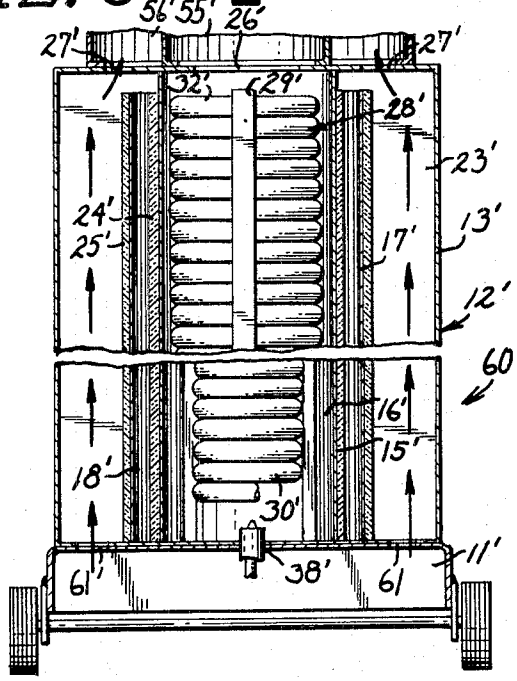
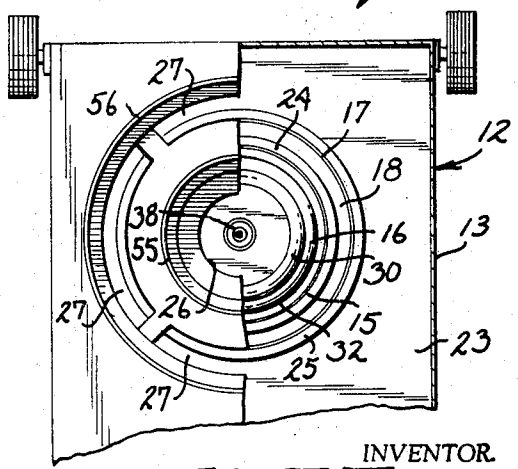


FIG. 4



INVENTOR.
John F. Finger
BY
Merchant & Gould
ATTORNEYS

STEAM CLEANER CONSTRUCTION

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to steam producing devices and more specifically to steam cleaners constructed to reduce the external temperatures of oil or gas fired steam cleaning devices of a generally portable nature.

2. Description of the Prior Art

In prior art devices of the type above described it is a particular problem to construct such devices to provide efficient conversion of water to steam while at the same time staying within an acceptable level of weight and manufacturing costs. Also, such devices normally have an external housing temperature which is somewhat uncomfortable to the touch of an operator coming into physical contact therewith, thus making same difficult to move about as in the case of portable steam cleaners.

SUMMARY OF THE INVENTION

With the above in mind it is a principal object of the invention to provide a device of the type above described which reduces the external temperature of the device to a level comfortable to the physical touch of an operator.

It is another object of the invention to provide a device of the above character which is relatively inexpensive to manufacture.

A still further object of the invention is the provision of a device of the type above described which is relatively light and portable.

To the above ends there is provided a steam cleaner including a base and housing means carried by the base which has a peripheral side wall and a top wall. A first tubular element extends between the base and the top wall and cooperates therewith to define a combustion chamber. A second tubular element, having a greater transverse dimension than the first tubular element, is carried by the base and extends longitudinally and concentrically with respect to the first tubular element to define therebetween a dead air space. The second tubular element, base, and housing means cooperate to define a circulation chamber with the top wall of the housing means defining vent means which provides communication between the circulating chamber and atmosphere and the combustion chamber and atmosphere. Coil means, mounted in the combustion chamber, have an inlet end, connected to a source of fluid under pressure, and an outlet end and heating means communicate with the combustion chamber for heating the coil means to a predetermined temperature. The first and second tubular elements each include insulating means adjacent the outer surfaces thereof which cooperate with the dead air space to reduce the transfer of heat from the combustion chamber to the circulating chamber. Natural convection of atmospheric air within the circulating chamber further reduces the transfer of heat from the combustion chamber to the housing means to a level approximately that of atmospheric air.

Further objects and advantages of the present invention will become apparent to those skilled in the art upon consideration of the following detailed specification, appended claims, and attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Referring to the drawings wherein like reference characters indicate like parts throughout the several views;

FIG. 1 is perspective view of a portable steam cleaner constructed in accordance with the present invention;

FIG. 2 is a diagrammatic view of the fluid conducting system of the structure of FIG. 1;

FIG. 3 an enlarged sectional view as seen from the line 3–3 of FIG. 1, portions thereof broken away and shown in section;

FIG. 4 is a view partially in top plan and partially in horizontal section of the structure of FIG. 3; and

FIG. 5 is a sectional view similar to FIG. 3 showing a modified embodiment of the present invention.

DETAILED SPECIFICATION

Referring to the drawing, FIGS. 1—4 show a preferred embodiment of a portable steam cleaner indicated generally by the numeral **10**. Steam cleaner **10** includes a wheel equipped base **11** and a housing means **12** which has a peripheral side wall **13** and top wall **14**. A first tubular element **15** is mounted within the housing **12** so as to extend between the base **11** and the top wall **14** and cooperates therewith to define a combustion chamber **16**. A second tubular element **17** is carried by the base **11** and extends longitudinally of the first tubular element **17**. The second tubular element **17** has a transverse dimension greater than that of the first tubular element **15** and defines therebetween a dead air space, identified at **18**. The second tubular element **17**, base **11**, and the peripheral side wall **13** of the housing means **12** cooperate to define a circulation chamber **23**. It will be noted, by particular reference to FIG. **3** of the drawings, that the second tubular element **17** terminates in spaced relation to the top wall **14** and that the cross-sectional area of the dead air space **18** is substantially less than the cross-sectional area of the circulating chamber **23** for reasons which will be more fully described hereinafter. Each of the tubular elements **15, 17** is provided, adjacent the outer surface thereof, with insulating means **25, 25'** respectively, also for reasons to be more fully described hereinafter.

Formed in the top wall **14** of the housing **12** is a generally centrally located vent **26** which provides communication between the combustion chamber **16** and atmosphere to exhaust gases of combustion from within the combustion chamber **16**. Radially outwardly of the vent **26** a plurality of vents **27**, formed in the top wall **14**, are arranged generally concentrically with respect to vent **26** to provide communication between the circulating chamber **23** and atmosphere as will be described during the description of operation.

Supported on the base **11** and positioned generally coaxially within the combustion chamber **16**, to extend substantially the entire length of the combustion chamber **16**, are fluid conduit coil means **28**. Fluid conduit coil means **28** is maintained in a generally coaxially position, relative to the first tubular element **29** secured to and carried by the base **11**. As shown, the coil means **28** includes an inner coil section **30**, having a fluid outlet end **31** and an outer coil section **32** having a fluid inlet end **33**. The inner and outer coil sections **30, 32** are constructed of vertically stacked convolutions which are positioned concentrically with respect to each other. The convolutions of the inner coil section **30** are in juxtaposition to adjacent convolutions of the outer coil section **32** and to adjacent vertically stacked convolutions of their respective coil sections **30, 32**.

Mounted in the base **11** so as to communicate with the lower end of the coil means **28** and combustion chamber **16** is heating means in the nature of a conventional oil burner, only the nozzle **38** of which is shown. That portion of the heating means, not shown, is normally contained within a housing portion **39** carried by the base **11** and positioned adjacent the peripheral side wall **13** of housing **12**. A fuel supply tank **40** operatively connected to the heating means, by conventional tubular conduits, is positioned directly above and supported by the housing portion **39**. It will be appreciated that other types of heating means, such as gas burners, may be utilized in the present structure, the only requirement being that such heating means must be of a portable nature.

FIG. **2** of the drawings diagrammatically shows a preferred method of connecting the fluid conduit coil means **28** to a source of fluid under pressure, such as water. As illustrated, there is shown a fluid reservoir **45** having an inlet conduit **46** leading from a supply of fluid. A float equipped valve **47** is connected to the inlet conduit **46** to control the level of fluid within the reservoir **45**. A fluid outlet conduit **48** has one end connected to the inlet end of fluid pump **49**, the outlet of the pump being connected to the inlet **33** of the outer coil section **32**. Connected to the outlet **31** of the inner coil section **30** is a flexible conduit **50** which terminates in a handle equipped nozzle **51** utilized to direct fluid flowing therefrom, in the form of steam, against an object to be cleaned thereby.

OPERATION

When it is desired to utilize the steam cleaner **10**, heretofore described, an operator connects the reservoir **45** to a source of fluid, such as water, by means of the conduit **46**. Thereafter, the heating nozzle **38** of the heating means is ignited to supply a source of heat to the coil **28**. When the coil **28** has been heated sufficiently to a temperature wherein steam begins to flow from the nozzle **51**, the pump **49** is electrically energized to provide a continuous flow of water to the coil **28**. It will be noted, that the temperature produced by the heating nozzle **38** is in the vicinity of 1500°F. Since the outlet **31** of the coil **28** is associated with the inner coil section **30** and the inlet of the coil **28** is associated with the outer coil section **32**, a relationship is set up wherein the incoming fluid is preheated through conductance of heat from the inner coil section **30** to the outer coil section **32**. Thus, fluid flowing from the outlet **31** of the inner coil section **30** is subjected to a maximum of heat to assure proper vaporization of the water within the coil means **28**.

In steam cleaning devices presently manufactured a particular problem has been the transfer of heat generated by the high temperature 1500°F. within the combustion chamber **16** to the peripheral side wall **13** of the housing **12**. As such, physical engagement of the device **10**, by an operator attempting to move same or accidentally during the operation of the device **10**, is rather uncomfortable and in some cases may even result in physical harm to the operator. Heat generated within the combustion chamber **16** is reduced to approximately 330°F. as it reaches the first tubular element **15**. The dead air space **18** and insulation **25**, associated with the second tubular element **17**, further reduces the heat to approximately 100°F. in the vicinity of the insulation **25**. It will be noted that expansion and contraction of air within the dead air space **18** is compensated for by virtue of the fact that the second tubular element **17** terminates short of the top wall **14** so as to vent the dead air space **18** through the plurality of openings **27**. Also, the relatively small transverse dimension of the dead air space **18** substantially prevents circulation of air within the dead air space **18**.

Because of the temperature difference between the insulation **25** and the peripheral side wall **13** of the housing **12** a circulation of air by convection is set up in the circulating chamber **23**. That is, air within the chamber **23** adjacent the insulation **25** of second tubular element **17** is heated to a temperature of approximately 100°F. Such heated air rises along the second tubular element and is exhausted through the innermost portion of the plurality of vents **27** and, in the process, sets up a circulation of air within the circulating chamber **23** so as to draw atmospheric air into the chamber **23**, through the outermost portion of the vents **27**, and downwardly along the peripheral wall **13** of the housing **12** toward the base **11** such as indicated by the arrows in FIG. **3**. In this manner, the peripheral wall **13** of housing **12** is maintained at a temperature substantially equal to that of the surrounding atmosphere, making the outer peripheral wall **13** comfortable to the touch of the operator. It will be noted, that the vent **26** is provided with a tubular extension **55** to protect an operator from exhausted gases of combustion blowing from the vent **26**. Since the gases of combustion are relatively hot, such tubular element **55** in turn would be relatively hot. To prevent accidental engagement of the extension **55** by an operator a second tubular extension is provided radially of the plurality of vents **27** in a generally concentrically disposed arrangement with respect to the tubular extension **55**. Tubular extension **56** is cooled by the atmospheric air entering the vent **27** and acts as a guard against accidental engagement of the extension **55** by the operator.

FIG. **5** of the drawings illustrates a slightly modified embodiment of the present invention, indicated generally by the numeral **60**. Since the modified embodiment **60** is generally similar to that illustrated in FIGS. **1—4**, like parts thereof are indicated with like reference numerals with a prime mark added. In the structure of FIG. **5** an additional plurality of vent

openings **61** are formed in the base **11** so as to provide communication between atmosphere and the lowermost portion of the circulation chamber **23'**. With this arrangement convection of air within the chamber **23'** results in a circulation of atmospheric air through the vent openings **61** into the chamber **23'** toward the plurality of openings **27'** formed in the top wall **14'**. Such circulation of atmospheric air obviously must flow along the insulation **25'** of the second tubular element **17'** and the peripheral wall **13'** of the housing **12'**. The circulation of air through the circulating chamber **23'** flows along and carries air adjacent the second tubular element **17'**, which is approximately 100°F., toward the plurality of vents **27'**. At the same time such air flows along the peripheral wall **13'** of housing **12'** to provide a barrier against transfer of heat from the second tubular element **17'**, by means of radiation, to the wall **13'** of housing **12'**.

In order to terminate use of steam cleaners **10, 60** an operator first shuts off the heating means. After a short period water flowing into the coil means **28, 28'** cools same to a point wherein only water flows from the nozzle **51**. At this time pump **49** is deenergized and the water level in reservoir **45** rises to activate float equipped valve **47** and shut off the flow of water from conduit **46**. Further flow of water through coil means **28, 28'** is thus terminated, leaving the coil means **28, 28'** charged with sufficient fluid for subsequent use of the steam cleaners **10, 60**.

It will be noted, that steam cleaners **10, 60** are constructed of relatively lightweight materials which lends to the portability thereof. In spite of the use of such lightweight material, which would normally result in relatively high heat loss from the combustion chamber **16, 16'**, to the peripheral side walls **13, 13'**, the particular arrangement of insulation **24, 25, 24', 25'** and the provision of dead air spaces **18, 18'** together with circulating chambers **23, 23'** provide structures which are completely comfortable to the physical touch of an operator.

I claim:

1. Steam cleaner construction comprising:

a. a base;

b. housing means carried by said base having a peripheral side wall and a top wall;

c. a first tubular element extending between said base and said top wall and cooperating therewith to define a combustion chamber;

d. a second tubular element carried by said base and extending longitudinally of said first tubular element;

e. said second tubular element having a greater transverse dimension than said first tubular element and defining therebetween a dead air space;

f. said second tubular element, said base, and said housing means cooperating to define a circulation chamber;

g. said top wall of said housing means defining vent means communicating with said circulating chamber and atmosphere and said combustion chamber and atmosphere;

h. fluid conduit coil means mounted in said combustion chamber having an inlet end connected to a source of fluid under pressure and an outlet end; and

i. heating means communicating with said combustion chamber for heating said coil to a predetermined temperature.

2. The structure of claim **1** in which the upper end of said second tubular element terminates in spaced relation to said top wall and in which the cross-sectional area of said dead air space is substantially less than the cross-sectional area of said circulating chamber.

3. The structure of claim **1** in which said first and second tubular elements each include insulating means adjacent the outer surface thereof.

4. The structure of claim **1** in which said fluid conduit coil means includes inner and outer coil sections having vertically stacked convolutions which are concentrically arranged with respect to each other.

5. The structure of claim **4** in which the convolutions of said inner coil section are in juxtaposition to adjacent convolutions of said outer coil section and to themselves vertically.

6. The structure of claim 1 in further combination:

a. a fluid reservoir having a fluid inlet connected to a source of fluid and a fluid outlet;

b. a fluid pump having an inlet connected to said outlet of said reservoir and an outlet connected to said inlet of said heating coil means; and

c. valve equipped float means disposed in said reservoir for controlling the fluid level therein.

7. The structure of claim 1 in which said base defines vent means communicating with said circulating chamber and atmosphere.

8. The structure of claim 4 in which said inlet of said fluid conduit coil means is associated with said outer coil section and in which said outlet of said fluid conduit coil means is associated with said inner coil section.