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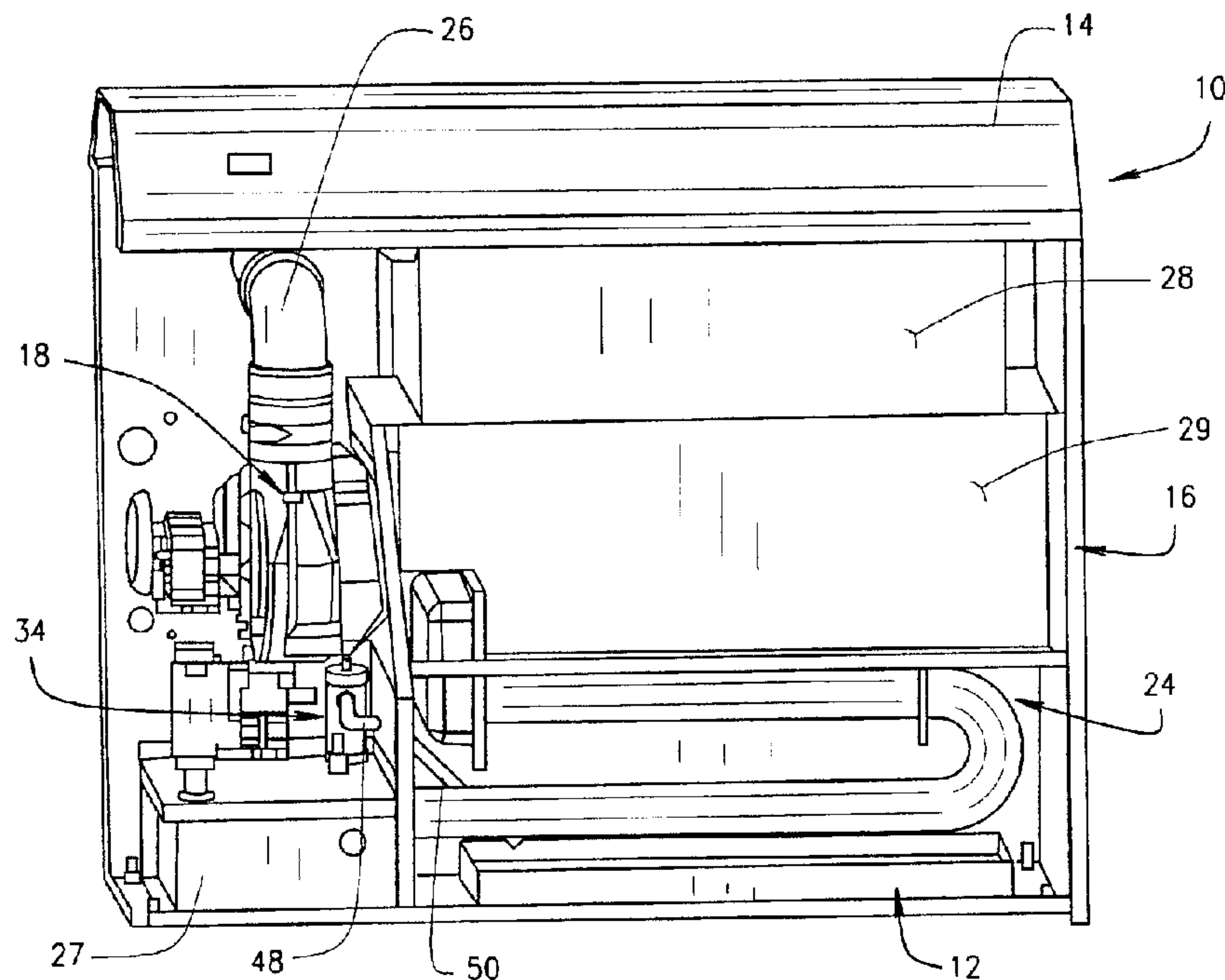
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(54) Titre : APPAREIL D'EVAPORATION POUR UN FOYER A HAUTE EFFICACITE OU UNE CHAUFFERETTE AYANT UNE FONCTION D'HUMIDIFICATION

(54) Title: EVAPORATION APPARATUS FOR HIGH EFFICIENCY FIRE PLACE OR HEATER WITH HUMIDIFICATION FEATURE



(57) **Abrégé/Abstract:**

A heater having an evaporating and humidifying apparatus therein, the evaporating and humidifying apparatus comprising a fluid pan with a heating element. In one aspect, the pan is in fluid communication with a condensate trap assembly. In one aspect the apparatus can include a base pan, the heating element, an insulator and an evaporation pan above the heating element. The evaporating and humidifying apparatus can include a fluid level sensor operatively associated with the heater controls. The condensate trap assembly may include a fluid level sensor operatively associated with the heater controls to determine fluid levels in the trap assembly. In one aspect the pan comprises an ultrasonic vaporization element in lieu of a heating element.

ABSTRACT

A heater having an evaporating and humidifying apparatus therein, the evaporating and humidifying apparatus comprising a fluid pan with a heating element. In one aspect, the pan is in fluid communication with a condensate trap assembly. In one aspect the apparatus can include a base pan, the heating element, an insulator and an evaporation pan above the heating element. The evaporating and humidifying apparatus can include a fluid level sensor operatively associated with the heater controls. The condensate trap assembly may include a fluid level sensor operatively associated with the heater controls to determine fluid levels in the trap assembly. In one aspect the pan comprises an ultrasonic vaporization element in lieu of a heating element.

EVAPORATION APPARATUS FOR HIGH EFFICIENCY FIRE PLACE OR HEATER WITH HUMIDIFICATION FEATURE

BACKGROUND OF THE INVENTION

High efficiency fireplaces or heaters can produce significant condensate. Various embodiments employ a tray located above the firebox to evaporate the condensed products of combustion and humidify in the area around the appliance. However, if a heater does not include a large, hot firebox, there is not enough heat generated within the heater itself to evaporate all the condensate.

Also, such heaters are generally used in cold weather to heat a space within a building. Often there is low humidity in the enclosed space as a result of the operation of heaters and furnaces. Low humidity can aggravate inhabitants by drying the skin and mucous membranes of inhabitants of the heated space.

It would be advantageous, therefore, to have an efficient apparatus within the heater to evaporate condensation and moisture. Moreover, it would be beneficial to use the evaporated condensate to humidify the area around the heater.

SUMMARY OF THE INVENTION

A heater having a condensate trap and an evaporating and humidifying apparatus, the apparatus comprising an evaporation pan with a heating element wherein heat from the heating element evaporates moisture from the evaporating pan to eliminate the moisture and generate humidity.

In another aspect, the pan comprises an ultrasonic vaporizing element to vaporize moisture collected in the pan.

The apparatus can include a sensor with a feedback to heater controls. Also the heater can include a water trap that normally feeds condensate to the apparatus. The trap can include a sensor with feedback to the heater controls.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a front elevational view of a heater employing the apparatus of the present invention, sans cover, to show the internal components of the heater;

Fig. 2 is an end plan view of the heater;

Fig. 3 is an enlarged perspective view of one embodiment of a condensate trap;

Fig 4 is a perspective view of an assembled evaporation apparatus; and

Fig. 5 is an exploded view of an evaporation apparatus.

DETAILED DESCRIPTION

In general, the present invention employs an electric element to heat condensate from the products of combustion for the purpose of humidification.

Figs. 1 and 2 illustrates a heater, indicated generally by number 10, which employs a representative embodiment of an evaporating apparatus indicating generally by reference number 12. Apparatus 12 also can be referred to as a humidifying apparatus, as will be understood from the detailed description, below.

The salient components of heater 10 include an outer housing 14 which enclose the inner working parts inside chamber 16. The working parts include an induced draft blower 18 that draws combustion products from a heat exchanger 24. An exhaust pipe 26 is in fluid communication with the heat exchanger and blower 18 to discharge exhaust gas. A burner housing 27 houses gas burners (not seen). Flames from the gas burner enter heat exchanger 24 tubes adjacent burner housing 27. A circulating air blower 28 draws in room air from the upper rear area of heater 10 across heat exchanger 24 and discharges heated air out of the lower front of the unit. Chamber 16 generally comprises sheet metal walls that define the inner chamber and shields, such as shield 29 over heat exchanger 24.

Heater 10 is operated or controlled in any acceptable way. One preferred aspect of a heater control system is disclosed in the assignee's patent application Serial No. 13/770,446, filed February 19, 2013, which is incorporated herein by reference

During operation, condensation occurs inside the heat exchanger tubes when the products of combustion are cooled below the dew point. This is a consequence of highly efficient gas heating equipment. There is a condensate collection point, indicated generally by number 30 adjacent induced draft blower 18 to collect condensation from combustion chamber 16. There is a second condensation collection point, indicated generally by number 32, on exhaust pipe 26. It will be appreciated that the two condensation collection points described herein are merely illustrative of the broad aspects of the invention. One skilled in the art will appreciate

that there can be one or there can be a plurality of collection points, optimally positioned within housing 14 to collect moisture and condensation. The number or location of the collection points is incidental.

In any event, heater 10 can include an apparatus to trap or collect the condensate from the collection points. One aspect of such an apparatus is trap assembly 34 shown in Fig. 3. Trap assembly 34 is a container or canister which can have a top 36, a closed bottom 38 and circumferential wall 40 that define an inner chamber 41 that has sufficient volume to accommodate a continuous flow of condensate from the condensate collection points without filling up. Conduits or tubes 42 and 44 extend through top 36 and terminate near the bottom of the inner chamber at their first ends and each one is in fluid communication with a condensate collection point at a second end of the tube.

There is an overflow drain 46 that extends through circumferential wall 40 and is in fluid communication with the inner cavity. Drain 46 is positioned on wall 40 adjacent top 36. This allows some level of fluid accumulation within the trap before it flows out of the overflow drain to the evaporating apparatus 12, as will be explained below. Hence, the position of the overflow drain may vary depending upon the fluid level desired.

Trap assembly 34 is positioned below blower 28 such that condensate will flow under force of gravity from the collection points into the chamber. The purpose of the condensate trap is to allow condensate to flow from the collection points even though the collection points are each at different pressures. These pressures are different

from the pressure at evaporation apparatus 12. Trap 34 allows condensate to flow without allowing flue gas to escape. Overflow drain 46 is in fluid communication with the upper end 48 of a condensate drain tube 50. Tube 50 extends downwardly and terminates in with an open end adjacent evaporating apparatus 12. Although in a preferred aspect of the invention, drain tube 50 terminates adjacent evaporating apparatus 12, it also may terminate in a discharge to or drain outside housing 14 to dispose of condensate.

Nevertheless, it will be understood that condensation is collected from the condensation points 30 and 32 and flows into trap assembly 34. When the fluid level reaches a predetermined level, i.e. at the level of overflow drain 46, it will flow out, through the upper end 48 of drain tube 50. In a preferred aspect it drains into evaporating apparatus 12. The location and configuration of the trap, the tubing and the condensation collection points can vary between heaters. The salient principle is that the heater may include apparatus to collect condensation and transport the condensate to the novel evaporating apparatus 12.

Trap assembly 34 can include a sensor, indicated generally by reference number 51. Sensor 51 can be any type of acceptable sensor, such as a float, electric eye, electrical connection switch. It will be noted that sensor 51 can be located within the canister or outside, depending upon the type. Regardless of the type of sensor employed, sensor 51 is configured to detect an excess accumulation of water in the trap, which could indicate a blocked drain or other impediment to fluid flow. Sensor 51 can be operatively connected to the heater controls so that detection of a critical

fluid accumulation would shut down the heater to prevent overflow of condensate. Also, it can be operatively connected to the evaporating apparatus to shut down the evaporating heating element, as will be explained.

Evaporating apparatus 12 is shown in detail in Figs. 4 and 5. In the exemplary embodiment, apparatus 12 includes a bottom pan 52 which, in the illustrated embodiment, has a generally rectangular shape. It will be understood that apparatus 12 can have any useful configuration that works well in the intended environment. Pan 52 includes a bottom wall 54, a first end wall 56 with holes 58 and 60, a second end wall 62 and first side wall 64 and a second side wall 66. The recited walls define an inner cavity 68. In one aspect, an insulative sheet 70 may be positioned in the cavity on bottom wall 54. Insulative sheet 70 can be constructed from any acceptable insulative material. Furthermore, top surface 72 of the insulative sheet can be heat reflective.

Apparatus 12 includes a vaporization element. In one aspect, the vaporization element is an electric heating element 74 is positioned in cavity 64. If the apparatus includes an insulative sheet, heating element 74 is positioned above the insulative sheet. Heating element 74 can be any conventional heating element with electrical connections 76 and 78 that protrude through holes 58 and 60 and are connected to electricity. In one aspect, an evaporating pan 80 is positioned on top of heating element 74 and under the open end of tube 50. Pan 80 has a bottom wall 82, a first end wall 84, a second end wall 85, a first side wall 86 and an opposed second side wall 88. The recited walls and bottom define an inner cavity 90. It will be noted that

the configuration of pan 80 is complementary to that of bottom pan 52 and sized so as to nest in the bottom pan. In other aspects or embodiments of the invention, there can be a layer of metal (not shown) between insulative sheet 70 and heating element 74. The size and configuration of the various components of the evaporating apparatus may vary without departing from the scope of the invention.

Also, it will be recognized by one skilled in the art that the evaporation apparatus can comprise only one pan, with a heating element operatively associated with the pan. By way of example, heating element 74 can be positioned inside an evaporation pan or outside, for example, under the pan. Moreover, the heating element can be integrated into the pan itself, for example, with heating wires within the pan material. In the appropriate circumstances, the heating element could be a gas flame, rather than an electric heating element. Hence, the term heating element can encompass any apparatus that heats moisture to evaporate or vaporize the moisture.

Furthermore, although the exemplary embodiments refer to pans for simplicity and convenience, it will be understood that any type of fluid reservoir that can collect and hold fluid such as condensate is within the scope of the invention.

In operation, there can be a sensor 92 associated with evaporating pan 80 to sense an accumulation of liquid in the pan. A feedback loop can actuate a switch to turn on heating element 74. In other aspects, a temperature sensor may be employed to sense when the condensate has boiled and can include a feedback loop to de-energize or shut off the heating element.

The heat from the heating element causes evaporation of the liquid in pan 80. Consequently, condensate from the operation of heater 10 is dissipated through evaporation. Sensor 92 (or another sensor) can be used to determine if the fluid level in the pan exceeds a predetermined level and shut down the heater to prevent further fluid accumulation. Sensor 92 can be any appropriate sensor that serves its intended purposes, such as the sensors described above relative to trap assembly 3 and can be located in or on, or associated with any of the evaporation apparatus components.

As set out above, heating element 74 can be operatively associated with sensor 51 of the trap assembly. If there is an increase in fluid in the trap, it could indicate that fluid is not flowing to the evaporation apparatus and the sensor could shut down the heating element or the entire heater.

In another aspect of evaporation apparatus 12, the vaporization element may be an ultrasonic vaporization device 94 in the pan, as shown in Fig. 5. An ultrasonic vaporization device uses a metal diaphragm vibrating at an ultrasonic frequency, much like the element in a high-frequency speaker, to create water droplets. An ultrasonic vaporization device is usually silent, and also produces a cool fog.

It will be appreciated that evaporated or vaporized liquid serves as a source of humidity for the space where the heater is located. As shown, evaporating apparatus 12 is located adjacent the bottom of heater 10, below heat exchanger 24 and blower 28. This arrangement permits air forced downward by the blower across the heat exchanger to pick up moisture from apparatus 12 and expel it into a room from the

bottom front of the heater. However, other locations of apparatus 12 that accomplish the desired purposes are intended to be included in the broad disclosure.

Heater 10 can include sensors and switches that allow the heating element or ultrasonic vaporizer to be actuated only when blower 28 is operating so vapor from the condensate is introduced into room air rather than building up in the heater. The heater with the evaporating apparatus 12 serves the dual function of providing heat and humidity.

The evaporation or vaporization feature of the heater may be employed in any heater that produces moisture in operation and has means for collecting the moisture and diverting it to the evaporation and vaporization elements.

The foregoing description and accompanying drawings are intended to be illustrative of exemplary embodiments of the heater only and should not be construed in any manner that limits the scope of the appended claims.

CLAIMS:

1. A heater comprising;
a control system for controlling the operation of the heater;
a burner;
a heat exchanger in communication with the burner;
a blower;
a condensate trap assembly; and
a humidifying apparatus comprising an evaporation pan in fluid connection with the condensate trap assembly, said pan associated with a vaporization element wherein the vaporization element vaporizes moisture from the evaporation pan to generate humidity.
2. The heater of claim 1, wherein the vaporization element is a heating element.
3. The heater of claim 1, wherein the vaporization element is an ultrasonic vaporization device.
4. The heater of claim 1, wherein the humidifying apparatus is below the heat exchanger.
5. The heater of claim 1, wherein the evaporation pan comprises a fluid sensor.

6. The heater of claim 5, wherein the evaporation pan fluid sensor is operatively associated with the vaporization element.
7. The heater of claim 5, wherein the evaporation pan fluid sensor is operatively associated with the control system.
8. The heater of claim 1, wherein the evaporation pan further comprises an insulative sheet.
9. The heater of claim 1, wherein the condensate trap assembly includes a fluid sensor.
10. The heater of claim 9, wherein the condensate trap assembly fluid sensor is operatively associated with the control system.
11. The heater of claim 9, wherein the condensate trap assembly fluid sensor is operatively associated the vaporization element.
12. The heater of claim 1, wherein the evaporation pan further comprises an insulative sheet.

13. The heater of claim 2, wherein the heating element is an electric heating element.
14. A heater comprising:
- a control system for controlling the operation of the heater;
 - a burner and associated heat exchanger;
 - a blower;
 - a condensate trap assembly; and
 - a vaporizing apparatus below the blower, the vaporizing apparatus comprising a fluid reservoir with a vaporization element disposed to vaporize fluid in the fluid reservoir.
15. The heater of claim 14, wherein fluid reservoir comprises a fluid sensor.
16. The heater of claim 14, wherein the vaporization element is a heating element.
17. The heater of claim 14, wherein the vaporization element is an ultrasonic vaporization device.
18. The heater of claim 15, wherein fluid reservoir fluid sensor is operatively associated with the control system.

19. The heater of claim 11, wherein the condensate trap assembly includes a fluid level sensor.

20. The heater of claim 15, wherein the condensate trap assembly fluid level sensor is operatively associated with the control system.

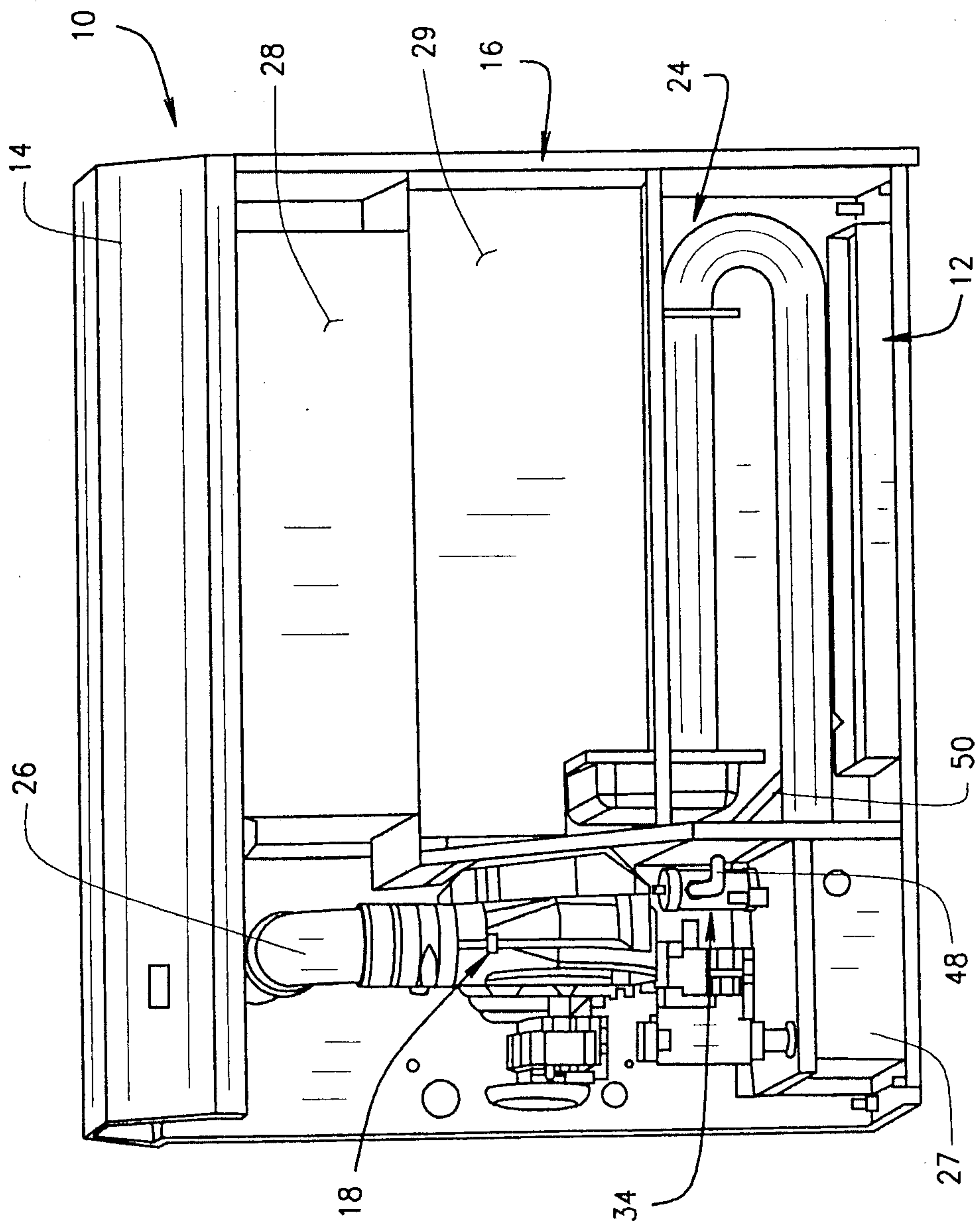


FIG. 1

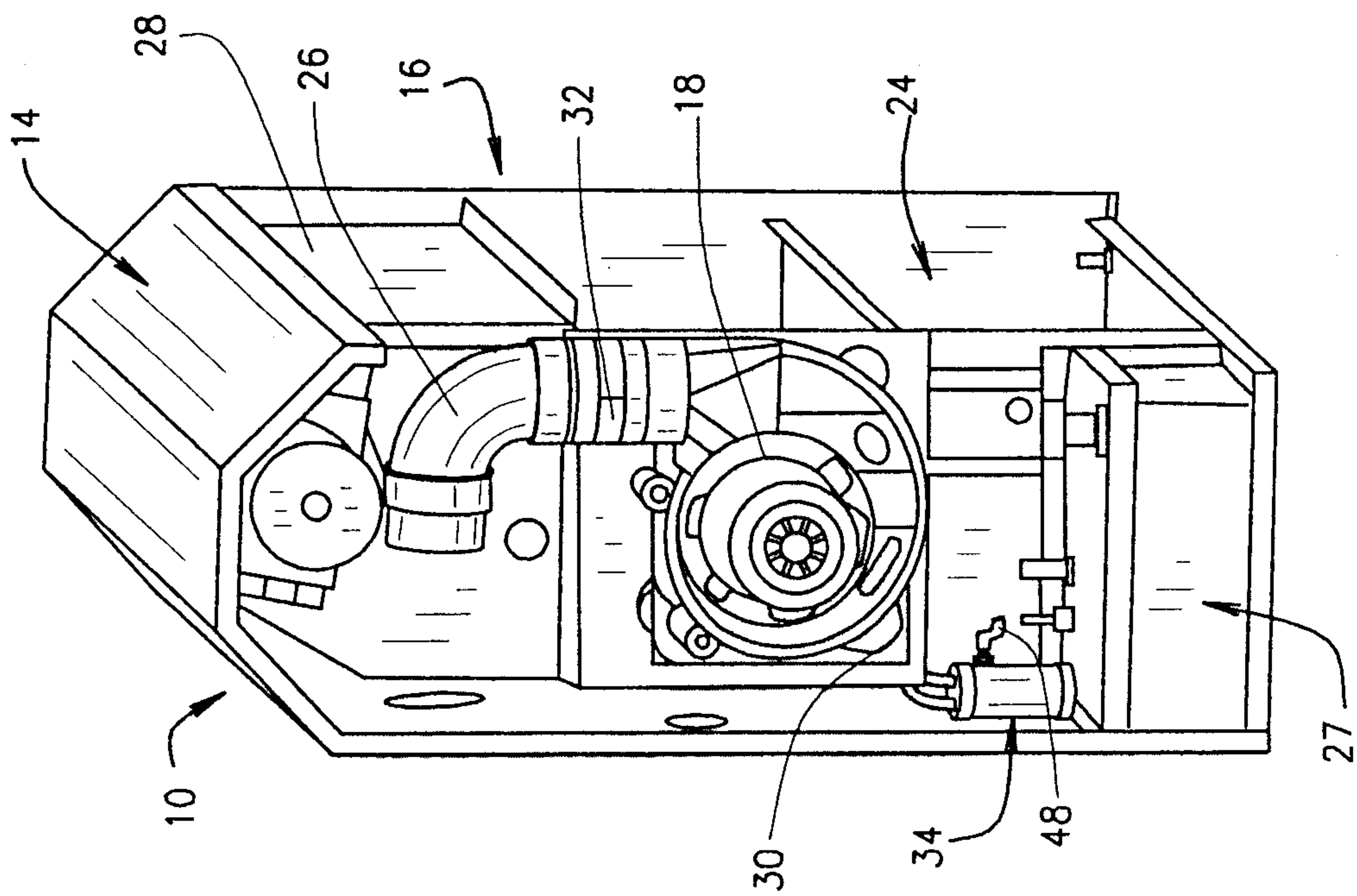


FIG. 2

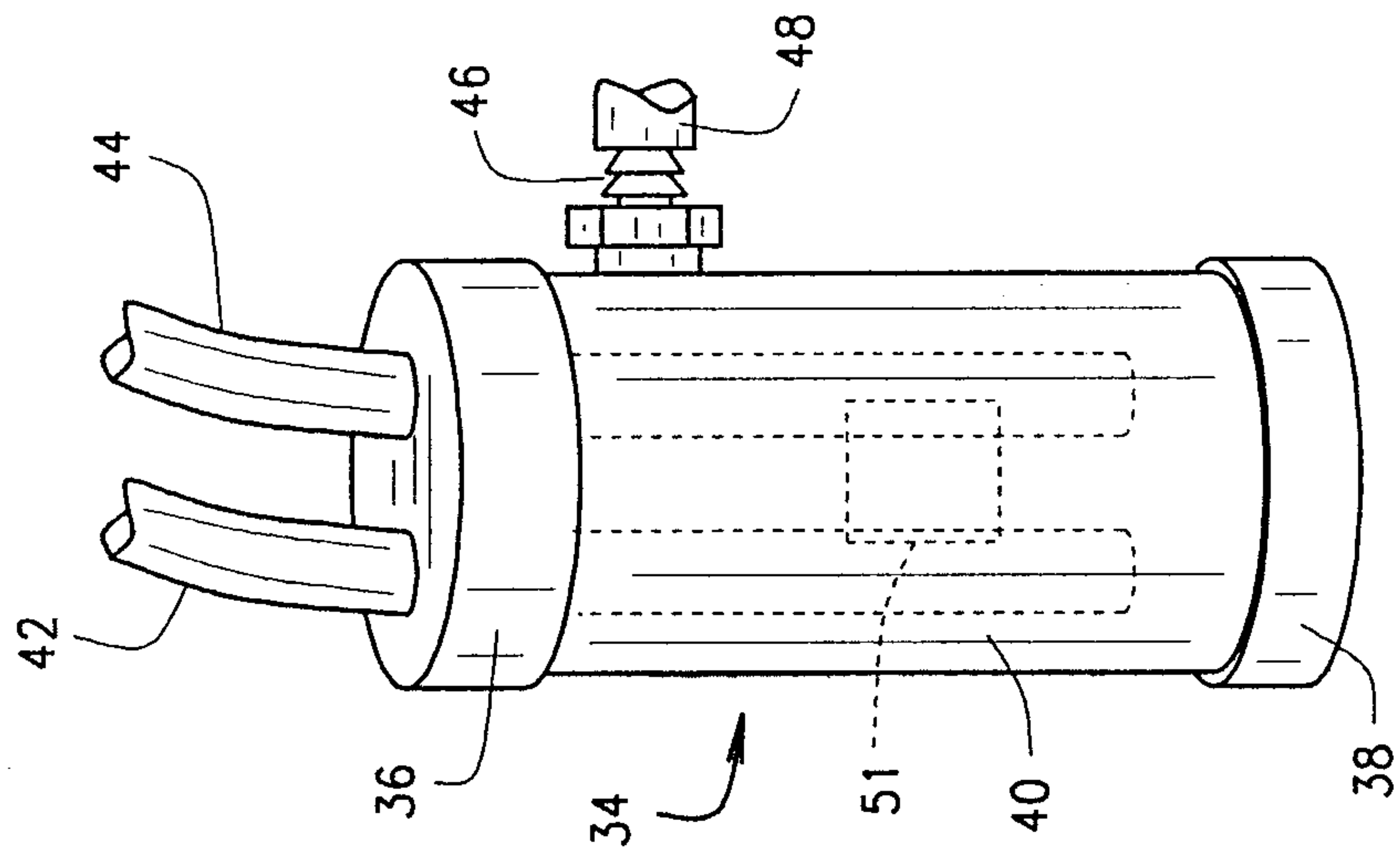


FIG. 3

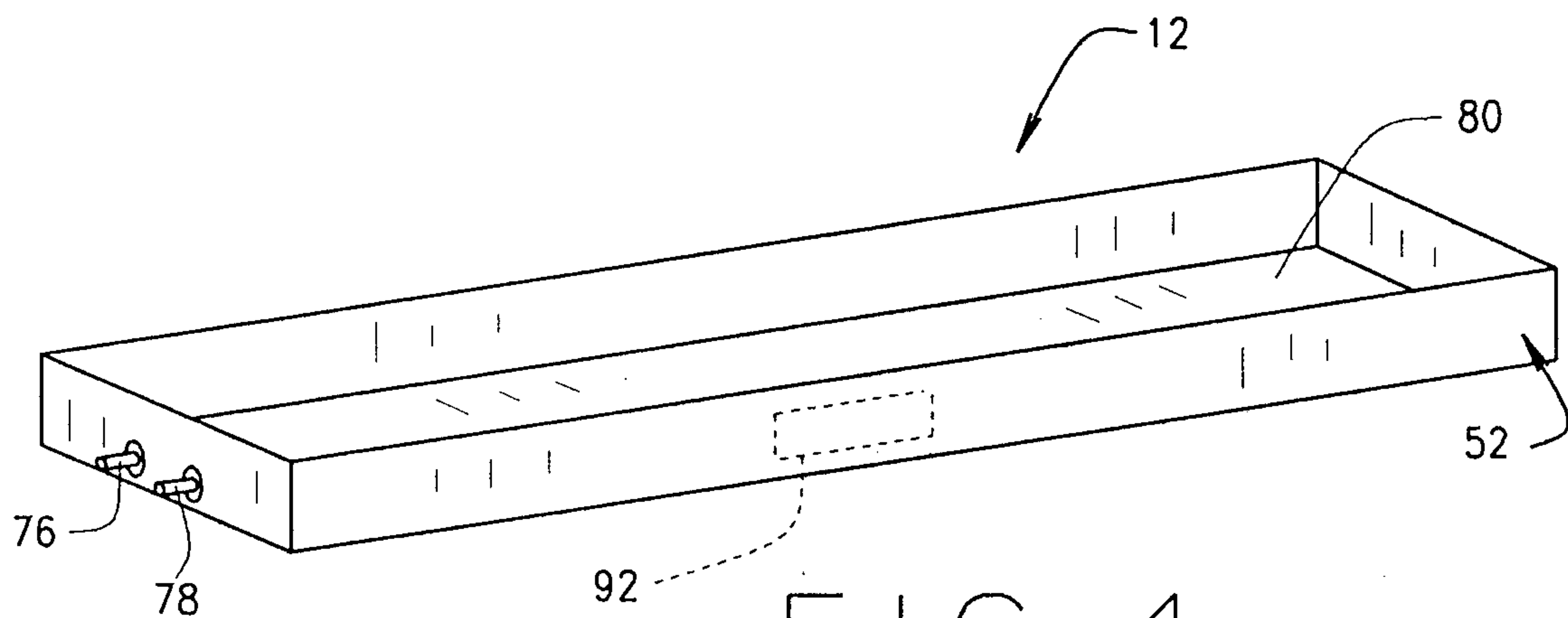


FIG. 4

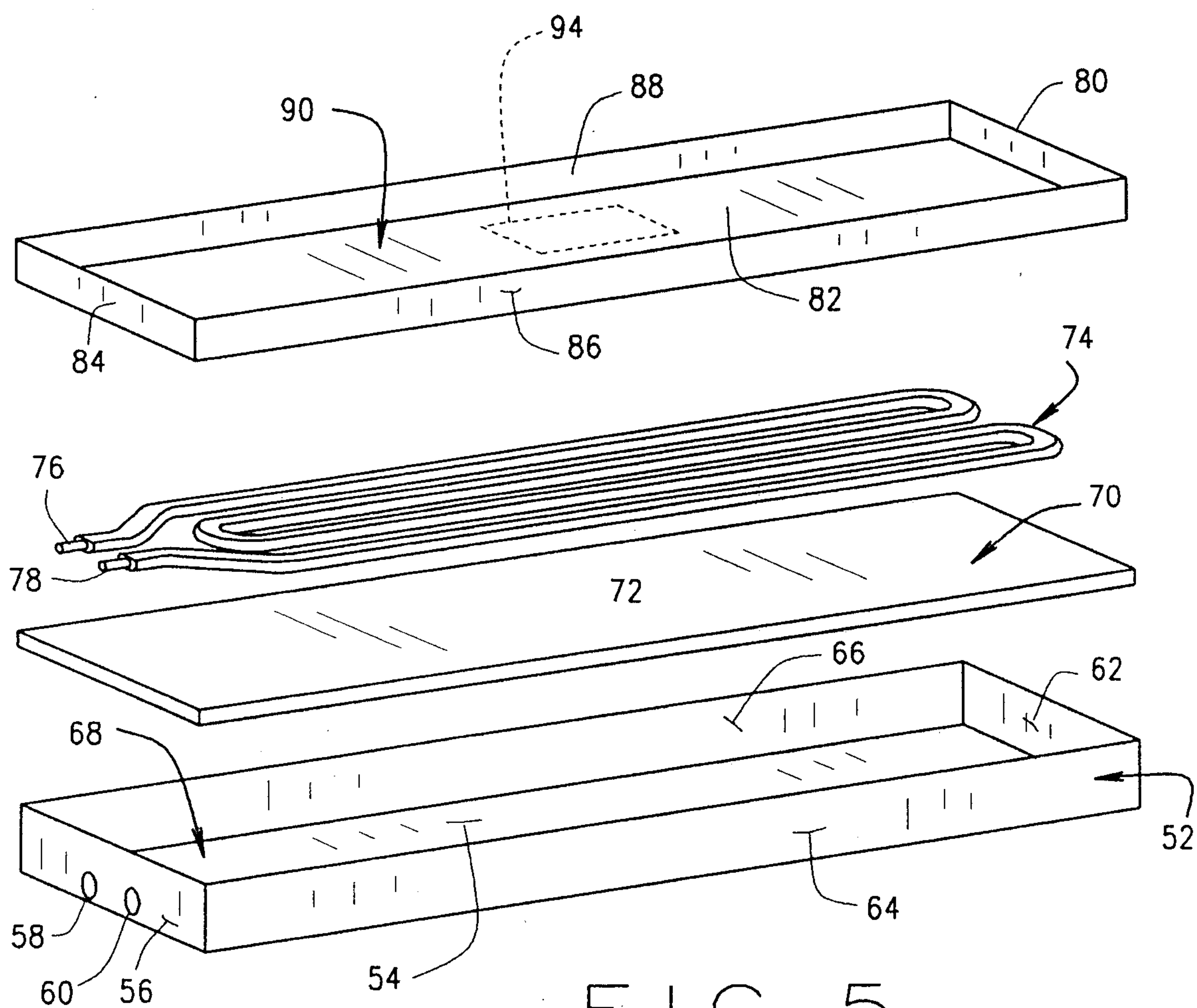


FIG. 5

