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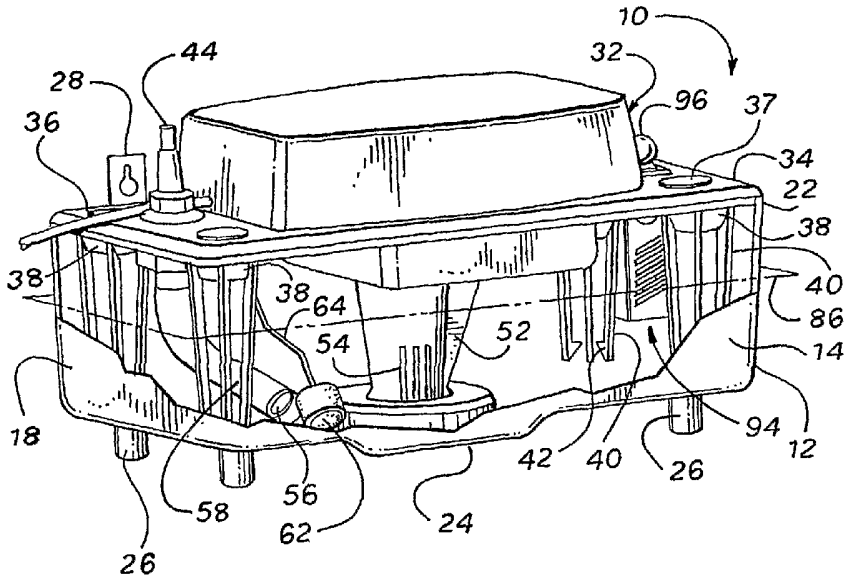
(54) **Title:** CONDENSATE PUMP



(57) **Abstract:** A condensate pump for an HVAC system includes a reservoir with a top assembly, which includes control electronics, a pump motor, and a pump impeller, mounted on top of the reservoir. The condensate pump includes wall hangers. The top assembly has a top cover with four inlet openings, and the top cover is reversible to accommodate placement of the electric service and the evaporator tube. The top cover has tube holders that extend into the reservoir so that the evaporator tube does not bottom out in the reservoir. The reservoir is made of clear plastic so that the water level can be readily observed. The condensate pump has control circuitry that can shut off the HVAC system or sound an alarm when the pump fails. The condensate pump has a drawer for biostat tablets. The drawer passes through the top assembly and extends into reservoir.

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CONDENSATE PUMP

FIELD OF THE INVENTION

[0001] This invention relates to a condensate pump that collects condensate water from the evaporator of an HVAC system and pumps the condensate water to another location for proper disposal.

BACKGROUND OF THE INVENTION

[0002] A condensate pump is used in an HVAC system to collect condensate water from the evaporator of the HVAC system and to pump the condensate water to a remote location for disposal. Particularly, the condensate pump typically comprises a reservoir, a float for detecting the level of condensate water in the reservoir, and a pump controlled by the float for pumping the water out of the reservoir to the remote location.

[0003] Condensate pumps are often located in extreme environments and subjected to moisture, heat, and cold. Moreover, condensate pumps are often installed in inaccessible locations where maintenance is difficult, and therefore reliability over many years is necessary. Further, the condensate water in the reservoir of the condensate pump provides an environment for growth of algae, spores, and other contaminants that can produce an unhealthy environment in the building where the condensate pump is located.

SUMMARY OF THE INVENTION

[0004] The present invention addresses the issues raised by the installation of a condensate pump in an extreme environment. Particularly, the condensate pump of the present invention is capable of operating reliably in such an extreme environment over an extended period of time. Further, the condensate pump of the present invention is designed to operate quietly. In addition, the condensate pump of the present invention insures that the condensate water in the reservoir does not create an environment for the growth of alga, spores, and other unhealthy environmental contaminants.

[0005] In order to achieve the objects outlined above, the condensate pump of the present invention embodies a number of features that together produce an improved condensate pump. The condensate pump of the present invention includes a reservoir with a top assembly, which

includes control electronics, a pump motor, and a pump impeller, mounted on top of the reservoir.

[0006] With respect to installation of the condensate pump, the condensate pump of the present invention includes wall hangers attached to the reservoir so that the pump can be mounted off of the floor in an elevated position for ease of installation and subsequent access. The top assembly has four openings, one at each corner, to accommodate a discharge tube from the HVAC evaporator. In addition, the top assembly can be reversed with respect to the reservoir thus offering installation flexibility to accommodate, for example, the placement of the electric service with respect to the discharge tube from the evaporator. Further, the condensate pomp has an automatic voltage sensing circuit that automatically adapts the control circuitry and the pump motor to accommodate either 120 volts or 240 volts. Consequently, installation personnel do not have to rewire the pump to accommodate the voltage that is available at the site.

[0007] With respect to maintenance, the condensate pump of the present invention includes various features to assist both in the reduction of maintenance requirements and to assist when maintenance is required. Of particular importance, the reservoir has tube holders that extend into the reservoir from each of the four openings in the top assembly. The tube holders insure that the discharge tube from the evaporator does not bottom out in the reservoir and thus restrict the flow of condensate water from the evaporator into the reservoir of the condensate pump. The reservoir is made of a clear plastic material so that the water level in the reservoir can be readily observed without removing the top assembly. Further, the condensate pump of the present invention has a power light so that maintenance personnel can readily determine whether the condensate pump has power or not. The condensate pump also has an audible alarm that is sounded when the condensate water reaches an above normal level that indicates that the pump has stopped working. In addition, the control circuitry of the condensate pump can shut off the HVAC system when an alarm condition is detected.

[0008] With respect to quiet operation, the condensate pump has rubber feet that support the condensate pump on a support surface to inhibit the transmission of vibration to the surrounding structure. Further, the motor and impeller for the condensate pump are mounted on a rubber bushing to further isolate any noise or vibrations generated by the motor from the surrounding environment.

[0009] With respect to environmental issues, the condensate pump has a tablet drawer that passes through the top assembly and extends into reservoir below. The tablet drawer holds several biostat tablets which when exposed to the condensate water in the reservoir chemically inhibit the growth of algae, spores, or other unhealthy environmental contaminants. The tablet drawer has openings in its sides to allow condensate water in the reservoir to pass through drawer and slowly dissolve the biostat tablets within the drawer. Because the reservoir is transparent, maintenance personnel can observe the degree to which the biostat tablets have dissolved and can replace them as needed in the tablet drawer.

BRIEF DESCRIPTION OF THE DRAWINGS

[00010] Fig. 1 is a side perspective view of the condensate pump in accordance with the present invention.

[00011] Fig. 2 is a back perspective view of the condensate pump in accordance with present invention.

[00012] Fig. 3 is a front elevation view of the condensate pump in accordance with the present invention.

[00013] Fig. 4 is a back elevation view of the condensate pump in accordance with the present invention.

[00014] Fig. 5 is a top plan view of the condensate pump in accordance with the present invention.

[00015] Fig. 6 is a side elevation in view of the condensate pump in accordance with the present invention.

[00016] Fig. 7 is an opposite side elevation view of the condensate pump in accordance with the present invention.

[00017] Fig. 8 is a detailed perspective view of the float control mechanism (low water position-pump off) of the condensate pump in accordance with the present invention.

[00018] Fig. 9 is a detailed perspective view of the float control mechanism (high water position-pump on) of the condensate pump in accordance with the present invention.

[00019] Fig. 10 is a detailed perspective view of the tablet drawer of the condensate pump in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[00020] Turning to Fig. 1, a condensate pump 10 comprises a reservoir 12 and a top assembly 32. The reservoir 12 comprises a water tight container with an open top defined by a periphery. In on embodiment the reservoir comprises a front panel 14, a back panel 16, a left side panel 18, a right side panel 20, and a bottom panel 30. The reservoir may be of any geometric shape. The reservoir 12 has rubber support legs 26 located on the four corners of the bottom panel 30. The reservoir 12 further has a flange 22 around the top periphery on which the top assembly 32 rests. In addition, hanger brackets 28 are mounted to the reservoir on the back panel 16. The hanger brackets 28 are used to mount the reservoir 12, on a wall or other elevated support in order to make later access to the condensate pump 10 in some cases easier. The reservoir 12 is constructed of a clear plastic material, such as polypropylene, so that the water level in the reservoir can be observed without removing the top assembly 32. The reservoir 12 further has a trough 24 molded into the bottom panel 30 for directing water remaining in the reservoir to the low point in the reservoir.

[00021] The top assembly 32 comprises a top cover 34 that rests on the flange 22 of the reservoir 12. A condensate water outlet connector 44 is mounted on one end of the top cover 34. The top cover 34 also has inlet openings 36 in the four corners of the top cover 34. Plugs 37 cover the inlet openings 36 that are not in use. Tube holders 38 are attached to the underside of the top cover 34 adjacent the inlet openings 36. The tube holders 38 consist of several downwardly extending legs 40 with a hook 42 at the lower end of each leg 40.

[00022] The top assembly 32 further comprises a motor 46 connected to an impeller 50 (Fig. 3). The motor 46 and the impeller 50 are mounted in a housing 52. The housing 52 is mounted to the top cover 34 of the top assembly 32 by means of a rubber bushing 66 (Fig. 9). The bushing 66 serves to isolate vibrations resulting from the operation of the motor and impeller from the top assembly 32 and therefore from transmission to the environment surrounding the condensate pump 10. The housing 52 extends from the top cover 34 into the trough 24 in the bottom panel 30 of the reservoir 12. The impeller 50 has impeller inlet ports 54 in the housing 52. The inlet ports 54 of the impeller 50 are positioned within the trough 24 in the bottom panel 30 of the reservoir 12 so that the impeller 50 can draw most of the condensate water out of the reservoir 12. The impeller 50 also has an impeller outlet port 56 in housing 52. The impeller outlet port 56 is connected by means of a tube 58 to the outlet connector 44 on the top cover 34

of the top assembly 32. The outlet connector 44 is connected to another tube (not shown) that delivers the condensate water to a remote location for proper disposal.

[00023] With reference to Figs. 2, 3, 4, 5, 8, and 9, the top assembly 32 further includes control circuitry 68 and interconnected float mechanism 60. The control circuitry 68 has an input voltage sensing circuit that determines whether the line voltage is 120 volts or 240 volts and automatically adapts the control circuitry to the available line voltage. The control circuitry 68 includes a motor micro switch 70 and an alarm micro switch 72. The motor micro switch 70 turns the motor 46 off and on in response to the level of the condensate water in the reservoir 12. The alarm micro switch 72 activates an audible alarm or shuts off the HVAC system when the condensate water reaches a level higher then normal within the reservoir 12. Both the motor micro switch 70 and the alarm micro switch 72 are controlled by the of float mechanism 60.

[00024] The float mechanism 60 comprises a float 62, a float arm 64, and a switch activator 74 connected to the float arm 64. The switch activator 74 rotates about switch activator pivot 76. The switch activator 74 has a motor switch stub (on) 78 and a motor switch stub (off) 80. In addition, the switch activator 74 has an alarm switch stub 82. As shown in Fig. 9, when the condensate water is at a low-level 84, the float 62 causes the micro switch activator 74 to pivot to the position shown so that the motor switch stub (off) 80 engages the micro switch 70 thereby shutting off the motor 46. When the condensate water rises to a level 86 (Fig. 8), the motor switch stub (on) 78 engages the micro switch 70 thereby turning on the motor 46. The activation of the motor 46 causes the impeller 50 to pump the condensate water out of the reservoir 12 through the tube 58 and out of outlet connector 44. Once the condensate water in the reservoir 12, has returned to the low level 84 (Fig. 9), the motor switch stub 80 of the switch activator 74 opens micro switch 70, and the motor 46 stops. The control circuitry 68 maintains the motor in the on or off condition during of the transition of the micro switch 70 between off and on.

[00025] If, however, the motor 46 fails to start and the condensate water rises to a high level 88, the alarm switch stub 82 engages the alarm micro switch 72. The engagement of the alarm micro switch 72 causes the condensate pump 10 to sound an audible alarm thereby alerting occupants that the condensate pump has failed to evacuate the condensate water from the reservoir 12. In addition, the activation of the alarm micro switch 72 can turn off the HVAC system thereby stopping the flow of condensate water from the evaporator to the reservoir 12 of the condensate pump 10.

[00026] In order to facilitate maintenance of the condensate pump 10, the reservoir 12 is transparent so that maintenance personnel can easily observe the level of condensate water in the reservoir 12. In addition, the control circuitry 68 has a power light so that maintenance personnel can determine whether the condensate pump has failed because of lack of power or for some other reason. Status of lights may also be included within the control circuitry 68 to show the float level and the related condensate water level, low condensate water 84, high condensate water 86, and alarm level condensate water 88.

[00027] In order to combat the formation of algae, spores, and other environmentally unhealthy contaminants that may grow in the condensate water, the condensate pump 10 of the present invention has a mechanism for delivery of biostat tablets 104 (Fig. 10) to the condensate water in the reservoir 12. The biostat tablets 104 are conventional biostat tablets used for the treatment of standing water in condensate water pans and the like. In order to introduce the biostat tablets 104 into the condensate water in the reservoir 12, a tablet drawer 94 is provided in the top cover 34. The tablet drawer 94 slides through an opening in the top cover 34. The tablet drawer 94 has a handle 96. The drawer 94 has diagonal openings 98. The biostat tablets 104 are placed in the drawer body 100, and the drawer 94 slides through the drawer opening in the top cover of 34. Once the drawer 94 is in place within the reservoir 12, the condensate water washes over the tablets 104 and slowly dissolves them releasing the active ingredients into the condensate water. Because the reservoir 12 is transparent, maintenance personnel can observe the degree to which the biostat tablets 104 have dissolved thereby indicating when replacement is required.

[00028] While this invention has been described with reference to preferred embodiments thereof, it is to be understood that variations and modifications can be affected within the spirit and scope of the invention as described herein and as described in the appended claims.

I claim:

1. A condensate pump for collecting condensate water and pumping the condensate water to a remote location comprising:

a. a reservoir having an open top and a bottom panel with a trough formed in the bottom panel;

b. a top assembly mounted on the open top of the reservoir and comprising

i. a top cover;

ii. a motor mounted on the top cover and connected to an impeller with a water inlet port and a water outlet port;

iii. a float assembly for determining the level of water in the reservoir; and

iv. a control circuit connected to the float assembly for controlling the operation of the motor based on the level of the water in the reservoir,

wherein the inlet port of the impeller is located in the trough to minimize the amount of water remaining in the reservoir after the water has been pumped to the remote location.

2. The condensate pump of Claim 1, wherein the top assembly further comprises an inlet opening in the top cover for allowing the flow of condensate water into the reservoir from an evaporator discharge tube and a tube holder extending from the inlet opening into the reservoir for restraining the evaporator discharge tube from contacting the bottom panel of the reservoir to keep the bottom panel from blocking the evaporator discharge tube.

3. The condensate pump of Claim 1, wherein the top assembly further comprises a drawer opening in the top cover and a drawer slideably mounted in the drawer opening for holding a biostat tablet, wherein the drawer extends into the reservoir and the drawer has a drawer opening to allow the water in the reservoir to contact the biostat tablet in the drawer.

4. The condensate pump of Claim 1, wherein the top cover has multiple inlet ports for allowing the flow of condensate water into the reservoir from an evaporator discharge tube and wherein the top cover can be mounted in a plurality of orientations with respect to the reservoir.

5. The condensate pump of Claim 1, wherein the reservoir has hanger brackets for allowing the reservoir to mounted on a support member.

6. The condensate pump of Claim 1, wherein the reservoir is transparent to allow observation of the water level in the reservoir.

7. A condensate pump for collecting condensate water and pumping the condensate water to a remote location comprising:

a. a reservoir having an open top and a bottom panel;
b. a top assembly mounted on open top of the reservoir and comprising
   i. a top cover;
   ii. a motor mounted on the top cover and connected to an impeller with a water inlet port and a water outlet port;
   iii. a float assembly for determining the level of water in the reservoir;
   iv. a control circuit connected to the float assembly for controlling the operation of the motor based on the level of the water in the reservoir;
   v. an inlet opening in the top cover for allowing the flow of condensate water into the reservoir from an evaporator discharge tube; and
   vi. a tube holder extending from the inlet opening into the reservoir for restraining the evaporator discharge tube from contacting the bottom panel of the reservoir to keep the bottom panel from blocking the evaporator discharge tube.

8. The condensate pump of Claim 7, wherein the top assembly further comprises a drawer opening in the top cover and a drawer slideably mounted in the drawer opening for holding a biostat tablet, wherein the drawer extends into the reservoir and the drawer has a drawer opening to allow the water in the reservoir to contact the biostat tablet in the drawer.

9. The condensate pump of Claim 7, wherein the bottom panel of the reservoir has a trough and the impeller is located in the trough to minimize the amount of water remaining in the reservoir after the water has been pumped to the remote location.

10. The condensate pump of Claim 7, wherein the top cover has multiple inlet ports for allowing the flow of condensate water into the reservoir from an evaporator discharge tube and wherein the top cover can be mounted in a plurality of orientations with respect to the reservoir.

11. The condensate pump of Claim 7, wherein the reservoir has hanger brackets for allowing the reservoir to mounted on a support member.

12. The condensate pump of Claim 7, wherein the reservoir is transparent to allow observation of the water level in the reservoir.

13. A condensate pump for collecting condensate water and pumping the condensate water to a remote location comprising:

a. a reservoir having an open top and a bottom panel;

b. a top assembly mounted on open top of the reservoir and comprising,

i. a top cover having a drawer opening therein;

ii. a drawer slideably mounted in the drawer opening for holding a biostat tablet, wherein the drawer extends into the reservoir and has an opening to allow the water to contact the biostat tablet in the drawer;

iii. a motor mounted on the top cover and connected to an impeller with a water inlet port and a water outlet port;

iv. a float assembly for determining the level of water in the reservoir; and

v. a control circuit connected to the float assembly for controlling the operation of the motor based on the level of the water in the reservoir.

14. The condensate pump of Claim 13, wherein the bottom panel of the reservoir has a trough and the impeller is located in the trough to minimize the amount of water remaining in the reservoir after the water has been pumped to the remote location.

15. The condensate pump of Claim 13, wherein the top assembly further comprises an inlet opening in the top cover for allowing the flow of condensate water into the reservoir from an evaporator discharge tube and a tube holder extending from the inlet opening into the reservoir

for restraining the evaporator discharge tube from contacting the bottom panel of the reservoir to keep the bottom panel from blocking the evaporator discharge tube.

16. The condensate pump of Claim 13, wherein the top cover has multiple inlet ports for allowing the flow of condensate water into the reservoir from an evaporator discharge tube and wherein the top cover can be mounted in a plurality of orientations with respect to the reservoir.

17. The condensate pump of Claim 13, wherein the reservoir has hanger brackets for allowing the reservoir to mounted on a support member.

18. The condensate pump of Claim 13, wherein the reservoir is transparent to allow observation of the water level in the reservoir.

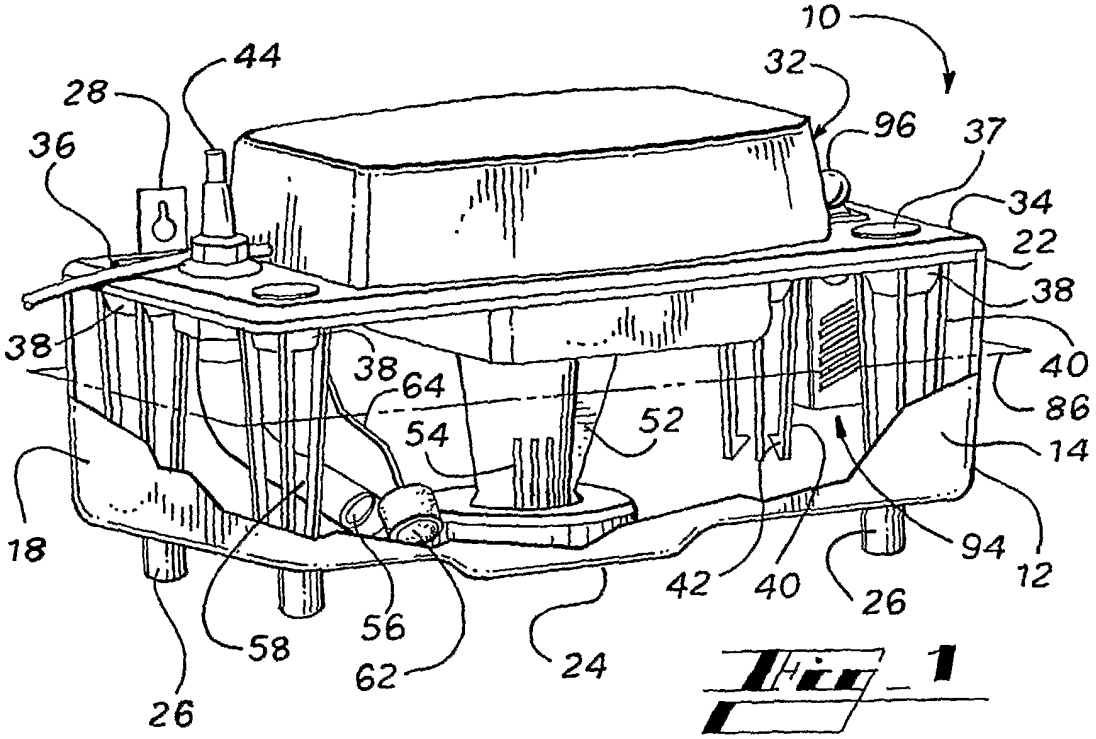

Fig_1

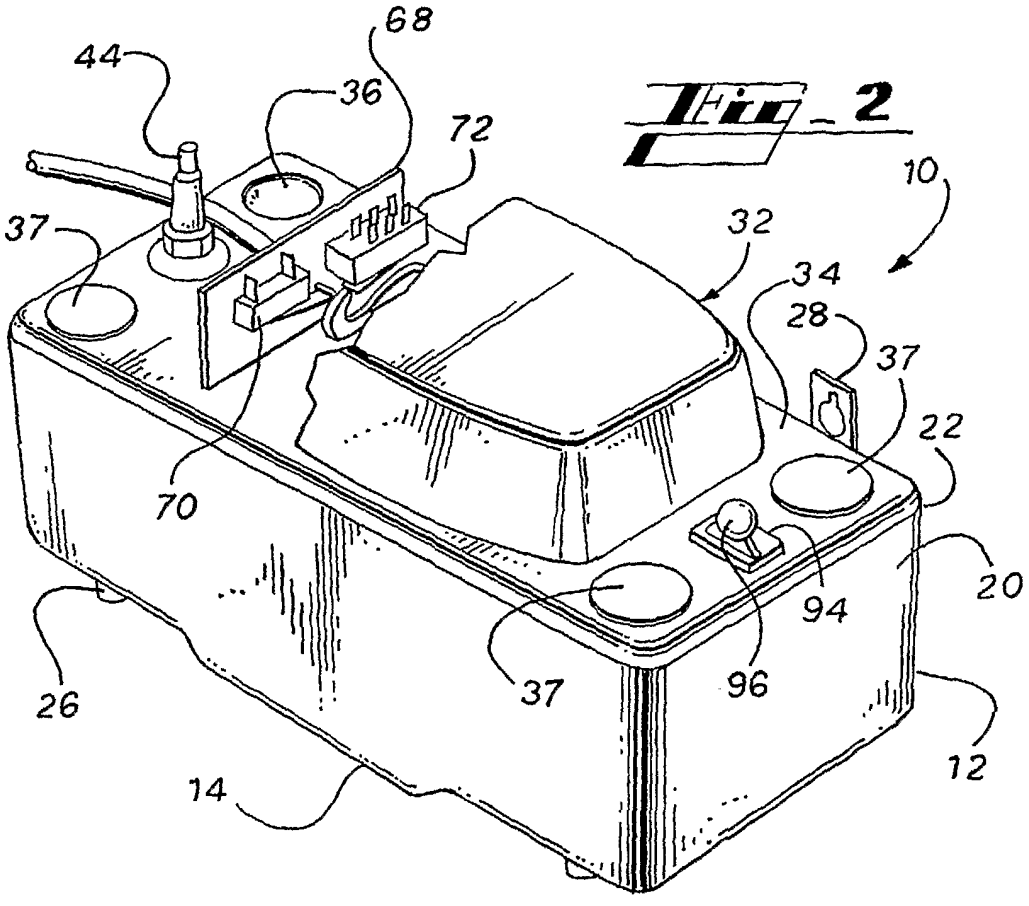

Fig_2

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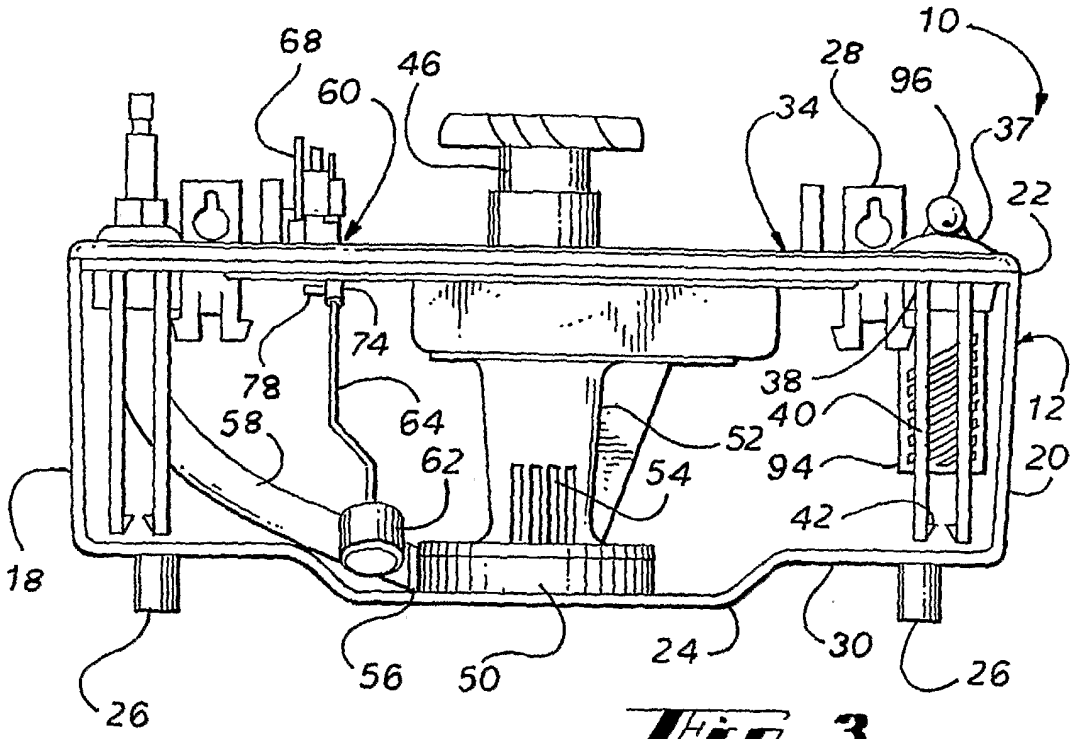
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Fig_3

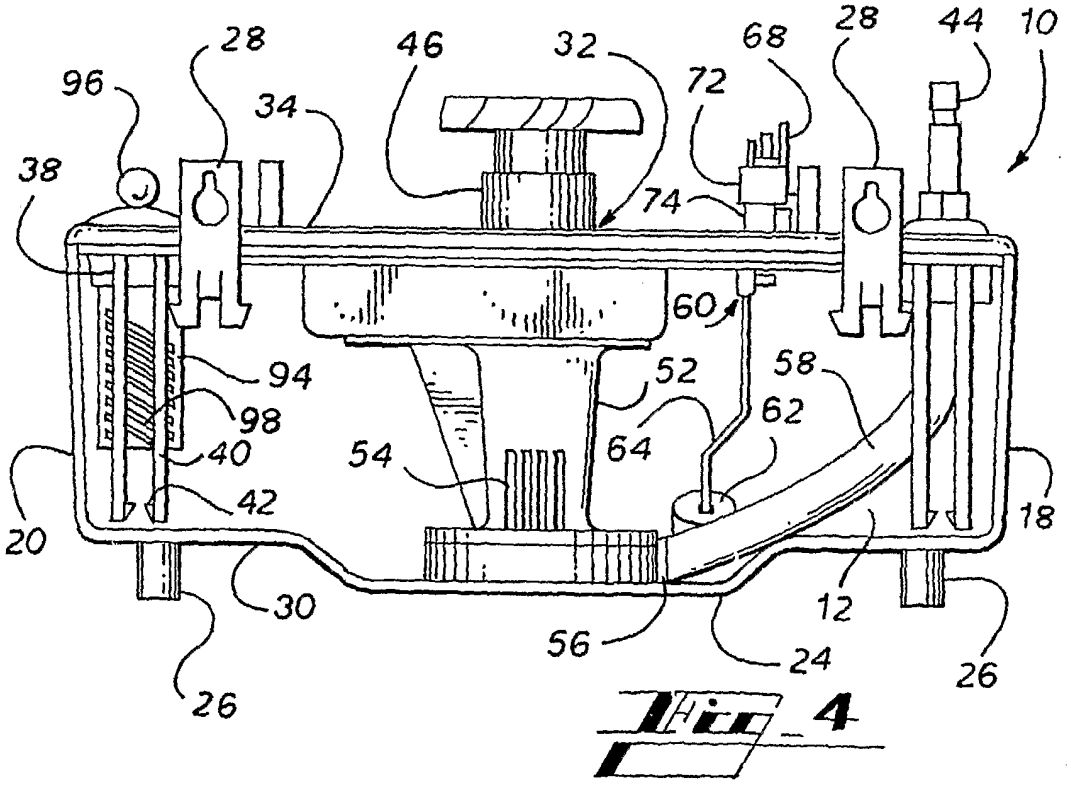
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Fig_4

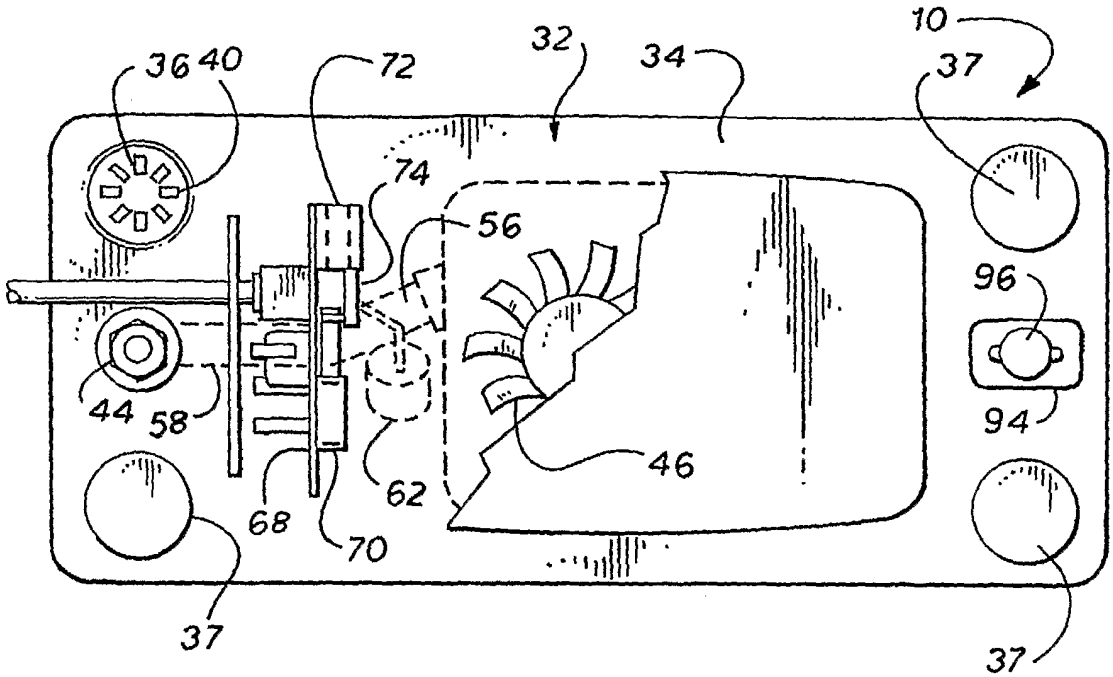
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Fig. 5

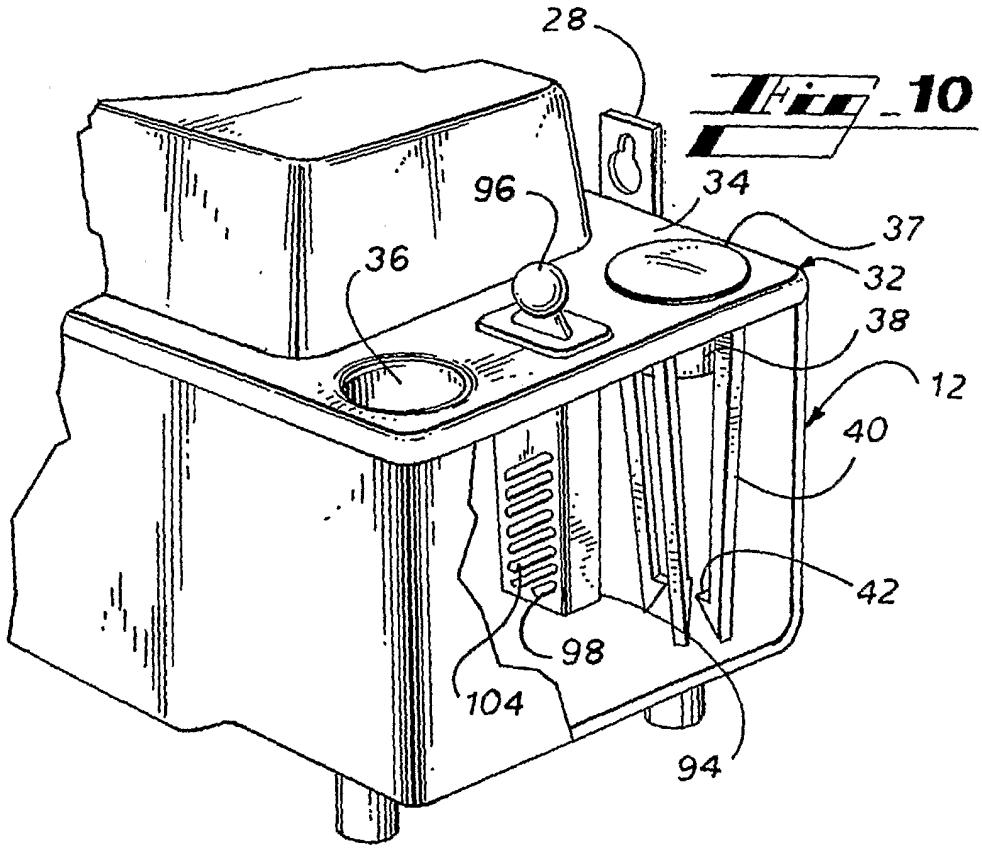
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Fig. 10

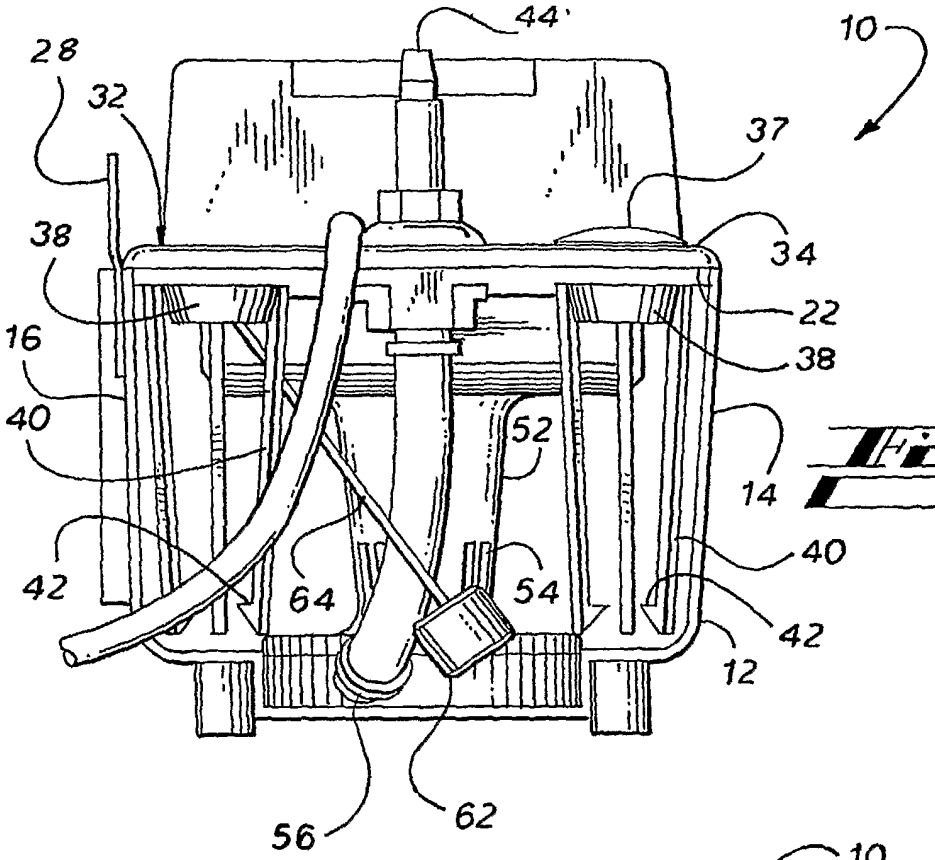
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Fig_6

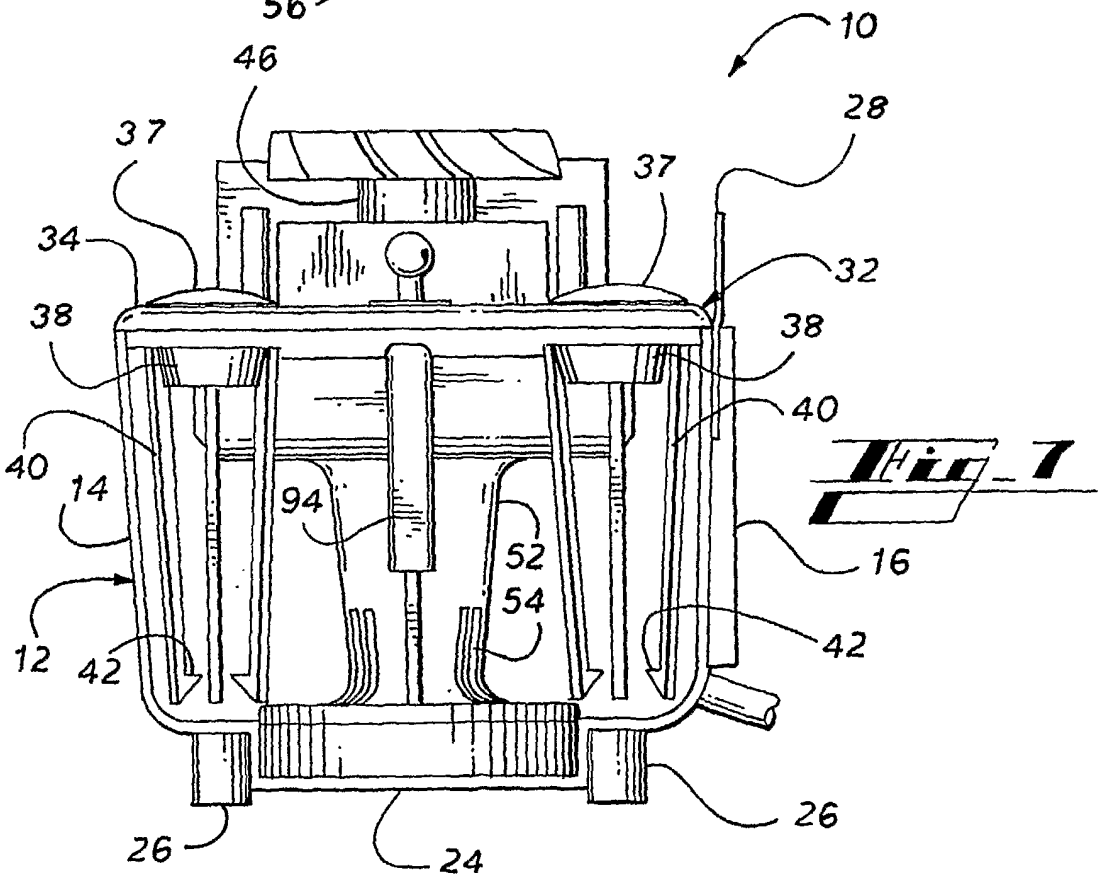
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Fig_7

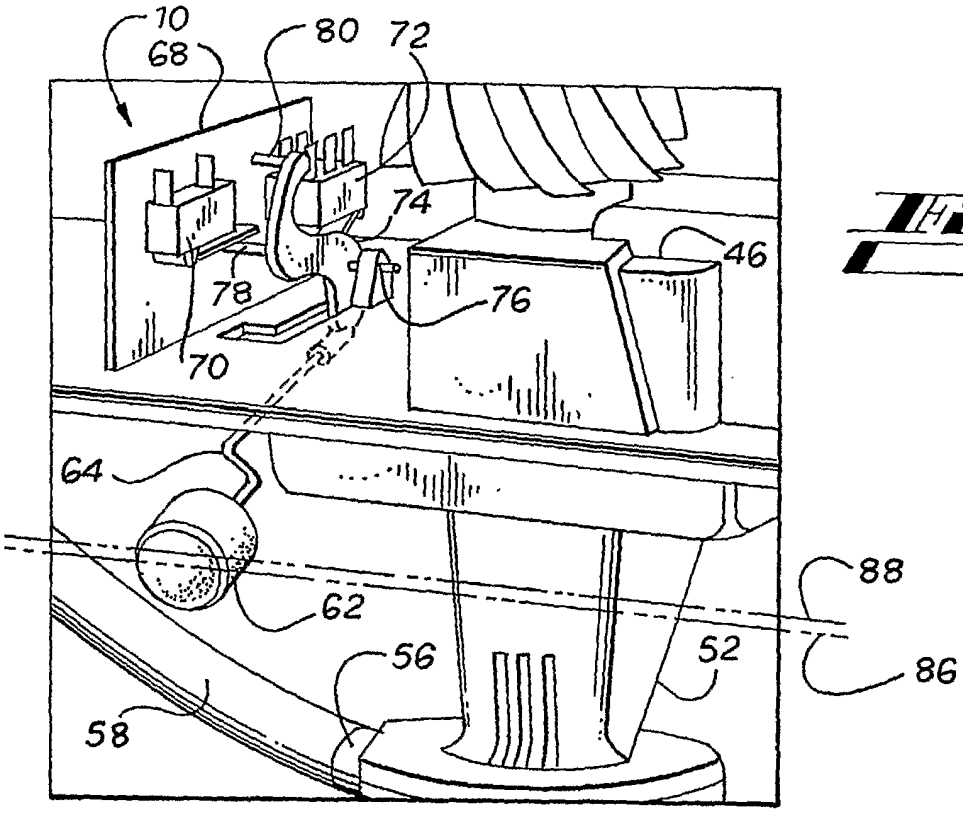
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Fig. 8

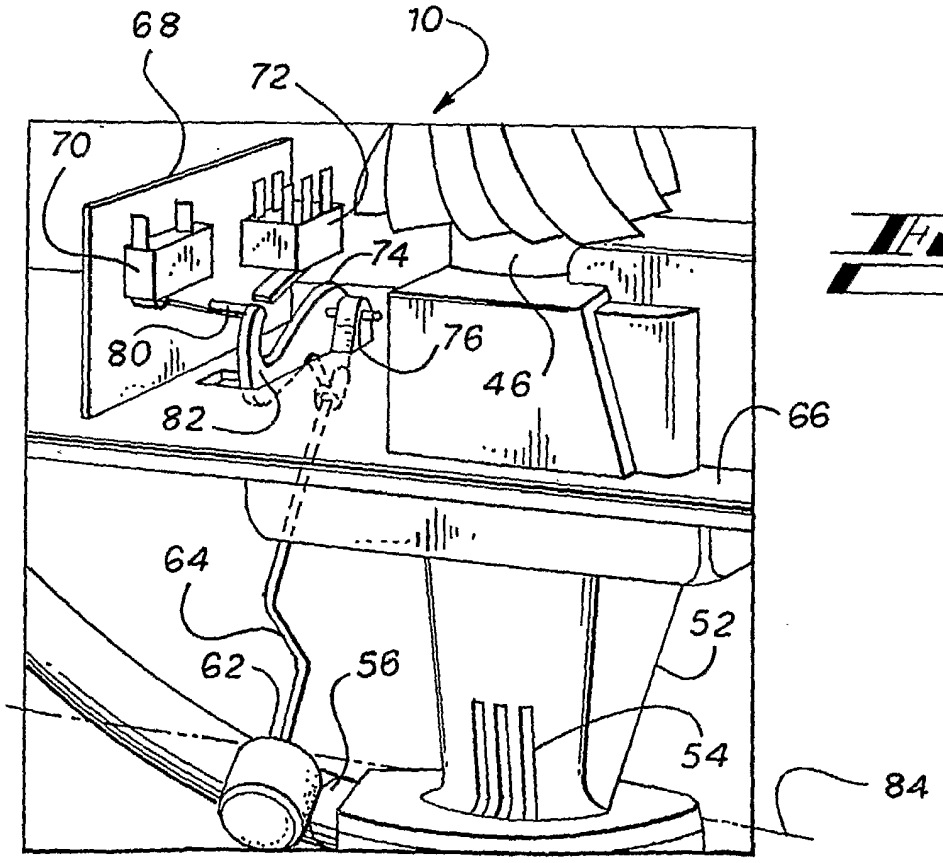
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Fig. 9