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(54) Improvements in or relating to pumps

(57) The present invention relates to improvements in or relating to pumps, in particular to pumps in air conditioning installations. In one aspect, there is described a pump assembly for use in an air conditioning system, the pump assembly (20) comprising a pump having a pump inlet (52) and a pump outlet (53), and wherein the pump inlet is in fluid communication with a reservoir (54), said reservoir being formed integrally with the pump assembly (20) and said reservoir having a reservoir inlet in fluid communication with a first fluid-carrying pipe of an air-conditioning installation; wherein the pump outlet (53) is in fluid communication with a second fluid-carrying pipe of an air-conditioning installation. In a second aspect of the invention, there is described a conduit elbow (10) having a first opening (12) and a second opening (13) and integrally housing (11) a pump assembly (20) as defined above.

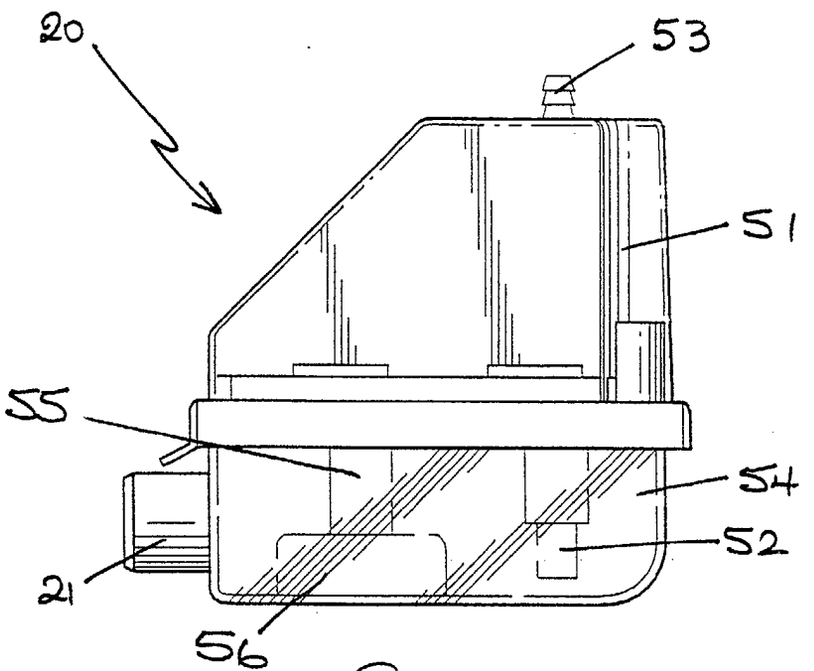

Figure 6

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Description

[0001] The present invention relates to improvements in or relating to pumps, in particular to pumps in air conditioning installations.

[0002] In air-conditioning installations within buildings, atmospheric moisture is extracted from the air by condensation. The condensate needs to be disposed of and typically this is arranged by pumping the condensate away from an evaporator unit, usually installed externally of the building, to a drain. Typically the pipework for the air-conditioning a carried by channels suspended from ceilings or in ducting or conduit for protection. Pumps involved in air-conditioning installations are often bulky and obtrusive as they need to be located in a position convenient for servicing. The present invention seeks to address this problem.

[0003] According to the present invention there is provided, in one aspect, a pump assembly for use in an air conditioning system, the pump assembly comprising a pump having a pump inlet and a pump outlet, and wherein the pump inlet is in fluid communication with a reservoir, said reservoir being formed integrally with the pump assembly and said reservoir having a reservoir inlet in fluid communication with a first fluid-carrying pipe of an air-conditioning installation; wherein the pump outlet is in fluid communication with a second fluid-carrying pipe of an air-conditioning installation.

[0004] Preferably, the pump assembly includes a float switch arrangement and adapted to cause actuation of the pump when a level of fluid within the reservoir exceeds a first predetermined level. More preferably, the float switch is adapted to cause actuation of an alarm when the level of fluid within the reservoir exceeds a second predetermined level, said second predetermined level being greater than the first predetermined level.

[0005] Preferably, the float switch arrangement comprises a sensor housing projecting into the reservoir, housing at least one sensor, suitably of the Hall effect semiconductor type, at a position defining said first predetermined level and a magnetic float free to move axially about the sensor housing.

[0006] In a second aspect, there is provided a conduit elbow having a first opening and a second opening and integrally housing a pump assembly as defined above.

[0007] Preferably, the elbow further includes at least one channel for receipt, in use, of cables and/or further pipework.

[0008] The above and other aspects of the present invention will now be described in further detail, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is an exploded perspective view of an embodiment of an elbow in accordance with the present invention in combination with connective conduit;

Figure 2 is a schematic side view of the conduit of Figure 1 in a typical air-conditioning installation;

Figure 3 is a detailed exploded view of the elbow of Figure 1;

Figure 4 is a detailed side view of the elbow of Figure 1 ;

Figure 5 is an exploded view illustrating the elbow of Figure 1 in combination with other components of a typical air-conditioning installation;

Figure 6 is a side view of an embodiment of a pump assembly in accordance with the present invention; and

Figure 7 is a bottom view of the pump assembly of Figure 6.

[0009] Referring to the Figures, there is illustrated an embodiment of an elbow 10 in accordance with the second aspect of the present invention. The elbow comprises a housing 11 having a first opening 12 and a second opening 13 defined between a base element 14 and a cover 15. Mounted within the channel element 14 is a pump assembly 20 having an inlet 21 and an outlet 22 orientated at 90° to the inlet 21. Pump assembly 20 incorporates an electrically operated pump and is supplied by means of an electrical power supply 23. In the preferred embodiments, the pump 20 also includes an alarm switch (not shown) which, by means of a cable 24, actuates an alarm and may be also switch off the air-conditioning unit in the event of pump failure.

[0010] In a typical air-conditioning installation, elbow 10 is used in combination with additional conventional elongate conduit channel 30 and cover 31 elements connected at each opening 12,13. In the embodiment shown, the elbow is designed with a rectangular section to match the rectangular section of the conduit with which the elbow is being used. It will be appreciated that many designs of conduit with widely varying dimensions are available. The design of the elbow housing 11 will be adapted accordingly to match.

[0011] Figure 2 illustrates the elbow 10 of Figure 1 in a typical installation in which the inlet 21 of the pump assembly 20 is in operative connection with the tray 32 of an evaporator unit 33.

[0012] In a preferred embodiment, the elbow housing 11 further includes a channel to allow for the routing of additional cables, breather tubes and additional pipework 34. In the embodiment illustrated, channel 40 is formed by provision of a dividing wall 41 projecting from the rear wall of the base element 14, dividing a channel 40 from an area of the base element housing the pump assembly 20.

[0013] The pump assembly 20 itself will now be described in further detail with particular reference to Fig-

ures 6 and 7. Pump assembly 20 includes a pump in a pump housing 51 and having a pump inlet 52 and a pump outlet 53. Pump inlet 52 is in fluid communication with a reservoir 54 formed integrally with the pump assembly 20. The reservoir has an inlet forming the pump assembly inlet 21.

[0014] In the preferred embodiment, the pump assembly 20 includes a float switch arrangement to cause actuation of the pump when the level of fluid within the reservoir reaches a certain level. Preferably, the float switch is adapted to trigger and alarm and/or prevent continued operation of the air conditioning system if the fluid level reaches a second, higher level, which may, for example, indicate a blockage in the system.

[0015] A typical float switch arrangement is illustrated in which a housing in the form of a sealed finger 55 depends from pump housing 51 into reservoir 54. Mounted within finger 55 are three axially spaced sensors (not shown) each responsive to a magnetic field induced by a magnetic float 56 around finger 55 and constrained to move axially with respect thereto. Typically, magnetic float 56 includes a disc-shaped magnet supported upon an foamed plastics float material, such as expanded polystyrene. Suitably, the sensors are of the Hall-effect semi-conductor type.

[0016] The lowermost sensor acts, as the fluid level in the reservoir falls, to turn off the pump. The intermediate sensor acts, as the fluid level begins to rise, to actuate the pump. The uppermost sensor acts when the fluid level reaches a height indicating that the capacity of the pump is being reached, perhaps indicating a blockage in the air-conditioning pipework. Typically, this sensor will trigger actuation of an alarm

[0017] Suitably, the pump is capable of pumping about 14 litres of water per hour at zero head.

[0018] The pump assembly and conduit elbow of the present invention offer a number of advantages over existing arrangements. For example, the conduit enables the pump assembly to be mounted such that the reservoir is horizontal in both left handed and right handed orientations. A typical problem with existing arrangements arises when the pump is not active. Condensate in the pipework and the conventional reservoir in the evaporator, which tends to be some distance from the pump, tends to siphon through the pump, which is usually at an elevated position, to the drain. This leads to difficulties priming the pump upon restarting and even if pumping can be restarted, it is associated with considerable noise as a large amount of air is drawn through the pump. The pump assembly of the present invention, by inclusion of an integral reservoir enables sufficient condensate to remain in the reservoir such that the pump inlet 52 remains covered, thereby avoiding difficulties and noise associated with priming of the pump. Additionally, a non-return valve can be incorporated between the pump inlet and pump outlet to prevent siphoning. Furthermore, the compact nature of the design of the pump assembly means that it can easily be accommodated within the elbow of air-conditioning conduit, whilst leaving sufficient room for other cabling and pipework.

Claims

1. A pump assembly for use in an air conditioning system, the pump assembly comprising a pump having a pump inlet and a pump outlet, and wherein the pump inlet is in fluid communication with a reservoir, said reservoir being formed integrally with the pump assembly and said reservoir having a reservoir inlet in fluid communication with a first fluid-carrying pipe of an air-conditioning installation; wherein the pump outlet is in fluid communication with a second fluid-carrying pipe of an air-conditioning installation.

2. A pump assembly as claimed in Claim 1 wherein the pump assembly includes a float switch arrangement and adapted to cause actuation of the pump when a level of fluid within the reservoir exceeds a first predetermined level.

3. A pump assembly as claimed in Claim 2 wherein the float switch is adapted to cause actuation of an alarm when the level of fluid within the reservoir exceeds a second predetermined level, said second predetermined level being greater than the first predetermined level.

4. A pump assembly as claimed in Claim 2 or Claim 3 wherein the float switch is adapted to stop operation of the pump when the level of fluid within the reservoir falls to a third predetermined level.

5. A pump assembly as claimed in any one of claims 2 to 4 wherein the float switch arrangement comprises a sensor housing projecting into the reservoir, housing at least one sensor, suitably of the Hall effect semiconductor type, at a position defining each of said predetermined levels, and a magnetic float constrained to move axially about the sensor housing.

6. A conduit elbow having a first opening and a second opening and housing a pump assembly as claimed in any one of claims 1 to 5.

7. A conduit elbow as claimed in Claim 6 wherein the elbow further includes at least one channel for receipt, in use, of cables and/or further pipework.

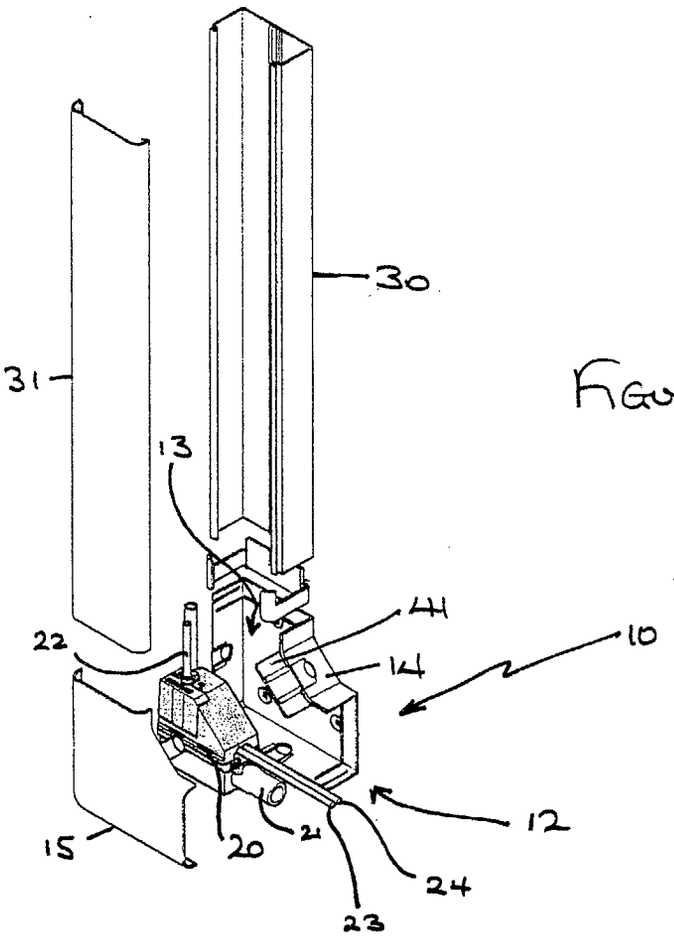

FIGURE 1

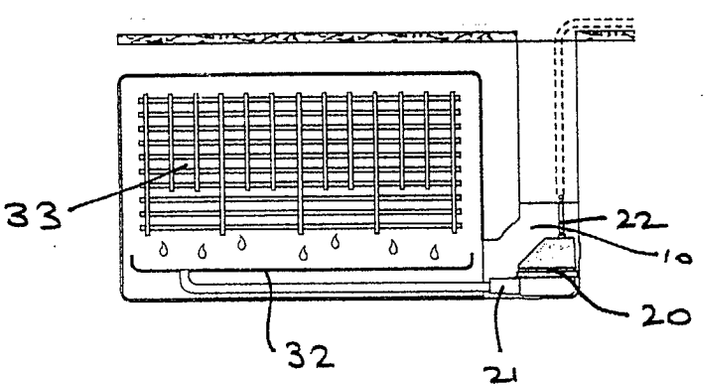

FIGURE 2

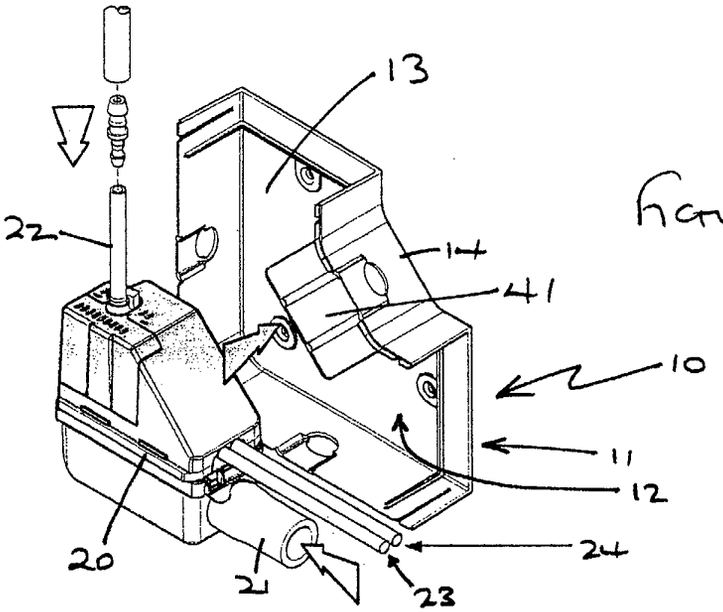

FIGURE 3

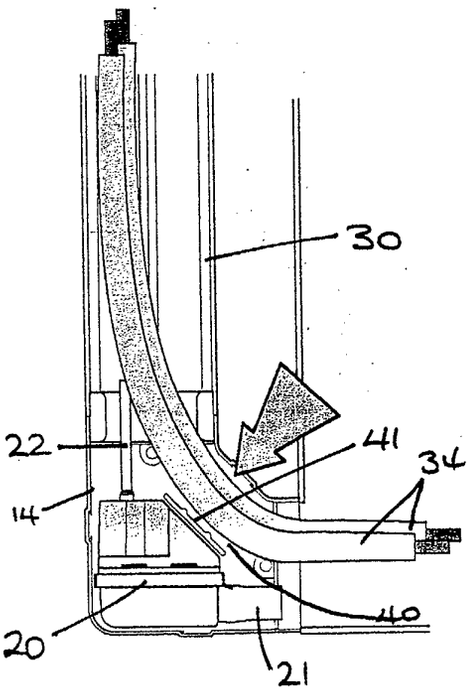

FIGURE 4

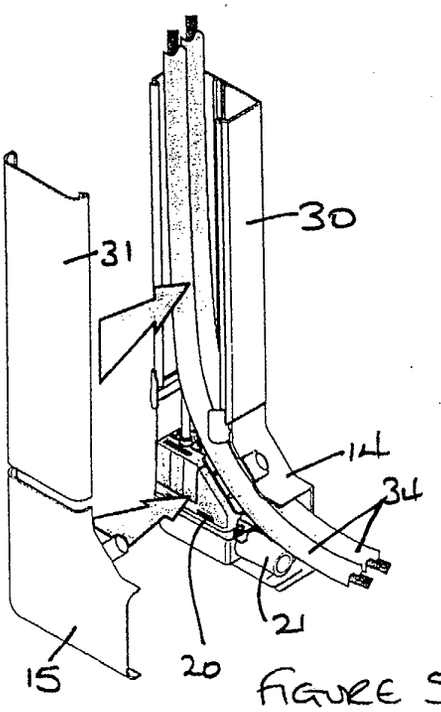

FIGURE 5

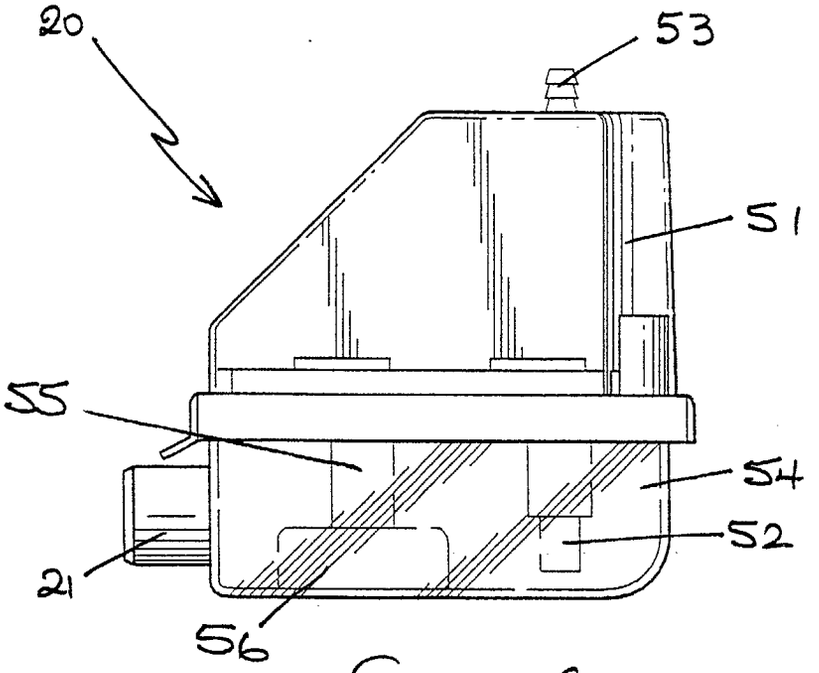

FIGURE 6

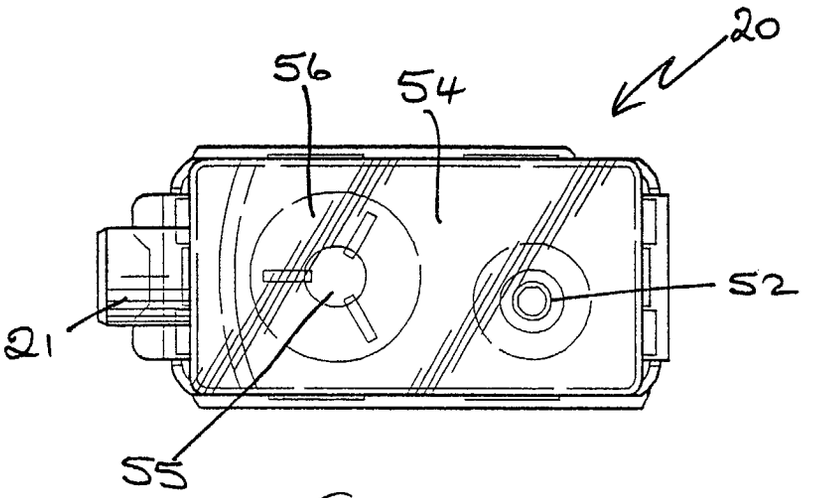

FIGURE 7

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EUROPEAN SEARCH REPORT

Application Number
EP 02 25 8380

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	PATENT ABSTRACTS OF JAPAN vol. 014, no. 447 (M-1029), 25 September 1990 (1990-09-25) -& JP 02 176327 A (TAISEI CORP), 9 July 1990 (1990-07-09) * abstract * ---	1-4	F24F13/22 F16L57/00
A	PATENT ABSTRACTS OF JAPAN vol. 1997, no. 12, 25 December 1997 (1997-12-25) -& JP 09 203536 A (MIRAI IND CO LTD), 5 August 1997 (1997-08-05) * abstract * ---	6	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	26 February 2003	Gonzalez-Granda, C

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EUROPEAN SEARCH REPORT

Application Number
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DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	PATENT ABSTRACTS OF JAPAN vol. 1997, no. 09, 30 September 1997 (1997-09-30) -& JP 09 112959 A (TOCHIGI NIKON:KK;NIKON CORP), 2 May 1997 (1997-05-02) * abstract * -----		
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	26 February 2003	Gonzalez-Granda, C

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26-02-2003

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