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(54) Chiller system

(57) A chiller system comprising an easy to install insulated copper piping between the fan coil units and the distribution collector header pipe.

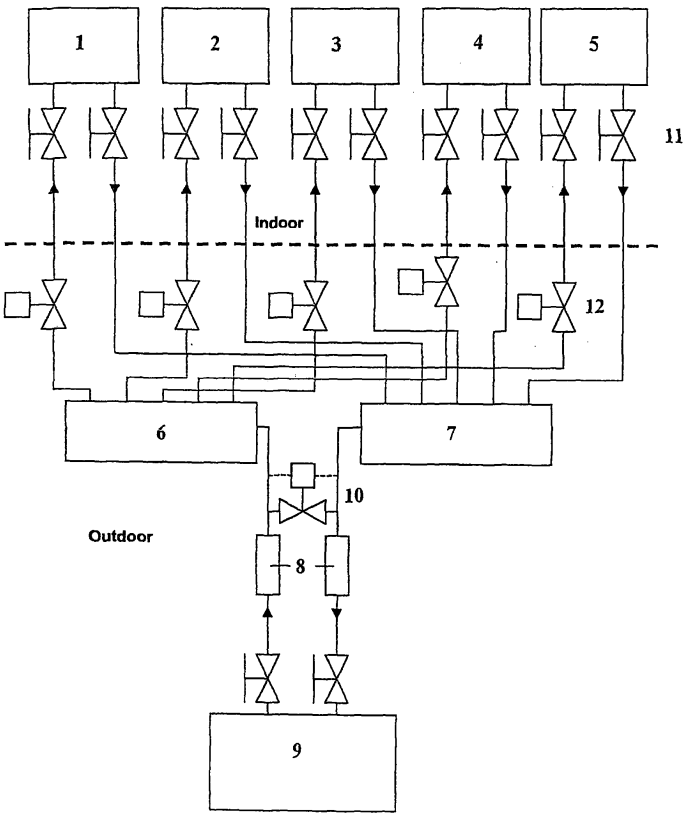

Figure 1

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Description

FIELD OF THE INVENTION

[0001] The invention relates to a method and system for the piping of a chiller system.

BACKGROUND ART

[0002] The conventional air-cooled chiller system uses galvanized steel or black steel pipe that is externally insulated with polyurethane foam and aluminum metal cladding for piping the water. These insulated pipes are expensive and are usually welded together. Hence, the system is expensive and difficult to install. Once installed, the system is difficult to disassemble.

[0003] The present invention consists of a chiller system with certain novel features which are more fully described and illustrated in the accompanying drawings, and particularly pointed out in the claims. It is understood that various changes in details may be made without departing from the scope of the invention, or sacrificing any of the advantage of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004]

Figure 1 is an illustrative view showing the overall piping configuration for a mini chiller system.

Figure 2(a) is an illustrative view showing the distribution collector header straight installation.

Figure 2(b) is an illustrative view showing the distribution collector header straight installation with gauge adaptor.

Figure 2(c) is an illustrative view showing the distribution collector header horizontal backward installation.

Figure 2(d) is an illustrative view showing the distribution collector header horizontal backward installation with gauge adaptor.

Figure 2(e) is an illustrative view showing the distribution collector header horizontal forward installation.

Figure 2(f) is an illustrative view showing the distribution collector header horizontal forward installation with gauge adaptor.

Figure 2(g) is an illustrative view showing the distribution collector header vertical installation.

Figure 2(h) is an illustrative view showing the distribution collector header vertical installation with gauge adaptor.

Figure 3 is an illustrative view showing the insulation for distribution collector header pipe.

Figure 4 is an illustrative view showing the distribution collector header assembly with nipple and flare nut.

Figure 5 is an illustrative view showing the multiple distributor collector header.

Figure 6 (a) is an illustrative view showing the distribution collector header assembly.

Figure 6 (b) is an illustrative view showing the gauge adaptor.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0005] The present invention relates to a piping installation system for a mini chiller and fan coil units forming the chiller system. Hereinafter, this specification will describe the piping installation system and the components thereof according to the preferred embodiments and by referring to the accompanying drawings. Limiting the description to the preferred embodiments of the invention and with reference to the accompanying drawings is merely to facilitate discussion of the present invention. However, it is envisioned that those skilled in the art may devise various modifications and equivalents without departing from the scope of the appended claims.

[0006] Figure 1 shows the present invention, a piping installation system. It differs from the conventional system in that it uses copper pipes preferably of ¾" (similar to those used in the installation of the split air-conditioning system) for piping the water and for connecting to the distribution header pipes (6) to the indoor fan coil units (1,2,3,4,5).

[0007] The present system is designed for a quick and easy to install mini chiller and fan coil unit forming the chiller system. The copper pipes and distribution header pipes (6) are insulated with closed cell elastomeric material to prevent condensation. Special adaptors are may be used to connect or terminate these water pipes to the distribution header pipes (6) and fan coil units (1,2,3,4,5).

[0008] The present system may comprise of other components and accessories such as the distribution collector header pipe (6), two way valve (On/Off Type and Modulating Type)(11), differential pressure bypass valve, electrical actuator and differential pressure controller, nipple flare, flare nut (10) and gauge adaptor (8). These components and accessories may be offered as part of the package for the quick and easy to install chiller system.

[0009] The differential pressure controller, electrical actuator and bypass valve (10) are used to control the amount of water going into fan coil units (1,2,3,4,5). This will ensure that a minimum volume of water flows to the fan coil units during partial or low loading conditions. Further, this will assist in the better regulation of the water level in the system and reduce the wastage of energy. In contrast, if a three-way valve is used for the fan coil unit, the chilled water may flow to the three-way valve and return to the chiller (9) thereby resulting in the waste of energy.

[0010] The distribution collector header pipes (6) are used to distribute water to the fan coil units (1,2,3,4,5) in the system. A number of fan coil units (1,2,3,4,5) may be

connected to one header. If more fan coil units are installed in the system, two or more distribution collector headers can be connected together.

[0011] Two-way valves (11) are used to regulate the water flow into fan coil units (1,2,3,4,5). Two types of two ways valves (11) may be used, On/Off and modulating. The fan coil unit (1,2,3,4,5) built-in room temperature sensor controls the On/Off type. An external room thermostat controls the modulating type valve. Gauge adapters (8) are used to for easy installation of the pressure gauges and thermometers. The entire above-mentioned system may be sold or offered with or without other additional and optional components and accessories.

[0012] In summary, the present system has various advantages. It helps to reduce the installation costs by the use of cheaper accessories i.e. differential pressure controller, actuator valve and two-way valves. Moreover, the present system is quick and easy to install with easy to connect adapters and distribution collector header pipes. Further, it also helps to ensure a smooth running and better regulation of the water level and system at all times.

Piping Installation Process

[0013] Two types of piping may be used for installation, galvanized steel pipe and copper pipe. Galvanized steel pipe may be used for the piping between the mini chiller and the distribution collector header pipe while copper pipe may be used for the piping between the fan coils units and distribution collector header pipe.

[0014] Copper pipes are preferred for the piping because they are flexible and lighter in weight. These pipes can be bent easily using hand tools. Strong connection joints can be made with various types of fittings (e.g. nipple and flare joints and nuts).

[0015] Type L or Type M copper tubes are preferred for the piping because of the higher internal working pressure of the material. A soft annealed temper is preferred as this allows for easy bending and workability of the piping installation.

[0016] Figure 2(a) - 2(h) show the various ways to install the distribution collector header. For instance, distribution collector header can be installed in straight position (2(a), 2(b)), horizontal backward position (2(c), 2 (d)), horizontal forward position (2(e), 2(f)) and vertical position (2(g), 2(h)) either with gauge adaptor or without gauge adaptor.

[0017] A common copper pipe tube insulation is made from closed cell elastomeric material may be used to insulate the galvanized pipes, copper pipes, distribution collector header pipes (6), valves and gauge adaptors to prevent condensation. It is recommended that the insulation thickness be preferably at least 1", ass shown in Figure 3. It is important to note that the correct size of tube insulation must be used to fit the corresponding pipes. Larger tube insulation is to be avoided, as this will result in air being trapped in between the pipe and insulation, which will result in condensation in the piping system.

[0018] For easy installation, accessories and components for the piping system are needed. Distribution collector header pipe may be used to distribute the chilled water or hot water to multiple fan coil units from one chiller unit and to collect water from multiple fan coil units and channel the water to the chiller unit. Each header may have 5 ports for connection to the fan coil units. The port size may be available in two sizes namely 1/2" or 3/4". A number of fan coil units can be connected to one distribution collector header pipe. The header pipe is capped on one end while the other end may be joined to a 2" to 1" reducer (Figure 5, 6(a) and 6 (b)). The header is joined onto the 1" connections on the chillers or joined onto after the gauge adaptor. Each chiller unit has a header to supply water to the fan coil units and a header for water to return from the fan coil units. Depending on the design of the water circuit, 2 or 3 of the header pipes can also be connected together to give more outlet ports. The outlet ports, when not in use, may be plugged. The header can also be movable in any direction for easy installation.

[0019] Figure 4 shows the distribution collector header assembly with a nipple and flare nut. Brass nipple flare joints and flare nuts are used to join the 2 way valves and header pipes to the copper pipes. The nipple flare joints and flare nuts may be available in two sizes namely 1/2" and 3/4".

[0020] Gauge adaptors provide connections to attach a pressure gauge and thermometer into the water flow. The adaptors are connected after the gate valve, which are connected to the chiller. Connection of the pressure gauge and thermometer are done via two 1/2" ports on the adaptor. Each chiller unit may have two gauge adaptors.

Claims

1. A chiller system comprising fan coil units and a distribution collector header pipe, wherein there is insulated copper piping situated therebetween.

2. A chiller system where the insulated piping between the mini chiller unit and the distribution collector header pipe is made of galvanized steel and the piping between the between fan coil units and the distribution collector header pipe is made of copper.

3. A system as in Claim 1 where the insulation for the copper piping is made of closed cell elastomeric material.

4. A system as in Claim 1 where the piping and other components of the system are installed using easy to connect nipple flare joints and flare nuts.

5. A system as in Claim 1 comprising of a differential

pressure bypass valve, differential pressure controller, gauge adaptor, actuator valve and two-way valves and insulated copper piping with nipple flare joints and flare nuts for easy connection.

6. A system as in Claim 1 where a differential pressure controller, electrical actuator and bypass valve are used to control the amount of water going into fan coil units.

7. A system as in Claim I where two-way valves are used to regulate the water flow into fan coil units.

8. A system as in Claim 1 where multiple fan coil units are connected to the mini chiller by more than one distribution collector header pipes.

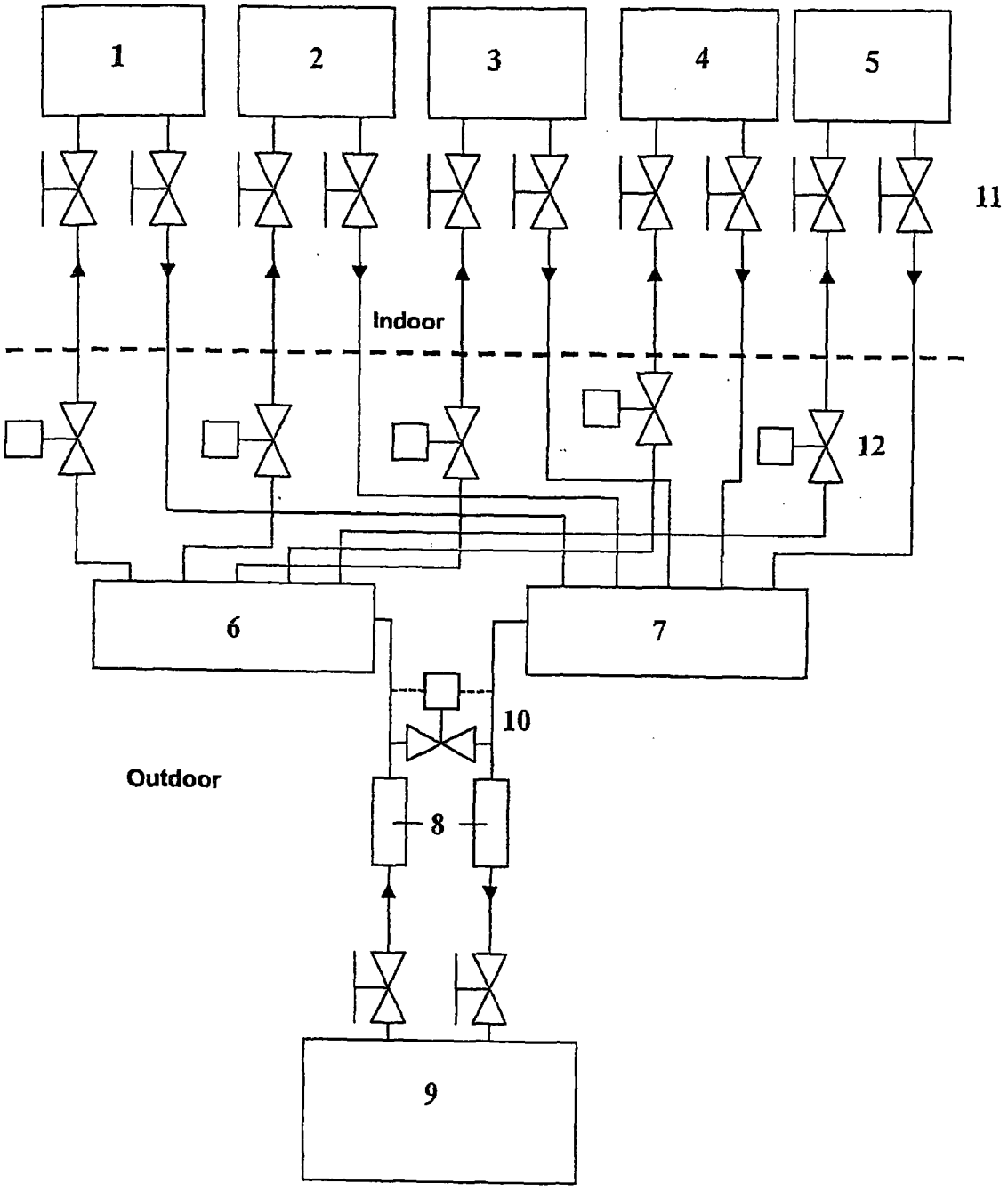
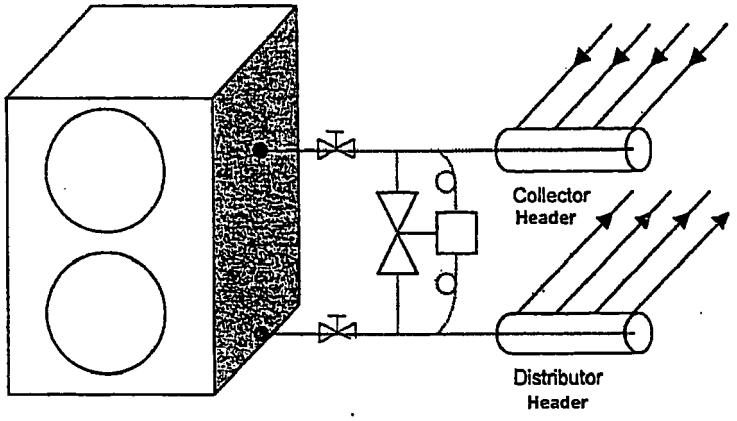


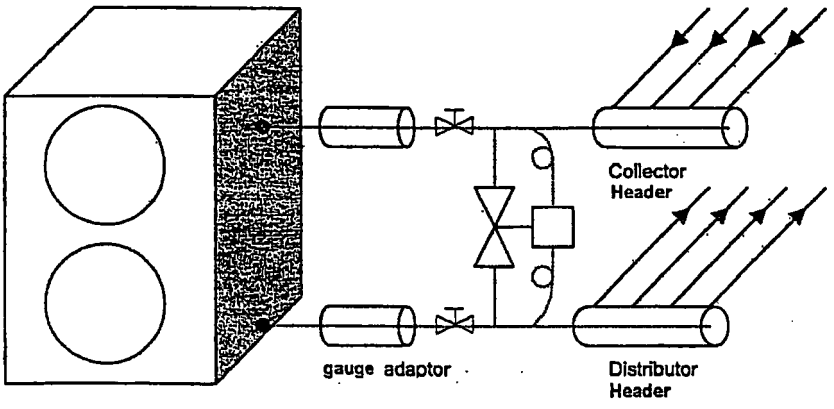
Figure 1

Figure 2(a)



Mini chiller

Figure 2(b)



Mini chiller

Figure 2(c)

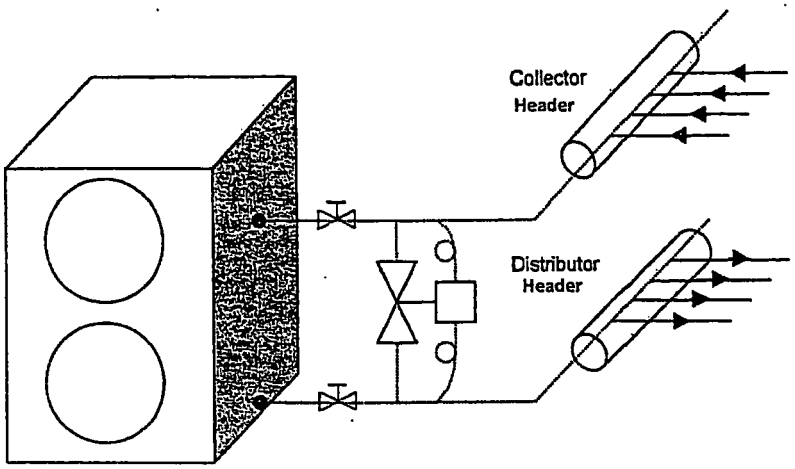


Figure 2(d)

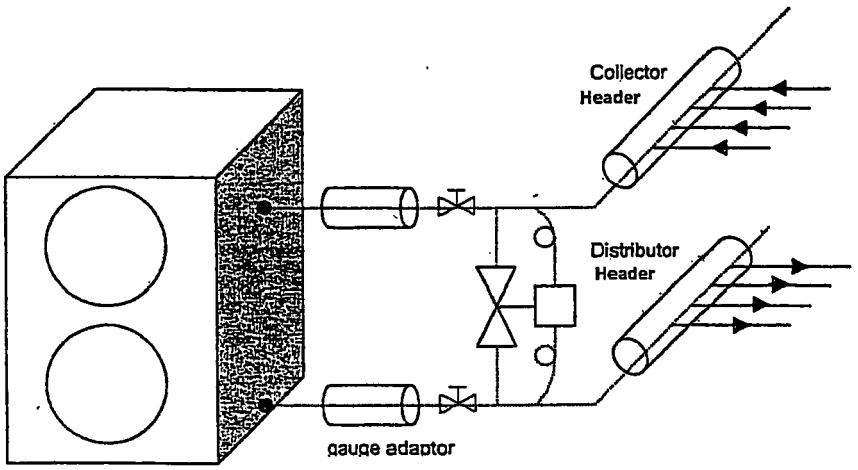


Figure 2(e)

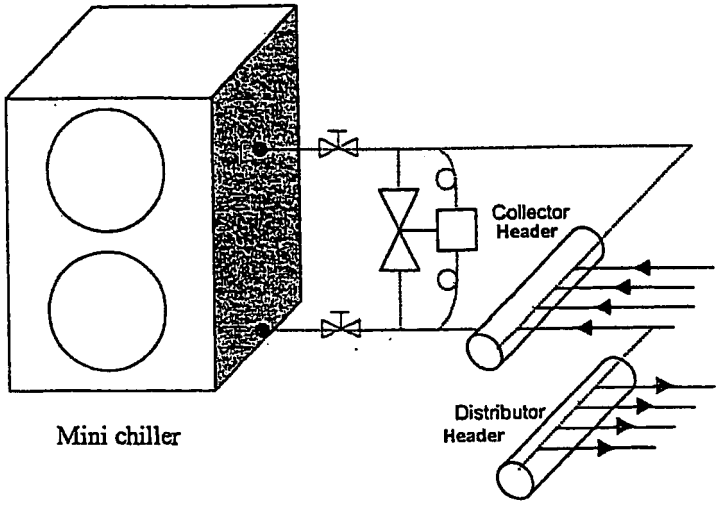


Figure 2(f)

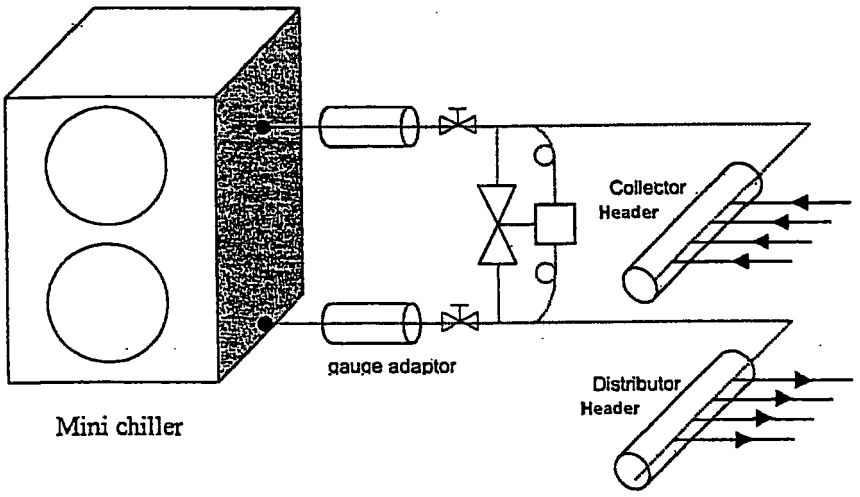


Figure 2(g)

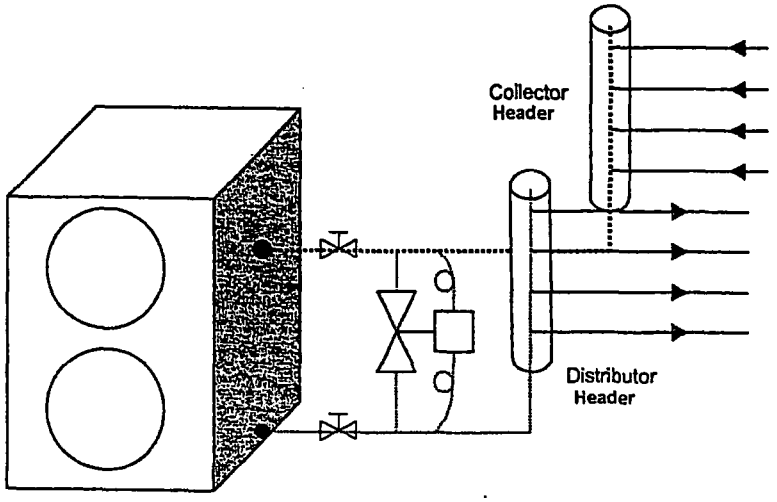
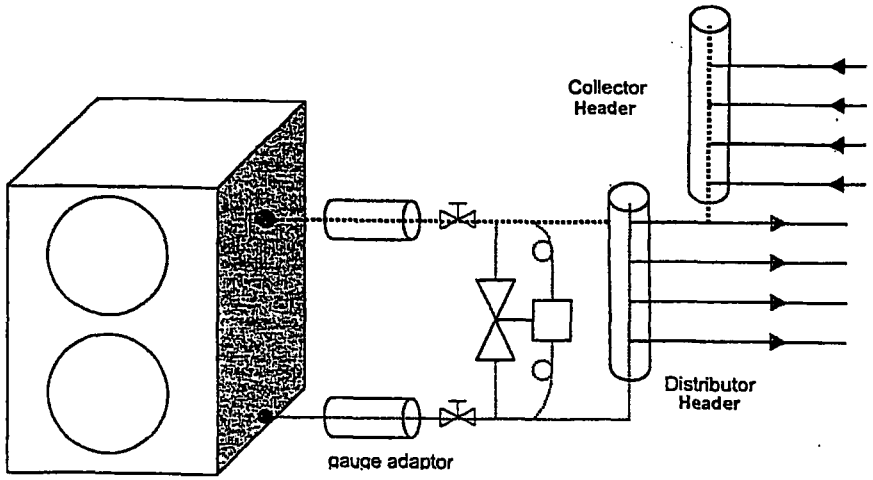


Figure 2(h)



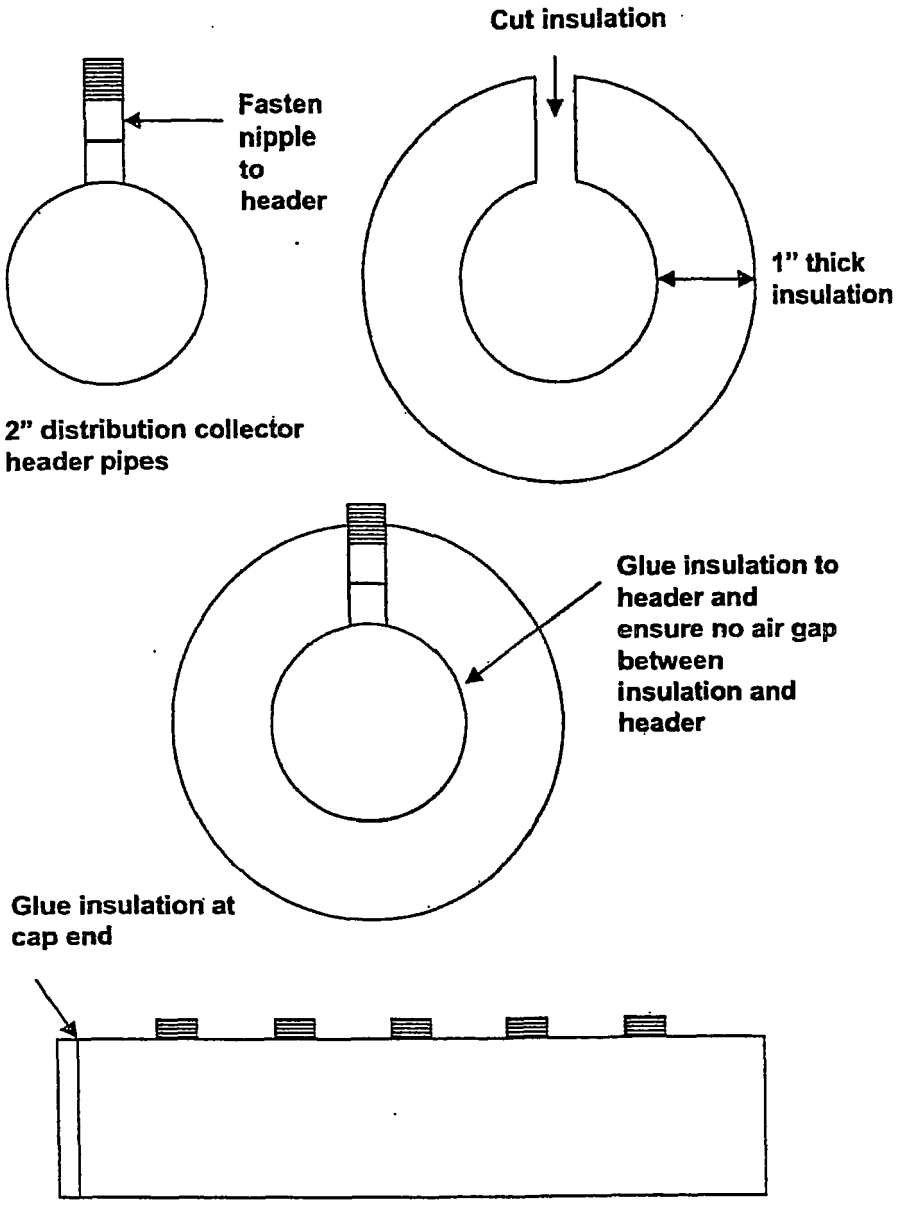

Cut insulation
Fasten nipple to header
1" thick insulation
2" distribution collector header pipes
Glue insulation to header and ensure no air gap between insulation and header
Glue insulation at cap end

Figure 3

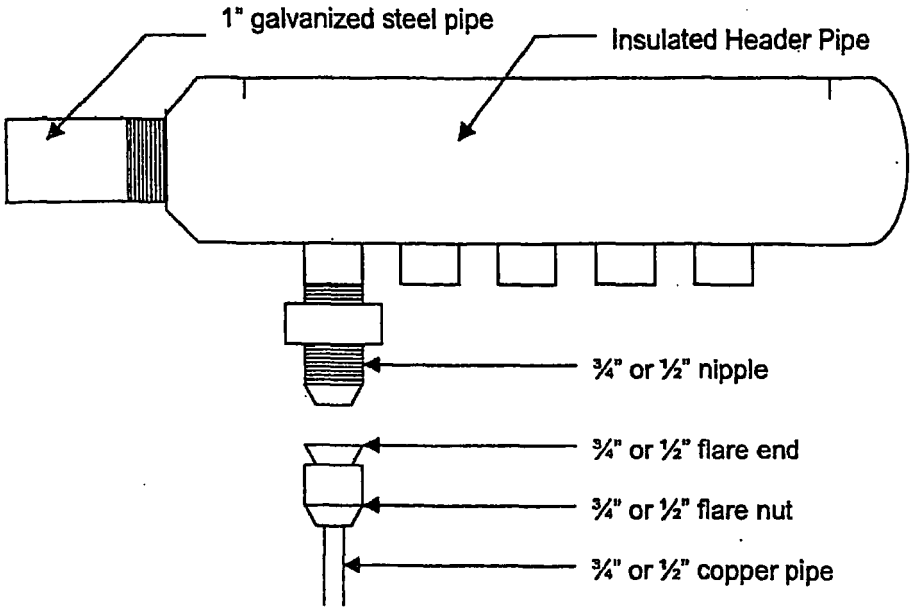

1" galvanized steel pipe
Insulated Header Pipe
¾" or ½" nipple
¾" or ½" flare end
¾" or ½" flare nut
¾" or ½" copper pipe

Figure 4

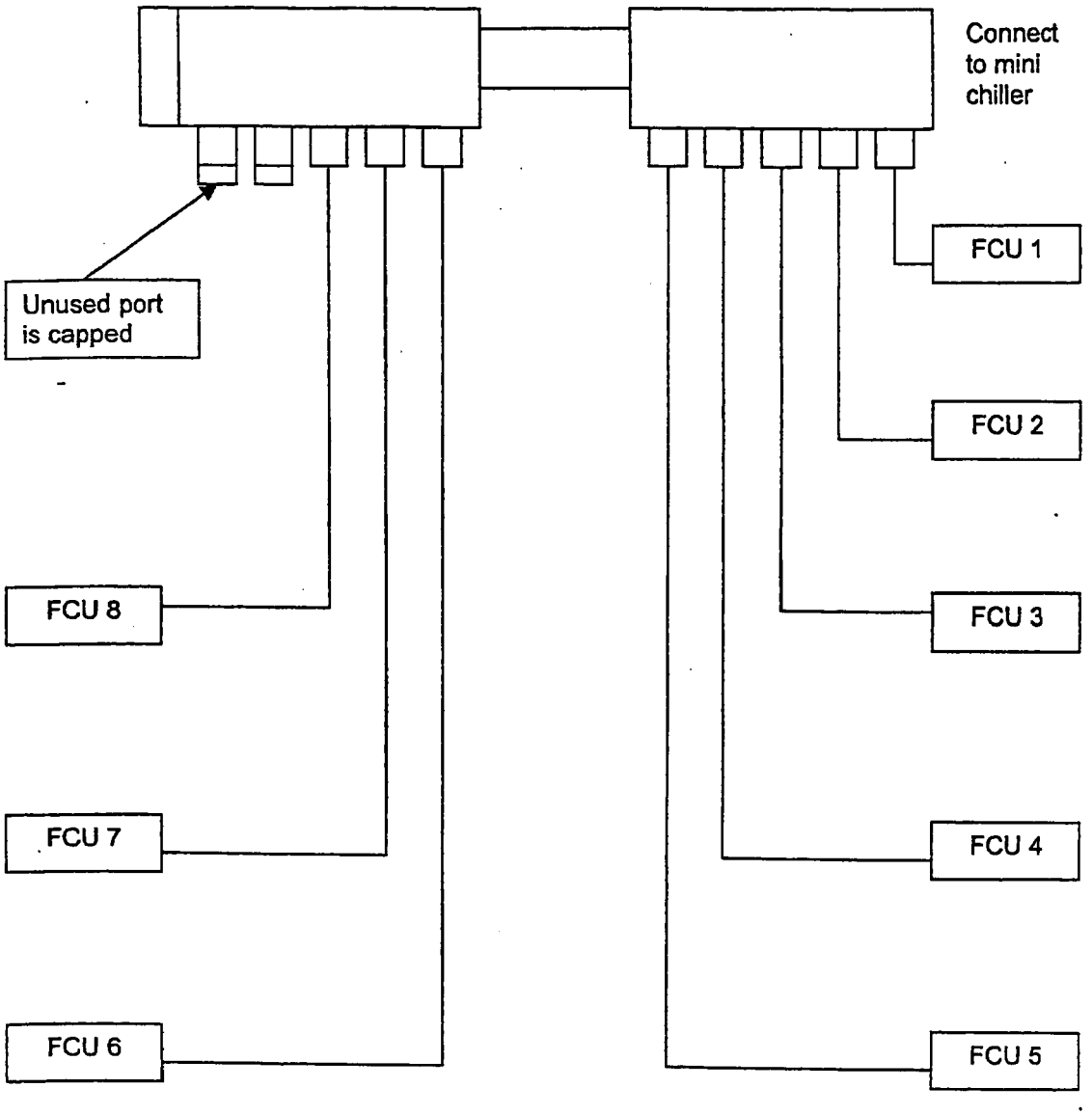

Connect to mini chiller
Unused port is capped
FCU 1
FCU 2
FCU 3
FCU 4
FCU 5
FCU 6
FCU 7
FCU 8

Figure 5

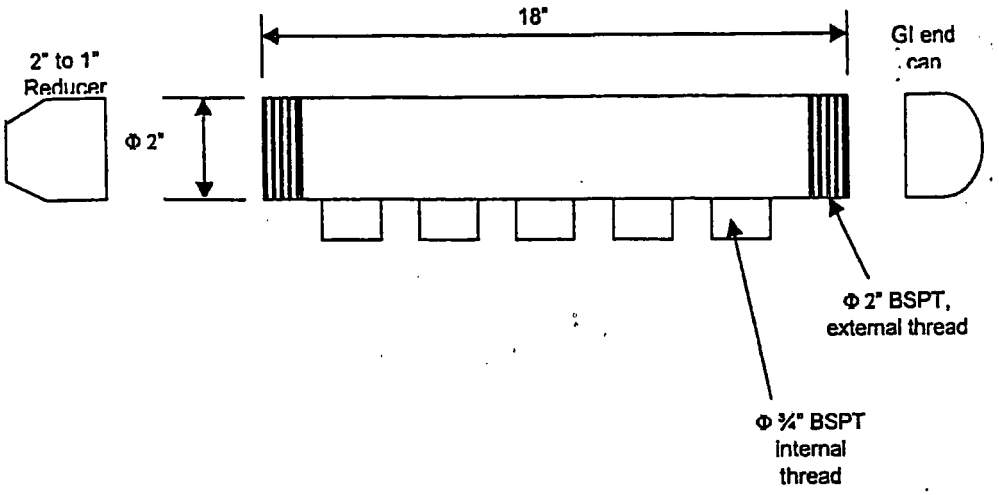


Figure 6 (a):

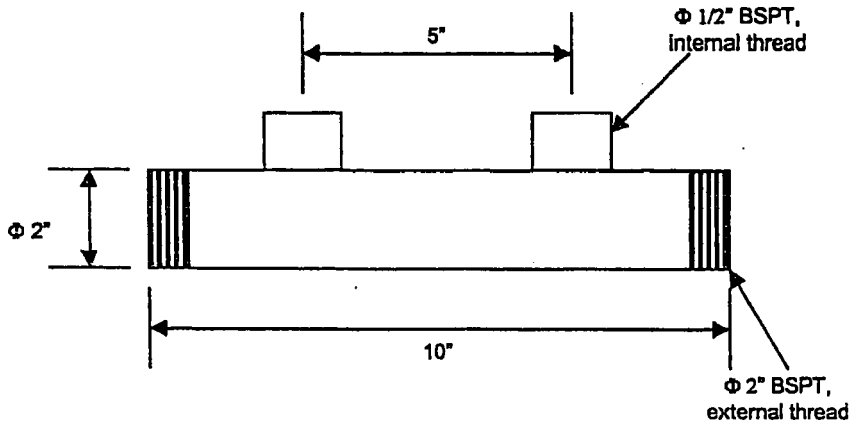


Figure 6 (b)