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MULTI-CIRCUIT PLATE AND HEADER ASSEMBLY

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Fig. 1.

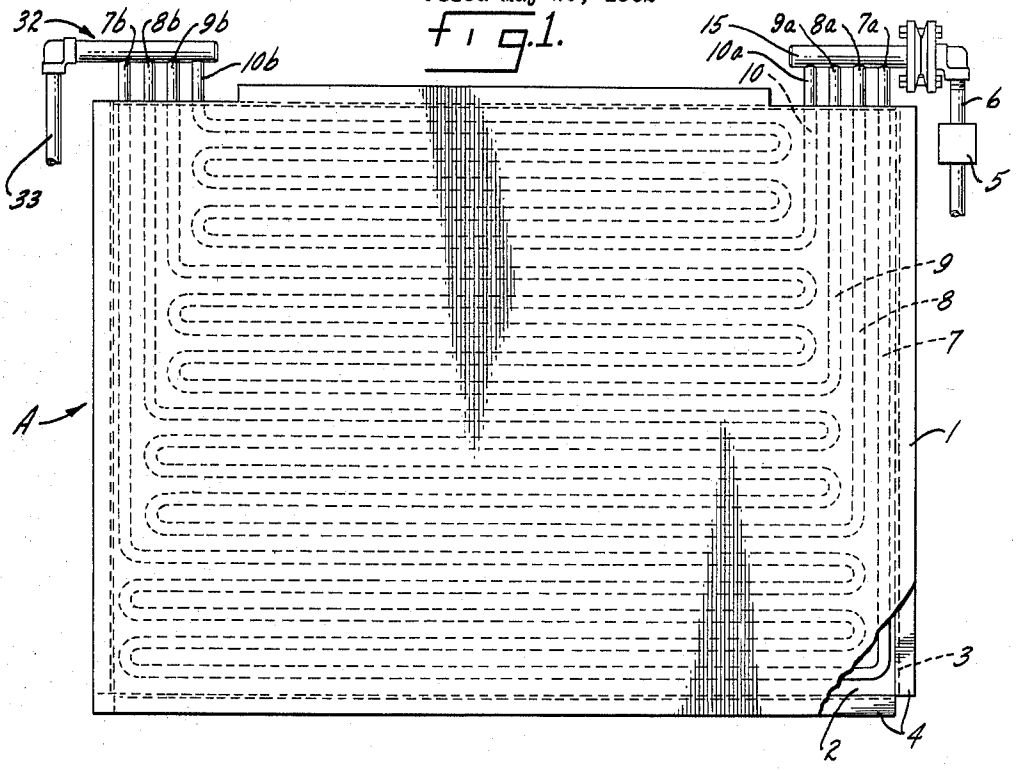
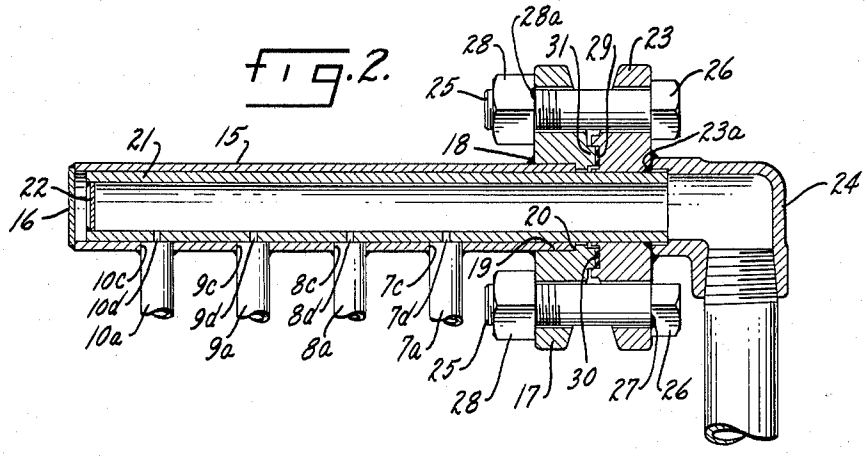


Fig. 2.



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MULTI-CIRCUIT PLATE AND HEADER ASSEMBLY

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This invention relates to an improvement in freezer plates and has for one purpose to provide means for maintaining a proper distribution of refrigerant to the coils of multi-circuit plates.

Another purpose is to provide means for maintaining an equal distribution of refrigerant in a plurality of cooling circuits.

Another purpose is to provide an improved header for multi-circuit plates.

Another purpose is to provide such a header which is easily applied and easily removed.

Another purpose is to provide a plate of the type shown with easily cleanable orifices.

Another purpose is to provide a plate of the type shown having orifices which are changeable to meet various refrigeration load conditions.

Other purposes will appear from time to time in the course of the specification and claims.

The invention is illustrated more or less diagrammatically in the accompanying drawings wherein:

FIGURE 1 is a plan view of the plate with the header in position and with the circuits of the plate indicated, with portions broken away; and

FIGURE 2 is an axial section on an enlarged scale through the header itself.

Like parts are indicated by like symbols throughout the specification and drawings.

Referring to the drawings, A generally indicates a typical plate which is formed, for example, of two side walls 1 and 2 which are indicated as generally plane and substantially parallel. The wall 1 is indicated as plane from edge to edge. The wall 2 may have bent from the edges thereof flanges which form edge walls 3. These edge walls 3 may terminate in flanges 4 which may be welded or otherwise secured to an edge portion of the plate side wall 1. The parts are connected to form a gas tight housing or container.

Within the plate are a plurality of coils which are adapted to be connected in a conventional refrigerant circuit. This circuit may, for example, be of the type in which a volatile refrigerant is employed. The circuit or the cycling mechanism may include a compressor of suitable type and a condenser. It is to be understood that the compressor delivers the refrigerant as a hot gas. This gas is received by a condenser. A suitable cooling medium, such as air, may be employed to abstract heat from the hot gas and to condense it to liquid form. The liquid gas, still under high pressure, is delivered toward the evaporator. The evaporator in the present instance is constituted by one or more plates such as are herein shown. Any suitable pressure reduction means may be employed in order that the liquid refrigerant, at reduced pressure, may evaporate in the plate or plates.

I illustrate more or less diagrammatically a pressure reduction valve 5 to which the liquid refrigerant under pressure may be delivered by any suitable duct 6 from the condenser. In the particular plate shown herein, I illustrate a plurality of plate circuits, numbered, for instance, as 7, 8, 9 and 10. Each such circuit receives the liquid refrigerant through its appropriate inlet duct 7*a*, 8*a*, 9*a* and 10*a*. Each circuit is constituted by a coil, as shown in FIGURE 1. Each such coil or circuit terminates at an outlet 7*b*, 8*b*, 9*b* or 10*b*. In order to maintain a proper distribution or an even delivery of the liquid refrigerant to the separate circuits or coils I employ the below described header structure.

With reference, for example, to FIGURE 2, 15 indicates an outside header tube, one end of which is closed as by the cap or end 16. It is open at its opposite end and receives a securing flange 17 which may be welded to it as at 18 and which snugly receives the tube in a circumferential recess 19, having an abutting end wall 20. Fitting into the outside header tube is an inside header tube 21, the inner end of which is closed, for example, by the cap 22. The outer end is open and is received within the securing flange 23, to which it is welded as at 23*a*. An elbow 24 is shown as welded to the outer face of the flange or ring 23. The flanges or rings 17 and 23 are apertured to receive holding bolts 25. These bolts are headed as at 26 and may, for example, be tack welded to the flange 23 as at 27. The nuts 28 may be employed to draw the flanges 17 and 23 together in a sealing or gas tight relationship. Any suitable seal ring 29 may be employed, shown as located in a channel 30 in the flange 23, into which enters the projecting ring 31 of the flange 17. The nuts 28 may be tack welded as at 28*a* to the flange 17. Thus, when the nuts have been tightened and welded a firm sealing connection is maintained between the flanges 17 and 23. The outer header tube 15 is shown as apertured at 7*c*, 8*c*, 9*c* and 10*c*, each such aperture being aligned with the appropriate inlet tube 7*a*, 8*a*, 9*a* or 10*a*, which may be welded to the outer surface of the outside header tube 15. Thus, refrigerant supplied through the tube 6 and through the elbow 24 enters the inside header tube 21 and is distributed thereby to the ducts 7*a*, 8*a*, 9*a* and 10*a* of the four separate circuits above described. In order to maintain a precisely uniform distribution of the refrigerant I illustrate the inside header tube 21 as having metering apertures 7*d*, 8*d*, 9*d* and 10*d*, each aligned with one of inlet tubes 7, 8, 9 and 10. The four last mentioned apertures may be precisely formed for uniform delivery.

The four circuits herein shown deliver evaporated refrigerant through the outlet ducts 7*b*, 8*b*, 9*b* and 10*b* to any suitable header or manifold generally indicated at 32 in FIGURE 1. From it extends any suitable return duct or pipe 33 which returns the evaporated refrigerant to the suction side of the compressor.

It will be realized that, whereas, I have described and illustrated a practical and operative device, nevertheless many changes may be made in the size, shape, number and disposition of parts without departing from the spirit of the invention. I therefore wish my description and drawings to be taken as in a broad sense illustrative or diagrammatic, rather than as limiting me to my precise showing.

The use and operation of the invention are as follows:

I illustrate means for insuring a precisely equal delivery of refrigerant to a plurality of circuits. The header arrangement herein shown may be employed, for example, in multi-circuit plates. It may also be used in connection with fully flooded systems. It will be understood, of course, that any suitable number of circuits or systems may be employed. It is easy to withdraw the inner header tube from the outer or to apply it. It is a simple matter to drill out or adjust the apertures 7*d*, 8*d*, 9*d* and 10*d* to insure that their delivery rate is uniform. By tacking the bolts 26 to their associated flange 23 they are held against unintended movement, and the flange 23 may be applied readily to or removed readily from the opposite flange 17. Similarly, the nuts 28 may be tack welded to the flange 17. This tack welding of bolt and nut prevents any unintended loosening of the connection between the two flanges.

Whereas I have shown my invention as applied to a four circuit plate header, it will be understood that any suitable number of circuits may be employed. It will also be understood that my invention may readily be applied to flooded systems.

Under some circumstances it is possible to provide minute apertures or pinholes in the wall of the inside header tube 21, which may of themselves serve as pressure reduction means. However, it is preferable and in general more practical to employ a separate pressure reduction valve or means, such as is indicated at 5. In that event the apertures 7*d*, 8*d*, 9*d* and 10*d* serve primarily as metering apertures.

In the structure herein shown, and referring, for example, to FIGURE 2, by releasing the nuts and bolts 25, 28, it is possible to have quick access to the inner tube 21. This permits easy cleaning of the orifices 7*d*, 8*d*, 9*d* and 10*d*. This becomes important, for example, in ammonia systems which may run dirty, with desposits of pipe scale, etc. A further advantage of this accessibility is that, if there is a change of load conditions to something other than that for which the plate was originally designed, the orifices may be changed to adapt them to such new condition. For example, the apertures can be reamed out to larger size, or they can be closed and repierced to smaller size.

The tacking feature earlier referred to becomes important in cases where the position of the parts prevents the ready insertion of a wrench. At the tack point 27, of FIGURE 2, a wrench may not be available because of the limited space. The bolt 25, 26 is prevented from rotating by the tack weld 27. The nut 28 can easily be reached by a wrench.

Similarly, in the upper part of FIGURE 2, the tack weld 28*a* can be used to immobilize the nut 28, assuming that because of lack of clearance it is easier to reach the bolt head 26 than the nut 28.

In some applications, if you tack the nut on one side of the joint and the bolt on the other, you insure that the apertures of the inner tube are aligned with those of the outer. In other words, you cannot insert the inner tube except in the proper position.

I claim:

1. A two piece, push-pull uniform flow refrigerant header assembly, said refrigerant header assembly including, in combination,

a first header member,

said first header member having an internal bore of substantially uniform diameter throughout its active length,

structure for connecting the first header member to a refrigerant conduit,

said first header being circular in external configuration and having a substantially constant, external diameter,

said first header member having a plurality of refrigerant apertures therein.

said apertures being of substantially uniform size and being substantially linearly aligned along a path which is substantially parallel to the axis of said first header member,

a second header member,

said second header member having a substantially constant diameter bore therein of a size sufficient to be slidably received on the first header member,

said second header member having a plurality of apertures therein of a size no smaller than the apertures in the first header member,

refrigerant sealing structure between the first and second header members,

the apertures in said second header members being in communication with refrigerant coil means,

closure means for preventing out-leakage of refrigerant from the end of the headers when in assembled engagement, and

structure for positively aligning and guiding the header members into assembled relationship with the apertures in the first and second header members aligned with one another, said structure including, in combination,

a first guide member fixed to one of the header members and extending toward the other header member when the headers are in assembled relationship,

a second guide member assemblable to the other of said header members and extending toward said one header member when the headers are in assembled relationship,

first and second receiving members,

the first receiving member being carried by the second header member, and

the second receiving member being assemblable with the first header member,

whereby the guide members and receiving members may interpenetrate only in the position in which the apertures are aligned with one another as the headers are moved into assembled relationship.

2. The two piece, push-pull uniform flow refrigerant header assembly of claim 1 further characterized in that the apertures of the first header member are substantially smaller than the apertures of the second header member and are formed and adapted to serve as metering apertures.

3. The two piece, push-pull uniform flow refrigerant header assembly of claim 1 further characterized in that said closure means comprises a closure member associated with each of the header members,

each closure member fluid tightly sealing the end of the header member with which it is associated.

4. The two piece, push-pull uniform flow refrigerant header assembly of claim 1 further characterized in that each header member carries an outwardly extending flange,

said guide members being carried by the flanges.

5. The two piece, push-pull uniform flow refrigerant header asesmbly of claim 4 further characterized in that the first guide member and the second receiving member are a nut and bolt assembly, and the second guide member and first receiving member are another nut and bolt assembly,

said nut and bolt assemblies being carried by the flanges whereby said flanges may be drawn toward one another in a locking relationship upon tightening of the nut and bolt assemblies.

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