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REFRIGERATION APPARATUS

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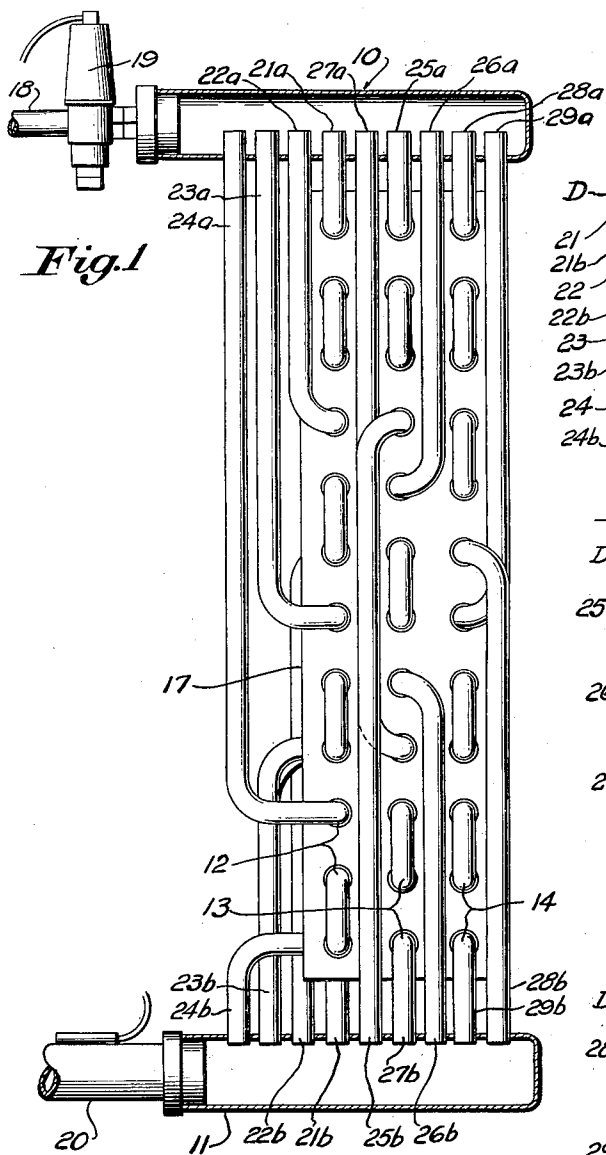


Fig. 1

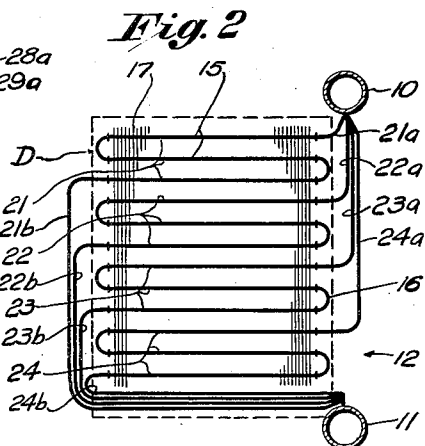


Fig. 2

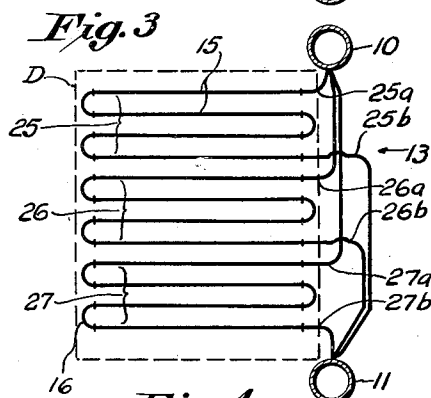


Fig. 3

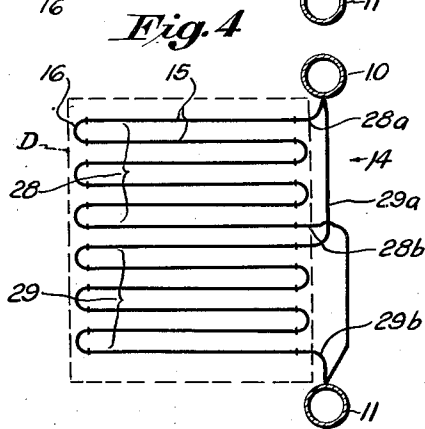


Fig. 4

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REFRIGERATION APPARATUS

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2 Claims. (Cl. 62—126)

This invention relates to refrigerant evaporation coils which are particularly adapted for use in air conditioning systems.

In modern evaporator practice, it is expedient for proper mass production purposes to form the coils of the unit from tubing of a uniform diameter, thus permitting a tube and fin assembly of a regular character. This practice, however, reduces the thermal efficiency of the unit in systems where the coils are so disposed as to have different load factors, as other than a uniform feed with this construction has not been obtainable.

In the present invention there is provided a novel manifolding system which permits the utilization of the above mentioned regular construction with the improvement that the effective lengths of the component coils of the unit are varied, to the end that the load factor of each is substantially similar, thus permitting the characteristic uniform feed without inefficiency.

A typical embodiment of the principles of the invention is illustrated in the accompanying drawing, wherein:

Fig. 1 is a side elevation of a cooling unit for an air conditioning system with the input and output headers thereof shown in section.

Figs. 2, 3, and 4 are diagrammatic sections taken on the lines 2—2, 3—3, and 4—4 of Fig. 1.

As shown in the drawing, the cooling unit consists of an upper or feed header 10, a suction header 11, and a plurality of interposed cooling coils which are disposed in three vertically disposed rows 12, 13, and 14 of horizontal tubes 15 of the same diameter, and connected, as hereinafter described, by loop fittings 16. The tubes extend through a common set of cross fins 17 and they are secured thereto.

The unit is connected in the usual refrigerant circuit (not shown) wherein liquid is supplied to the header 10 through a feed conduit 18 under control of a thermostatic expansion valve 19, and, after being permitted to expand in the coils, it is removed from the suction header 11 through a suction conduit 20.

The unit is positioned in an air duct "D" (Fig. 2) with the fins disposed edgewise to the air stream, and, assuming the tube row 12 (Fig. 1) to be the forward row in respect of the air stream, it will be apparent that it will bear the greatest cooling burden; since air velocity and the heat exchange differential progressively diminish in the second and third rows. Assuming arbitrarily that under proper feed conditions the rows 12, 13, 14 bear the load factors of 45

per cent, 33 per cent, and 22 per cent respectively, it will be understood that if each row constituted an individual circuit, as is usual in prior art devices, then with a uniform refrigerant feed from the header 10, a disproportionate supply condition would be set up.

I propose to obtain a correct refrigerant feed by dividing the tube rows into a number of coils or zones proportioned in number to the predetermined load factors. Using the above indicated factors, it will be observed that the rows 12, 13, and 14 bear load factors of approximately 4/9, 3/9, and 2/9 respectively. Thus, the row 12 is divided into four individual coils 21, 22, 23 and 24 (Fig. 2) having input extremities 21a, 22a, 23a, 24a, entering the feed header, and output extremities 21b, 22b, 23b, and 24b, communicating with the suction header 11. The second row 13 is provided with three coils or zones (Fig. 3) 25, 26, 27, having input and output extremities 25a, 26a, 27a, and 25b, 26b, and 27b, communicating respectively with the headers 11 and 12. The third row 14 (Fig. 4) is formed into two zones or coils 28, 29 having input extremities 28a, 29a, and outlet extremities 28b, 29b similarly connected to the headers.

In operation, since the tubing throughout the unit is preferably of a uniform character, it naturally follows that the feed from the header 10 into the input extremity of each coil will be at substantially the same rate. By varying the total number of coils in each row in direct proportion to the estimated load factor of each row, I adapt each coil to receive such refrigerant volumes without underloading them. As a result, every coil performs to maximum efficiency at all times, and this efficiency will be found to reflect favorable economies in operation and maintenance.

The embodiment which I have described was especially selected because of the relative regularity of the load factors, and it will be understood that in cases where this ideal ratio is not obtainable, the rows may be divided to give a close approximation of the desired ratios, without a noticeable degree of inefficiency. The invention may also be varied in the precise row disposal and in the number of rows without departing from the inventive concept as set forth in the following claims.

I claim:

1. In an air cooling system, an air duct, a cooling unit comprising upper and lower headers, a plurality of vertically disposed and similar rows of tubing mounted transversely in said air duct, 55

each row being connected to form a plurality of independent coils, the number of coils in each row being different and in direct ratio to the load factors of the rows, and means connecting the coils in parallel to the headers.

2. In an air cooling system, an air duct, a cooling unit comprising upper and lower headers, a plurality of vertically disposed and similar rows of tubing mounted transversely in said air duct,

the tubes in each row being parallel to each other, each row being connected to form a plurality of independent coils, the number of coils in each row being different and in direct ratio to the load factors of the rows, input and output extremities secured to each coil and communicating with the headers.

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