

[54] **CHILLER FOR ICE RINK REFRIGERATION SYSTEMS**

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[22] Filed: **Apr. 30, 1973**

[21] Appl. No.: **355,938**

[52] U.S. Cl. **62/235, 62/515**

[51] Int. Cl. **A63c 19/10**

[58] Field of Search **62/235**

[56] **References Cited**

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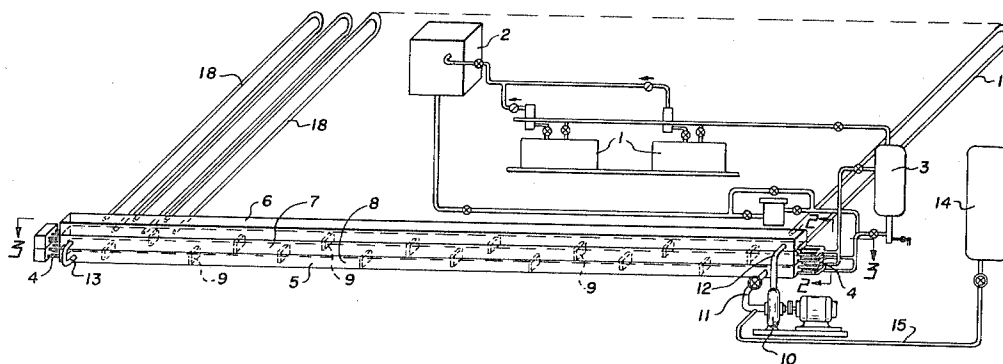
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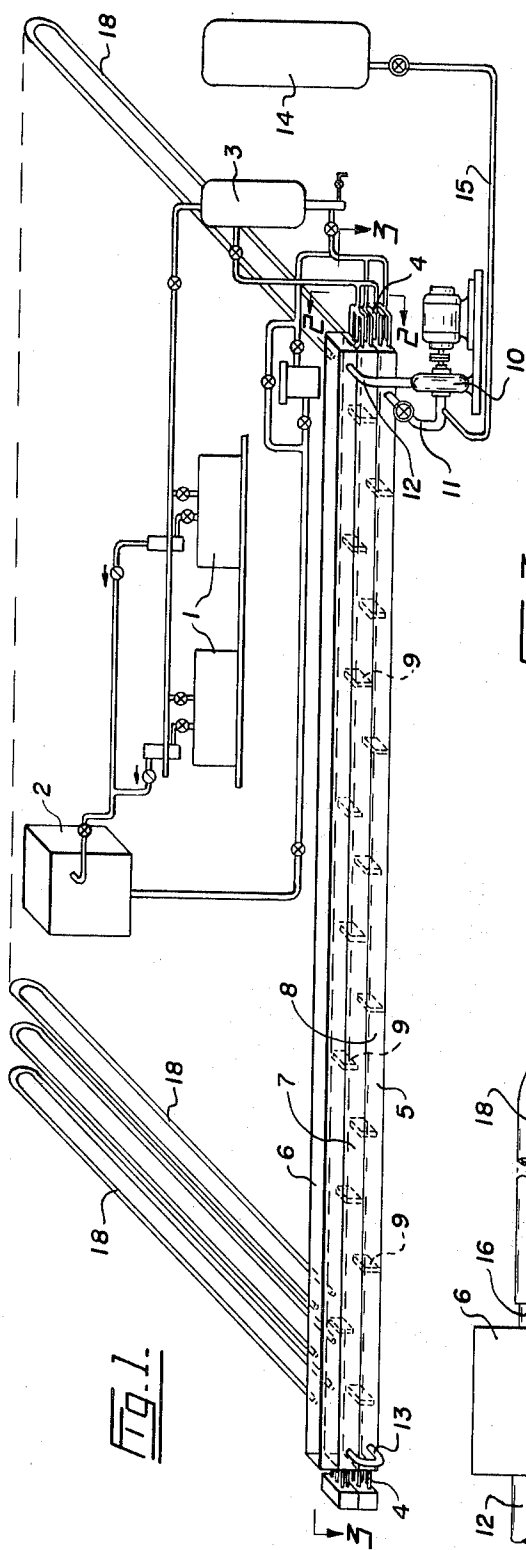
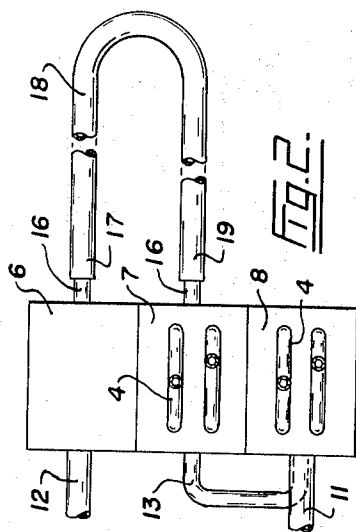
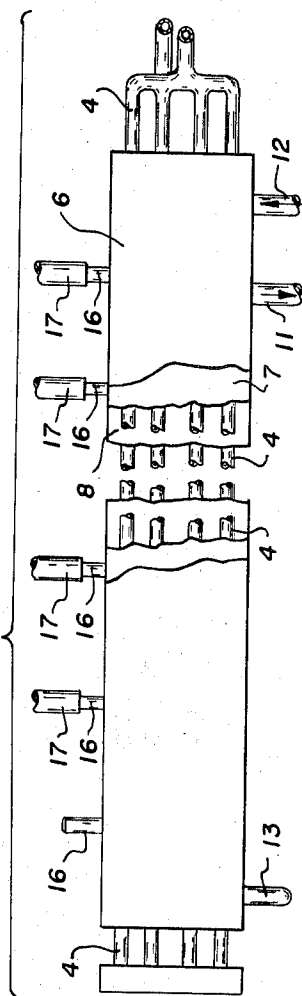
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[57] **ABSTRACT**

A chiller consisting of a tubular header for location alongside an ice rink and beneath the ice level. The chiller is divided into three vertically arranged longitudinal chambers having connectors for ice forming pipes which extend beneath the rink. Refrigerant conduction piping extends longitudinally through the chiller and connections are provided for a circulation pump to circulate the chilling medium within the header. The chilling medium being circulated through the header and ice forming pipes is chilled by heat exchange with the refrigerant carried by the refrigerant conduction piping from a refrigeration unit connected thereto.

13 Claims, 3 Drawing Figures





CHILLER FOR ICE RINK REFRIGERATION SYSTEMS

The invention relates to a chiller for use in an ice rink refrigeration system and to systems incorporating such chillers.

In conventional systems for ice rink refrigeration, the refrigeration unit including the usual compressor and condenser circulates refrigerant through a chiller tank. Brine chilled in the tank is then pumped through a piping network extending beneath the rink to form and maintain the ice formation.

The refrigeration unit and the chiller tank are located in a room adjacent to the rink. The tank is of a substantial size and in fact occupies the major portion of the refrigeration space, thus increasing building cost. In addition, the tank itself is constructed as a pressure vessel and is extremely expensive due to the fact that it has to meet the exacting standards necessary for such vessels. A further disadvantage lies in the fact that a very large quantity of refrigerant is necessary to charge the system; for a full size rink in the region of 1,100 pounds.

It is among the objects of the present invention to provide an improved form of chiller which overcomes the above disadvantages and results in a substantial reduction in the cost of the total system.

The invention therefore provides a chiller for use in an ice rink refrigeration system, comprising a tubular header for location along the full length of one edge of the rink, so as to lie below the level of the rink, a plurality of connectors extending laterally from the header for connection to a plurality of ice forming pipes extending beneath the surface of the rink, means for connection to a circulating pump for circulating a chilling medium through said header and ice forming pipes, and refrigerant conduction piping extending through said header for conducting refrigerant from a refrigeration unit, whereby when the chiller is connected into a refrigeration system including ice forming pipes, a circulating pump and a refrigeration unit, the chilling medium circulating through the header and ice forming pipes is chilled by heat exchange with the refrigerant carried by the refrigerant conduction piping.

The invention will now be described with reference to the accompanying drawing in which

FIG. 1 is a semi-diagrammatic perspective view of a refrigeration system incorporating a chiller according to the invention and,

FIG. 2 is a sectional elevation on the line 2—2 of FIG. 1,

FIG. 3 is a plan view partly cut away, on the line 3—3 of FIG. 1.

Referring to the drawings, the refrigeration system shown comprises a conventional battery of two compressors 1 and a condenser 2 which circulate refrigerant through a bulk tank 3. From the bulk tank 3, the refrigerant is circulated through refrigeration piping 4 which extends through a chiller in the form of a tubular header 5. The tubular header 5 is generally rectangular in section and divided into first, second and third or upper, middle and lower longitudinally extending chambers 6, 7 and 8. Transverse baffles 9 are provided at intervals along each of the middle and lower chambers 7 and 8. A pump 10 is connected through a suction pipe 11 and delivery pipe 12 to the right hand ends of the chambers 6 and 8 as shown in the drawing for circulat-

ing chilling medium through the chambers. At their left hand ends, the chambers 7 and 8 are connected by a transfer pipe 13. A reserve tank 14 for the chilling medium is also provided whereby the medium may be supplied to the suction 11 of the pump through a connection 15.

Each of the chambers 6 and 7 has connector nipples 16 extending therefrom for connection to the ends 17 of ice forming pipes 18. The pipes 18 are U-shaped as shown and have one end 17 connected to a nipple 16 extending from the upper chamber 6 and the other end 19 connected to a nipple extending from the middle chamber 7.

The chilling medium with which the header 5 and pipes 18 are filled is brine or other suitable medium such as ethylene or propylene glycol. The refrigerant with which the refrigeration system and the piping 4 is filled may be any convenient refrigerant such as ammonia or Freon (registered trade mark).

In operation, the cooling medium is discharged by the pump 10 to the upper chamber 6 and then passes through the ice forming pipes 18 and back to the middle chamber 7. The cooling medium then passes along the chamber 7, through the transfer pipe 13, and back to the pump through the lower chamber 8 and pump suction 11. The cooling medium is chilled as it passes through the chambers 7 and 8 of the header 5 by the refrigerant passing through the piping 4.

By providing a chiller in the configuration shown in the drawing alongside and beneath the edge of an ice rink, the necessity for providing a large expensive chiller tank and an associated structure to contain it is avoided. This results in a saving of at least 10 percent in the cost of a system when installed.

I claim:

1. Ice rink refrigeration apparatus, comprising
 - a closed tubular chiller header for location along substantially the full length of an edge of the rink near the level of the rink, said header being divided into first and second coextending chambers,
 - a plurality of outlet connectors extending laterally from one of said chambers for connection to one end of a plurality of ice forming pipes extending beneath the surface of said rink,
 - a plurality of inlet connectors extending laterally from the other of said chambers for connection to opposite ends of said pipes,
 - means for connecting one end of one of said chambers to an outlet of a circulating pump and an end of the other of said chambers to an inlet of said pump for circulating a chilling medium through said header chambers and said ice forming pipes, and
 - refrigerant conducting piping extending through one of said header chambers for conducting refrigerant from a refrigeration unit through the chilling medium in the latter chamber,
 - whereby when the header is connected into a refrigeration system including ice forming pipes, a circulating pump and a refrigeration unit, the chilling medium circulating through the header chambers and the ice forming pipes is chilled by heat exchange with the refrigerant carried by the refrigerant conducting piping in said chambers.

2. Apparatus as claimed in claim 1 including a third chamber in the header coextending with said second chamber, and

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transfer means for connecting an end of said second chamber to the adjacent end of said third chamber,

said refrigerant conducting piping extending through the second and third chambers.

3. Apparatus as claimed in claim 2 wherein said outlet and inlet conductors extend laterally from the first and second chambers.

4. Apparatus as claimed in claim 1 including baffles in one of said chambers for generating turbulence in the chilling medium during circulation thereof.

5. Apparatus as claimed in claim 2 including baffles in the second and third chambers for generating turbulence in the chilling medium during circulation thereof.

6. Apparatus as claimed in claim 1 in which said refrigerant conducting piping comprises a plurality of pipes extending through said second chamber.

7. Apparatus as claimed in claim 2 in which said refrigerant conducting piping comprises a plurality of pipes extending in series through said second chamber and said third chamber.

8. Ice rink refrigeration apparatus, comprising a closed tubular chiller header for location along substantially the full length of an edge of the rink near the level of the rink, said header being divided into first and second coextending chambers,

a plurality of U-shaped ice forming pipes extending from the header beneath the ice level of the rink, one end of each pipe being connected to the first chamber and the other end of said each pipe being connected to the second chamber,

a circulating pump connected to ends of the first and

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second chambers for circulating a chilling medium through said chambers and said pipes, and piping extending through said second chamber and connected to a refrigeration unit,

whereby chilling medium circulated through said header and ice forming pipes is chilled in the header by heat exchange with the refrigerant carried from the refrigeration unit by the refrigerant conduction pipes.

9. Apparatus as claimed in claim 8 including a third chamber in the header coextending with the second chamber, said pump being connected to ends of the first and third chambers adjacent one end of the header, and

transfer means conducting the adjacent ends of the second and third chambers adjacent the opposite end of the header.

10. Apparatus as claimed in claim 8 including baffles in the second chamber for generating turbulence in the chilling medium during circulation thereof.

11. Apparatus as claimed in claim 9 including baffles in the second and third chambers for generating turbulence in the chilling medium during circulation thereof.

12. Apparatus as claimed in claim 8 in which said refrigerant conducting piping comprises a plurality of pipes extending through said second chamber.

13. Apparatus as claimed in claim 9 in which said refrigerant conducting piping comprises a plurality of pipes extending in series through said second chamber and said third chamber.

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