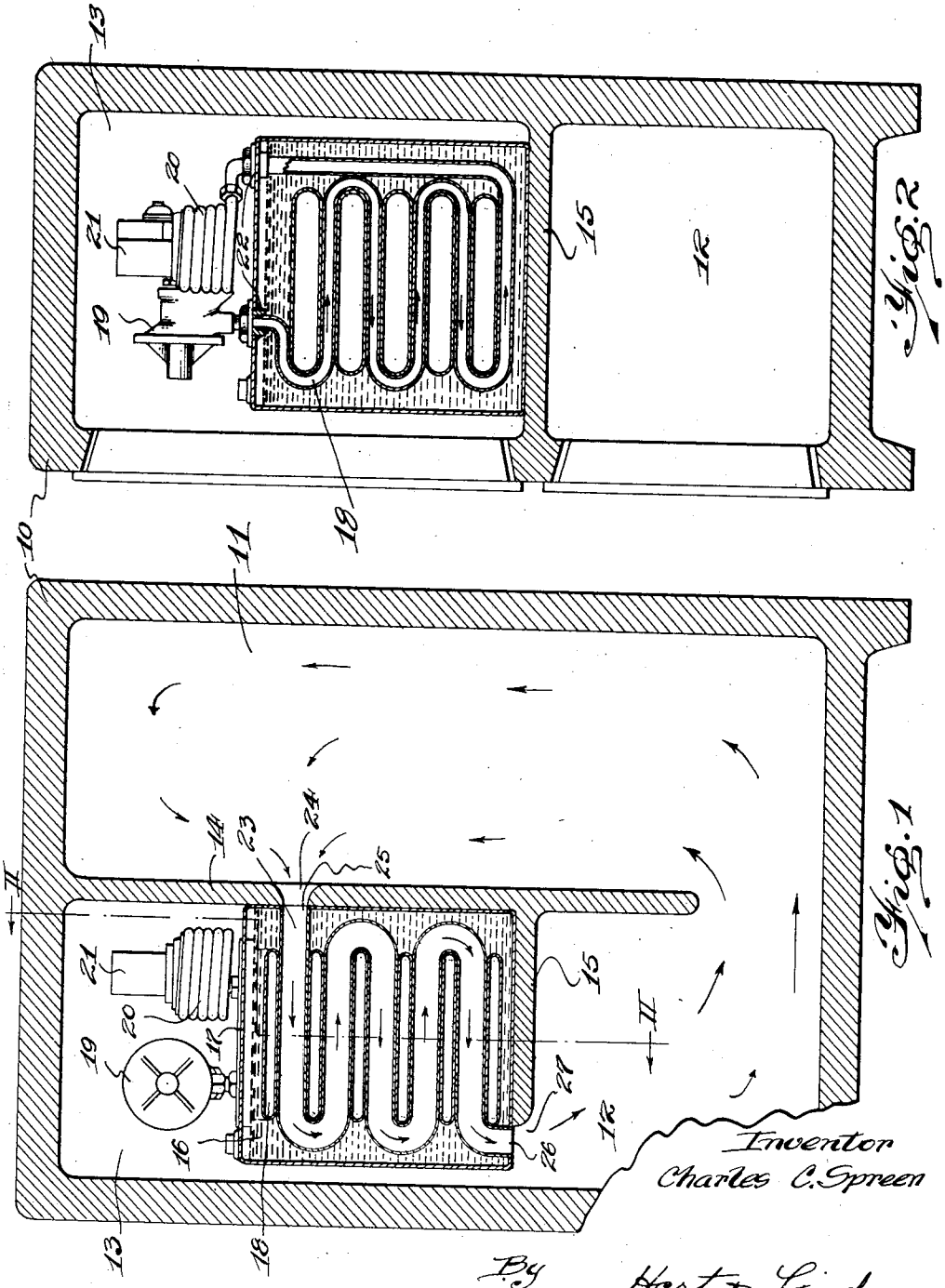
July 16, 1929. C. C. SPREEN 1,720,768

COOLING UNIT FOR REFRIGERATING MECHANISM

Filed Sept. 8, 1927 2 Sheets-Sheet 1



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COOLING UNIT FOR REFRIGERATING MECHANISM

Filed Sept. 8, 1927 2 Sheets-Sheet 2

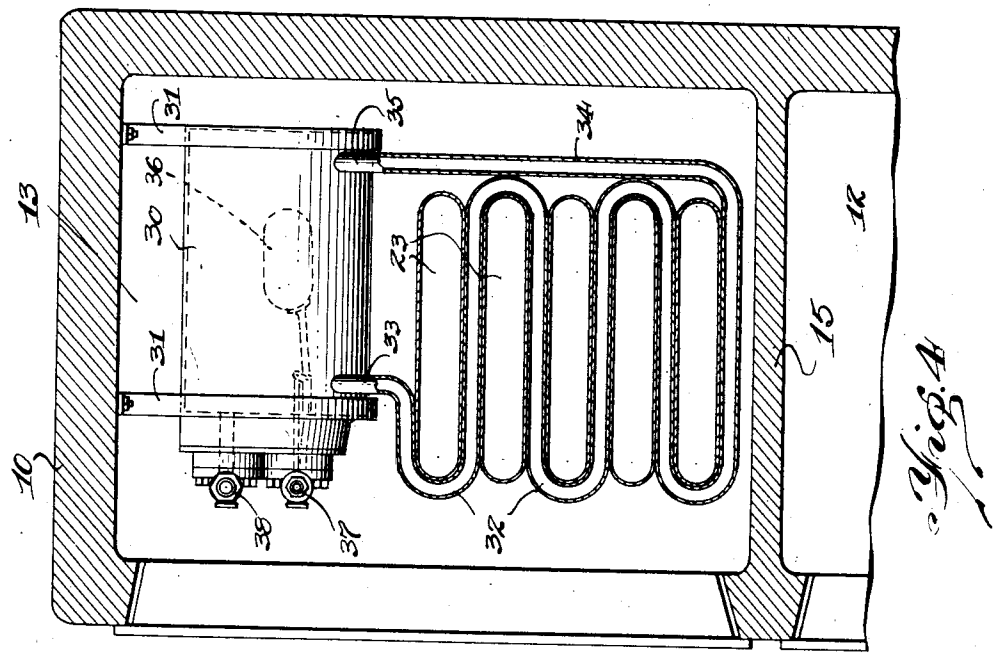


Fig. 4

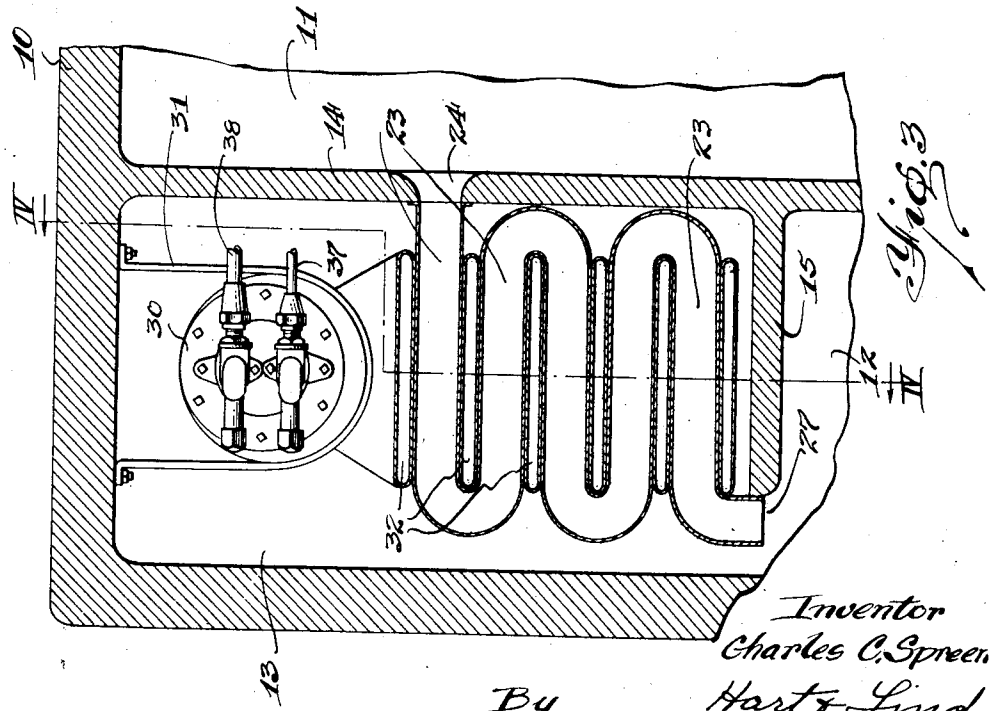


Fig. 3

Inventor
Charles C. Spreen
By Hart & Sind
Attorneys

Patented July 16, 1929. 1,720,768

UNITED STATES PATENT OFFICE.

CHARLES C. SPREEN, OF DETROIT, MICHIGAN, ASSIGNOR TO KELVINATOR CORPORATION, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

COOLING UNIT FOR REFRIGERATING MECHANISM.

Application filed September 8, 1927. Serial No. 218,159.

My invention relates to refrigerators of the type wherein a circulating cooling medium is employed to cool food storage chambers, and it has particular relation to a novel means for securing effective heat transfer relationship between the circulating cooling medium and the heat absorbing means.

Heretofore it has been customary, particularly in mechanically cooled refrigerators, to cause the circulating cooling medium, usually air, to pass over the exterior surface of the refrigerant evaporator, or brine tank surrounding such evaporator, if one is employed, in order to cool it. Although this method of cooling the air is generally satisfactory, it is apparent that a more intimate contact between the cooling air and the refrigerant container would result in lowering the temperature of the circulating air and therefore of the refrigerator.

By my invention I have provided a novel arrangement of the air path through the refrigerating chamber whereby more intimate contact of the air and the refrigerating means may be secured.

One object of my invention consists in providing means for securing association of the cooling air and the refrigerant chamber in novel and intimate heat transferring relationship.

Another object of my invention is to provide a novel type of interlaced passageways for the cooled air and the refrigerant whereby each is substantially surrounded by the other.

A further object of my invention consists in providing means for bringing the cooling air and the heat absorbing means into intimate heat transferring relationship which is simple and inexpensive to construct, durable in operation, and which lends itself readily to compactness of design.

For a better understanding of my invention, reference may now be had to the accompanying drawings of which:

Fig. 1 is a vertical cross-sectional view of a mechanically cooled refrigerator embodying the so-called "dry" system, and constructed in accordance with my invention.

Fig. 2 is a vertical cross-sectional view of the structure illustrated in Fig. 1, the view being taken substantially along the line II—II thereof.

Fig. 3 is a fragmentary vertical cross-sectional view of a mechanically cooled refrigerator embodying the so-called "wet" system, and constructed in accordance with my invention.

Fig. 4 is a vertical cross-sectional view of structure illustrated in Fig. 3, the section being taken substantially along the line IV—IV thereof.

Referring particularly to the structure illustrated in Figs. 1 and 2, I have shown a refrigerator cabinet 10 comprising two refrigerated food storage chambers 11 and 12, which are cooled by the circulation of air, and an air cooling chamber 13, which is separated from the chamber 11 by means of a vertical wall 14 and from the chamber 12 by means of a horizontally extending wall 15. Disposed within the air cooling chamber 13 is a cooling unit 16 comprising a brine tank 17 within which is disposed an expansion coil 18, constituting a portion of an ordinary mechanical refrigerating system of the "dry" type. Admission of the refrigerant to the expansion coil 18 is controlled by means of an expansion valve 19, of the usual type, mounted on the brine tank 17. The expansion coil 18 consists of a relatively flat tube or envelope bent into sinuous contour, the upper end thereof being connected to the condensing coil of the refrigerating system through the expansion valve 19, and the lower end thereof being connected to the low side of a compressor (not shown of a suitable refrigerating system through a tubular coil 20, within which is disposed a thermostat 21 adapted to control the operation of an electrical motor whereby the compressor is driven. The two ends of the coil 18 which are connected to the expansion valve 19 and the thermostat coil 20 pass through the top of the brine tank 17 and are sealed thereto as indicated at 22.

A sheet metal casing or envelope 23, of sinuous contour, adapted to serve as an air passageway, is disposed within the brine tank 17 and is interlaced or interfitted and aligned with the expansion coil 18, so that alternate spaces in the stack formed thereby contain refrigerant and the remaining spaces contain air to be cooled, as indicated in the drawing. The upper end of the casing 23 is disposed opposite an opening 24 in the vertical partition wall 14 and extends through an opening 25 in the side of the brine tank 17, to the edge of which opening the end of the casing is welded or otherwise suitably se-

cured in sealed relationship. In like manner, the lower end of the casing 23 passes through an opening 26 in the bottom of the brine tank, to the edges of which it is suitably secured to form an air tight connection. The lower end of the casing 23 is disposed opposite an opening 27 in the horizontal partition wall 15.

From the foregoing description it will be apparent that the refrigerant enters the cooling unit through the expansion valve 19, passes downwardly through the expansion coil 18 and then upwardly through the thermostat coil 20, as indicated by arrows in Fig. 2, from which it leaves the cooling unit to return to the remainder of the refrigerating system. As indicated by arrows in Fig. 1, the air which serves as a cooling medium for the food storage chambers 11 and 12 passes upwardly through the chamber 11, through the opening 24 in the wall 14 into the air conduit or casing 23, thence downwardly through the various convolutions of the casing 23 to its lower end where it passes through the opening 27 in the wall 15 into the chamber 12. From the chamber 12 it passes downwardly and thence laterally to the chamber 11 through the opening beneath the lower end of the vertical wall 14.

From this description it will be apparent that each convolution of the air passageway 23 is disposed between adjacent convolutions of the expansion coil 18, and that the portions thereof connecting the ends of the individual convolutions of the casing 23 are immersed in the brine within the tank 17 and is thus additionally cooled. The provision of the sinuous arrangement of both the refrigerant and the cooling air provides means for securing a relatively large area of contact between the two passageways in a relatively small space. In addition thereto, the frequent reversal of direction to which both fluids are subjected in passing through tortuous paths causes these fluids to engage the casings in which they are contained with a scouring action which prevents the formation and existence of pockets of fluid which might otherwise be formed and serve as heat insulating mediums.

Referring now to Figs. 3 and 4, I have shown in the drawings a refrigerant cabinet 10 provided with food storage chambers 11 and 12 and an air cooling chamber 13, as previously described. Disposed within the chamber 13 is a header 30 of the usual "wet" system type, which is supported by means of brackets 31. A refrigerant containing coil 32 of sinuous contour is connected at its upper end to one end of the header as indicated at 33 and is connected at its lower end by means of an upright pipe 34 to the opposite end of the header, as indicated at 35. Disposed within the header 30 is a float valve 36, of the usual construction, for regulating the admission of refrigerant thereto. The header 30 is connected to a suitable condenser (not shown) of a refrigerating system by means of a pipe 37, and to the low side of a compressor (not shown) by means of a connection 38. As described in connection with Figs. 1 and 2, an air conducting conduit or casing 23, of sinuous contour, is interlaced or interfitted and alined with the depending coil 32 so as to secure intimate heat transferring relationship therewith. The upper end of the casing 23 is disposed opposite the opening 24 in the vertical wall 14 and the lower end thereof is disposed opposite the opening 27 in the horizontal wall 15, as described in connection with Figs. 1 and 2.

From this description it will be apparent that the air to be cooled is brought into intimate contact with the refrigerant containing coil or chamber by means of a novel arrangement which lends itself readily to simple and inexpensive construction and to compactness of design.

Although I have illustrated but one form of my invention and have described in detail only two applications thereof, it will be apparent to those skilled in the art that it is not so limited but that various modifications and changes may be made therein without departing from the spirit of my invention or from the scope of the appended claims.

What I claim is:

1. In a refrigerator, a cooling unit provided with a conduit of sinuous contour adapted to serve as a container for a heat absorbing medium, and a conduit of sinuous contour adapted to serve as a passageway for a cooling fluid and having its convolutions interlaced with the convolutions of the first mentioned conduit.

2. In a refrigerator, a refrigerant conduit passageway of sinuous contour, and an air conduit of sinuous contour alinged therewith, the individual convolutions of each of said conduits being disposed between adjacent convolutions of the other conduit.

3. In a mechanically refrigerated device, a food chamber adapted to be cooled by the circulation of air, an air cooling chamber provided with a conduit of sinuous contour adapted to contain refrigerant, and a metallic conduit of sinuous contour interfitted and alined with said refrigerant conduit and in open communication with said food chamber.

4. In a mechanically refrigerated device, a food chamber adapted to be cooled by the circulation of air, an air cooling chamber provided with a conduit of sinuous contour adapted to contain refrigerant, and a metallic conduit of sinuous contour interfitted and alined with said refrigerant conduit and in open communication with said food chamber, both of said conduits being immersed in a chamber containing a liquid.

5. In a mechanically refrigerated device, a food chamber adapted to be cooled by the circulation of air, an air cooling chamber provided with a conduit of sinuous contour adapted to contain refrigerant, and a metallic conduit of sinuous contour interfitted and alined with said refrigerant conduit and in open communication with said food chamber, both of said conduits being enclosed within a brine tank.

6. In a cooling device, a storage chamber adapted to be cooled by circulating a cooling medium therethrough, a cooling chamber associated with said storage chamber and provided with a conduit of sinuous contour adapted to contain a heat absorbing medium, and a conduit of sinuous contour interfitted and alined with said sinuous conduit and in open communication with said storage chamber and adapted to serve as a passageway for said cooling medium.

In testimony whereof I hereunto affix my signature.

CHARLES C. SPREEN.