

May 22, 1951

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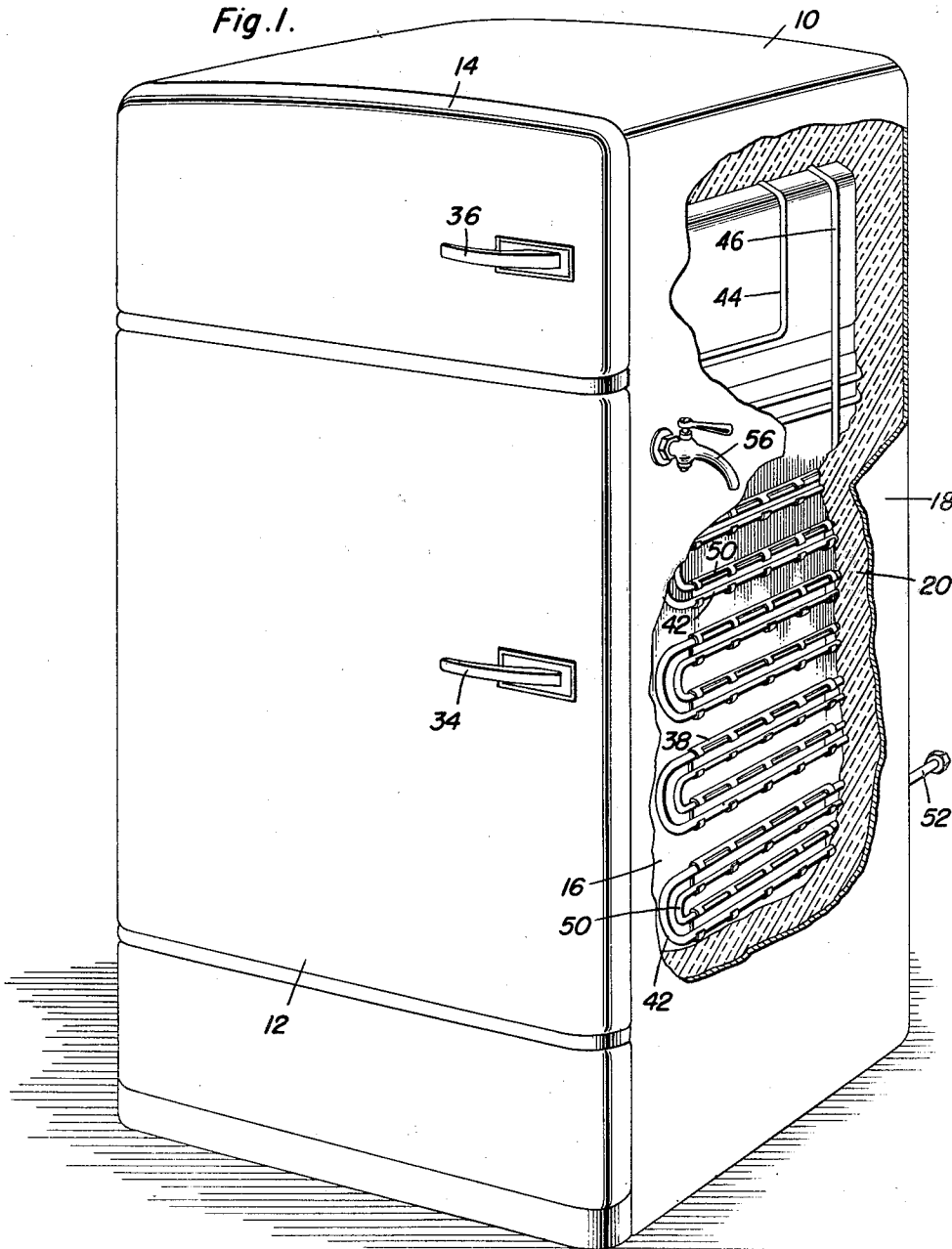
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LIQUID COOLING DEVICE FOR REFRIGERATORS

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3 Sheets-Sheet 1

Fig. 1.



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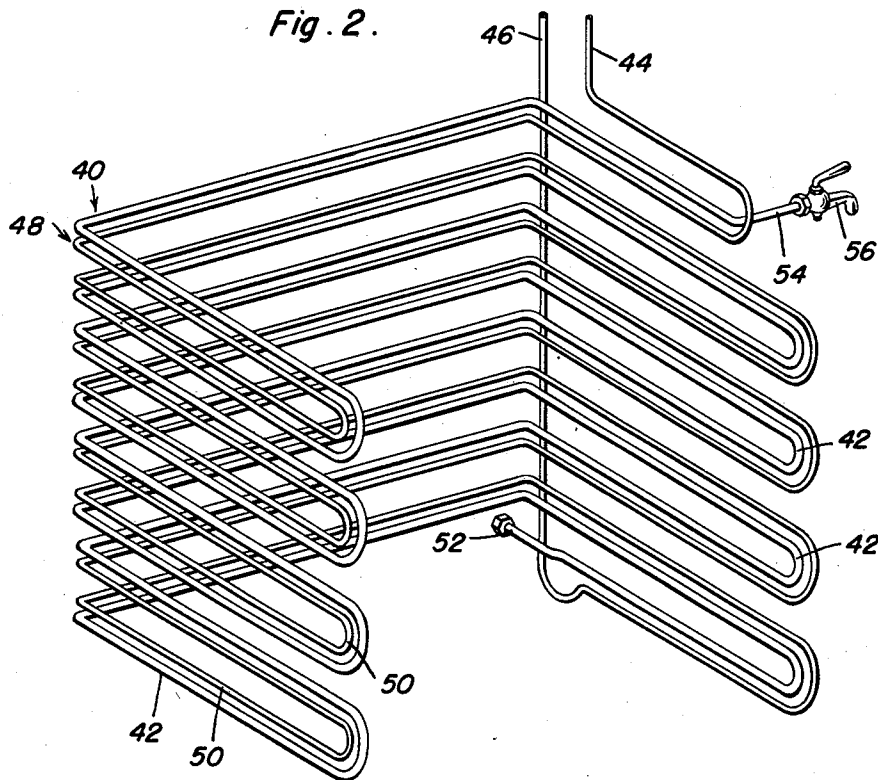
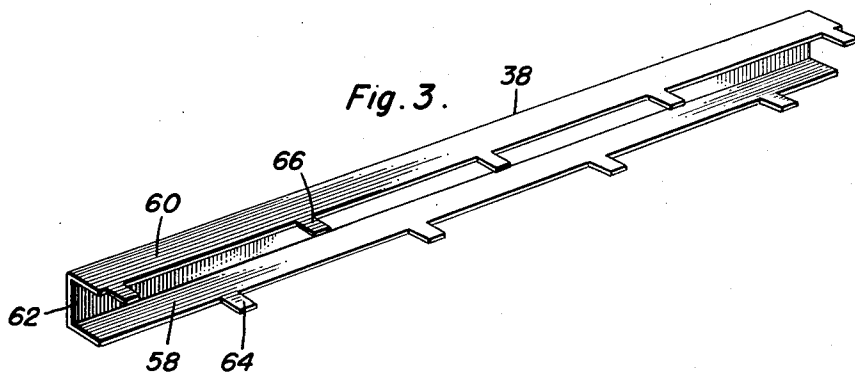
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Fig. 4.

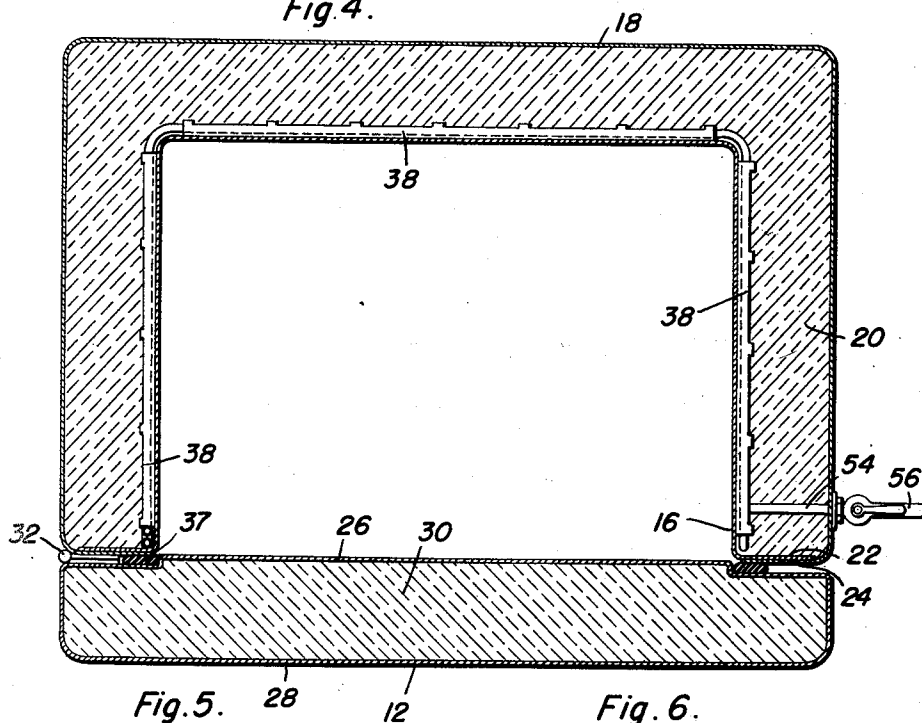


Fig. 5.

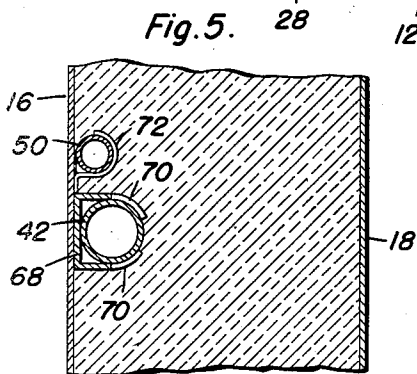


Fig. 6.

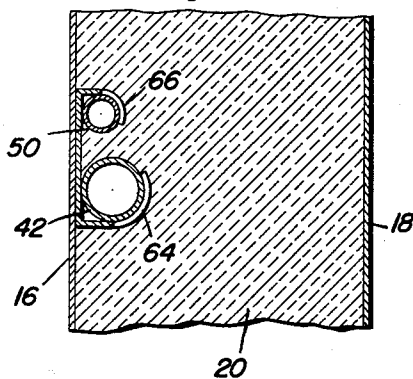
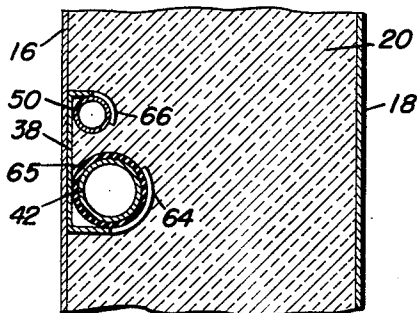


Fig. 7.



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LIQUID COOLING DEVICE FOR REFRIGERATORS

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1 Claim. (Cl. 62-141)

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This invention comprises novel and useful improvements in a liquid cooling device and more specifically pertains to a novel and efficient arrangement and incorporation of a liquid cooling coil in close proximity and heat exchange relation to the refrigerating coil of a household refrigerator.

The primary object of this invention is to provide means which may be readily incorporated in the manufacture of a household refrigerator for conveniently and efficiently cooling and dispensing liquids therefrom.

A further object of the invention is to provide an improved construction of liquid cooling coil which may be intimately associated in an improved, convenient heat exchange relation with the refrigerating coil of a household refrigerator for continuously cooling liquids supplied thereto.

Yet another object of the invention is to provide an improved and efficient manner for securing a liquid cooling coil in closely nested, compact, heat exchange relation with the conventional refrigerating coil of a household refrigerator.

A still further object of the invention is to provide novel means for supporting, cushioning, retaining and vibrationally insulating the nested convolutions of refrigerating and liquid cooling coils disposed in the space between the inner and outer casings and in the insulating lining thereof of household refrigerators.

A still further object of the invention is to provide a construction and a method whereby a liquid cooling coil may be positioned in compact, heat exchange relation with a refrigerating coil and secured with the same to the inner casing member of a household refrigerator during the process of manufacture and assembly of the inner casing, the insulating lining and the outer casing to form the refrigerator cabinet.

A still further object of the invention is to provide an improved construction of household refrigerator having a liquid cooling coil disposed in heat exchange relation with the refrigerating coil and in particular in heat exchange relation with a predetermined portion of the refrigerator coil whereby the contents of the liquid cooling coil may be chilled to and maintained at a predetermined temperature.

And a final important object of the invention is to provide an improved household refrigerator having a liquid cooling coil disposed in heat exchange relation with refrigerating coil thereof and wherein the liquid dispensing outlet may be selectively disposed either exteriorly of the refrigerator or within the food storage compartment thereof.

These, together with various ancillary features and objects of the invention which will later become apparent as the following description pro-

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ceeds, are attained by this device, preferred embodiments of which have been illustrated by way of example only in the accompanying drawings, wherein:

Figure 1 is a perspective view of one embodiment of household refrigerator incorporating the principles of this invention, a portion of the side thereof being broken away to disclose the manner in which the convolutions of the refrigerating coil and the liquid cooling coil are nested together and secured to the inner casing member of the refrigerator;

Figure 2 is a perspective view of a refrigerator coil and a liquid cooling coil, the same being disclosed as nested together and forming a unit or sub-assembly for mounting upon the inner casing of a refrigerator during the course of assembly of the same;

Figure 3 is a perspective view of one of the channel members for supporting the convolutions of the coils upon the inner casing member of the refrigerator;

Figure 4 is a horizontal sectional view through the refrigerator illustrated in Figure 1, disclosing the manner of positioning the refrigerating and liquid cooling coil assemblies therein, and indicating the location of the liquid dispensing means thereof;

Figure 5 is a fragmentary vertical sectional detail view through a portion of the wall of the refrigerator disclosing one manner of securing the convolutions of the liquid and refrigerating coils to the inner casing member of the refrigerator;

Figure 6 is a view similar to Figure 5 but showing a modified manner of securing the convolutions of the two coils in the refrigerator;

Figure 7 is a further modification similar to Figure 5 but disclosing a vibration cushioning means for silencing any rattling of a coil convolution.

Reference is now made more particularly to the accompanying drawings, wherein like numerals designate similar parts throughout the various views. Indicated at 10 in Figure 1 is a well known and conventional form of household refrigerator, which is provided with hinged doors 12 and 14 whereby separate access may be attained to the food storage compartment and the freeze compartment of the refrigerator.

As indicated best in Figure 4, the cabinet of the refrigerator 10 includes an inner metal casing 16 and an outer metallic casing 18 which are separately formed and during the course of assembly are nested together with a heat insulating lining 20 therebetween, and are then permanently united into a sealed assembly by interturning and overlapping end flanges 22 and 24 of the inner and outer casings respectively and welding or otherwise permanently uniting these flanges,

The cabinet thus formed has an open front which is closed by the two doors 12 and 14 above mentioned, it being understood that a partition not shown, is horizontally disposed in the cabinet to divide the interior of the same into a lower food storage compartment and an upper freeze compartment.

The door 12 is constructed similar to the walls of the refrigerator 10, including an inner metallic casing 26, an outer metallic casing 28, together with an insulating lining 30 therebetween, this door being hinged to the cabinet 10 as at 32, and provided with a handle and latch member 34.

The upper door 14 of the freeze compartment is to be understood as being similarly constructed being provided with the latching and handle member 36. A suitable gasket member 37 surrounds the opening of the doors to establish an airtight seal between the doors and the refrigerator cabinet.

In further accordance with conventional design, this well known type of refrigerator is provided with a plurality of vertically spaced horizontally positioned channel members 38, these members being disposed on the sides and back of the inner casing member 16 in the space between the inner and outer casing members. In the conventional form of the household refrigerator illustrated, these channel members receive therein the convolutions of the Freon or refrigerating coil. This coil consists of a conduit which is folded upon itself to provide vertically spaced horizontally extending convolutions, the end portions of these convolutions being bent at right angles to form a U-shaped assembly which is indicated as an entirety in Figure 2 by the numeral 40. The vertically spaced convolutions of the coil 40 are indicated by the numeral 42 and as shown in Figure 2 and Figure 4 will extend about and embrace side walls and back wall of the inner casing member, throughout a predetermined portion of the height thereof. Customarily, the Freon or refrigerating coil 40 extends throughout substantially the entire height of the food storage compartment and at its upper end is provided with a terminal portion 44 which may be integrally or mechanically connected with the refrigerating coil which surrounds the freeze unit. The other end of the coil 40 as indicated at 46, is connected to the refrigerating compressor of the circulating refrigerant cooling system.

The improvement forming the substance of this invention consists in providing a second coil, indicated generally at the numeral 48 in Figure 2 and which is shaped similarly to the coil 40. The second coil constitutes a liquid cooling coil and likewise includes a plurality of vertically spaced horizontally extending convolutions 50 which are provided with terminal portions 52 which are adapted to extend through the back wall at the bottom of the refrigerator cabinet for connection with any suitable source of liquid such as the household water system or the like, soft drinks or other liquor which it is desired to refrigerate, while the other end of the cooling coil as indicated at 54 extends laterally from the space between the inner and outer casing members and through one of the casing walls and is provided with a dispensing faucet or the like 56. As illustrated in the drawings, the member 54 extends through the outer casing member 18 so that the faucet 56 is positioned exteriorly of the refrigerator whereby access may be had to the same without the necessity for opening the door 12

thereof. However, it is to be understood and it is preferred to provide a fitting of any suitable type so that the faucet 56 may be selectively positioned on the exterior or on the interior of the refrigerator, within the food storage chamber thereof, as preferred. Preferably the coil 48 is so proportioned that its convolutions may be nested with those of the coil 40 as indicated clearly in Figure 2, whereby the nested coils may be assembled as a unit during the course of manufacture of the refrigerator. When so assembled, the inner coil, that is the liquid cooling coil 48 is nested within the convolutions of the refrigerating coil and in an intimate heat exchange relation therewith, whereby the liquid within the cooling coil will be chilled to the predetermined temperature by heat exchange with the refrigerating coil 40.

It will be here noted that it is preferred to associate the liquid cooling coil with the lower portion only of the refrigerating coil, or at least with that portion which is below the freeze chamber, in order that the liquid within the cooling coil may not be exposed to the danger of being frozen but may be maintained at substantially the temperature prevailing within the food storage chamber.

Obviously, various means may be provided for securing the two coil unit to the inner casing member. A satisfactory embodiment for this purpose is disclosed in Figures 1, 3 and 6.

Here each of the channel members 38 is provided with parallel side walls 58 and 60, and with a bottom wall 62 extending therebetween. This bottom wall 62 is welded or otherwise rigidly secured to the inner casing member on that side which is exposed to the insulating lining 20 between the two casing members. The convolutions 42 of the refrigerating coil 40, and which are usually although not necessarily larger than the convolutions 50 of the liquid cooling coil 48, rest upon the bottom side wall 58 of the channel member 38, while the convolutions 50 of the cooling coil 48 are disposed adjacent the upper side wall 60. In order to retain these convolutions in proper position, and at an evenly spaced distance from each other, in order to maintain a uniform heat exchange rate therebetween, any desired fastening means are provided. Conveniently, these fastening means may take the form of integral lugs 64 formed upon the bottom side wall 58 and 66 formed upon the upper side wall 60. These lugs may be disposed in parallel relation to each other, but are preferably interdigitated or staggered as shown in Figure 3. The integral lugs are bent inwardly to partially embrace the adjacent convolutions, and thereby retain these convolutions against the bottom of the channel members 62 in fixed relation to each other.

It is to be understood that instead of lugs extending from the side walls 58 and 60, the latter may be provided with slots or cut away portions to define tongues or fingers which may be bent into convolution retaining position. Further, separate fastening means could be provided for securing the convolutions in position.

Alternatively, a separate channel member could be provided for each convolution but each of the side walls and back wall of the inner casing member, although the single channel member is preferred as necessitating the assembly of fewer parts.

Alternatively, and in some instances preferably, the construction shown in Figure 7 would be deemed more desirable. This construction is

identical with that shown in Figure 6, except that either or both of the convolutions 42 and 50 are provided with cushioning or anti-rattling members which may be in the form of sleeves completely surrounding the convolution, or any desired portion thereof, bushings or baskets which surround the convolutions adjacent the lugs 64 and 76, or merely strips of rubber or other material as desired. In any event, these anti-vibrating, cushioning members are intended to prevent the objectionable noise occasioned by the rattling by the convolutions against the channel members, the inner casing member, their supporting lugs, or upon each other under the vibration arising from the operation of the refrigerating compressing system.

It is desired to point out that in the manufacture of this type of refrigerator, the inner casing member 16 is first formed, the channel members disposed in proper position and secured thereto, the refrigerating coil unit is then applied to the channels and secured thereby to the inner casing member, after which the insulating lining is applied and the outer casing assembled and sealed to form the refrigerator cabinet. This invention is particularly adapted to make use of this present conventional method of assembly by merely interposing the additional step of nesting the cooling coil within the refrigerating coil after the latter has been assembled in the channel members, after which the two coils are rigidly secured or fastened and the process of assembly completed as indicated above. Thus, with a minimum expense of labor, and a very minor expense of a single additional coil, the conventional refrigerator may be economically modified during its manufacture to incorporate therein the facilities and conveniences of a liquid cooling system. The refrigerator is thus widened in its utility to provide a built in, compact, and long lived means for continuously refrigerating a liquid, whether water or soft drinks, in an economical and satisfactory manner.

Attention is now directed to Figure 5 wherein there is shown a further modified manner in which the nested coils may be secured to the inner casing member. In this embodiment, a channel member, 68 is provided which is adapted to snugly receive the convolution 42 of the refrigerating coil, either with or without the vibration cushioning member as desired. Any suitable means such as the previously mentioned integral lugs, 70 are provided for rigidly attaching and securing the convolution within the channel member. The adjacent convolution of the cooling coil, 50, is secured by a separate bracket or channel member 72 to the inner casing member 16 in close, heat exchange relation with convolutions 48. The method of assembly is the same as the other embodiments.

It is to be here noted that the vibration cushioning member 65, illustrated in Figure 7 and described above, may be equally employed in any of the various modified means for supporting the coil convolutions, but for simplicity of illustration it has been indicated as a part only in Figure 7. Moreover, with one or both convolutions of the two coils provided with the vibration cushioning means, the coils may be brought into contact or juxtaposition with each other in

the interest of forming a more compact unit, without danger of the vibration producing an objectionable rattling in the inaccessible space between the casing members of the refrigerating cabinet.

It will be particularly noted that both the refrigerating coil and the cooling coil are embedded within the insulating lining 20 in the interest of compactness, and that there is no loss or leakage of heat into the cooling coil from the exterior of the cabinet.

From the foregoing, the construction and operation of the device will be readily understood and further explanation is believed to be unnecessary. However, since numerous modifications and changes in the construction, method of assembly and mode of use will readily occur to those skilled in the art, after a consideration of the foregoing specification and accompanying drawings, it is not desired to limit the invention to the exact construction shown and described, but all suitable modifications and equivalents may be resorted to falling within the scope of the appended claim.

Having described the invention, what is claimed as new is:

A refrigerator cabinet having walls comprising inner and outer casings with a heat insulating liner therebetween, food storage and freeze compartments in said cabinet, a cooling coil between said casings having vertically spaced horizontal convolutions secured to the inner casing and positioned about a portion of said food storage compartment, said coil being connected to a refrigerating coil positioned about a portion of said freeze compartment, means connected to said cooling coil and said refrigerant coil for circulating a refrigerant therein, said cooling coil comprising a plurality of spaced convolutions, a liquid cooling coil between said casings having a plurality of spaced convolutions nested within convolutions of said cooling coil in heat exchange relation therewith, channel members mounted upon said inner casing between said casings, said cooling coil and said liquid cooling coil each having a convolution received in each channel member, means for securing each convolution within its channel member, said convolutions within a channel member being disposed each adjacent a side wall of the channel member, said last means comprising lugs on each side wall partially embracing the convolution adjacent thereto for maintaining said convolutions in said channel member in spaced relation to each other, and liquid inlet and liquid outlet means connected to said liquid cooling coil.

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