Sept. 7, 1954 C. H. BEANE 2,688,237

EXPANSION DEVICE FOR REFRIGERATION UNITS

Filed Aug. 13, 1951

Fig. 2

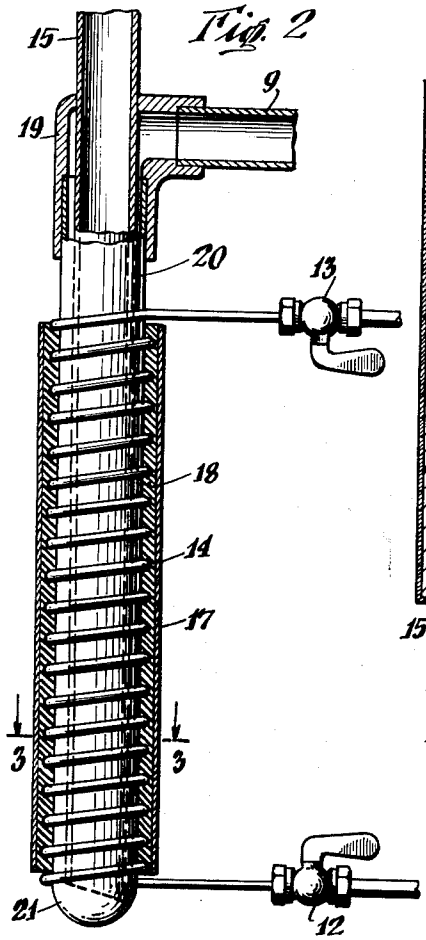


Fig. 1

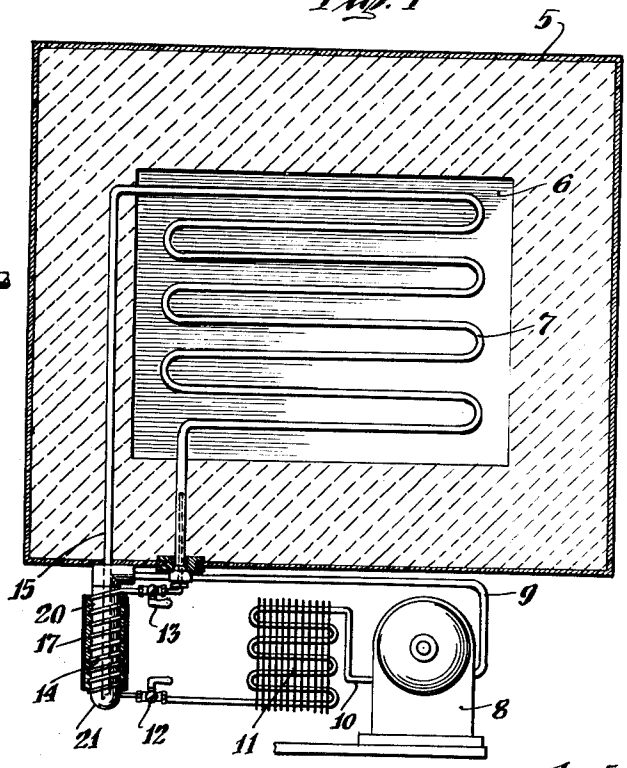


Fig. 4

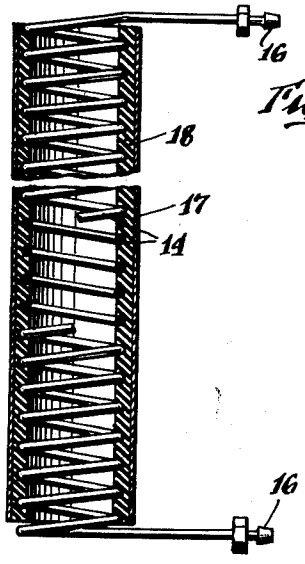


Fig. 3

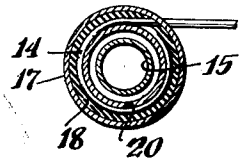
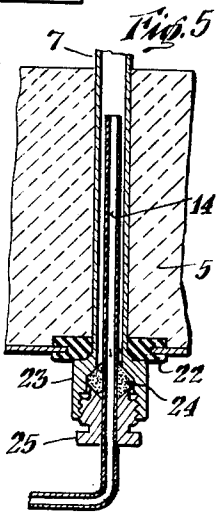


Fig. 5



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EXPANSION DEVICE FOR REFRIGERATION UNITS

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6 Claims. (Cl. 62—117.55)

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This invention relates to a structually and functionally improved refrigeration assembly and a unit for use in that assembly.

It is an object of the invention to furnish an apparatus in which the expansion device may be in the form of a capillary tubing capable of being readily replaced under field service conditions; such replacement occurring with the expenditure of minimum effort and time and requiring only ordinary skill.

A further object is that of providing a structure of this nature in which an efficient heat exchange will occur between the tubing and the parts with which it is associated.

Another object is that of furnishing an assembly embodying relatively few parts each individually rugged and simple in design, such parts being capable of ready connection and detachment from each other.

With these and other objects in mind reference is had to the attached sheet of drawings illustrating one practical embodiment of the invention and in which:

Fig. 1 is a sectional side view showing in somewhat diagrammatic manner an assembly embodying the present teachings;

Fig. 2 is a sectional side view showing in enlarged scale the detailed structure of one form of unit;

Fig. 3 is a transverse sectional view taken along the line 3—3 and in the direction of the arrows as indicated in Fig. 2;

Fig. 4 is a view similar to Fig. 3 but showing the unit in dismounted position; and

Fig. 5 is a fragmentary sectional view showing a preferred grouping of the parts.

Referring primarily to Fig. 1 there has been diagrammatically indicated at 5 an enclosure of any suitable design which defines a space 6 to be cooled. To this end an evaporator 7 preferably in the form of a coil is disposed in that space. A motor driven compressor 8 is furnished to which is connected the usual suction line 9. The compressor discharges through a line 10 within which there is interposed a condenser 11. Conveniently shut-off valves 12 and 13 of any suitable design are associated with the discharge end of line 10 as well as the intake end of evaporator 7. An expansion device being interposed between the evaporator and the condenser, it follows that with the compressor operating, a refrigeration cycle is provided.

As will be understood the parts heretofore identified may form units of any desired assembly. This might embrace a more or less conventional refrigerator, a deep freeze, a display cabinet, a conditioning system, etc. Suitable refrigerant is employed. Ordinarily the condenser will have disposed adjacent it a fan or other fluid impeller to assure a maximum heat exchange between that fluid and the surfaces of the condenser. The evaporator as well as the condenser may embody any desired design according to the needs of a given installation. The expansion unit has in Fig. 1 been shown mainly disposed to the outside of the enclosure 5. In actual practice it might be partially or wholly housed so as to reduce to a minimum losses which would otherwise occurs.

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The expansion device sets up in the usual manner the resistance necessary to maintain the proper head pressure and still supply the liquid refrigerant to the evaporator in accordance with installation requirements and at the necessary pressures. This expansion unit, according to the present teachings, will be in the form of a capillary tubing 14 which is spirally coiled to encircle the discharge line 15 extending from the evaporator 7. The opposite ends of the capillary coil are provided with quick detachable couplings 16 of any acceptable configurations and which may readily be connected with and uncoupled from the adjacent tube lines. Conveniently the cooperating and coupling portions may form parts of the valves 12 and 13, and simply include tapered seat portions against which the parts 16 may bear without any danger of leakage occurring.

In providing the coil 14 it may be spirally disposed to define a somewhat restricted cylindrical area. This tubing will, of course, embody certain resiliency. The coil is enclosed within a sleeve 17. Also disposed within this sleeve it is preferred to place a body of thermal mastic material 18. This body will extend in contact with the convolutions of coil 14. It will also extend in contact with the inner face of sleeve 17. It should incorporate good heat conductivity. Also it should define a bore such that the inner edges of the coil convolutions are more or less exposed or else just covered by the material. Therefore it will be apparent that a good heat exchange relationship will be established between the interior of the capillary tubing and a member adjacent which the bore face of the body of material 18 is disposed.

An accommodator conveniently forms a part of the assembly and preferably includes an elbow member 19 to the laterally extending passage of which the suction line 9 is coupled. Line

15 extends through the fitting 19 and is enclosed by a tube 20 having its upper end secured to the downwardly extending branch of the fitting. Line 15 terminates short of the end of tube 20 which is closed as indicated at 21. Therefore fluid discharging through line 15 will reverse its flow and move upwardly through tube 20 and so into suction line 9.

Now with tube 20 disposed within the bore defined by coil 14 it is apparent that the refrigerant flowing from the condenser 11 and through the coil 14 to the evaporator 7 will be cooled. With such cooling a high degree of operating efficiency will occur. The accommodator will remain in position against any movement with respect to tube 20, not alone due to the fact that the ends of tube 14 are connected and supported by adjacent lines, but mainly because of the frictional engagement which will occur between the coil and the outer face of tube 20. That contact being relatively firm, it also follows that a maximum heat exchange will be effected between the parts.

Under conditions of service if it is necessary to replace the expansion device then all that is necessary is for the technician to close valves 12 and 13. Thereupon couplings 16 may be detached. The entire assembly carrying with it the coil 14 may now be stripped off of tube 20. Thereupon a new unit may be disposed upon the tube by simply applying pressure in an axial direction to assure what might be termed a "shove-fit." With the coupling parts 16 again connected, the valves may be opened and the servicing operation of this unit has been completed.

In the foregoing description reference has been made to tubing, lines, coils, etc. As shown in the drawings these may conveniently embrace parts of generally circular configuration. However it is apparent that other configurations might also be employed within these definitions. As afore brought out the structure of the several units might be modified in numerous particulars without departing from the spirit of the invention as defined by the claims.

Finally, and as shown especially in Fig. 5, the end of the capillary tube may be disposed within the entrance end of the evaporator 7. In that event a grommet 22 of rubber or other suitable material may be employed to support the parts with respect to the enclosing structure 5. A coupling assembly involving screw-threaded parts 23 and 25 together with an interposed packing 24 may also be provided at this point. This will assure against any leakage. In the event that a shut-off valve such as 13 is employed then it may be interposed in the capillary tube 14 at a point short of the discharge end of the latter. Of course, in the event of that end of the capillary tube being disposed as in Fig. 5 then such end is somewhat extended over the showings in Figs. 2 and 4. With a structure of this nature embodied in the assembly the point of first expansion of the refrigerant occurs well within the insulated area of the enclosure.

I claim:

1. In a refrigeration assembly in combination an evaporator embracing a hollow fluid-conducting body having intake and outlet ends, a motor-driven compressor having an inlet and an outlet, a condenser connected to the compressor outlet, a tube assembly provided with an intake and an outlet and presenting an outer unit having a projecting closed end constituting an unobstructed mounting portion, the outlet of said assembly being connected to the compressor inlet, the inlet of said assembly being connected to the outlet end of said evaporator, an expansion device comprising a coil of tubing of small cross-sectional area and also having inlet and outlet ends, the former end being connected to the condenser, the outlet end of said coil extending into the intake end of said evaporator and the body of said coil embracing the exterior face of the mounting portion of the outer unit of said assembly and being slidable in telescopic relationship therewith to be detachably mounted thereon.

2. In a refrigeration assembly in combination an evaporator embracing a hollow fluid-conducting body having intake and outlet ends, a motor-driven compressor having an inlet and an outlet, a condenser connected to the compressor outlet, a tube assembly provided with an intake and an outlet and presenting an outer unit having a projecting closed end constituting an unobstructed mounting portion, the outlet of said assembly being connected to the compressor inlet, the inlet of said assembly being connected to the outlet end of said evaporator, an expansion device comprising a coil of tubing of small cross-sectional area and also having inlet and outlet ends, the former end being connected to the condenser, the outlet end of said coil extending into the intake end of said evaporator, the body of said coil embracing the exterior face of the mounting portion of the outer unit of said assembly and being slidable in telescopic relationship therewith to be detachably mounted thereon, an insulated structure enclosing said evaporator and the outlet end of said coil being disposed within the area of said structure.

3. In a refrigeration assembly in combination an evaporator embracing a hollow fluid-conducting body having intake and outlet ends, a motor-driven compressor having an inlet and an outlet, a condenser connected to the compressor outlet, a tube assembly provided with an intake and an outlet and presenting an outer unit having a projecting closed end constituting an unobstructed mounting portion, the outlet of said assembly being connected to the compressor inlet, the inlet of said assembly being connected to the outlet end of said evaporator, an expansion device comprising a coil of tubing of small cross-sectional area and also having inlet and outlet ends, the former end being connected to the condenser, the outlet end of said coil extending into the intake end of said evaporator, the body of said coil embracing the exterior face of the mounting portion of the outer unit of said assembly and being slidable in telescopic relationship therewith to be detachably mounted thereon, couplings for removably connecting the ends of said coil with the adjacent condenser and evaporator and a sleeve movable as a unit with and enclosing and insulating said coil from the adjacent atmosphere.

4. A readily removable expansion unit for use in a refrigeration assembly having a tube providing an unobstructed mounting portion projecting from the outlet end of an evaporator, said unit comprising a capillary tube disposed in coil formation to encircle the tube portion and being slidable in telescopic relationship therewith to be detachably mounted thereon, couplings at the ends of said tube for removably connecting the same with the ends of a condenser and evaporator forming parts of the assembly and a sleeve movable as a unit with and

enclosing and insulating said coil from the adjacent atmosphere.

5. A readily removable expansion unit for use in a refrigeration assembly having a tube providing an unobstructed mounting portion projecting from the outlet end of an evaporator, said unit comprising a capillary tube disposed in coil formation to encircle the tube portion and being slidable in telescopic relationship therewith to be detachably mounted thereon, couplings at the ends of said tube for removably connecting the same with the ends of a condenser and evaporator forming parts of the assembly, a sleeve having a diameter greater than that of said tube coil and movable as a unit therewith, a layer of insulating material enclosed within said sleeve in contact with said coil and the inner edge portions of said coil being exposed on the inner face of said insulating layer for direct contact with the tube portion of said refrigeration assembly.

6. In a refrigeration assembly in combination an accumulator comprising an outer unit having one closed end and presenting an outer face providing an unobstructed mounting portion, an

evaporator discharge line extending in spaced relationship within said outer unit and terminating at a point short of the closed end thereof whereby refrigerant discharged by the evaporator line will reverse its flow within said unit and move in heat exchange contact with the inner surfaces thereof, a capillary tube disposed in coil formation to encircle said mounting portion and said tube being slidable in telescopic relationship with said mounting portion to be detachably supported thereby for removal over the closed end of said accumulator.

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