

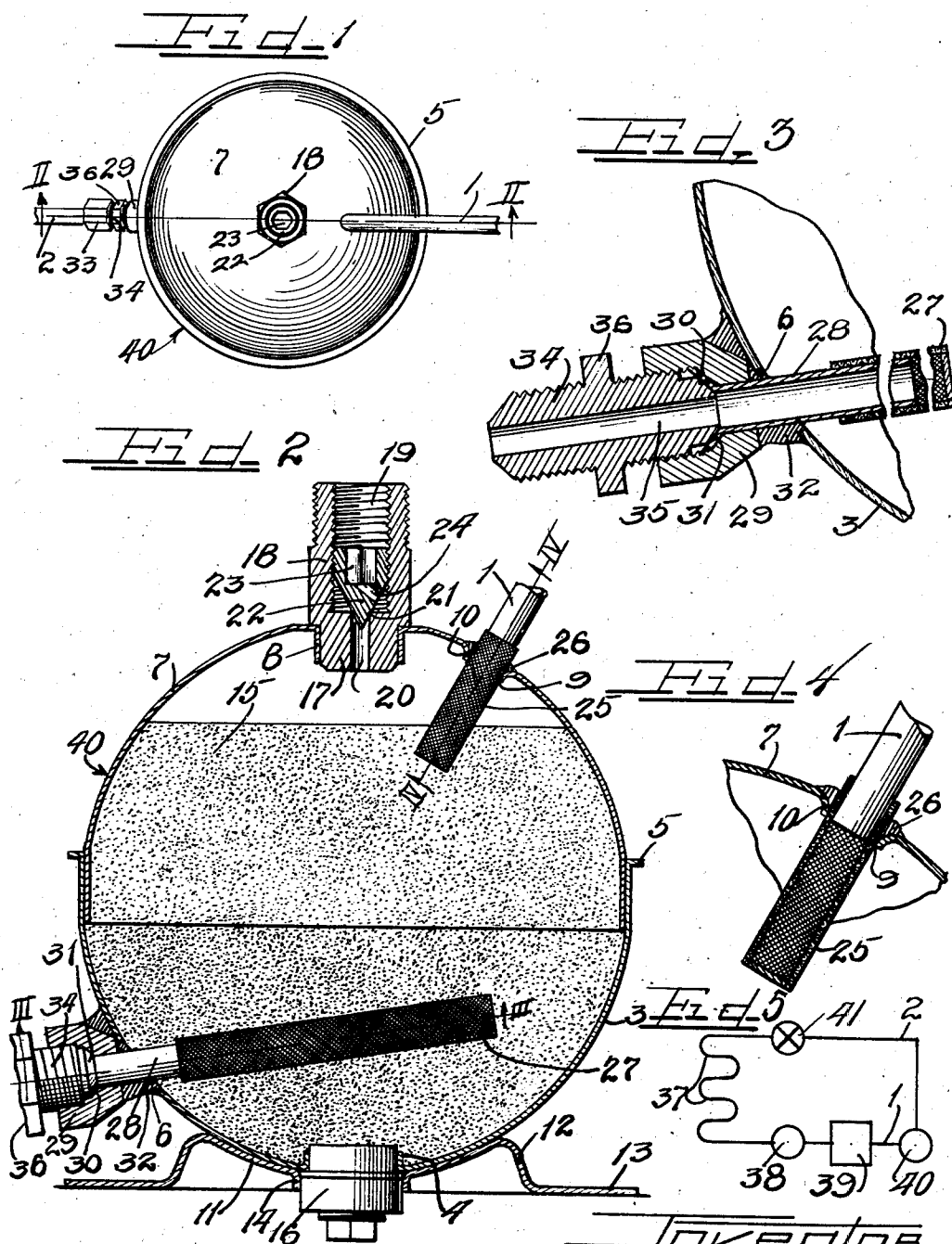
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COMBINATION RECEIVER AND DEHYDRATOR

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COMBINATION RECEIVER AND DEHYDRATOR

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This invention relates to a receiver and dehydrating means and more particularly to an improved and simplified form of a combination receiver and dehydrator unit which is particularly applicable for use in compressor-condensor-expander type refrigerator systems, using a selected kind of volatile refrigerant liquid in continuous repetitive cycles and wherein it is desirable to provide for the proper dehydrating of the refrigerant in a simple and efficient manner.

Heretofore in the various types of self-contained electric refrigerating units, of the vapor compression class, a separate receiver has frequently been used in the system following the condenser. This has been particularly true in systems employing a capillary tube for metering the refrigerant in place of an expansion valve. A separate dehydrating unit has also been employed in systems of the above type for even though the refrigerant be employed in a closed cycle, it has been found that moisture will get into the refrigerant and should be removed for most efficient operation.

One of the principal features and objects of the present invention is to combine the dehydrator with the receiver in a single compact structure.

It is a further object of this invention to provide a simple and effective type of combination liquid refrigerant receiver and dehydrator for use with a vapor compression type refrigerator system and adapted to simultaneously serve as a liquid refrigerant receiver and as a medium for screening and dehydrating the liquid refrigerant as it passes through the unit.

It is a further object of this invention to provide a refrigerator system with an improved unit connected in series with the refrigerant line and containing a dehydrating medium within a liquid refrigerant receiving chamber in which the intake and outlet for the refrigerant are screened to prevent the entrance of the dehydrating medium into the refrigerant circulating line.

Another object of the invention is to provide apparatus for and a method of dehydrating a refrigerant while it is being circulated in a repetitive cycle in a self-contained refrigerating system.

Still another object of the invention is to dehydrate and screen a liquid refrigerant while it is being conducted through a receiver connected in the refrigerant line of a refrigerating system.

The invention comprises a novel structure in a combination hereinafter described and more par-

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ticularly pointed out and defined by the appended claims.

On the drawing:

Figure 1 is a plan view of a combination receiver and dehydrator embodying the principles of this invention and adapted for connection in the refrigerant line of a vapor compression type refrigerating system or the like.

Figure 2 is an enlarged vertical detailed section taken on line II—II of Figure 1 with parts shown in elevation.

Figure 3 is a fragmentary sectional view taken on line III—III of Figure 2.

Figure 4 is a fragmentary sectional view taken on line IV—IV of Figure 2 with portions shown in elevation.

Figure 5 is a schematic diagram of a refrigerating system including a combination receiver and dehydrator.

As shown on the drawing:

This invention relates to refrigerating systems and more particularly to vapor compression types of refrigerator systems using a volatile liquid as a refrigerant in a closed circuit, the efficiency of the operation of which is increased by the use of an improved combination receiver and dehydrator, embodying the principles of this invention, and adaptable for connection in series in the refrigerant line of the system.

One type of refrigerating system in which the combination receiver and dehydrator may be used, is a self-contained electric refrigerating unit of the vapor compression type using a volatile liquid refrigerant in a closed circuit including an evaporator unit 37, a compressor 38, a condenser 39, a receiver and dehydrator unit 40 and an expansion valve 41 (Figure 5). The receiver and dehydrator 40 includes an inlet tube section 1 leading from the condenser 39 and an outlet refrigerant tube section 2 arranged to be connected to an expansion valve 41 or its equivalent.

The combination receiver and dehydrator unit as clearly illustrated in Figure 2, comprises a hemispherical base or lower body section 3 constructed of metal or other suitable material and having a filler opening in the bottom thereof surrounded by a ring or collar 4. The upper margin of the base section 3 is deflected outwardly to form a peripheral flange 5. The lower hemispherical base section 3 is also provided with an outlet opening 6. Mounted and interfitted with the lower base section 3 is a hemispherical upper or top section 7 constructed of metal or other suitable material and having an opening in the top thereof surrounded by an inwardly directed

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ring or collar 8. The upper body section 7 has the open lower portion thereof projected downwardly into the upturned lower body section 3 to form a tight fit therewith. The two body sections 3 and 7 are brazed or otherwise rigidly secured together at their overlapping portions to complete and form a spherical liquid refrigerant receiver housing or casing. The upper receiver section 7 is also provided with a liquid refrigerant inlet opening 9 surrounded by an inwardly turned ring or flange 10.

Spot welded or otherwise rigidly secured to the outer surface of the bottom receiver section 3 is a concave or cup-shaped holder 11 forming a part of a supporting base 12 formed with a supporting base plate or flange 13 upon which the unit is supported. The cup-shaped holder 11 of the supporting base is provided with a middle opening surrounded by a ring or flange 14. The opening in the holder 11 is positioned below and in axial alignment with the opening in the bottom of the receiver section 3 and said registering openings are used to permit the interior of the receiver housing or casing to be filled to about 85% of its capacity with a dehydrating element or substance 15. The dehydrating substance 15 is of a kind which will not powder; such, for example, as silica gel having a suitable grain size such as 14 to 20 mesh. After the desired amount of silica gel has been deposited in the receiver housing, the bottom openings of said receiver housing are closed by means of a plug 16 which is sealed in place.

Engaged in the top opening, formed by the collar 8 of the top section 7 of the housing, is a reduced end or base 17 which forms a part of a purge valve body or housing 18 which projects axially from the top of the housing. The purge valve housing 18 is provided with an internally threaded valve chamber 19, the lower end of which communicates with a passage 20 provided in the base 17 of the purge valve housing and in communication with the interior of the receiver housing above the top level of the silica gel contained therein. Where the upper end of the passage 20 communicates with the internally threaded valve chamber 19, a valve seat 21 is formed. A conical purge valve 22 within the purge valve housing is adapted to coact with the valve seat 21 to close the passage 20 or open the same by the rotation of the valve 22 the upper portion of which is of cylindrical form and is externally threaded as indicated in Figure 2. The valve 22 is provided with a square opening 23 for the reception of a square tool of any desired type for operating the valve. Communicating with the lower end of the square opening 23 in the valve is a valve by-pass or outlet passage 24 which is diagonally disposed and opens out through one side of the conical purge valve 22 so that when the purge valve 22 is open, bleeding of air out of the receiver housing in the refrigerant system is permitted to take place until a little of the refrigerant starts to come out, at which time the control valve 22 is again tightly closed.

The refrigerant vapor after being compressed in the compressor of the refrigerating system is advanced through the condenser where the refrigerant is liquified and then passes through the refrigerant line tube section 1 to enter the upper end of the receiver housing. Engaged on the end portion of the refrigerant tube section 1 as clearly illustrated in Figure 4, in the open end of a tubular type screen 25 constructed of

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Monel metal or the like and having the inner end thereof closed by screening or by a solid end piece. The tube 1 and the tubular entrance screen 25 are assembled after which the tubular screen 23 is inserted through the opening 9 in the top section of the receiver housing formed by the ring or collar 10. When the tubing section 1 and the screen 25 are in the position shown in the Figure 4, a solder 26 is used to solder the screen 25 to the tube section 1 and simultaneously solder the tube section 1 and the screen 25 to the upper section 7 of the receiver housing. As shown in Figure 2, the inner end portion of the entrance screen 25 projects through the space above the silica gel 15 and extends into the upper portion of the silica gel a short distance as illustrated in the figure.

This arrangement permits the liquid refrigerant from the line 1 to enter the upper portion of the receiver and dehydrating casing or housing and permits the refrigerant to pass through the screen 25 into the upper portion of the housing and into the silica gel to become dehydrated thereby.

The liquid refrigerant passing through the silica gel within the receiver housing passes downwardly and enters into a cylindrical or sleeve type outlet screen 27 constructed of Monel metal or the like. The inner end of the outlet 27 is closed by means of a screen end piece or by a solid end piece as preferred, while the opposite end of the cylindrical screen is open and is slipped over an end portion of a metal outlet tube or sleeve 28 to which it is soldered or otherwise rigidly secured. The screen 27 and the tube 28 are assembled before mounting and after an internally threaded socket 29 is slidably engaged over the tube 28 permitting a beveled internal shoulder 30 of the socket to seat on a conical flange 31 integrally formed or rigidly secured on the outer end of the tube 28 by means of solder or other suitable material. With the screen 27, the tube 28 and the socket 29 assembled as a unit the screen may be projected through the opening 6 in the lower section of the receiver housing. Solder 32 is then used to rigidly secure both the tube 28 and the socket 29 to the outer surface of the receiver housing section 3 with the solder filling the opening 6 to tightly close the joints.

As illustrated in Figure 1 the refrigerant line tube 2 is provided with the ordinary type of coupling nut 33 which is adapted to be threaded onto one end of an externally threaded union or coupling fitting 34 the opposite threaded end of which is threaded into the socket 29 rigidly secured to the receiver housing. The union or coupling 34 has the ends thereof beveled as clearly illustrated in Figure 3 so that the end of the coupling 34 which is threaded into the socket 29 seats tightly against the conical pipe flange 31 to form a tight joint so that the axial passage 35 in the union or coupling 34 completes the passage between the tube 28 and the refrigerant line tube 2. For the purpose of operating the union or coupling 34 a nut portion 36 is formed integrally on the exterior of said union between the ends thereof.

As illustrated in the drawing an improved and simplified form of combination receiver and dehydrator unit is provided and is adapted to be conveniently connected in series in the refrigerant line of a vapor compression type refrigerating system to provide a simple and efficient means for receiving the refrigerant liquid from

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the line tube section 1, leading from a refrigerating system condenser, and permitting the liquid refrigerant to enter and be stored in the receiver housing. The refrigerant stored in the receiver is now dehydrated by the action of the silica gel in the housing. The dehydrated liquid refrigerant when needed is permitted to pass from the receiver into the refrigerant line tube section 2 on its way to the expansion valve and the evaporator unit of the refrigerator system in which the combination receiver and dehydrator is connected.

During the operation of a vapor compression type refrigerating system in which the combination receiver and dehydrator unit of this invention is adapted to be used, any air which may find its way into the closed refrigerant line gradually finds its way into the space above the silica gel in the combination receiver housing. The air thus trapped in said housing may be ejected by means of the purge valve unit by opening the purge valve 22 allowing the trapped air to escape through the passage 20 and the outlet passage 24 in the valve out through the upper end of the purge valve housing 18. The purge valve 22 is closed when the trapped air has escaped and when a little of the refrigerant starts to come out.

While the valve 22 is primarily used as a purge valve, attention is called to the fact that the valve may also be used as a charging valve to permit additional refrigerant to be added to the system.

While the improved combination receiver and dehydrator has been described for use in a vapor compression type of refrigerating system it will of course be understood that the combination unit of this invention may be adaptable for other types of refrigerating systems. It is furthermore to be understood that various details of construction may be varied through a wide range without departing from the principles of this invention and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

I claim as my invention:

1. A combination refrigerant receiver and dehydrating unit connectable in the refrigerant line of a refrigerating system, said unit comprising a housing having a filler opening therein, a refrigerant dehydrating substance deposited in the housing through said filler opening, a plug means in said filler opening to tightly seal the same, a screened refrigerant intake member connected with the refrigerant line and projecting into the housing to admit a refrigerant therein to pass through said substance, a screened refrigerant outlet member in said housing and projecting from the housing, and coupling means for connecting the screened outlet member with the refrigerant line of said system.

2. In a vapor compression type of refrigerating system a combination refrigerant receiver and dehydrator unit connectable in the refrigerant line of the system, said unit comprising a housing, an air purge means on said housing, means for filling the housing, a refrigerant dehydrating compound in said housing filling the major portion thereof, tube members projecting into the housing to permit a flow of refrigerant through the housing and through the compound therein to dehydrate the refrigerant, and screens on said tube members within the housing of a mesh per-

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mitting the refrigerant to pass therethrough but preventing entrance of the compound into the refrigerant line of the system.

3. In a device of the class described for use in a refrigerating system, a combination refrigerant receiver and dehydrating unit connectable in the refrigerant line of the system, said unit comprising a housing having a filling opening therein, means for closing the opening, an air purge unit on the housing, a bed of silica gel particles filling the major portion of the housing, a screened refrigerant intake means for connection with the refrigerant line of the system, and a screened refrigerant outlet means for connection with said refrigerant line.

4. In a device of the class described for use in a refrigerating system, a combination refrigerant receiver and dehydrating unit connectable in the refrigerant line of the system, said unit comprising a housing, a bed of silica gel particles filling the major portion thereof, a screened refrigerant intake means for connection with the refrigerant line of the system, a screened refrigerant outlet means for connection with said refrigerant line, and an air purge valve means on said housing above the silica gel and operable to permit the escape of air from the housing.

5. In a refrigerator system using a volatile liquid refrigerant, a combination refrigerant receiver and dehydrator unit comprising a closed housing, a screened refrigerant intake means connected in the refrigerant line of the system and projecting into the housing, a screened refrigerant outlet means in the housing and connected in the refrigerant line of said system, a refrigerant dehydrating element in said housing and having a grain mesh size preventing entrance of the element into the screened intake means and into the screened outlet means, and an air purge valve unit in the housing for permitting the discharge of air therefrom.

6. In a refrigerator system using a volatile liquid refrigerant, a combination refrigerant receiver and dehydrator unit comprising a closed housing having a filling opening therein, a purge valve on the housing, a screened refrigerant intake means connected with the refrigerant line of the system and projecting into the housing, a screened refrigerant outlet means in the housing and connected with the refrigerant line of said system, a refrigerant dehydrating element in said housing and having a grain mesh size preventing entrance of the element into the screened intake means and into the screened outlet means, and means for closing the housing opening after the refrigerant dehydrating element has been deposited in the housing.

7. In a refrigerator system using a volatile liquid refrigerant, a combination refrigerant receiver and dehydrator unit comprising a closed housing, a refrigerant intake means connected with the refrigerant line of the system and with the housing, a refrigerant outlet means connected with said housing and with the refrigerant line of said system, a refrigerant dehydrating element in the housing and having a grain mesh size preventing entrance of the element into the intake and outlet means, and a charging valve in the housing for the addition of refrigerant to the system.

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