Jan. 11, 1944. C. C. MELKE 2,338,953

REFRIGERATING APPARATUS

Filed Aug. 27, 1942

Fig. 1

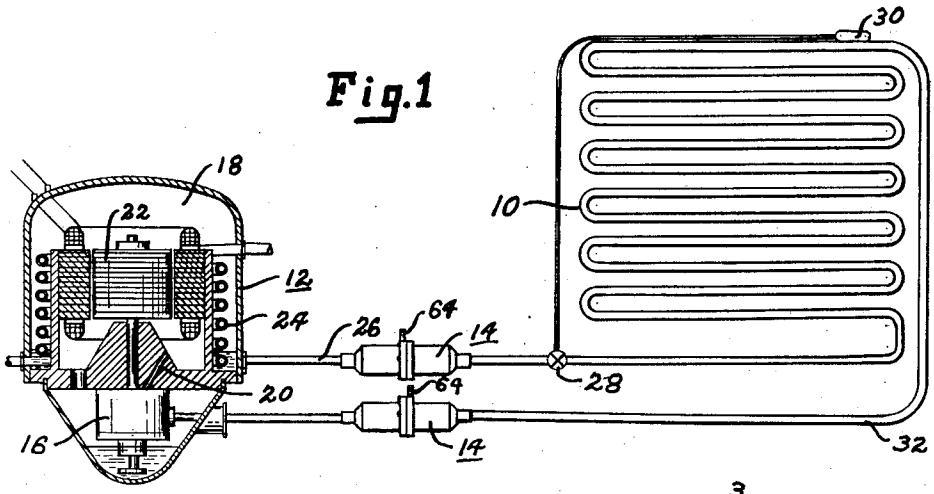
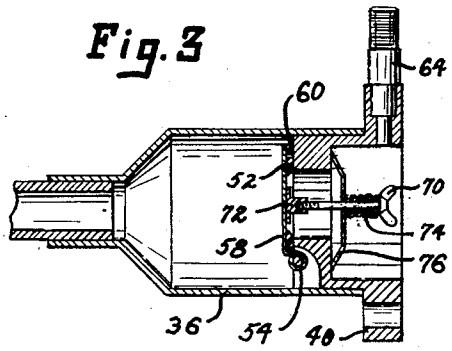



Fig. 3



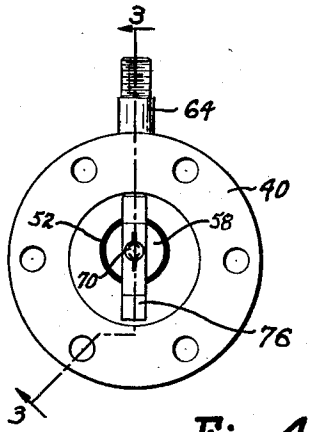
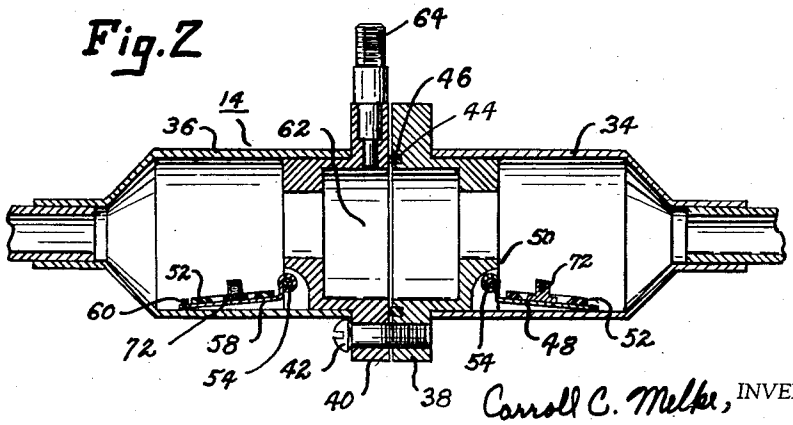




Fig. 4

Fig. 2




Carroll C. Melke, INVENTOR.

BY Spencer, Hardman & Fehr, attorneys.

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2,338,953

## REFRIGERATING APPARATUS

Carroll C. Melke, Dayton, Ohio, assignor to General Motors Corporation, Dayton, Ohio, a corporation of Delaware

Application August 27, 1942, Serial No. 456,326

6 Claims. (Cl. 62—115)

This invention relates to refrigerating apparatus and more particularly to an improved arrangement for connecting an evaporator to a refrigerant liquefying apparatus.

Experience has shown that refrigerating systems which are completely assembled and charged with refrigerant and lubricant at the factory give far less trouble than those systems which are assembled and charged with refrigerant at the point of use. In order to overcome the disadvantages resulting from assembling and charging the systems away from the factory, it is an object of my invention to provide an improved refrigerant line coupling provided with valves which are arranged so that it is possible to charge the refrigerating apparatus with the proper amount of lubricant and refrigerant at the factory even though the elements of the refrigerating system are not all connected together before leaving the factory. My invention is particularly useful in a system of the type wherein the motor, compressor and condenser are all mounted within a single casing and are shipped separately from the evaporator.

One object of this invention is to provide a refrigerant line connecting means which has incorporated therein a pair of inexpensive valves which serve to close the broken ends of the refrigerant lines during shipment.

Another object of this invention is to provide an improved dual valve coupling wherein the valves are inexpensive check valves which may be positively held closed during shipment.

Still another object of this invention is to provide an improved arrangement for opening a pair of oppositely disposed check valves placed within a refrigerant line.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing, wherein a preferred form of the present invention is clearly shown.

In the drawing:

Fig. 1 is a diagrammatic view, partly in section, of a refrigerating system embodying my invention;

Fig. 2 is a sectional view showing a dual valve coupling unit for connecting refrigerant lines.

Fig. 3 is a sectional view taken on line 3—3 of Fig. 4 showing one of the valves held in the closed position for shipping purposes.

Fig. 4 is an elevational view of the unit shown in Fig. 3.

Referring now to Fig. 1 of the drawing, I have shown a refrigerating system of the type comprising a conventional evaporator unit 10 connected to a sealed motor-compressor-condenser unit 12 by means of a pair of coupling elements generally designated by the reference numeral 14. The motor-compressor-condenser unit 12 comprises a conventional rotary compressor 16 which discharges compressed refrigerant into the compartment 18 through the passage 20. A motor 22 is disposed within the chamber 18 and serves to drive the compressor 16 in accordance with well known practice.

A water coil 24 is disposed within the chamber 18 and serves to cool and condense the refrigerant vapor discharged into the chamber 18 by the compressor 16. The liquefied refrigerant leaves the unit 12 through the liquid line 26 in which a coupling 14 is located. The flow of refrigerant to the evaporator is controlled by a conventional thermostatic expansion valve 28 which includes the thermostatic bulb 30 located adjacent the outlet of the evaporator in accordance with well known practice. The refrigerant vapor flows from the evaporator 10 to the compressor 16 through the line 32 in which a second coupling 14 is located.

In Fig. 2, I have shown a sectional view of the coupling 14 on an enlarged scale so as to more clearly show the construction of the valve units which make up the coupling. Reference numeral 34 designates one valve unit which may be connected to the end of one refrigerant line and reference numeral 36 designates another valve unit which may be connected to the end of another refrigerant line. For purposes of illustration, the units 34 and 36 have been shown as provided with flange portions 38 and 40 respectively which may be held together by means of a plurality of machine screws 42. Obviously, any other suitable means may be provided for holding the units 34 and 36 together without departing from the spirit of my invention. The flange portion 38 is provided with a circular groove 44 in which a gasket element 46 is provided. The gasket 46 serves to provide a refrigerant tight joint between the flanges 38 and 40. The gasket 46 as well as the other gaskets referred to hereinafter may be made of any rubber-like material which is unaffected by the refrigerant and lubricant used within the system. "Neoprene" or "duprene," for example, may be used for the gasket material.

Reference numeral 48 designates a movable check valve element which is adapted to seat against the valve port 50 when in the closed position. The check valve 48 is provided with a gasket 52. Reference numeral 58 designates a mov-

able check valve element which is similar to the element 48 in all respects except that it is provided with a resilient pad 60 which is slightly thicker than the gasket 52. Each of the valves 48 and 58 is pivotally mounted by means of a pin 54 carried by the main valve frame. By virtue of the above described arrangement, the evaporator unit, for example, may be shipped separately from the rest of the system and each part of the system may be properly purged and charged with refrigerant at the factory prior to shipment and then connected together at the point of use without danger of contaminating the interior of the refrigerant circuit and without disturbing the refrigerant charge. The check valves hold the ends of the refrigerant lines closed prior to assembly of the coupling elements.

After the coupling elements 14 have been assembled and the bolts 42 have been properly tightened, the cavity 62, which is formed between the valves 48 and 58, is purged in accordance with well known purging methods and a small charge of liquid refrigerant is introduced into the cavity through the valve stem assembly 64. The valve stem assembly 64 is similar in construction to the well known valve stem assemblies commonly used on automobile tires and needs no further description. As the liquid refrigerant in the cavity 62 vaporizes, a pressure will be built up in the cavity sufficient to force at least one of the check valves into the open position. Since the valve 58 is provided with a resilient pad 60 which is slightly thicker than the gasket 52, it is apparent that the valve 58 is biased towards the open position whereby a smaller pressure differential is required to open this valve than valve 48.

Referring now to Fig. 1, it is obvious that the coupling which is provided in the refrigerant line leading to the evaporator must be arranged so that the check valve facing the compressor will open first since operation of the compressor will tend to build up a pressure sufficient to open the check valve movable away from the compressor outlet. Again referring to Fig. 1, it is apparent that the coupling provided in the line 32 should have the check valve which is disposed towards the evaporator open first since if this valve is opened, the other will eventually open during the normal operation of the refrigeration system. Once the valves have been opened and the refrigerating system has been placed in operation, the valves will remain permanently open. For purposes of illustration, the check valves have been shown of the type which are held open by gravity. When using valves of this type, it is important that the pivots 54 are disposed towards the bottom so that the valves will tend to remain open after once having been opened.

By placing a portion of the refrigerant charge within the motor-compressor-condenser unit 12 and the remainder within the evaporator unit 10, the refrigerant pressures may be maintained above normal atmospheric pressure within each unit, whereby the check valves will be held closed without the aid of any external means for holding the valves closed. However, experience has shown that the rough handling given apparatus of this type during shipment is sufficient at times to jar open one of these valves, and for that reason, I have provided a thumb screw 70, as shown in Fig. 3, for holding the check valve closed during shipment. This thumb screw is provided with a threaded end which is threaded into an adapter 72 carried by the check valve. A spring 74 surrounds the shank of the screw 70 and is disposed between the head of the screw and a bracket element 76 which is disposed as shown in Figs. 3 and 4. By virtue of this arrangement, the check valves may be positively held in closed position during storage and transit. Prior to connecting the units 34 and 36 together, the thumb screws 70, springs 74 and brackets 76 are removed so that the valves are free to open in response to the proper pressure differential which may be produced in the manner explained hereinabove.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. In a refrigerating system, a compressor, a condenser, an evaporator, refrigerant lines connecting said compressor, condenser and evaporator, a coupling for said lines having first and second units connected together, a check valve in each of said coupling units, and means for introducing refrigerant under pressure into the space formed between said check valves so as to force at least one of said check valves open.

2. Means for connecting one portion of a refrigerating system containing a charge of refrigerant to another portion of a refrigerating system containing a charge of refrigerant which comprises in combination, a pipe coupling having a first check valve adapted to be connected to the one portion of the refrigerating system and having a second check valve adapted to be connected to the other portion of the refrigerating system, and means for introducing refrigerant under pressure intermediate said valves so as to force at least one of said valves open.

3. Means for connecting one portion of a refrigerating system containing a charge of refrigerant to another portion of a refrigerating system containing a charge of refrigerant which comprises in combination, a pipe coupling having a first check valve unit adapted to be connected to the one portion of the refrigerating system and a second check valve unit adapted to be connected to the other portion of the refrigerating system, means for securing said first valve unit to said second valve unit, means for introducing refrigerant under pressure intermediate the valves of said units, and means for biasing one of said valves towards open position independent of any fluid pressure difference.

4. Means for connecting one portion of a refrigerating system containing a charge of refrigerant to another portion of a refrigerating system containing a charge of refrigerant which comprises in combination, a pipe coupling having a first valve unit adapted to be connected to the one portion of the refrigerating system and a second valve unit adapted to be connected to the other portion of the refrigerating system, means for securing said first valve unit to said second valve unit, and means for introducing refrigerant under pressure intermediate the valves of said units, one of said valves being so constructed and arranged as to open at a lower pressure than the other of said valves.

5. In a pipe coupling, a first coupling element, a second coupling element, means for holding said first and second coupling elements together, a valve in said first coupling element, a valve in said second coupling element, at least one of said valves being a fluid pressure operated valve, and means for building up a fluid pressure

between said valves for opening said one of said valves.

6. In combination with a fluid line in which the fluid normally flows in one direction only, a pressure operated check valve in said line normally held open by gravity but arranged to be held in the closed position by the fluid when placed in closed position, means for opening said check valve including a second valve disposed down stream from said check valve, and means for introducing fluid under pressure between said valves so as to build up a pressure between said valves sufficient to open said check valve.

CARROLL C. MELKE.