Oct. 12, 1948. L. S. COOPER 2,451,072

REFRIGERATING SYSTEM HAVING THERMOMETER-RECEIVING WELL AT THE EVAPORATOR INLET AND OUTLET

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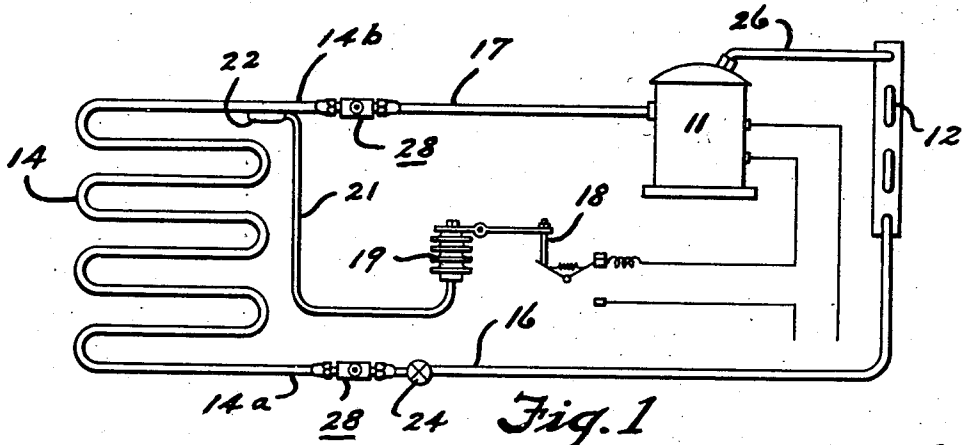


Fig. 1

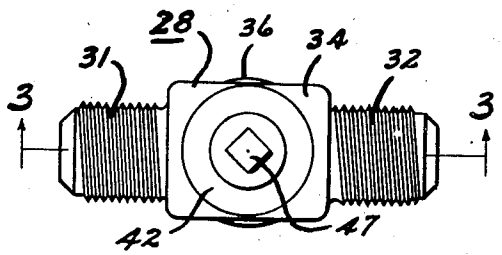


Fig. 2

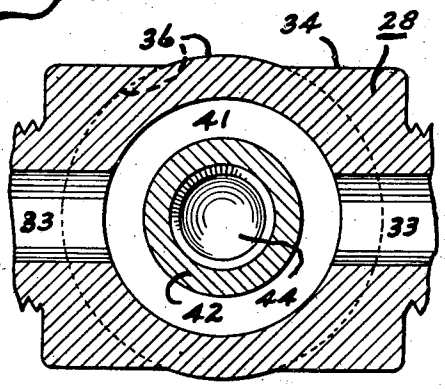


Fig. 4

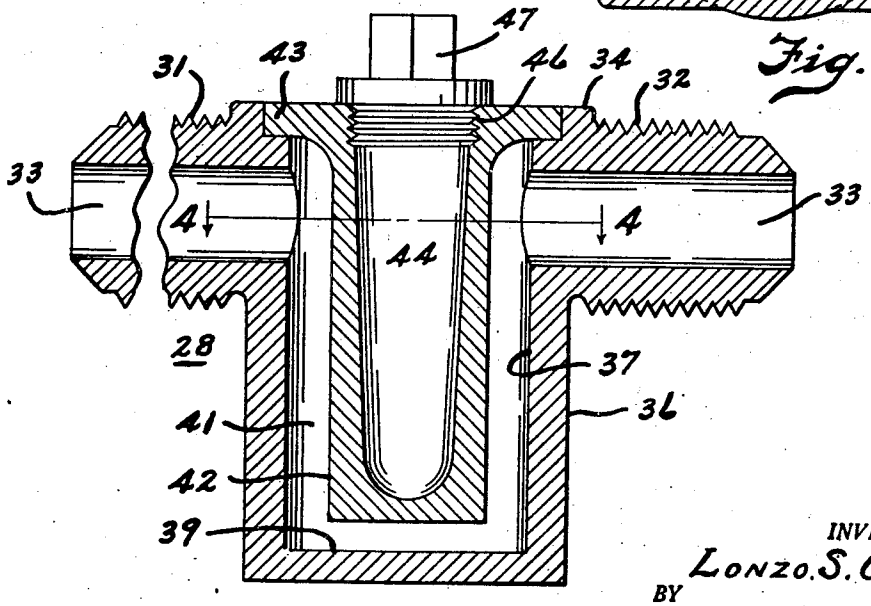


Fig. 3

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REFRIGERATING SYSTEM HAVING THERMOMETER-RECEIVING WELL AT THE EVAPORATOR INLET AND OUTLET

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1 Claim. (Cl. 62—115)

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This invention relates to refrigerating systems and particularly to refrigerating systems of the direct expansion type.

In a refrigerating system where refrigerant is expanded through a series conduit evaporator or cooling element it is frequently desirable, particularly in commercial installations, to obtain exact indications of the temperature of refrigerant entering the evaporator and of that leaving the evaporator in order to determine the work being done by the evaporator so as to properly set or adjust the expansion valve. Makeshift arrangements have heretofore been employed to determine such indications and, for example, a thermometer has been secured to the inlet and outlet conduit ends of evaporators by spring clips or by taping the thermometers in contact therewith. In such practice the temperature of the refrigerant flowing through the evaporator has not been determined exactly because the thermometer was affected by the temperature of ambient air. Refrigerating systems ordinarily have a coupling at the inlet and outlet ends of the evaporator to which the conduits connecting same with a refrigerant translating device are attached. I contemplate the use of couplings for this purpose which are provided with means forming a well therein for receiving a thermometer from exteriorly thereof whereby a substantially true or exact indication of the temperature of refrigerant flowing into and out of the evaporator may be obtained.

An object of my invention is to provide an improved refrigerating system particularly of the direct expansion series refrigerant flow evaporator type.

Another object of my invention is to provide in elements ordinarily included in refrigerating systems a means for obtaining substantially true or exact temperatures of refrigerant entering the evaporator and of that leaving the evaporator.

In carrying out the foregoing objects it is still a more specific object of my invention to provide a refrigerating system with means for receiving a thermometer and which means protects the thermometer from temperatures of ambient air so as to obtain an exact indication of the temperature of refrigerant flowing into and out of the evaporator of the system.

Further objects and advantages of the present

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invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form is clearly shown.

In the drawings:

Fig. 1 is a diagrammatic showing of a refrigerating system having my invention embodied therein;

Fig. 2 is a top view of a coupling employed in the refrigerating system shown in Fig. 1 and constructed in accordance with my invention;

Fig. 3 is an enlarged vertical sectional view of the coupling shown in Fig. 2 and is taken on the line 3—3 thereof; and

Fig. 4 is a fragmentary horizontal sectional view of the coupling taken on the line 4—4 of Fig. 3.

Referring to the drawings, for illustrating my invention, I have shown in Fig. 1 thereof a closed refrigerating system of the direct expansion series refrigerant flow evaporator type. This system includes a refrigerant translating device including a motor-compressor 11, a condenser 12 and an evaporator or cooling element 14. The evaporator 14 is of the series flow conduit type and may, if desired, be provided with a plurality of metal cross fins to augment the cooling effect produced thereby in any suitable compartment to be cooled. A conduit 16 establishes communication between the translating device or condenser 12 and the inlet end 14a of evaporator 14. Another conduit or pipe 17 establishes communication between the translating device or motor-compressor 11 and the outlet end 14b of the evaporator 14. In order to intermittently operate the motor-compressor 11 a snap switch 18 may be interposed in the power line leading to the motor. The switch 18 includes a diaphragm or bellows 19 which is connected, by a pipe or conduit 21, to a bulb 22 secured in intimate thermal contact with the outlet conduit end 14b of evaporator 14. Bellows, 19, pipe 21 and bulb 22 form a closed circuit which contains a volatile fluid capable of causing expansion and contraction of bellows 19 for actuating switch 18 to control cyclic operations of the motor-compressor 11 in response to temperature changes at the outlet end 14b of evaporator 14 as it is well known and conventional in the art. A pressure responsive expansion valve 24 is interposed in the con-

duit 16 adjacent the refrigerant inlet end 14a if the evaporator 14 to control or regulate the amount of liquid refrigerant to be admitted to the evaporator 14 as is also conventional in the art. Operation of motor-compressor 11 of the refrigerant translating device withdraws gaseous or evaporated refrigerant from evaporator 14 through conduit 17 and causes this refrigerant to be compressed and circulated, through a conduit 26, into the condenser 12 where the compressed refrigerant is cooled and liquefied in any suitable or desirable manner. Liquefied refrigerant is directed through conduit 16, under control of valve 24, into the evaporator 14. The evaporator 14 upon absorbing heat, from within a compartment in which it is located, causes refrigerant therein to vaporize and this evaporated refrigerant is returned to the translating device when the motor-compressor 11 operates. Systems of the type disclosed ordinarily have couplings interposed therein for connecting the inlet end 14a of evaporator 14 to conduit 16 and for connecting the outlet end 14b of the evaporator to conduit 17. In the present disclosure such couplings are indicated generally by the reference character 28.

In accordance with my invention the couplings 28 of the present disclosure are of unique design in order to enable the accomplishment of the preceding objects. For example, the coupling 28 is of substantially T-shape and includes threaded ends 31 and 32 adapted to receive flare nuts on the conduit end 14a or 14b of evaporator 14 and flare nuts on the end of conduit 16 and conduit 17 respectively. The T-shaped coupling casting 28 is hollowed out as at 33 to provide a passage or path of flow for refrigerant through the same. The main body portion of coupling casting 28 consists of a rectangular upper part 34 and a rounded depending part 36 (see Fig. 4). A bore 37 extends from the top of the coupling 28 down to a point near the bottom wall 39 (see Fig. 3) of the rounded part 36 thereof to provide a chamber 41 within the coupling. Means in the form of a hollow plug 42, having a flange 43 welded or otherwise suitably secured to the top portion 34 of coupling 28, closes the chamber 41 and seals the refrigerant passage 33 extending through the coupling. Plug 42 has its outer cylindrical wall spaced from wall 37 of the chamber 41 to permit refrigerant to flow through the passage 33 from one side of coupling 28 to the other side thereof. Thus it will be noted that plug 42 is disposed in the path of flow of refrigerant passing through coupling 28 and that the refrigerant may flow entirely around same. Plug 42 is hollowed out as at 44 to form a well for the reception of a thermometer as will be more fully described hereinafter. Such a thermometer may be of the glass pocket type well known to refrigeration servicemen and ordinarily carried by them. The walls of well 44 are tapered outwardly from the bottom to the top thereof and these walls are threaded as at 46 to receive a threaded closure cap 47.

In the use of a refrigerating system of the type disclosed and particularly commercial installations, it frequently becomes necessary or desirable to determine the efficiency of or the work being done by the evaporator. Such systems are usually provided with some sort of a coupling in order to connect the refrigerant conduits to the evaporator and by employing a coupling of the type herein disclosed the task of obtaining readings of the temperatures of refrigerant entering and of

that leaving evaporator 14 is simplified and, in addition, a more accurate temperature reading is obtained. When the serviceman is desirous of determining the temperature of refrigerant flowing through the evaporator 14 the cap 47 on coupling or couplings 28 is removed and the well 44 is partially filled with a non-freezable fluid such as glycerine or oil. After a few minutes of operation of the system, to bring the temperature of the fluid placed in well 44 substantially to that corresponding to the temperature of refrigerant flowing through the coupling 28, a thermometer is inserted into the well. The walls of well 44 being disposed in the path of flow of refrigerant through the coupling 28 causes the refrigerant to flow around and in intimate thermal contact with the plug means 42. The temperature of the refrigerant is conducted through the metal walls of well 44 and through the body of liquid therein to the thermometer placed in the well. In actual practice the reading registered on the thermometer inserted in a coupling of the type herein disclosed has been found to be within a degree or two of the exact temperature of the refrigerant. Thus the serviceman is enabled to quickly obtain the temperatures he desires to carry out calculations as to the efficiency of or work being done by the evaporator of a refrigerating system. The expansion valve 24 may be adjusted or regulated while the temperatures on the thermometer are being noted to change the amount of refrigerant flowing through evaporator 14 in accordance with the serviceman's calculations. After such readings are obtained and after the valve 24 has been adjusted the cap 47 may be replaced upon a coupling 28 to seal the liquid within the well 44 for future similar use. Should replacement of cap 47 be forgotten no breakage or damage will occur to the coupling 28 by virtue of water entering the well during defrosting of the evaporator. As before stated I provide the well with outwardly tapering walls and any water, which might become trapped in the thermometer well, will upon freezing therein be caused to expand in a direction outwardly of the well along its tapered walls to thus avoid breaking or cracking of the walls of plug means 42.

From the foregoing it will be seen that I have provided an improved refrigerating system wherein the improvement embodied therein is particularly useful in normal periodic checking or when trouble arises in the operation of the system. By providing the improved coupling of the type having a thermometer receiving well therein the thermometer inserted in the well is not affected by ambient air temperatures and the serviceman is enabled not only to more quickly ascertain the temperature of refrigerant flowing through the evaporator but also ascertains substantially the exact temperature of the refrigerant. This is of paramount importance in correcting expansion valve and switch settings in a refrigerating system and particularly in systems employed to preserve highly perishable food products, drugs or serums.

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, as may come within the scope of the claim which follows.

What is claimed is as follows:

A closed refrigerating system comprising in combination, a refrigerant translating device, a cooling element having a refrigerant inlet and a refrigerant outlet, a conduit establishing communication between said device and the inlet of said

element and a conduit establishing communication between said device and the outlet of said element, a coupling connecting said first named conduit to said cooling element, a coupling connecting said second named conduit to said cooling element, and each of said couplings having means disposed in the path of flow of refrigerant therethrough and forming a well adapted to receive a thermometer from exteriorly of said couplings for indicating the temperature differential between refrigerant entering and refrigerant leaving said cooling element.

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The following references are of record in the file of this patent:

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