

[54] **DEVICE FOR SERVICING
REFRIGERATION SYSTEMS**

[72] Inventor: Clarence C. Rawlins, 25 Indian Trail, Barrington, Ill. 60010

[22] Filed: Apr. 17, 1970

[21] Appl. No.: 29,614

[52] U.S. Cl.: 251/148, 251/291, 137/322, 62/292

[51] Int. Cl.: F16k 31/50, F25b 45/00

[58] Field of Search: 251/148, 151, 152, 291, 292, 251/215; 137/317, 319, 320, 322, 228, 229; 62/292, 298, 299

[56] **References Cited**

UNITED STATES PATENTS

2,320,042 5/1943 McMahan.....137/319

2,765,806	10/1956	Webster.....	137/322
1,703,311	2/1929	Litle, Jr.	62/299
1,830,894	11/1931	Ullstrand et al.....	137/319 X
2,614,400	10/1952	May.....	62/292
3,424,181	1/1969	Morse.....	62/292 X

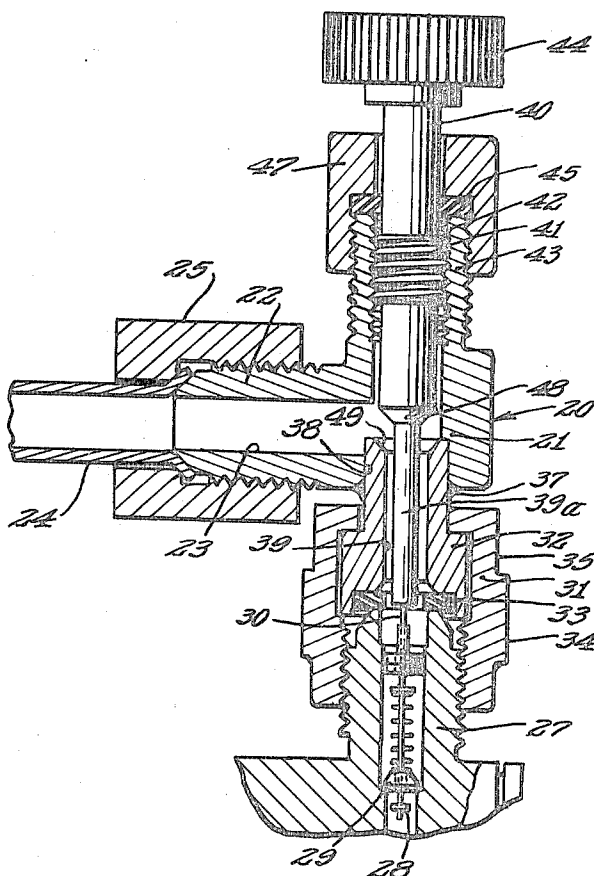
Primary Examiner—William R. Cline

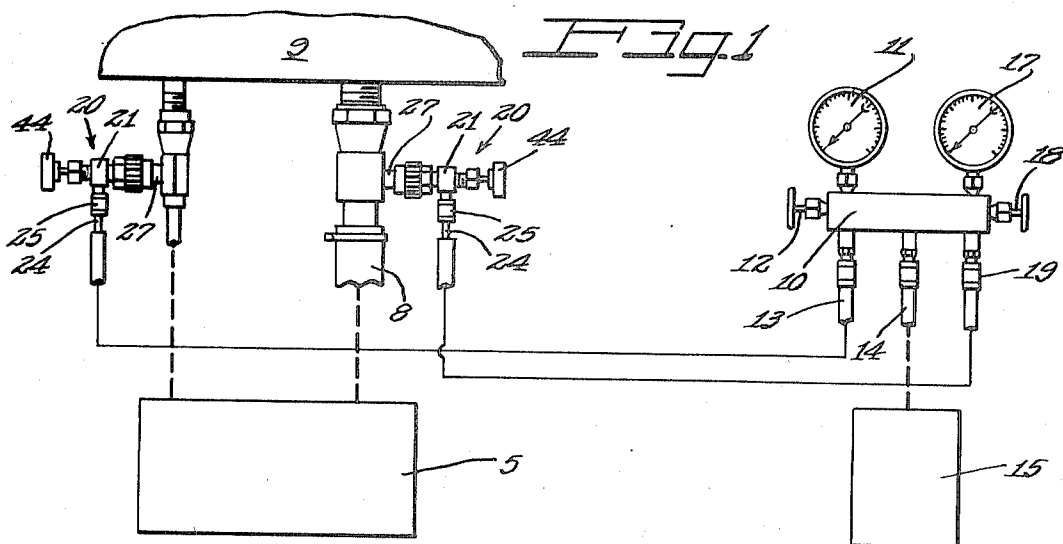
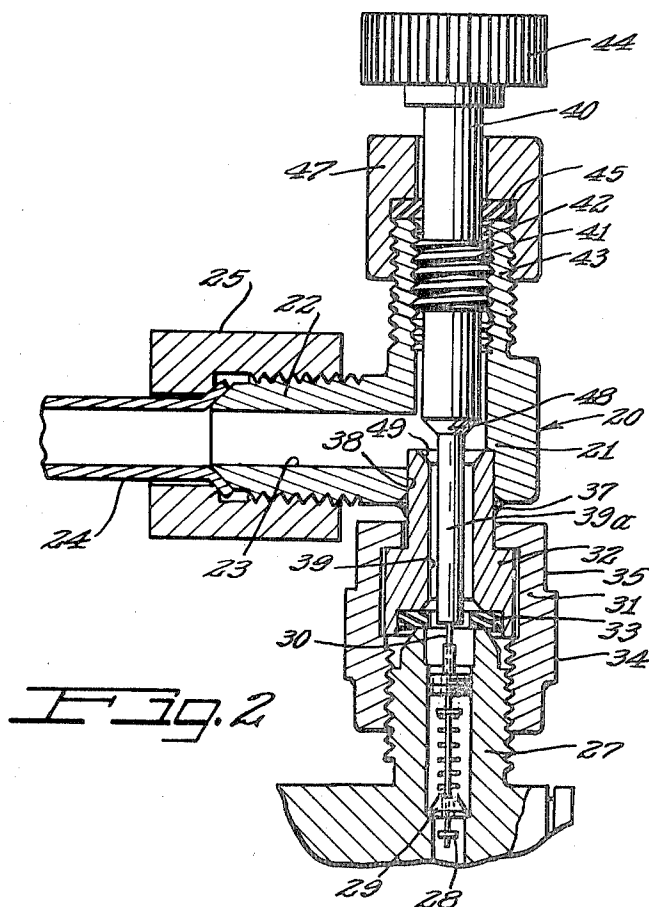
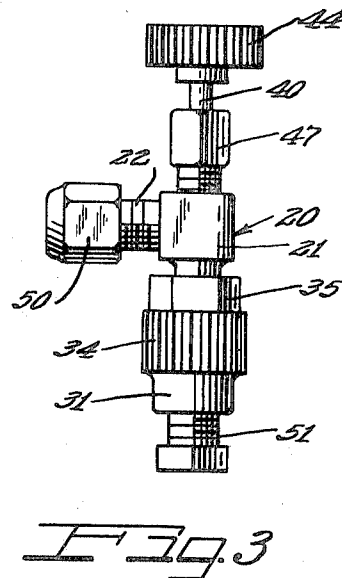
Attorney—Hill, Sherman, Meroni, Gross & Simpson

[57] **ABSTRACT**

A device for servicing refrigeration systems of refrigerators and air conditioners, which involves the use of a novel coupling facilitating connection of testing or refilling equipment to the liquid refrigerant supply line and the suction line in the system, without escape of refrigerant.

5 Claims, 3 Drawing Figures





INVENTOR.

Clarence C. Rawlins

BY *Hill, Sherman, Benson, Chas. & Angell* ATTORNEYS

DEVICE FOR SERVICING REFRIGERATION SYSTEMS

This invention relates to the art of servicing refrigeration systems utilizing compressible evaporative fluid refrigerant, and is more particularly concerned with a device by which such servicing is facilitated.

As referred to herein "refrigeration system" is intended to mean any system in which a compressible evaporative fluid is employed to remove heat from an enclosed space, including without limitation refrigerators for preserving perishables and air conditioners. In the servicing of such systems, it becomes necessary to test the refrigerant line pressure and also to supply the line with additional or makeup refrigerant if necessary. For this purpose, the refrigerant lines may be equipped with one or more access connections having nipples to which testing or supply lines are adapted to be coupled and which are equipped with normally closed, depressibly operable valves. In the course of attaching the testing or supply lines to or removing them from such connections it has heretofore been common experience that substantial volume of refrigerant would escape as a result of depressing and opening of the respective valves during attachment and before the couplings could be tightened, and during detachment before the couplings could be removed. In addition to disadvantages of refrigerant loss, the escaping refrigerant produced a dangerous environmental condition with liability of injury to servicemen's hands due to contact with the couplings chilled to below freezing temperature, or due to direct impingement by the escaping refrigerant gas or liquid.

According to the present invention the foregoing and other disadvantages, shortcomings, difficulties, inefficiencies and problems are overcome by providing a new and improved device for servicing refrigeration systems efficiently without detrimental refrigerant loss and with perfect safety.

An object of the invention is to provide a new and improved device for servicing refrigeration systems without loss of refrigerant.

A further object of the invention is to provide new and improved means in servicing equipment for refrigeration systems enabling attachment of servicing lines without loss of refrigerant.

Still another object of the invention is to provide new and improved safety coupling means for safely and efficiently connecting a servicing line such as a testing line or a refrigerant supply line to a refrigeration system having a connection provided with a depressible normally closed valve.

Other objects, features and advantages of the invention will be readily apparent from the following description of a preferred embodiment thereof, taken in conjunction with the accompanying drawing, although variations and modifications may be effected without departing from the spirit and scope of the novel concepts embodied in the disclosure, and in which:

FIG. 1 is a schematic illustration of a refrigeration system and servicing equipment;

FIG. 2 is an enlarged vertical sectional detail view through a safety coupling device embodying features of the invention and employed in connecting the test equipment to the refrigeration system; and

FIG. 3 is a side elevational view of the safety coupling showing the same in idle condition.

On reference to FIG. 1 a refrigeration system is schematically depicted in which an evaporator 5 is operatively connected through a liquid refrigerant supply line or duct 7 and a gaseous refrigerant return or suction line or conduit 8 with a compressor and condenser assembly (not shown) within a housing 9. This provides a closed circuit in which a liquifiable and evaporable refrigerant such as Freon is circulated through the evaporator in a well-known manner. Inasmuch as such a refrigeration system must be maintained in a fairly delicate balance for highest efficiency, it is advisable to test the system from time to time to determine that the charge of refrigerant is in proper volume as reflected by pressure in the liquid supply line. If there appears to be need for replenishing or augmenting the refrigerant charge, additional refrigerant is then delivered to the system from a supply source.

To enable a serviceman to test and supply the refrigeration system conveniently a portable apparatus may be used including a manifold 10 mounting a line pressure testing gauge 11 adjacent to a valve having a handle 12 and adapted to be placed in communication with the liquid refrigerant duct 7 by means of a connecting line or duct 13. Means are also provided by the manifold 10 for recharging or supplying makeup refrigerant to the refrigeration system, and comprising a duct 14 connected to or arranged to be connected to a liquid refrigerant supply container 15 and communicating through the manifold 10 and past a pressure gauge 17 and under the control of a valve operated by a handle 18 with a refrigerant supply duct 19 adapted for connection with the refrigeration system and more particularly the suction duct 8 thereof.

According to the present invention, a respective safety coupling 20 is provided for connecting each of the pressure testing duct 17 and the supply duct 19 with the respective refrigeration system ducts 7 and 8. As best seen in FIG. 2, each of the couplings 20 comprises a body 21 having thereon an externally threaded nipple 22 which has a bore 23 adapted to be placed in liquid flow communication with a flared tubular metal terminal 24 of the duct 13 or 19, as the case may be, detachably secured in fluidtight relation to the nipple by means of a coupling nut 25.

Also carried by the body 21 are means for effecting communication with a valved access nipple 27 extending from the respective fitting of the refrigerant line 7 or the suction line 8, and more particularly the fitting by which such line is connected to the compressor/condenser unit within the housing 9. Escape of refrigerant from within the fitting through the nipple 27 is normally prevented by a check valve 28 which is normally spring biased outwardly into closing relation to a generally inwardly facing valve seat 29 and has an outwardly extending rod or stem 30 which is adapted to be depressed inwardly to unseat the valve when desired. Externally the nipple 27 is threaded to be received within a coupling nut 31 rotatably engaged upon a shouldered tubular base extension 32 having recessed into its outer end a sealing gasket or ring 33 which effects a sealed joint between the end of the nipple 27 and the base 32 when the nut 31 is threaded onto the nipple and draws the base tightly toward the end of the nipple. To facilitate both manual and wrench manipulation of the nut 31, it is desirably provided with an annular knurled surface area 34 and a wrench face area 35. To facilitate assembly, the base 32 is desirably formed separate from the body 21 and provided with a reduced diameter tubular extension 37 secured as by means of brazing into a bore 38 in the body with the inner end of the extension opening into and effecting communication between a bore 39 therein and the bore 23. Through this arrangement, the coupling assembly 20 is adapted to effect a sealed communicating connection between the associated refrigerant line terminal 24 and fitting nipple 27.

In order to enable the coupling assembly 20 to be operated to tap the associated refrigerant line, means are provided including a manually operable depressor comprising a plunger 39a of smaller diameter than and extending reciprocally coaxially in the bore 39 in alignment with the valve stem 30 when the coupling has been attached to the nipple 27. For moving the plunger 39a between valve stem depressing and inactive positions within the coupling assembly, it is preferably constructed and arranged as a rigid inward extension from a rotary shaft 40 having a threaded area 41 operatively engaged within a tapped bore 42 of a tubular extension 43 on the body 21 coaxially aligned with the base extension 37. By turning the shaft 40 as by means of a handwheel or manipulating head 44 on its outer end, the shaft and thereby the plunger 39a can be run inwardly or outwardly relative to the coupling body. Leakage past the shaft is prevented by means of a packing 45 compressed thereabout and against the outer end of the extension 43 by a packing nut 47 screwed onto external threads of this extension.

To facilitate assembly and operation, the shaft 40 is of substantially larger diameter than the plunger 39a, and a stepped

juncture face 48 is present where they join. This juncture 48 faces toward and is amply separated from an inner end face 49 on the base extension 37 about the opening from the bore 39 and through which the plunger 39a extends to assure free flow of refrigerant past the gap between the faces 48 and 49 when the plunger is operated to open the valve 28.

Inasmuch as the test lines 13 and 19 may have to be connected to refrigeration system lines that are not equipped with depressible stem valves, and it is highly desirable to maintain the interior of the coupling assembly 20 perfectly clean and avoid any foreign matter getting therein when it is not in use on the respective test line, the opposite ends of the passage through the coupling assembly should be closed. For this purpose, as best seen in FIG. 3, the coupling assembly 20 is provided with a screw-on closure cap 50 removably threaded onto the coupling nipple 22. In addition, a screw-in plug 51 is desirably removably threadedly engaged in the coupling nut 31 and may be driven against the sealing ring 33 to maintain perfect closure. In fact, the plug 51 may be used to close the opening into the coupling assembly through the nut 31 during inactive condition of the coupling assembly even though it remains attached to the selected test equipment conduit 13 or 19.

Assuming that it is desired to test and, if necessary, replenish the refrigeration system, the respective coupling assemblies 20 are prepared for attachment to the nipples 27 by attaching them to the respective test lines 13 and 19, by removing the respective plugs 50 and 51, by backing off the depressor plunger 39a in each instance to be sure the respective valves 28 will not be prematurely opened, and attaching the coupling assemblies to the selected nipples 27 by means of the coupling nuts 31. After the coupling nut 20 has been attached in fluidtight relation to the liquid refrigerant line 7, the depressor plunger 39a is operated to depress and open the valve 28, whereupon pressure in the liquid refrigerant line 7 is adapted to be tested by operation of the gauge 11. Should it be necessary to replenish the refrigeration system, the coupling assembly 20 associated with the equipment line 19 is adapted to be operated similarly as already described, and replenishment effected through such line from the refrigerant supply 15. After testing and replenishment have been completed, the plungers 39a are backed off to close the respective valves 28 to avoid any loss of refrigerant from the system, and the testing equipment removed. This assures that the final system pressure as revealed by the test pressure gauge or gauges will remain true after the testing equipment couplings 20 are removed. Before use on another system the test lines 13 and 19, or at least the line 13, are desirably purged by manipulating the valves in the manifold 10 while the refrigerant supply 15 is connected.

It will be understood that variations and modifications may be effected without departing from the spirit and scope of the novel concepts of this invention.

I claim as my invention:

1. In a coupling for refrigeration system testing or refrigerant replenishing equipment of the kind including a pressure gauge and a duct connected therewith to communicate with a refrigerant line in said system through an access nipple having a normally closed valve which must be depressed to open:

a coupling body having a passage therein with openings at opposite ends;

means for connecting one end of said passage in communication with said duct;

means for connecting the opposite end of said passage in operative communication with said nipple;

means operable selectively after both ends of said passage have been connected as aforesaid to depress and open said valve;

and comprising a plunger aligned with said opposite end and means for operating said plunger;

said plunger being fixed coaxially on one end of a rotary shaft which has its opposite end portion projecting from said body and has a manipulating head thereon comprising said means for operating the plunger;

said body and said shaft having interengaging threaded means for effecting reciprocal movements of said shaft and thereby said plunger by rotation of said shaft by manipulation of said head;

a nipple providing said means for connecting to the duct;

a cap for closing said nipple when free from the duct;

said means for connecting the opposite end of the passage comprising an extension on said body carrying a rotary coupling nut;

and a threaded closure plug engageable in said nut;

whereby the interior of the coupling is maintained clean and free from foreign matter getting therein when the coupling is not in use.

2. In a coupling according to claim 1, said body extension having a shoulder within said coupling nut, a sealing ring on said shoulder, said plug being drivable against said sealing ring to maintain a perfect closure.

3. In a coupling for refrigeration system testing or refrigerant replenishing equipment of the kind including a pressure gauge and a duct connected therewith to communicate with a refrigerant line in said system through an access nipple having a normally closed valve which must be depressed to open:

a coupling body having a passage therein with openings at opposite ends;

means for connecting one end of said passage in communication with said duct;

means for connecting the opposite end of said passage in operative communication with said nipple;

means operable selectively after both ends of said passage have been connected as aforesaid to depress and open said valve;

and comprising a plunger aligned with said opposite end and means for operating said plunger;

said plunger being fixed coaxially on one end of a rotary shaft which has its opposite end portion projecting from said body and has a manipulating head thereon comprising said means for operating the plunger;

said body and said shaft having interengaging threaded means for effecting reciprocal movements of said shaft and thereby said plunger by rotation of said shaft by manipulation of said head;

and said body having a tubular base extension comprising a separately formed shouldered member carrying a rotary coupling nut engageable with said access nipple and having a tubular projecting portion engaged in said body in alignment with said plunger and shaft, providing a part of said passage and having said plunger extending thereinto.

4. In a coupling according to claim 3, said shaft being of substantially larger diameter than said plunger, said tubular base extension having a bore of larger diameter than said plunger but of smaller diameter than said shaft and opening within said body toward said shaft, and said shaft having a stepped shoulder which faces toward an inner end face of said tubular base extension in spaced relation to assure free flow of refrigerant past the gap between the shoulder and face when the plunger is driven inwardly to open the normally closed valve.

5. In a coupling according to claim 3, a sealing ring recessed into the outer end of said extension to effect a sealed joint between the end of the nipple and the extension when the nut is threaded onto the nipple and draws the extension toward the end of the nipple.

* * * * *