Feb. 1, 1966 J. J. SPARANO 3,232,070

REFRIGERANT SAVER

Filed May 17, 1963 2 Sheets-Sheet 1

FIG. 1

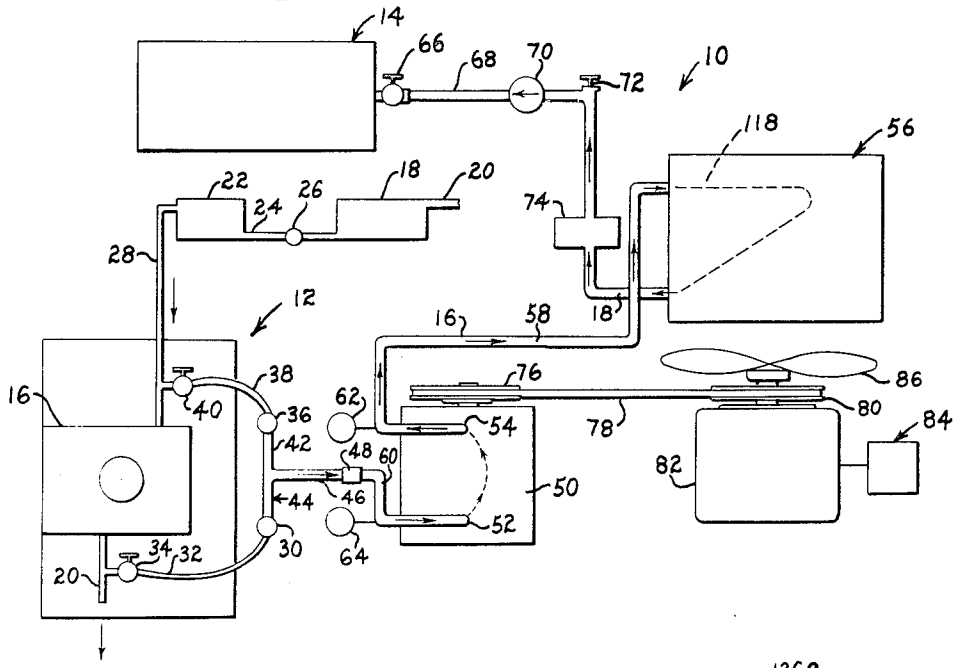
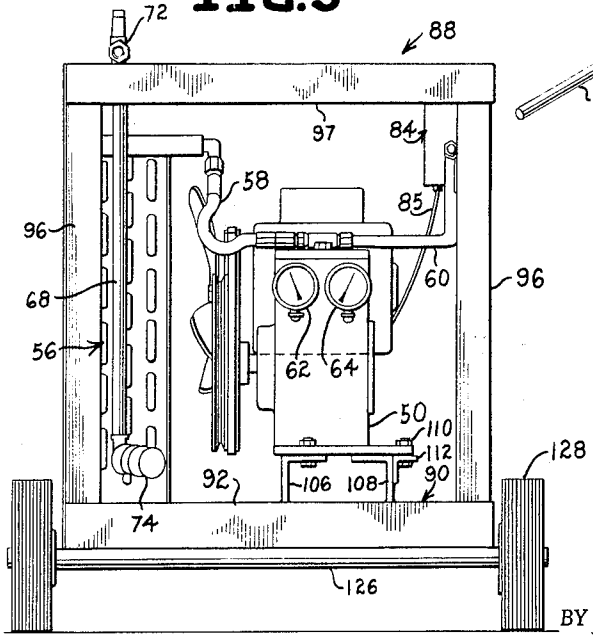



FIG. 3



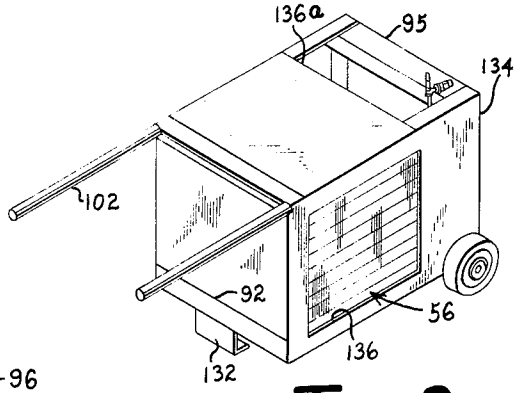




FIG. 2

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Feb. 1, 1966 J. J. SPARANO 3,232,070

REFRIGERANT SAVER

Filed May 17, 1963 2 Sheets-Sheet 2

FIG. 4

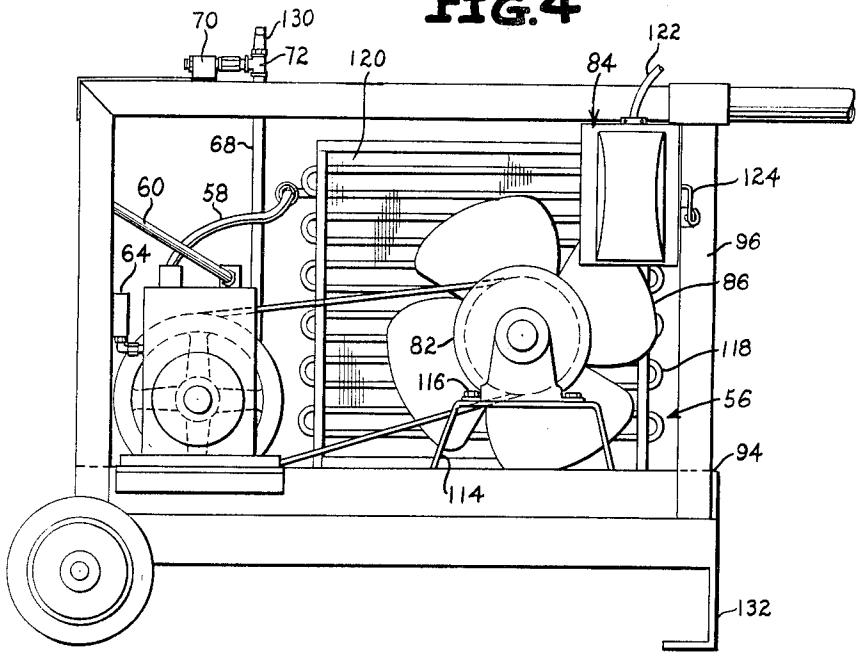
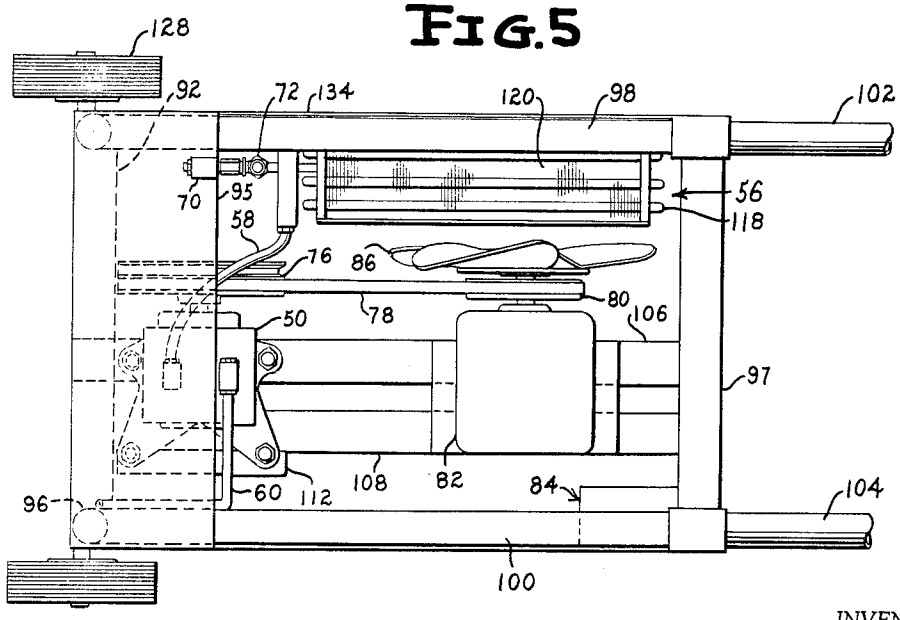



FIG. 5




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# REFRIGERANT SAVER

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9 Claims. (Cl. 62—149)

This invention relates to a Refrigerant Saver, and more particularly to a device for pumping out the refrigerant fluid from a disabled or inoperative refrigeration system.

Normally, when a refrigeration system breaks down or becomes inoperative, when the system is repaired, all the refrigerant or refrigeration fluid therein is normally lost and wasted. This is because the inoperative refrigeration unit or system is unable to pump its own refrigerant into its receiver tank with its own power when repairs have to be made on the unit or system. Obviously, this results in a costly waste of valuable material, since conventional refrigerants such as freon, are relatively expensive and often large quantities of the refrigerant are lost during repair of a disabled refrigeration unit. For example, truck-trailer refrigeration units have up to 40 lbs. of refrigerant therein that may be lost during repair of the units. Accordingly, it is a primary object of this invention to provide a method and apparatus for saving and storing the refrigerant in a disabled refrigeration unit that normally would otherwise be wasted or lost.

It is yet another object of the invention to provide a refrigerant saver that is arranged to form a compact unit and is easily portable.

It is yet another object of the invention to provide a refrigerant saver that is not only useful for withdrawing refrigerant fluids from refrigeration systems, but is also useful for evacuating partially filled tanks into one or more supply tanks.

It is yet another object of the invention to provide a device which is not only adapted to pump refrigerants in a gaseous state from a refrigeration unit or other source, but is also capable of compressing and condensing the refrigerant into a liquid and discharging this liquid into a storage tank.

It is another object of the invention to provide a device not only for pumping and condensing refrigerant fluids from disabled refrigeration units, but also for drying and straining foreign materials from the refrigerant before discharging it into a storage tank.

It is yet another object of the invention to provide a refrigerant saver that utilizes conventional parts in its construction thereby simplifying the manufacture and reducing the cost thereof.

It is another object of this invention to provide a refrigerant saver that is light in weight, simple to operate, is reliable in use, and requires a minimum of maintenance.

It is another object of the invention to provide a refrigerant saver that has pressure gauges to indicate the input and output pressure thereof.

The invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawings, wherein:

FIG. 1 is a diagrammatic view illustrating the refrigerant saver connected to a conventional refrigeration system so as to withdraw the refrigerant therefrom;

FIG. 2 is a perspective view of one form of the invention;

FIG. 3 is an enlarged elevational end view of FIG. 2;

FIG. 4 is an enlarged elevational rear view of the device shown in FIG. 2;

FIG. 5 is an enlarged plan view of the device shown in FIG. 2.



As illustrated diagrammatically in FIG. 1, the refrigerant saver 10 comprising this invention is connected to a disabled conventional refrigeration unit 12 so as to withdraw its refrigerant therefrom, condense the refrigerant, and store it in liquid form in a tank 14 of the refrigerant saver 10.

The conventional refrigeration unit 12 may include a compressor 16 having its outlet or high pressure side connected to a condenser 18 by a conduit 20. The outlet of the condenser 18 is connected to an evaporator 22 by means of a conduit 24 containing in series therewith, an expansion valve 26. The outlet of the evaporator 22 is connected to the inlet side of the compressor 16 by means of a conduit 28. The conventional refrigeration unit 12 may also include a receiver tank, not shown, for storing refrigerant.

The refrigeration unit 12 operates in a conventional manner. The compressor 16 compresses the refrigerant vapors in the unit and forces them through conduit 20 into the condenser 18 whereupon the compressed refrigerant vapors are cooled and condensed into a liquid. The compressed vapor of liquid refrigerant is allowed to escape through an expansion valve 26 and conduit 24 whereupon the refrigerant rapidly expands and vaporizes within the evaporator 22 which is cooled by the expanding refrigerant. The refrigerant absorbs heat from the interior of a refrigerator, a room, etc. The vaporized and expanded refrigerant is then returned to the compressor 16 by conduit 18 whereupon it repeats the above cycle.

The compressor 16 of the refrigeration unit 12 includes a high pressure gauge 30 connected to the conduit 20 by means of a conduit 32 and high pressure cut-off service valve 34. A low pressure gauge 36 is connected to the conduit 28 by means of a conduit 38 and a low pressure cut-off service valve 40. The conduits 32 and 38 may be connected together by a conduit 42 of a T-fitting 44. The T-fitting 44 also includes a stem 46 having a conventional pipe coupling 48 on one end thereof.

As illustrated in FIG. 1, the basic component parts of the refrigerant saver 10 include a conventional compressor or pump 50 having an inlet 52 and outlet 54. Outlet 54 is connected to the inlet of a condenser 56 by a conduit 58. Inlet 52 is connected to the pipe coupling 48 of the T-fitting 44 by a conduit 60. Conduits 58 and 60 are connected to high and low pressure gauges 62 and 64 respectively.

The storage tank 14 has a conventional cut-off valve 66. The cut-off valve 66 may be connected to the outlet of the condenser 56 by means of a conduit 68 which may include in series therewith a one-way or check valve 70, a shut-off angle valve 72 and a drier strainer 74.

The compressor 50 includes a drive shaft mounting a pulley 76 having a belt 78 therearound. The belt 78 also extends around a pulley 80 mounted on the drive shaft of a conventional electric motor 82. The electric motor is controlled by a conventional switch mounted within a switch box 84. The motor 82 also drives a propeller or fan 86 which forces air over the condenser 56 for cooling same.

FIGS. 2 through 5 indicate a practical embodiment of the refrigerant saver 10 illustrated in FIG. 1. As illustrated in FIGS. 3 through 5, the refrigerant saver is mounted within a box-shaped frame or housing 88 which includes an open lower rectangular frame 90 composed of four angle member 92 and 94 welded together. A vertical post 96, preferably of cylindrical or tubular cross section is secured to each corner of the lower frame 90 and extends upwardly therefrom. The upper ends of the front posts 96 are secured together by means of a horizontally extending tube 100 parallel to the tube 98 as illustrated in

FIG. 5. The tubes 98 and 100 project beyond the posts on one end of the frame so as to form spaced parallel handles 102 and 104. The upper ends of posts 96 are also secured together by angle members 95 and tubular member 97.

A pair of angle members 106 and 108 extend between the angle members 92 of frame 90 and are welded to the upper surfaces thereof as illustrated in FIGS. 3 and 4. The angle members 106 and 108 form a support for the compressor 50 which is secured on the angle members by means of bolts and nuts 110. As shown in FIG. 3, a smaller angle member 12 may be welded to the angle member 108 for receiving some of the nut and bolt assemblies 110.

As shown in FIG. 5, the compressor 50 is mounted on one of the ends of the angle members 108 and 106, and a fan support 114 of generally inverted U-shape is mounted on the other ends of the angle members. The electric motor 82 is bolted on the support 114 by means of bolts 116.

A vertically extending condenser or radiator 56 is mounted on the front of the frame 88 and comprises a continuous tube 118 deformed into a plurality of parallel horizontally extending sections as shown in FIGS. 4 and 5, which extend through vertically extending, thin and metallic spaced cooling plates 120. The inlet to the condenser 56 is connected to the outlet or high pressure side of the compressor 50 by means of conduit 58. The fan 86 mounted on the drive shaft of the motor 82 is adjacent the condenser 56 so as to force cooling air therethrough. The switch box 84 for controlling the motor 82 may be mounted on an upper rear corner of frame 88. The switch box 84 is connected to a conventional source of electricity by means of a cord 122 which may contain a plurality of conductors, and the switch box is connected to motor 50 by cord 85. Switch box 84 includes a conventional manually operated switch operating lever 124.

One end of frame 88 has secured to the lower portion thereof, an axle 126 which rotatably supports a pair of wheels 128.

The outlet conduit 68 from the condenser 56 extends vertically upward from the bottom of the condenser through the drier strainer 74. The upper end of the conduit 68 passes through the shut-off angle valve 72 and check valve 70. Valve 72 may be manually operated by a handle means or knob 130.

An operator, by standing between the handles 102 and 104, and by grasping and elevating the handles, may manually propel the refrigerant saver in the manner of a wheelbarrow. When the refrigerant saver is at rest, one end thereof is normally supported by an L-shaped bracket 132 so that the bracket, in conjunction with the wheels 128, support the frame in a horizontal position.

The front of the device is preferably covered with a cover 134 comprising a flat plate having a rectangular aperture 136 therethrough in alignment with the condenser 56 for permitting air to pass through the condenser. The top of the frame is normally covered by a top plate 136*a* extending between and secured to the members 98 and 100.

High and low pressure gauges 62 and 64 are secured to the compressor 50 in side-by-side relation for easy viewing as illustrated in FIG. 3.

The refrigerant saver 10 may be connected to a disabled refrigeration unit 12 as illustrated in FIG. 1. When using the refrigerant saver 10, the shut-off valve 72 is first closed and the inlet conduit 60 of the saver is connected to the T-fitting stem 46 by means of a coupling 48 while the valves 34 and 40 remain closed. The outlet conduit 68 of the condenser 56 is connected to the valve 66 of tank 14. The valves 34 and 40 are opened approximately half-way and the connection between the conduit or hose 68 to the tank 14 is slightly loosened. This will cause purging or escape of gases at the loosened connection and as the vapors flow from the unit 12 through the saver 10, all air in the saver will be exhausted therefrom. The high and low pressure valves 34 and 40 are then closed while the tank valve 66 is opened. The switch 84 is then closed so as to energize the motor 82 for operating the compressor 50. The valves 40 and 34 are opened whereupon the compressor 50 will withdraw refrigerant from the unit 12, compress the refrigerant and force it into condenser 56 whereupon it is cooled and condensed into a liquid which flows through drier strainer 74, shut-off valve 72, check valve 70, valve 66 and into tank 14. Check valve 70 prevents reverse flow of the liquid and the drier strainer 74 removes impurities from the refrigerant.



As the refrigerant is pumped or withdrawn from the refrigeration unit 12, the pressure indicated by the low pressure gauge 40 will gradually decrease. When this gauge 40 indicates a pressure below atmospheric, the refrigerant saver is cut off. If, after standing a while, pressure again gradually builds up as in conduit 28, as indicated by gauge 40, the refrigerant saver is again cut on until the pressure drops below atmospheric again in conduit 28. When the pressure again drops below atmospheric, the refrigerant saver is again cut off, and this process is repeated until the pressure in conduit 28 holds at atmospheric or below when the refrigerant saver is not operating. This indicates that all of the refrigerant has been removed from the disabled refrigeration unit 12. Then, the valves 40, 34, 72 and 66 are all closed and the regrigerant saver is disconnected from the tank 14 and the refrigeration unit 12. A small amount of refrigerant will always remain in the refrigerant saver to keep out moisture and air.

If the storage tank or drum 14 has been left open to atmosphere, the air and moisture therein may be removed therefrom by connecting its valve 66 to the suction line 60 of the refrigerant saver, opening the valve 66 and valve 72, and then operating the saver whereupon the compressor 50 will withdraw moisture and air from the tank.

For maximum efficiency, the dried strainer 74 should be replaced every thirty to sixty days, depending on how often the refrigerant saver is used.

Inasmuch as various changes may be made in the form, location and relative arrangement of the several parts without departing from the essential characteristics of the invention, it will be understood that the invention is not to be limited except by the scope of the appended claims.

I claim:

1. A refrigerant saver for removing refrigerant from a disabled refrigeration unit comprising a portable unit embodying a pump means having an inlet and an outlet, operating means drivingly connected to said pump means, condenser means having an inlet and an outlet, conduit means connecting the outlet of said pump means to the inlet of said condenser means, conduit means connected to the outlet of said condenser means and adapted to be connected to a tank, fluid propelling means adjacent to said condenser, said operating means being connected to said fluid propelling means so as to cause it to force fluid against said condenser means for cooling the same, and means for connecting the inlet of said pump means with the high and low pressure sides of a disabled refrigeration unit whereby to fully exhaust refrigerant therefrom.

2. A refrigerant saver as defined in claim 1, wherein said operating means comprises an electric motor a control switch operatively connected by conductor means to said electric motor.

3. A refrigerant saver as defined in claim 2, wherein the second mentioned conduit means includes in series therewith, a check valve permitting flow only away from said condenser means.

4. A refrigerant saver as defined in claim 2, wherein the second mentioned conduit means includes in series therewith a drier strainer.

5. A refrigerant saver as defined in claim 2, wherein the second mentioned conduit means includes in series therewith a manually operative cut-off valve.

6. A refrigerant saver as defined in claim 2, wherein the second mentioned conduit means includes in series therewith a check valve permitting flow only away from said condenser means, a drier strainer, and a manually operative cut-off valve.

7. The combination of a disabled refrigeration unit and an ambulatory refrigerant saver adapted to be hand operated, said refrigeration unit including a compressor, a condenser, and an expansion valve means, an evaporator, passage means connecting said compressor, said condenser, said expension valve and said evaporator being in series so as to form a closed circuit; said refrigerant saver ambulatory unit comprising pump means having an inlet and an outlet, connector means connecting the inlet of said pump means to said passage means of said disabled refrigeration unit, operating means drivingly connected to said pump means, condenser means having an inlet and an outlet, conduit means connecting the outlet of said pump means to the inlet of said condenser means, means connected to the outlet of said condenser means and adapted to be connected to a storage tank whereby the refrigerant saver pumps the refrigerant from said disabled refrigeration unit, compresses and condenses the refrigerant and forces it into the storage tank, and said connector means including first and second conduits, each connected respectively to the inlet and outlet of said compressor, both said first and second conduits being connected to the inlet of said pump means.

8. The combination of claim 7 including a pressure gauge and a cut-off valve in each of said first and second conduits.

9. A refrigerant saver for servicing a disabled refrigeration system wherein said system includes a compressor having a high pressure side connected with a condenser, a low pressure side connected with an evaporator, an expansion valve between the condenser and evaporator



and discharged and suction service valves connected respectively with said low pressure and high pressure sides of the compressor, said refrigerant saver comprising a compact unit on a supporting means adapted for convenient manual transport of the unit and the unit further embodying a compressor pump having an inlet and an outlet, a T-conduit fitting, said fitting having the leg of the T connected with said pump inlet, conduits connecting the ends of the head of the said T with the discharge and suction valves of the regrigeration system compressor, low pressure and high pressure gauges in the said conduits connected respectively with said discharge and suction valves, a low pressure gauge connected with said pump inlet, a condenser having an inlet and an outlet, a conduit connecting said pump outlet with said condenser inlet, a high pressure guage connected with the last stated conduit, operating means for said compressor pump, a discharge conduit having an end connected to said outlet of the last named condenser, means at the other end of said discharge conduit adapted for connecting the latter conduit to a refrigerant storage means, a one-way valve in said latter conduit opening toward said connecting means, a shut-off valve between said one-way valve and the last named condenser, and strainer means between said shut-off valve and the last named condenser.


**References Cited by the Examiner**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 1,126,605 | 1/1915 | Wolf | 62—174 |
| 1,744,287 | 1/1930 | Tibbetts | 62—292 |
| 2,226,851 | 12/1940 | Franck | 62—292 |
| 2,285,520 | 6/1942 | Keyser | 62—239 |
| 2,341,430 | 2/1944 | Elsey | 62—474 |
| 2,400,620 | 5/1946 | Zwickl | 62—85 |
| 2,464,563 | 3/1949 | Doeg | 62—292 |
| 2,557,252 | 6/1951 | Bannister et al. | 62—239 |
| 2,972,235 | 2/1961 | Smith | 62—85 |


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