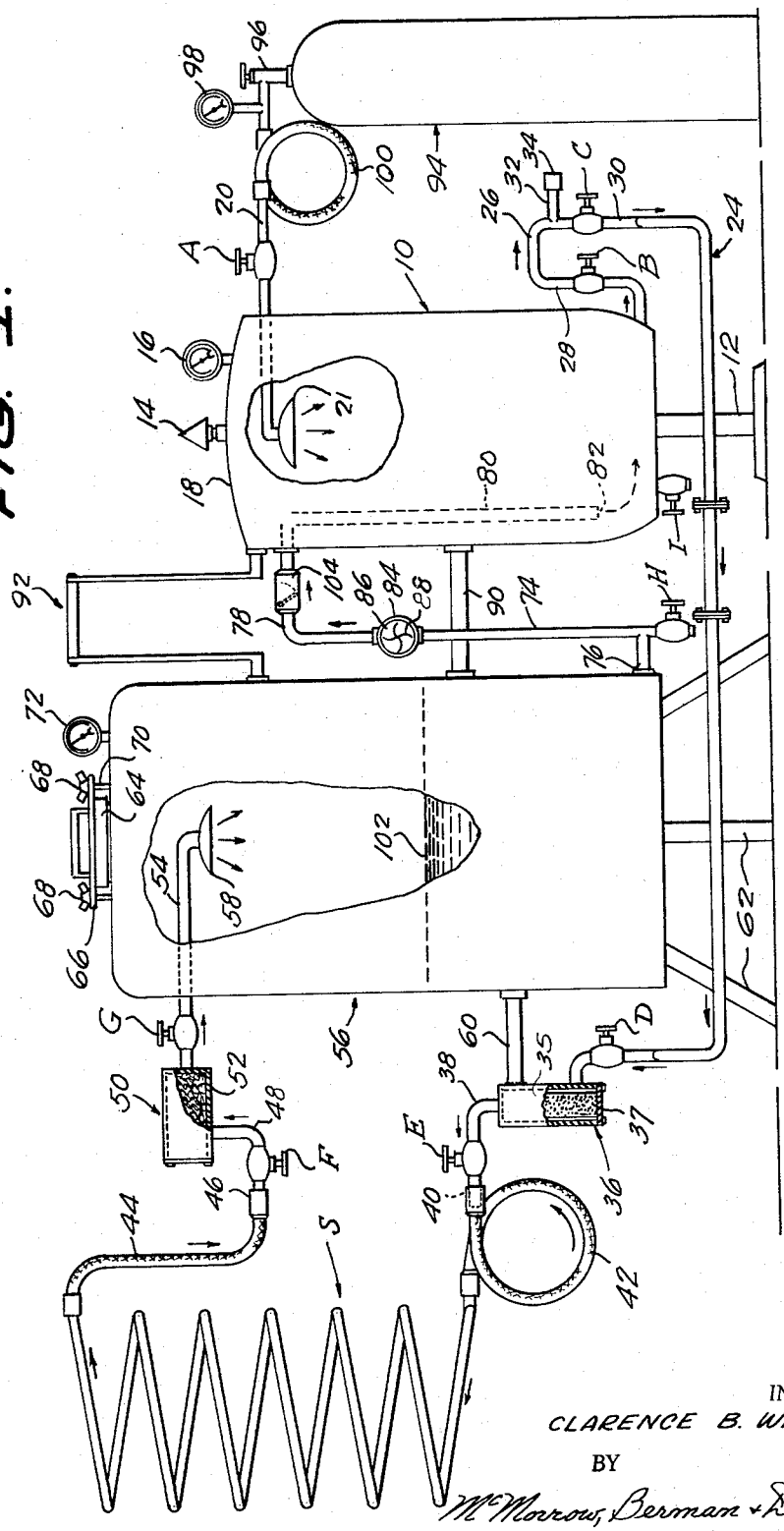
Jan. 3, 1967 C. B. WILLIAMS, JR 3,295,538

REFRIGERATION SYSTEM CLEANER

Filed Oct. 18, 1963 2 Sheets-Sheet 1

FIG. 1.



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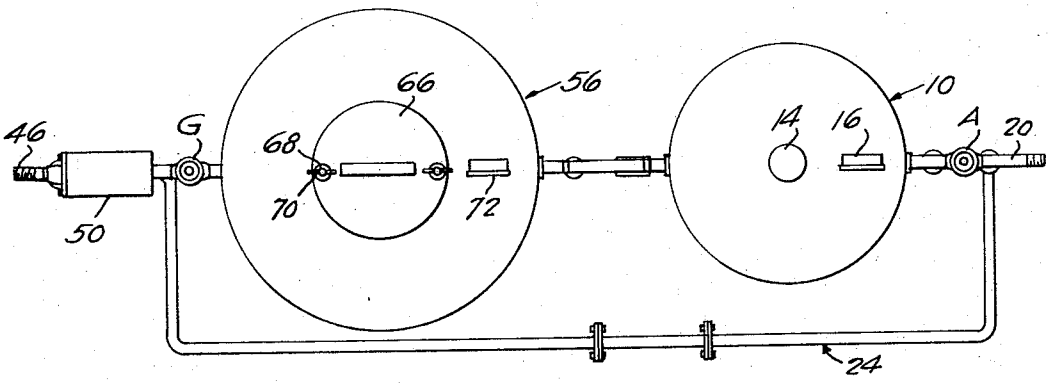


FIG. 2.

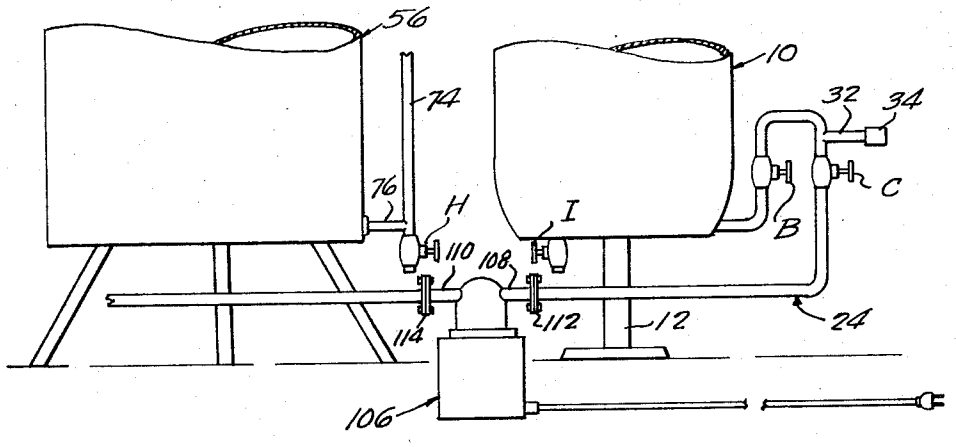


FIG. 3.

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REFRIGERATION SYSTEM CLEANER

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8 Claims. (Cl. 134—111)

This invention relates to a novel cleaner for refrigeration and air conditioning systems, and the like.

The primary object of the invention is the provision of a more efficient, more easily used, and more economical device of the kind indicated, which involves the pressure circulation of cleaning fluid through the system to be cleaned, and the return of the solution so used into the device, until contaminated and required to be replaced in the device.

Another object of the invention is the provision of a device of the character indicated above, which is especially designed for the cleaning of refrigeration systems wherein the electric compressor thereof has burned out, in order to prevent the corrosion and other damage, chemical and otherwise which accompany the burning or charring of the compressor windings, as a preliminary to replacing the damaged compressor.

A further object of the invention is the provision of a device of the character indicated above, which lends itself to be constructed in readily portable forms, so that the devices can be readily transported to the work.

Other important objects and advantageous features of the invention will be apparent from the following description and the accompanying drawings, wherein, for purposes of illustration only, specific forms of the invention are set forth in detail.

In the drawings:

FIGURE 1 is a side elevation of a device of the present invention, partly broken away and in section, utilizing a pressure tank of dry nitrogen or air;

FIGURE 2 is a top plan view thereof; and

FIGURE 3 is a fragmentary view, like FIGURE 1, showing an electric circulating pump instead of a pressure tank.

Referring in detail to the drawings, and first to FIGURES 1 and 2 thereof, the device therein illustrated comprises a preferably upright pressure and solution reclamation tank **10**, supported on a foot **12**. A pressure relief valve **14** and a pressure gauge **16** are connected through the top **18** of the tank **10**. A pressure inlet pipe **20** extends laterally from the upper part of the sidewall of the tank **10** and terminates in a hose connector nipple (not shown). Connected in the inlet pipe **20** is a manual valve A.

A pressure line **24** emerged from the tank **10**, near its lower end, and has, close to the tank, an inverted U-shaped portion **26**, in whose first leg **28** is incorporated a manual valve B, and in its second leg **30**, a manual valve C. On the second leg **30**, above the valve C, is a fitting **32**, normally closed by a cap **34**. The pressure line **24** extends forwardly alongside of the tank **10**, to a drier **36**, which has a removable cover **35** and a replaceable cover **37**. A manual valve D, in the pressure line **24**, is located close to the drier **36**. A pipe **38** emerges from the top of the drier **36** and terminates in a hose connecting nipple **40**, and a manual valve E is incorporated in the pipe **38**.

A flexible hose **42** is adapted to be connected, at related ends, to the nipple **40**, and to one end of a system S to be washed and cleaned. The other end of the system S is adapted to be connected, by means of a flexible hose **44**, to the nipple **46** of a pipe **48**, which extends from the bottom of a filter **50**, containing suitable changeable absorbent fabric filter material **52**. The pipe **48** has therein a manual valve F, preceding the filter **50**.

The filter **50** is carried by and is in communication with a horizontal pipe **54**, which traverses the upper part

of the side wall of an erect solution reservoir tank **56**, and terminates in a centered downwardly directed spray head **58**. A manual valve G is in the pipe **54** between the filter **50** and the spray head **58**. A bracket **60**, extends between and is fixed to the tank **56** and the drier **36**. The tank **56** is supported on legs **62**.

On the top of the tank **56** is an open neck **64**, closed by a pressure cover **66**, held down by wing nuts **68** on bolts **70** rising from the tank. A pressure gauge **72** rises from the top of the tank **56**. Drain valves H and I are provided on the bottoms of the tanks **56** and **10**, respectively. The drain valve H is at the lower end of a vertical pipe **74** which extends along the rear side of the tank **56**, and is connected to the tank **56**, by means of a short pipe **76**, above the valve H, and entering the tank **56** near its bottom.

At its upper end, the vertical pipe **74** has a rearwardly extending horizontal portion **78**, on its upper end, which traverses the sidewall of the tank **10**, and terminates in a downwardly extending portion **80**, whose open lower end **82** is near the bottom of the tank **10**. A liquid sight indicator **84** is incorporated in the vertical pipe **74**, and has a transparent face **86**, which exposes a rotary impeller **88**. The indicator **84** provides convenient means for visually checking not only the flow of fluid, but also the condition or cleanness of the fluid. A horizontal rigid bracket **90** extends between and is fixed to the tanks **56** and **10**, and an inverted U-shaped carrying handle **92** has related legs thereof fixed to the facing sides of these tanks.

A pressure tank **94** containing either dry nitrogen or air, has a discharge fitting **96**, on its upper end, which incorporates a pressure regulator **98**. A flexible hose **100** is utilized to connect the discharge fitting **96** to the nipple of the pressure inlet pipe **21**, of the pressure and solution reclamation tank **10**, which terminates in a downwardly directed spray head **21**.

The tank **10** initially contains Freon 11 (F–11), or any other suitable chemical, which can be used over and over without losing its chemical composition. The amount of such fluid in the tank **10** is limited to about three-quarters of the capacity of the tank, but can be affected by the capacities of the tank **10** and the tank **56**.

In use and operation, for a cleaning operation, the valves A, B, C, D, E, F, G are opened, the cap **34** being in place on the pressure pipe fitting **32**, and the drain valves H and I remain closed. The pressure from the pressure tank **94** then produces pressure on the fluid and any air in the tank **10** is forced to flow out of the tank **10**, through the pressure line **24**, to and through the drier **36** to and through the system S, through the filter **50**, and into the top of the tank **56**, through the spray head **58**. The level of the cleaning solution **102**, in the tank **56**, is as shown in FIGURE 1, below the midheight of the tank **56**.

The cleaning solution **102** is then forced out of the tank **56** through the vertical pipe **74**, the sight indicator **84**, and through a one-way check valve **104**, incorporated in the horizontal pipe **78**, and into the lower part of the tank **10**, from the lower end **82** of the pipe **80**. This circulation of the cleaning fluid continues as long as desired.

To reclaim all of the cleaning solution **102** into the reclamation tank **10**. the valves A and B are closed, valve C opened, the cap **34** is removed from the fitting **32**, and the hose **20** from the pressure tank **94**, is applied to the fitting **32**.

In the alternate form of the invention, shown in FIGURE 6, an electric circulating pump **106** is connected in the line **24**. The pump **106** has intake and discharge pipes **108** and **110**, which are coupled, as indicated at **112** and **114**, respectively to the ends of a break in the pressure line **24**. In operation, the valves A, B, and C

are closed, and the cap 34 remains in place until a reclamation operation is to be initiated, at which time valves A and B are closed. When the pump 106 is in operation, the valve A is out of the circuit but valves B and C open. Otherwise, the operation is the same as for the device of FIGURES 1 and 2.

Although there have been shown and described preferred forms of the invention, it is to be understood that the invention is not necessarily confined thereto, and that any change or changes in the structure of and in the relative arrangements of components thereof are contemplated as being within the scope of the invention as defined by the claims appended hereto.

What is claimed is:

1. A device of the character described, comprising a pressure and solution reclaiming tank, a cleaning solution tank adapted to contain cleaning solution, a pressure line extending from the reclamation tank, a drier in communication with the pressure line and having an outlet pipe adapted to be connected to one end of a system to be cleaned, a filter having an inlet pipe adapted to be connected to the other end of the system to be cleaned, said filter having an outlet pipe entering the upper part of the solution tank on a level above the solution therein and terminating in a downwardly facing spray head, a vertical pipe connected at its lower end to the lower part of the solution tank below the solution level therein, said vertical pipe being connected at its upper end to a horizontal pipe portion entering the upper part of the reclamation tank and terminating in a down pipe having an open lower end near the bottom of the reclamation tank, and a source of pressure operatively connected to the pressure line.

2. A device of the character described, comprising a pressure and solution reclaiming tank, a cleaning solution tank adapted to contain cleaning solution, a pressure line extending from the reclamation tank, a drier in communication with the pressure line and having an outlet pipe adapted to be connected to one end of a system to be cleaned, a filter having an inlet pipe adapted to be connected to the other end of the system to be cleaned, said filter having an outlet pipe entering the upper part of the solution tank on a level above the solution therein and terminating in a downwardly facing spray head, a vertical pipe connected at its lower end to the lower part of the solution tank below the solution lever therein, said vertical pipe being connected at its upper end to a horizontal pipe portion entering the upper part of the reclamation tank and terminating in a down pipe having an open lower end near the bottom of the reclamation talk, and a source of pressure operatively connected to the pressure line, said reclamation tank having a pressure inlet pipe entering the upper part thereof and terminating in a downwardly facing spray head.

3. A device of the character described, comprising a pressure and solution reclaiming tank, a cleaning solution tank adapted to contain cleaning solution, a pressure line extending from the reclamation tank, a drier in communication with the pressure line and having an outlet pipe adapted to be connected to one end of a system to be cleaned, a filter having an inlet pipe adapted to be connected to the other end of the system to be cleaned, said filter having an outlet pipe entering the upper part of the solution tank on a level above the solution therein and terminating in a downwardly facing spray head, a vertical pipe connected at its lower end to the lower part of the solution tank below the solution level therein, said vertical pipe being connected at its upper end to a horizontal pipe portion entering the upper part of the reclamation tank and terminating in a down pipe having an open lower end near the bottom of the reclamation tank, and a source of pressure operatively connected to the pressure line, said reclamation tank having a pressure inlet pipe entering the upper part thereof and terminating in a downwardly facing spray head, said pressure source comprising a pressure tank having a discharge fitting connected to the pressure inlet pipe and containing a pressure regulator.

4. A device of the character described, comprising a pressure and solution reclaiming tank, a cleaning solution tank adapted to contain cleaning solution, a pressure line extending from the reclamation tank, a drier in communication with the pressure line and having an outlet pipe adapted to be connected to one end of a system to be cleaned, a filter having an inlet pipe adapted to be connected to the other end of the system to be cleaned, said filter having an outlet pipe entering the upper part of the solution tank on a level above the solution therein and terminating in a downwardly facing spray head, a vertical pipe connected at its lower end to the lower part of the solution tank below the solution level therein, said vertical pipe being connected at its upper end to a horizontal pipe portion entering the upper part of the reclamation tank and terminating in a down pipe having an open lower end near the bottom of the reclamation tank, and a source of pressure operatively connected to the pressure line, said reclamation tank having a pressure inlet pipe entering the upper part thereof and terminating in a downwardly facing spray head, said pressure source comprising a pressure tank having a discharge fitting connected to the pressure inlet pipe and containing a pressure regulator, said pressure line having a fitting, a cap normally engaged and closing the fitting, the discharge fitting of the pressure tank being adapted to be connected to said fitting with the cap thereof removed for producing a reverse flow of fluid through the device.

5. A device of the character described, comprising a pressure and solution reclaiming tank, a cleaning solution tank adapted to contain cleaning solution, a pressure line extending from the reclamation tank, a drier in communication with the pressure line and having an outlet pipe adapted to be connected to one end of a system to be cleaned, a filter having an inlet pipe adapted to be connected to the other end of the system to be cleaned, said filter having an outlet pipe entering the upper part of the solution tank on a level above the solution therein and terminating in a downwardly facing spray head, a vertical pipe connected at its lower end to the lower part of the solution tank below the solution level therein, said vertical pipe being connected at its upper end to a horizontal pipe portion entering the upper part of the reclamation tank and terminating in a down pipe having an open lower end near the bottom of the reclamation tank, and a source of pressure operatively connected to the pressure line, said pressure line having a fitting, a cap normally closing said fitting, said pressure source comprising a circulating pump connected in the pressure line between said fitting and the drier.

6. A device of the character described, comprising a pressure and solution reclaiming tank, a cleaning solution tank adapted to contain cleaning solution, a pressure line extending from the reclamation tank, a drier in communication with the pressure line and having an outlet pipe adapted to be connected to one end of a system to be cleaned, a filter having an inlet pipe adapted to be connected to the other end of the system to be cleaned, said filter having an outlet pipe entering the upper part of the solution tank on a level above the solution therein and terminating in a downwardly facing spray head, a vertical pipe connected at its lower end to the lower part of the solution tank below the solution level therein, said vertical pipe being connected at its upper end to a horizontal pipe portion entering the upper part of the reclamation tank and terminating in a down pipe having an open lower end near the bottom of the reclamation tank, and a source of pressure operatively connected to the pressure line, said pressure line having a fitting normally closed by a cap, first and second manual valves on said pressure pipe at opposite sides of the fitting, a third

manual valve in the pressure line between the second valve and the drier, a fourth manual valve in the outlet pipe of the drier, a fifth manual valve in the outlet pipe of the filter, a one-way check valve in the horizontal portion of the vertical pipe, and a solution flow sight indicator incorporated in the vertical pipe between the solution tank and said check valve.

7. A device of the character described, comprising a pressure and solution reclaiming tank, a cleaning solution tank adapted to contain cleaning solution, a pressure line extending from the reclamation tank, a drier in communication with the pressure line and having an outlet pipe adapted to be connected to one end of a system to be cleaned, a filter having an inlet pipe adapted to be connected to the other end of the system to be cleaned, said filter having an outlet pipe entering the upper part of the solution tank on a level above the solution therein and terminating in a downwardly facing spray head, a vertical pipe connected at its lower end to the lower part of the solution tank below the solution level therein, said vertical pipe being connected at its upper end to a horizontal pipe portion entering the upper part of the reclamation tank and terminating in a down pipe having an open lower end near the bottom of the reclamation tank, and a source of pressure operatively connected to the pressure line, said pressure line having a fitting normally closed by a cap, first and second manual valves on said pressure pipe at opposite sides of the fitting, a third manual valve in the pressure line between the second valve and the drier, a fourth manual valve in the outlet pipe of the drier, a fifth manual valve in the outlet pipe of the filter, a one-way check valve in the horizontal portion of the vertical pipe, and a solution flow sight indicator incorporated in the vertical pipe between the solution tank and said check valve, said reclamation tank having a pressure inlet pipe terminating in a downwardly facing spray head in the upper part of the reclamation tank, said pressure inlet pipe having a sixth valve incorporated therein.

8. A device of the character described, comprising a pressure and solution reclaiming tank, a cleaning solution tank adapted to contain cleaning solution, a pressure line extending from the reclamation tank, a drier in communication with the pressure line and having an outlet pipe adapted to be connected to one end of a system to be cleaned, a filter having an inlet pipe adapted to be connected to the other end of the system to be cleaned, said filter having an outlet pipe entering the upper part of the solution tank on a level above the solution therein and terminating in a downwardly facing spray head, a vertical pipe connected at its lower end to the lower part of the solution tank below the solution level therein, said vertical pipe being connected at its upper end to a horizontal pipe portion entering the upper part of the reclamation tank and terminating in a down pipe having an open lower end near the bottom of the reclamation tank, and a source of pressure operatively connected to the pressure line, said pressure line having a fitting normally closed by a cap, first and second manual valves on said pressure pipe at opposite sides of the battery, a third manual valve in the pressure line between the second valve and the drier, a fourth manual valve in the outlet pipe of the drier, a fifth manual valve in the outlet pipe of the filter, a one-way check valve in the horizontal portion of the vertical pipe, and a solution flow sight indicator incorporated in the vertical pipe between the solution tank and said check valve, and first brackets extending between and supportably connecting the reclamation tank to the solution tank and connecting the drier to the solution tank, and a handle extending between and connected to the solution tank and the reclamation tank.

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