June 8, 1965 E. S. LYON 3,188,238

TANK CLEANING METHOD AND APPARATUS

Filed Feb. 10, 1964

FIG. 1

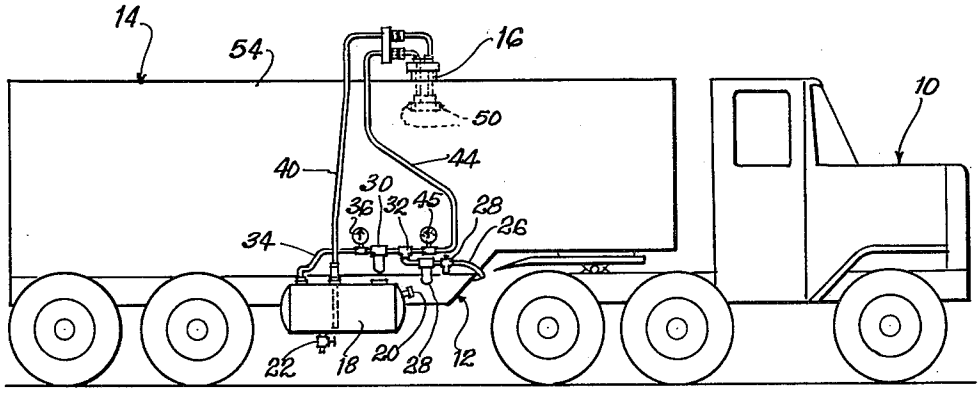


FIG. 2

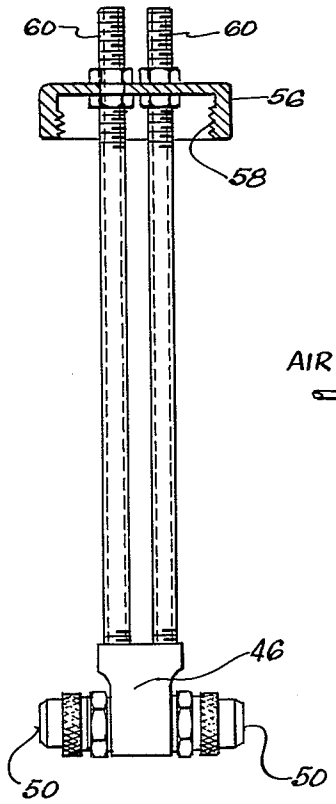
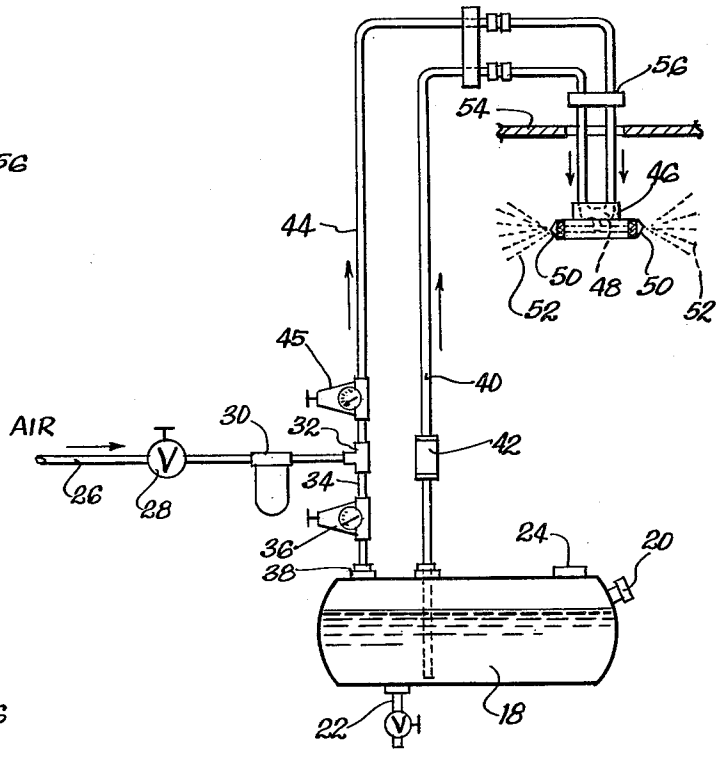


FIG. 3



INVENTOR
Edward S. Lyon
by Toms, McDougall & Hersh
Attys

United States Patent Office

3,188,238

Patented June 8, 1965

3,188,238

TANK CLEANING METHOD AND APPARATUS

Edward S. Lyon, Oak Park, Ill., assignor to Micro-Mist Systems, Inc., Chicago, Ill., a corporation of Illinois

Filed Feb. 10, 1964, Ser. No. 343,849
3 Claims. (Cl. 134—24)

This invention relates to a method and apparatus for the cleaning of tanks used for the storage and/or transportation of chemicals and other materials. In particular, the invention is concerned with the cleaning of tanks which are used for the handling of materials which leave an undesirable residue after removal of the materials from the tanks.

In the storage and transportation of chemicals and related materials, large tanks are commonly used. Such tanks may take the form of storage tanks maintained in a particular location or they may comprise tanks on trucks, railroad tank cars, or other portable tanks. In such situations, it is common practice to employ the tanks for the handling, at different times, of a wide variety of materials.

Where the materials in a tank are to be periodically changed, it is usually necessary to remove any traces of a material before the introduction of a new material. This is necessary since even small amounts of some chemicals can contaminate other chemicals introduced into a tank at a later time.

The removal of residue from a tank is preferably undertaken immediately after a major portion of the contents of the tank is removed. It is desirable to undertake the cleaning operation immediately since this greatly simplifies the operation, however, in many cases, it is impractical or impossible to clean the tanks immediately. In the case of trucks or railroad cars, it is often necessary to return these to a base of operation where cleaning facilities are available. In the case of more permanent storage tanks, current methods for cleaning often make it inconvenient to undertake this operation immediately.

It is a general object of this invention to provide a simple and efficient structure for use in the removal of undesirable residue from storage tanks.

It is a further object of this invention to provide a system of the type described which is particularly suitable in the case of truck and railroad tanks since the cleaning apparatus can be associated directly with the tank structure for transportation therewith.

It is an additional object of this invention to provide a system of the type described which is simple and convenient to operate whereby the cleaning of tanks can be undertaken immediately following removal of the major portion of the contents of the tanks.

These and other objects of this invention will appear hereinafter, and for purposes of illustration but not of limitation, specific embodiments of this invention are shown in the accompanying drawings in which:

FIGURE 1 is a side elevation of a truck including an apparatus characterized by the features of this invention;

FIGURE 2 is a detailed view illustrating the nozzle structure of the apparatus; and,

FIGURE 3 is a diagrammatic illustration depicting the circuitry employed in the use of the system of this invention.

The apparatus of this invention generally includes a means adapted to be associated with tanks normally employed for the storage of chemicals and the like. It is known that chemicals stored and transported in tanks leave residues in the tanks when they are removed therefrom, and it is also known that cleaning fluids are available which can be utilized for removing the undesirable residues. The system of the instant invention provides a

unique method and apparatus involving the handling of the cleaning fluids whereby the chemical residues can be removed in a highly efficient manner.

The structure of this invention generally comprises a cleaning fluid container which is associated with the main storage tank. Means are provided for applying pressure to the fluid in the container, and conduit means connect the container with a fluid spray head located inside the storage tank. A source of pressurized gas is also included in the system and conduit means connect this gas with the spray head whereby fluid under pressure is forced into the spray head simultaneously with the introduction of the pressurized gas. The combination of the fluid and the gas forms a mist which is distributed throughout the interior of the tank whereby the solvent action of the cleaning fluid will provide for removal of the undesirable residue. The arrangement of this invention has been found to satisfactorily clean a large storage tank in a matter of a few minutes.

An important concept of the instant invention relates to the use of the apparatus in conjunction with portable tanks of the type carried by means of trucks or on a railroad car. In such an arrangement, the apparatus of this invention is directly attached to the supporting structure for the tanks whereby it is available for use immediately after removal of the chemicals from the tanks. The structure of this invention is characterized by simplicity with respect to its attachment to the tank and is also characterized by great efficiency since the pneumatic system associated with the truck or train can be employed as a source of pressure for displacement of the fluid, and as a source of pressurized gas.

The accompanying drawings illustrate the use of the instant invention in combination with a truck although the concepts herein, when applied to stationary tanks or to trains, will be readily understood when consdering the distribution of the embodiment illustrated.

The truck 10 includes a trailer portion 12 which supports a tank 14 adapted to carry chemicals in a known manner. Located at the top of conventional tanks, there are provided one or more openings 16 which are utilized for the introduction of cleaning fluids. As will be explained, the apparatus of this invention is preferably designed whereby it can be connected at one of these conventional openings.

The system of this invention includes a cleaning fluid container 18 which is provided with an inlet opening 20 and a drain valve 22. A pressure gauge 24 may be associated with the tank to provide a convenient means for determining the prevailing conditions therein.

A conduit 26 is connected to a source of gas pressure which, in the illustrated embodiment, comprises the source of air under pressure. A shut-off valve 28 is provided for controlling the supply of air, and an air filter 30 is included to eliminate undesirable quantities therein. The conduit 26 extends to a branch 32, and a first line 34 extends through pressure regulator 36 to an attachment 38 whereby this line communicates with the interior of the tank 18. The valve 36 is employed to regulate the pressure of the fluid which is discharged from the tank through conduit 40. A liquid filter 42 is provided in the line 40 to eliminate undesirable quantities in the cleaning fluid.

A second line 44 extends from the branch 32 and each of the lines 40 and 44 communicate with a spray head 46. An air pressure regulator 45 is also included in the line 44. As best shown in FIGURE 3, the lines 40 and 44 converge at 48 whereby the high pressure fluid and gas can commingle and issue from the nozzle openings 50 to form a mist 52.

In the preferred use of the structure of this invention,

the nozzle is arranged in the tank so that it is located closely adjacent the top wall 54 of the tank. Since the mist issuing from the nozzle openings is usually characterized by a tendency to slowly settle within the tank, it is preferred that the mist initiate from near the top of the tank. It will be understood, however, that the mist by its very nature will quickly spread throughout the interior of the tank before significant settling has occurred.

FIGURE 2 illustrates a suitable means for locating the spray head in position within the tank. The cap 56 is internally threaded at 58 whereby the spray head can be quickly connected to the tank through the use of externally threaded neck 16 of the type conventionally formed in tanks of the type illustrated. To facilitate the location of the spray head, the conduits 40 and 44 may be attached to the threaded ends 60 once the spray head is in place.

In the use of the system of this invention, the nozzle structure is located within the tank immediately after the tank is empty. It is preferred that the nozzle structure be located a minimum of three inches below the top wall of the tank in order to achieve maximum efficiency. The air pressure valve 28 is then opened to commence introdutcion of the pressurized fluid and pressurized air. In a tank trailer appliaction, an emergency valve can be installed in the conduit 26 to insure that the air pressure will not be applied unless there is ample pressure in the brake system. For example, an 85 pound emergency valve can be employed ahead of the valve 28 so that the brake system will be protected.

The described system provides for the cleaning of a tank of standard size in a matter of minutes. It has been found that the normal pressure available from the pneumatic system of a tank trailer will provide particle sizes small enough so that two gallons of solvent will cover a tank having a 6000 gallon capacity. In this connection, it will be understood that the pressure applied is not a critical factor since a mist can be produced under a wide range of pressures. With the regulator valves employed, it is possible to provide a wide variety of operating arrangements and the conditions will vary widely depending on the nature of the chemical, the type of solvent, the size of the tank and the available pressure.

The system described is extremely efficient since the driver of a truck can quickly attach the disclosed structure which is permanently associated with the trailer supporting the tank. Once the spray nozzle is in place, the only operation required is the opening of the air valve. The cleaning operation can be commenced at the point of unloading and can continue while the tank is being transported to a new location. The use of the air brake system eliminates the necessity for providing a separate source of air pressure. Modification of available tank structures to accommodate the system of this invention is easily undertaken since only a single connection need be made to the source of pressurized air. The solvent container and associated lines can be attached to the trailer by any suitable means.

The apparatus and method of this invention is contemplated for use in combination with the storage and transportation of a variety of products including resins, varnishes, paints, lacquers and adhesives. Chemical solvents currently utilized for the cleaning of tanks containing such materials may be employed in the disclosed system. It is preferred that non-combustible solvents be employed in order to eliminate the danger of an explosion as a result of the handling of the solvents in the manner disclosed.

It will be understood that various changes and modifications may be made in the above described invention

which provide the characteristics of this invention without departing from the spirit thereof particularly as defined in the following claims.

That which is claimed is:

1. An apparatus for the cleaning of tanks used for the storage of chemicals and the like and carried on a portable supporting structure, said apparatus comprising a cleaning fluid container, means for applying pressure to the fluid in said container, said container means also being supported by said structure, a fluid spray head adapted to be inserted into said tank, conduit means communicating said container with said spray head, a source of pressurized gas, and conduit means connecting said spray head with said source whereby said fluid and said gas can be simultaneously introduced into said spray head to form a mist which is distributed throughout the interior of said tank, and wherein pressure is applied to said fluid by pneumatic means which are included in an air brake system for said structure, said pneumatic means also providing a source for said pressurized gas.

2. An apparatus for the cleaning of tanks used for the storage of chemicals and the like and carried on a truck trailer, said apparatus comprising a cleaning fluid container, means for applying pressure to the fluid in said container comprising pneumatic means, said pneumatic means also providing a source for said pressurized gas, and said pneumatic means being included in an air brake system for said truck trailer, said container also being carried by said truck trailer, a fluid spray head adapted to be inserted into said tank with the outlet nozzles thereof being disposed adjacent the top of said tank, conduit means communicating said container with said spray head, a source of pressurized gas, and conduit means communicating said spray head with said source whereby said fluid and said gas can be simultaneously introduced into said spray head to form a mist which is distributed throughout the interior of said tank.

3. A method for the cleaning of tanks carried on a truck trailer and employed for the transportation of chemicals which leave a residue remaining in the tank after the trank is substantially completely emptied, comprising the steps of including a spray head in said tank at a point near the top wall thereof immediately after removal of the chemicals from the tank, introducing into said spray head under high pressure a cleaning fluid capable of dissolving the chemical residue in the tank, simultaneously introducing into said spray head a gas under high pressure whereby said fluid and said gas will commingle in said spray head and form a mist for distribution throughout said tank, and including the steps of connecting the high pressure air from the pneumatic brake system of said tank trailer to a supply of said fluid to provide for the high pressure introduction of said fluid, and connecting said high pressure air to said spray head to provide for the introduction of said gas.

References Cited by the Examiner

UNITED STATES PATENTS

1,816,954	8/31	Byerley	134—102
2,596,151	5/52	Hudson	134—168

FOREIGN PATENTS

520,413	4/40	Great Britain.

CHARLES A. WILLMUTH, *Primary Examiner.*

J. G. NORTH, *Examiner.*