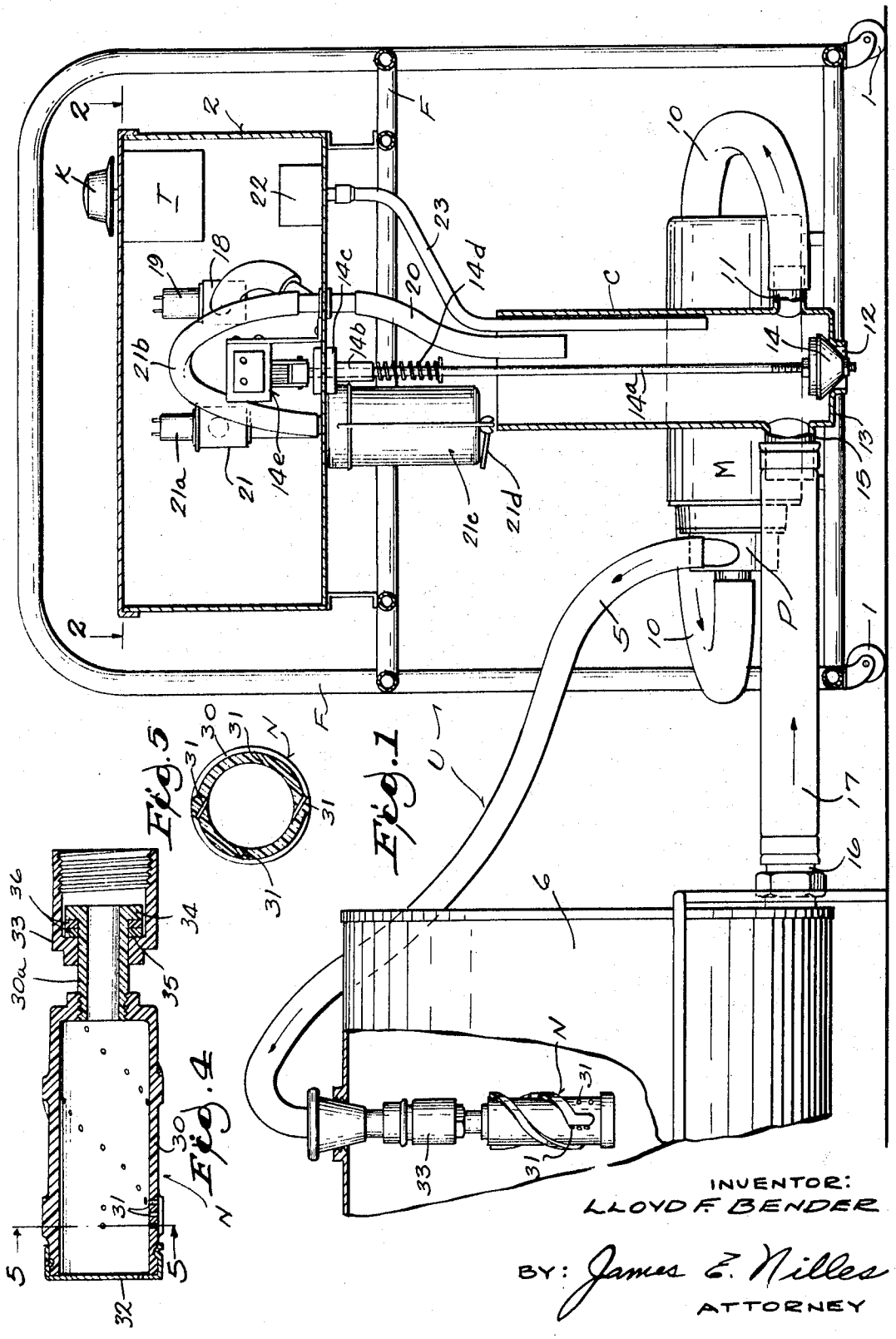
June 10, 1969 L. F. BENDER 3,448,742

PORTABLE, AUTOMATIC WASHING UNIT FOR TANKS

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June 10, 1969 L. F. BENDER 3,448,742

PORTABLE, AUTOMATIC WASHING UNIT FOR TANKS

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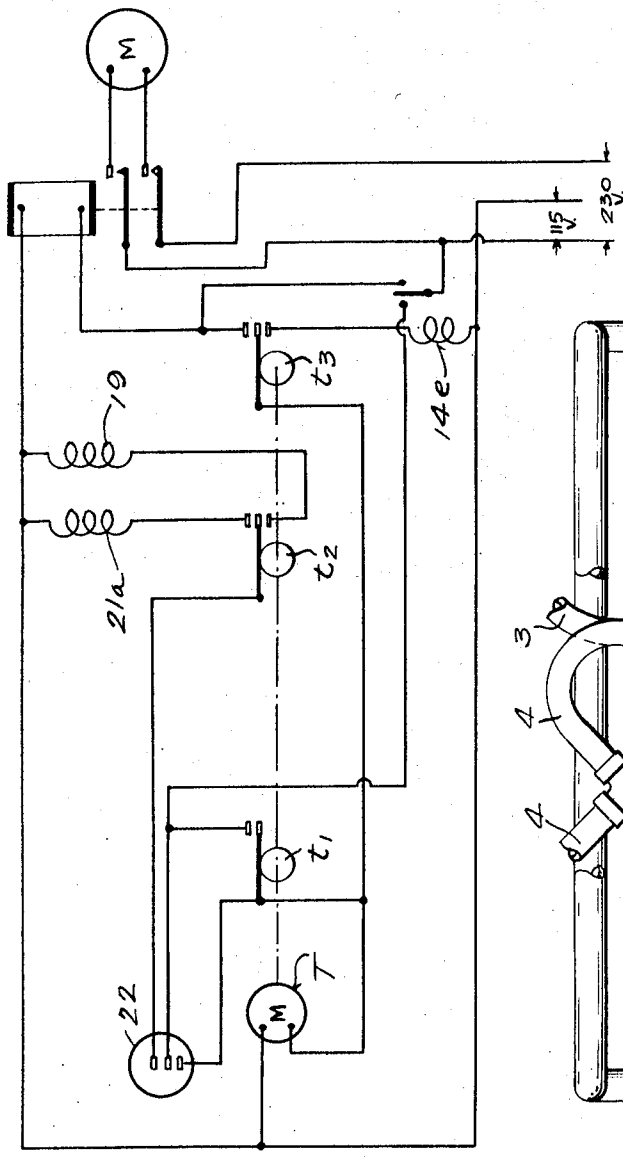



Fig. 3

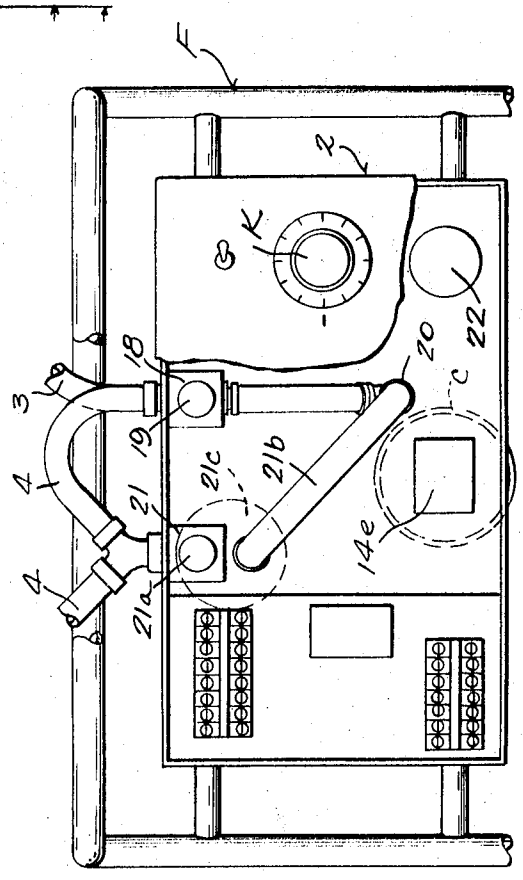



Fig. 2

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3,448,742

# PORTABLE, AUTOMATIC WASHING UNIT FOR TANKS

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U.S. Cl. 134—57 9 Claims

## ABSTRACT OF THE DISCLOSURE

Portable equipment for automatically washing liquid storage tanks or the like and having a regulating chamber to provide a single, portable piece of equipment capable of cleaning tanks of various sizes, shapes, elevations or locations.

## BACKGROUND OF THE INVENTION

Equipment of this character has been proposed and used, such as in dairy equipment for cleaning milk bulk tanks or storage tanks where the present invention finds particular but not exclusive utility. These prior art devices have had shortcomings, such as the inability to accommodate any tank, regardless of its disposition or location. Usually these prior devices were suitable for cleaning only a specific tank installation, or for cleaning-in-place equipment such as shown in my Patent 3,310,061, issued Mar. 21, 1967, entitled, "Milk Line Equipment."

## SUMMARY OF THE INVENTION

The present invention provides a portable unit for automatically cleaning liquid tanks regardless of their size, shape or disposition. For example, storage tanks, truck transport tanks or bulk holding tanks can be automatically cleaned with a number of rinsing and washing cycles, all with a single portable unit. This improved unit includes a regulating chamber which renders the unit usable regardless of the height of the drain of the tank and without any adjustment being required of the pressure control tube or other parts, except to provide proper height relationship of the unit relative to the tank being cleaned. The invention also contemplates the use of a spinning discharge nozzle for insertion in the tank to insure complete cleaning thereof.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is an elevational view of the unit provided by the present invention as used in cleaning a tank, certain parts being shown as broken away, in section or removed for clarity in the drawings;

FIGURE 2 is a plan view taken generally along line 2—2 in FIGURE 1, certain parts being shown as broken away or removed for clarity;

FIGURE 3 is an electrical wiring circuit used with the invention;

FIGURE 4 is an enlarged, sectional view of the nozzle shown in FIGURE 1; and

FIGURE 5 is a cross sectional view taken along line 5—5 in FIGURE 4.

## DESCRIPTION AF THE PREFERRED EMBODIMENT

The unit U includes a support frame F fabricated from steel tubing, or the like, which is welded together and provided with castor wheels 1 for easy portability. A control box 2 is rigidly supported on the frame and has a pair of water hoses 3 and 4 extending therefrom for detachable connection to conventional spigots (not shown), respectively, of conventional cold and hot water lines which furnish the necessary water. Also supported on the frame is a conventional electric motor driven fluid



pump P of the impeller type having its outlet connected to a conduit 5 for delivering the water to the upper side of a tank 6 to be cleaned. The inlet of the fluid pump is connected by a conduit 10 to a nipple 11 in the lower side of a regulating chamber C also carried on the frame.

The regulating chamber C is generally cylindrical in shape, upright and may be open at its top and has a discharge or drain opening 12 in its bottom 13 which forms a valve seat for a vertically shiftable valve element in the form of drain stopper 14.

The drain stopper 14 is connected to the lower end of a stopper rod 14*a* that extends centrally down into the chamber. The stopper 14 is conical in shape and may be of resilient material for good seating, such as rubber. The stopper 14 is also adjustable on the rod by a threaded connection therewith. The rod is vertically shiftable in a bushing 14*b* fixed by a lock nut 14*c* to the bottom of the control box. A spring 14*d* biases the rod downwardly. The rod and stopper are raised, thus opening the drain outlet 12 of the chamber, by the action of the electric solenoid 14*e* connected to the top end of the rod. The drain solenoid 14*e* is energized by a timer T.

The timer includes conventional cams *t*1, *t*2 and *t*3 for operating the various components, also in the control box, to be described. The timer is set by a control knob K on top of the control box.

The chamber C also has a nipple 15 adjacent its bottom end and the passage 16 of the tank is in fluid communication, via conduit 17, with the nipple 15 and chamber.

Thus the general flow of fluid is from the supply spigots (not shown), through a mixer valve 18, and operated by solenoid 19, and down a liquid feeder tube 20 into the chamber C. Water from the hot water line 4 can also be diverted (as will later appear) by a hot water valve 21, operated by solenoid 21*a*, into a jar 21*c* of detergent and this water picks up the detergent and carries it via tube 21*b* into the feeder tube 20, and consequently the chamber C and tank 6. The detergent is used for the second cycle, namely the washing cycle, as will appear, and jar 21*c* may be filled manually by releasing the bail handle 21*d* (FIGURE 1), or by automatically timed means (not shown).

It should be noted that the height of the regulating chamber C is set relative to tank 6 being cleaned so that the fluid level in the tank is regulated to, that is the same as, the level of the fluid in chamber C.

The fluid level is controlled or regulated by the level of the fluid in chamber C. Therefore, height of the chamber inlet 15 and tank outlet 16 should be approximately the same. For example, assuming the stopper 14 is down and thus closes the discharge outlet 12 of the chamber, the level of the fluid in the chamber C is controlled by a normally closed pressure switch 22, which switch causes closing of the solenoid operated water valve. The switch 22 is actuated by the height of the fluid in a pressure tube 23 extending from the pressure switch downwardly into the chamber. The switch 22 regulates the water valves and consequently the flow of the water to chamber C. The extent to which the pressure tube extends into the chamber determines the height to which the chamber will fill, and this setting need not be adjusted.

An example of a general cycle of operation for washing the tank, may be as follows: clean water (at a temperature of about 95 degrees for cleaning milk, for example, from the tank) is supplied from the mixing valve 18 and is first used to rinse the tank 6. When the water rises to a certain height in the chamber C, as determined by the pressure tube 23, the pressure switch 22 connected to the tube then energizes the electric timer T, which in turn shuts off the water valve, stopping the filling of the chamber C and tank 6. The timer then permits a rinse cycle,

turning on the fluid pump P, say for example three minutes, during which the water is circulated through the tank, being sprayed therearound by the rotating nozzle N, to be described in detail. At the end of this three minute cycle, the pump motor is shut off, halting the rinse water circulation through the tank, and the timer then causes lifting of the stopper **14** and opening of the drain valve **12** to dump the dirty water to the sewer.

The stopper valve is then closed by its solenoid **14***e* which is actuated by the timer, and hot water from the supply spigot then picks up a predetermined amount of detergent from container **21***c* and then fills the chamber C and tank **6** to the level set by the pressure tube **23** and switch **22**. The pump is then turned on by the timer to circulate the washing solution through the tank for a period of time set on the timer, say ten minutes. Then the timer shuts off the pump and the solution is drained when the timer actuates the solenoid **14***e* and causes stopper **14** to raise.

The drain stopper **14** then closes and the chamber and tank are then filled to the proper level with clear rinse water, or containing an acid if desired for cutting the "milkstone" or other film from the tank. The acid would be picked up by the siphoning or flow of cold water past an orifice of a solenoid valve (not shown). The pump circulates the water through the tank for a predetermined period of time for the final rinse.

After the drain valve has been opened sufficiently to drain the system, it closes and the entire washing cycle has been completed.

Referring again to the nozzle N, it includes a hollow spinner **30** having a series of non-radial holes **31** extending through its cylindrical wall at an angle so that a high velocity spray issues from the rotating nozzle and circulates water and detergent to all parts of the tank interior. The tank is thus thoroughly and easily sanitized.

The end of the spinner **30** is closed by a cap **32** and an adapter **33** is threaded on the end of conduit **5**. A flange **34** adjacent the end of the reduced portion **30***a* of the spinner seats on washers **36** against the internal shoulder **35** in the adapter to permit the spinner to rotate freely in the adapter due to water under pressure being sprayed from those holes **31** that extend generally tangentially from the spinner.

The spinning nozzle N, which is driven by the water being forced therefrom under pressure, insures that the water completely cleans the interior of the tank.

## RESUME

The portable unit provided by the present invention can be used with any type of tank without any adjustment, and the integral regulating chamber contains the pressure tube for determining water level, the fill tube and the drain. It is only necessary to set the regulating chamber at a height where the level of the fluid in the chamber will be the same as that desired in the tank to be cleaned.

All of the controls are compactly located in the box **2** and the entire unit is readily portable and highly efficient and easily used.

I claim:

**1**. A portable and automatic washing unit for tanks comprising a support frame, an electric motor driven fluid pump carried on said frame, a fluid regulating chamber carried on said frame, conduit means connected at one end to the discharge of said pump and having a free end adapted to be placed in a tank to be cleaned, a second conduit connected at one end to the inlet of said pump and at the other end to said regulating chamber, a third conduit connected at one end to the lower portion of said chamber and its other end being connectible to the lower portion of said tank, both third conduit connections being at substantially the same level whereby fluid drains between said chamber and tank to regulate the fluid level within said tank, said chamber also having a drain outlet, a drain stopper means engageable with said drain outlet and mounted for shifting between a drain outlet closed position and a drain outlet open position; electrical control means including an electric timer, a solenoid operated water supply valve, a water supply conduit connected to said water supply valve for supplying water to said chamber and consequently to said tank, water level regulating means extending into said chamber and including a pressure switch for causing said timer to close said water supply valve when water in said chamber reaches a predetermined height, and stopper solenoid means for raising said drain stopper means to the drain open position, said electric timer being operative to sequence the actuation of said solenoid operated water supply valve, said electric motor driven fluid pump, and said stopper solenoid means.

**2**. A unit as set forth in claim **1** including a control box located above said chamber and housing said electrical control means.

**3**. The combination of claim **2** further characterized in that said water level regulating means includes a pressure tube extending downwardly from said control box and into said chamber to sense the water level therein.

**4**. The combination defined in claim **2** further characterized in that said drain stopper means includes a stopper for engaging said drain outlet and having a rod extending upwardly therefrom and into said control box for connection with said stopper solenoid means.

**5**. The combination defined in claim **3** further characterized in that said drain stopper means includes a stopper for engaging said drain outlet and having a rod extending upwardly therefrom and into said control box for connection with said stopper solenoid means.

**6**. A unit as defined in claim **1** including a rotatable nozzle on said free end of said conduit means in said tank, said nozzle being rotatable by water passing therethrough to thoroughly clean the inside of said tank.

**7**. A unit as defined in claim **3** including a rotatable nozzle on said free end of said conduit means in said tank, said nozzle being rotatable by water passing therethrough to thoroughly clean the inside of said tank.

**8**. A unit as defined in claim **4** including a rotatable nozzle on said free end of said conduit means in said tank, said nozzle being rotatable by water passing therethrough to thoroughly clean the inside of said tank.

**9**. A unit as defined in claim **5** including a rotatable nozzle on said free end of said conduit means in said tank, said nozzle being rotatable by water passing therethrough to thoroughly clean the inside of said tank.


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