

- [54] **WASTE DISPOSAL SYSTEM AND METHOD** 3,463,159 8/1969 Heinlich..... 137/525.1 X
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- [51] Int. Cl..... **B08b 3/00**
- [58] Field of Search..... 137/205, 15, 525.1, 137/209; 141/59; 222/130; 134/169; 4/1; 417/149, 148

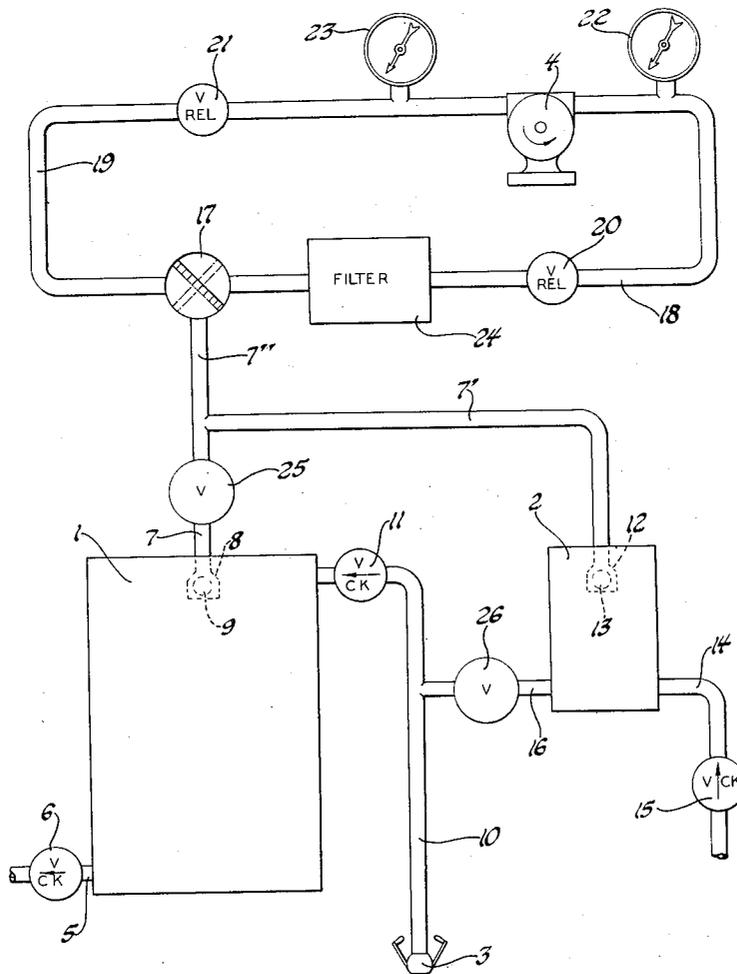
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[57] **ABSTRACT**

Vacuum and pressure are selectively applied by an air pump through a conduit interconnecting two tanks which have a second interconnecting conduit connectable to the access fitting of a boat waste receptacle. Application of vacuum withdraws the waste from the receptacle into one of the tanks and lake water into the second tank through a third conduit whose inlet end can be dropped overboard. The lake water is then expelled by air pressure into the receptacle as a flushing fluid and thence withdrawn into the first tank from which it and the previously withdrawn waste are finally expelled through a fourth conduit connectable to a public sewer or other disposal facility.

2 Claims, 3 Drawing Figures

- [56] **References Cited**
- UNITED STATES PATENTS**
- 1,587,864 6/1926 Sargent..... 137/205
- 3,378,025 4/1968 Hilde 137/205
- 3,115,148 12/1963 Tiljendahl..... 137/205
- 3,422,844 1/1969 Grise..... 137/525.1



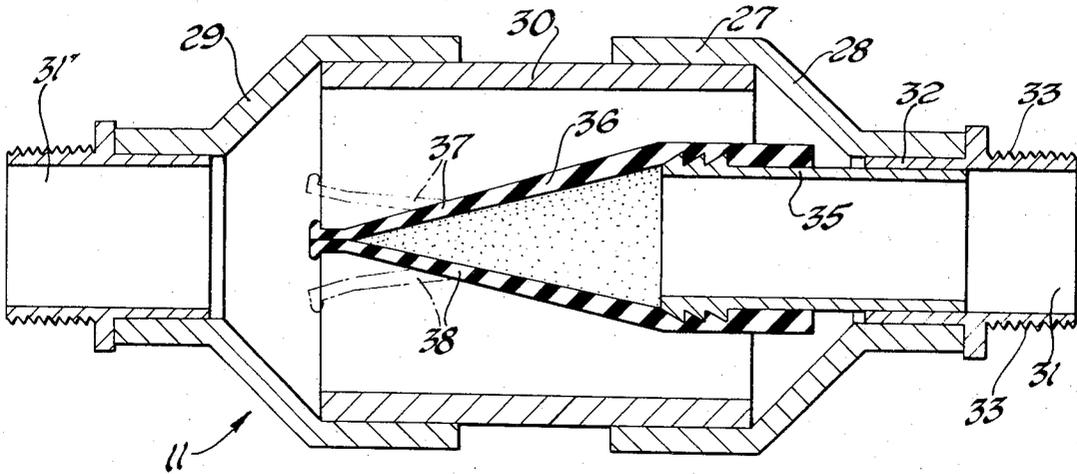


Fig. 2

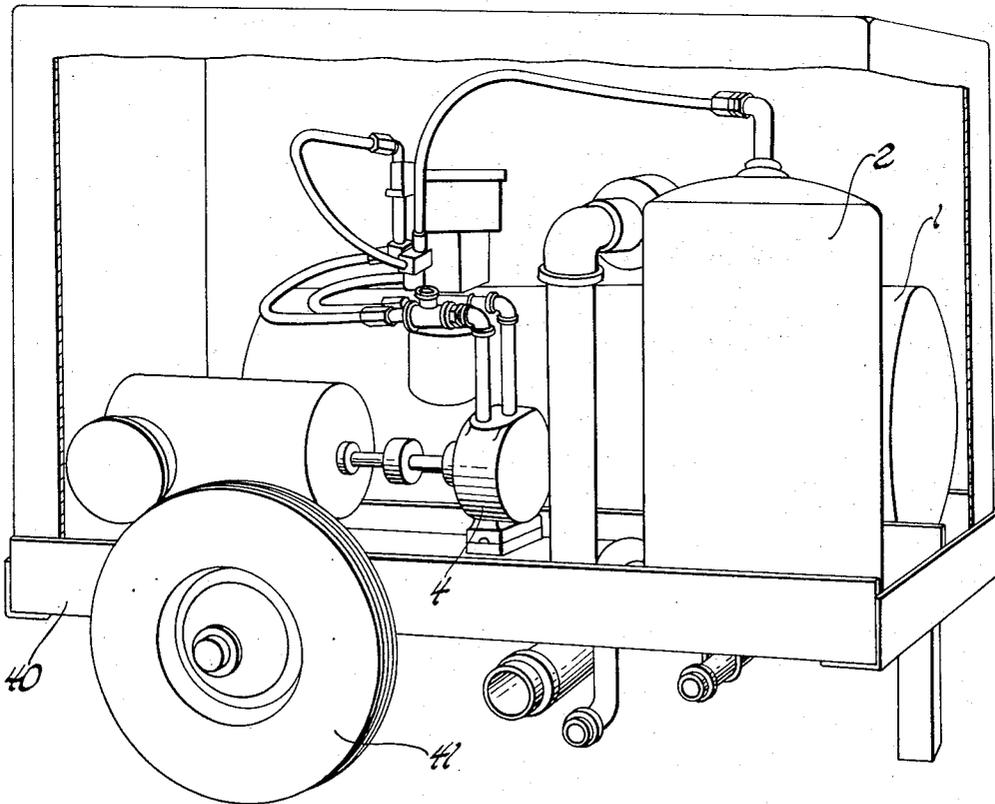


Fig. 3

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WASTE DISPOSAL SYSTEM AND METHOD

BACKGROUND OF THE INVENTION

1. Field of the Invention

My invention relates to the art of servicing, i.e., 5
cleanout and flushing, of toilet waste receptacles, of
small pleasure boats, airplanes, travel trailers and like
vehicles. Increasing anti-pollution legislation imposes
severe problems on the operators of such craft. For ex-
ample, certain states now prohibit the indiscriminate 10
dumping of such receptacles into the adjacent water-
ways, even at considerable distances off shore. This
makes it necessary for operators of such craft to make
suitable provision for discharging their receptacles into
a public sewer system or other land based disposal fa- 15
cility approved by the authorities. My invention pro-
vides an improved system and method for accomplish-
ing this desired result which both is entirely sanitary
and takes but a relatively few minutes to accomplish.
A principal feature of my invention distinguishing it 20
from the prior art is that provision is made for first
withdrawing the waste from the receptacle being ser-
viced, followed by flushing the receptacle and with-
drawing the flushing fluid therefrom, followed, if de-
sired, by refilling the receptacle with a second quantity
of flushing fluid, and thence finally expelling the with- 25
drawn waste and initial flushing fluid into a public
sewer. The system also distinguishes importantly from
the prior art in that the pump means is completely iso-
lated from the waste and flushing fluid flow circuit so
that all problems of clogging the pump are avoided.

2. Description of the prior art

The closest approach to such a system in the prior art
of which I am aware is that disclosed in the U.S. Pat.
No. 3,528,462 to Quase wherein waste from the boat 30
access fitting is withdrawn through a pump to a sub-
merged storage tank, from which it may be periodically
discharged through suitable piping to an installation on
shore for later further removal by a tank truck or the
like. No provision, however, is made for flushing and 40
refilling the waste receptacle in the boat, and all waste
withdrawn therefrom must pass through the pumps. In
the U.S. Pat. No. 3,546,713 to Gagne an on-board
waste disposal system for boats is disclosed in which the
waste is pumped into successive tanks for maceration, 45
sterilization and liquid separation, respectively, from
the last of which the liquid is discharged over board
below the water line. No provision is made for removal
of the solid wastes, and, as in the Quase patent, all
waste flow is directly through the various pumps used 50
in the circuit.

SUMMARY OF THE INVENTION

It is therefore a principal object of my invention to
provide for servicing such vehicle equipped waste re- 55
ceptacles by selectively applying vacuum or air pres-
sure to a waste holding tank and a flushing fluid hold-
ing tank in order to draw the waste into the former and
flushing fluid into the latter so that the flushing fluid
may thence be delivered to the receptacle and thereaf- 60
ter withdrawn into the waste holding tank for final ex-
pulsion therefrom along with the previously withdrawn
waste into a public sewer or other external disposal fa-
cility. It is a further important object of my invention
to provide such a system wherein the pumping of waste 65
and flushing fluid from the receptacle being serviced is
accomplished without allowing these materials to pass

through the pump, thereby avoiding any possibility of
the pump becoming clogged or worn by passage of
those materials therethrough.

In accordance with the invention, the waste recepta-
cle may be refilled with clean flushing fluid by with-
drawing a second quantity thereof into the flushing
fluid holding tank and thence discharging the same into
the receptacle after the initial flushing fluid quantity
therein has been withdrawn into the waste holding 10
tank.

The means by which these and other objects and ad-
vantage of the invention are attained will be more
clearly understood from the following detailed descrip-
tion of one preferred embodiment selected for illustra-
tion, having reference to the drawings, wherein: 15

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagrammatic layout of a waste receptacle
servicing system embodying the invention;

FIG. 2 is a cross sectional view of a check valve used
in the system of FIG. 1;

FIG. 3 is an elevational view of a physical unit incor-
porating the features of the system shown in FIGS. 1
and 2. 25

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now in detail to the drawings, and first to
FIG. 1, a system is shown including a closed waste hold-
ing tank 1, a closed flushing fluid holding tank 2, a cou-
pler 3 connectable to a typical waste access fitting (not
shown) of the boat or other vehicle whose waste recep-
tacle is to be serviced, an air pump 4 and suitable con-
necting conduits for carrying out the invention.

The waste holding tank 1 has an outlet, preferably lo-
cated in the lower portion thereof, in the form of a con-
duit 5 through which flow is limited to the outward di-
rection only by a check valve 6. The conduit 5, down-
stream of the check valve 6, may be connected by a
flexible hose (not shown) to a public sewer or other
suitable waste disposal facility. In the upper portion of
the tank 1 is a combined dual inlet and outlet shown in
the form of a conduit 7 which connects with the inter-
ior of the tank via a valve seat 8. A fluid level respon-
sive valve 9 is provided for closing the outlet conduit
7 against outward flow by moving into abutment with
the seat 8 when the fluid level in the tank reaches a pre-
determined height. The tank 1 is also provided with an
inlet, preferably but not necessarily located in the
upper portion thereof, as shown in the form of a con-
duit 10 through which flow is limited to the direction
inwardly of the tank by a check valve 11. The conduit
10 serves as a waste conduit, being connected at its op-
posite end to the coupler 3. The conduit 7 is an air con-
duit having a branch 7' whose opposite end forms a
combined inlet and outlet in the upper portion of the
flushing fluid holding tank 2. As in the case of the tank
1, the latter combined inlet and outlet is provided with
a valve seat 12 which is closable against flow there-
through by a fluid level valve 13. The tank 2 also has
an inlet, shown in the form of a conduit 14, through
which flow is limited to the direction inwardly of the
tank by a check valve 15. To this conduit 14, upstream
thereof from the check valve 15, may be connected a
flexible hose (not shown) leading to a suitable source
of flushing fluid. In the case of servicing a waste recep-
tacle of a boat while docked this is simply accom-

plished by extending the opposite end of the flexible hose overboard below the water line. Obviously, however, the end of the conduit 14 upstream of the check valve 15 might be similarly connected to any suitable water reservoir or pressure water supply line. The flushing fluid holding tank 2 is also provided with a combined inlet and outlet in the form of a conduit 16 which connects thereto at a height preferably located below that of the valve seat 12 and valve 13. This conduit 16, which serves as a flushing fluid delivery conduit, connects at its lower end with the coupler 3 in common with the waste conduit 10.

A second branch 7" of the air conduit 7 is shown leading to a four-way or selector valve 17. The air conduit branch 7" forms a combined inlet and outlet of the selector valve 17 which interconnects, through a vacuum air line 18 and a pressure air line 19 with the inlet and outlet, respectively, of the air pump 4. It will be understood that the pump 4 is suitably driven, as by an electric motor (not shown). A suitable adjustable relief valve 20 is shown installed in the vacuum air line 18 to limit the vacuum applied therein by the pump 4 to a predetermined value, such as 15 inches of mercury. Also a suitable pressure relief valve 21 is shown installed in the air pressure line 19 to limit the pressure developed therein to a predetermined value, such as 20 pounds per square inch. 22 and 23 are gauges to indicate the respective vacuum and pressure, respectively, developed by the pump 4 in operation. A filter 24 may also be incorporated in the vacuum air line 18 to intercept moisture and any foreign particles which might otherwise be drawn into the pump 4.

Selectively closable and openable valves 25 and 26 are shown installed in the air conduit 7 and flushing fluid conduit 16, respectively. The inclusion of the valve 25 is not essential to the operation of the system, but it does perform the useful function of expediting the applications of vacuum and pressure to the flushing fluid holding tank 2 during withdrawal of fluid therein through the conduit 14, and expulsion of such fluid into the receptacle via the coupler 3, respectively, since closure of the valve 25 during those times renders it unnecessary to build up the same vacuum or pressure in the waste holding tank 1. Also, while the selector valve 17 and the valves 25 and 26 may be operated manually, it will be appreciated that suitable energizing means (not shown) such as solenoids may be incorporated therewith in a circuit including timing or sensing devices and a start button, so the different sequential operations of the system may be carried out automatically.

The sequence of operating steps in servicing a waste receptacle will now be described. The air pump 4 preferably operates continuously throughout the cycle, and upon setting the selector valve 17 in the dotted line position shown and opening the valve 25 and closing the valve 26 vacuum will then be applied both to the waste holding tank 1 and the flushing fluid holding tank 2. This will result in withdrawing the waste contained in the receptacle being serviced into the tank 1 and simultaneously withdrawing flushing fluid through the conduit 14 into the tank 2. Since such waste receptacles are normally vented, this action may be continued until an audible loss of vacuum is noted in the waste conduit 10. It will be appreciated that the capacity of the waste holding tank 1 should be large enough to accommodate the contents of the largest receptacle intended to be

serviced, plus the fluid holding capacity of the flushing fluid holding tank 1. Over-filling of the flushing fluid holding tank is prevented by closure of the fluid level responsive valve 13 therein. Next, upon resetting the selector valve 17 to the solid line position shown, closing valve 25 and opening the valve 26 air pressure will then be applied by the pump 4 to the tank 2 for expelling the flushing fluid therefrom, into the receptacle via the coupler 3. When this is completed, the selector valve 17 is reset in its dotted line position, the valve 25 is again opened and the valve 26 is again closed, whereupon vacuum is again applied by the pump to the tanks 1 and 2 resulting in the flushing fluid being withdrawn from the waste receptacle through the coupler 3 into tank 1 while simultaneously a fresh quantity of flushing fluid is drawn into the tank 2 through the conduit 14. Thereafter, if it is desired to refill the waste receptacle with a fresh quantity of flushing fluid, which is usually the case, the selector valve 17 is moved to its solid line position, the valve 25 is closed and the valve 26 is opened, thereby resulting in air pressure being applied to the contents of the tank 2 to force the fresh flushing fluid through the coupler 3 into the waste receptacle. Thereafter, or if such refilling of the receptacle is deemed unnecessary, the valve 25 may be opened and the valve 26 closed with the selector valve 17 in its solid line position so that pressure is applied by the pump through conduit 7 to the waste holding tank 1 to expel to the sewer via the conduit 5 all of the waste and flushing fluid previously withdrawn thereinto from the receptacle. It will be appreciated that the check valve 11 in the waste conduit 16 prevents return of waste there-through during this discharge of material from the tank 1, and that likewise the check valve 15 prevents return flow of flushing fluid through the conduit 14 when discharging such fluid from the tank 2 to the receptacle, and that check valve 6 prevents loss of vacuum in the waste holding tank 1 during withdrawal thereinto of waste from the receptacle via the coupler 3 and waste conduit 10.

Referring to FIG. 2 it will be seen that the check valve 11 in the waste conduit leading to the tank 1 preferably comprises an elongated housing 27 which may be constructed in one piece, or in a plurality of sections as shown. In the particular embodiment illustrated the body of the housing is formed of a pair of oppositely facing bell shaped members 28 and 29 whose large ends are joined together by a cylindrical member 30. The inlet to the housing is formed by a nipple 31 having an inner portion 32 extending into and sealingly joined to the smaller end of the bell member 28, and an outer portion 33 which may be serrated or threaded as at 34 for gripping engagement with the adjacent end of the waste conduit 16 (FIG. 1). Likewise, the outlet end of the housing is similarly formed by a nipple 31' for connecting the smaller end of the bell member 29 to its connecting end of the waste conduit 16. Sealingly received within the inner portion 32 of the nipple 31 and extending therefrom into the housing is a rigid sleeve member 35 connecting a further extending sleeve-like member 36 of elastically flexible material. The opposite sidewalls 37, 38 of this flexible member 36 are preformed so as to normally taper toward and into abutment with each other (as shown in their solid line positions) to form a closure against reverse flow through the housing. During forward flow, fluid pressure forces the extended ends of the opposing sidewalls 37, 38 out

of engagement with each other and toward their positions shown in dotted lines. Preferably a valve of this construction is also used for the check valve 6 in the discharge conduit 5 from the waste holding tank 1. Valves of this construction have proven exceptionally reliable and positive in operation and have a further advantage of requiring relatively low fluid pressures to effect forward flow therethrough, yet afford a positive seal against reverse flow.

FIG. 3 shows a portable unit incorporating the waste holding tank 1, flushing fluid holding tank 2, air pump 4, valving and interconnecting conduits and flow lines described in connection with FIGS. 1 and 2. The assemblage, as shown, is mounted on a trailer-like chassis 40 having road wheels 41 for conveniently maneuvering the unit around a marina dock, air field or travel trailer servicing area.

It is appreciated that the individual components of the system may take various different forms and that their interconnections may be modified from those specifically illustrated and described without departing from the spirit and scope of my invention as hereinafter claimed.

Having thus described my invention, I claim:

1. In a system for servicing waste receptacles of marine and other vehicle-equipped sanitary facilities, a coupler connectable to the waste receptacle to be serviced, a waste holding tank having an outlet connectable to an external sewer, a flushing fluid holding tank having an inlet connectable to a source of flushing fluid, a waste conduit interconnecting said coupler and waste holding tank, a flushing fluid conduit interconnecting said coupler and flushing fluid holding tank, and means for selectively applying vacuum and air pressure to the interiors of each of said tanks for sequentially effecting the withdrawal of waste into the waste holding tank from the receptacle, delivering a quantity of flushing fluid to the receptacle, withdrawal of the flushing fluid quantity into the waste holding tank and expulsion of said waste and flushing fluid quantity from the waste holding tank to said sewer, said means including an air pump having an inlet and outlet, an air conduit having connections with each of said tanks, a valve selectively operable to connect the air conduit to either of said pump inlet or pump outlet, and valves respectively operable to control air flow to and from said waste holding tank via said air conduit and flow of flushing fluid to and from said flushing fluid holding tank via said flushing fluid conduit, said air conduit connections with the tanks being located in the

upper portions of the tanks and each including a valve seat and a fluid level responsive valve movable against the seat to block flow outwardly of the tank when the fluid level therein reaches a predetermined height, said means further including check valves in each of said waste holding tank outlet, flushing fluid tank inlet, and waste conduit, at least one of said check valves in the waste holding tank outlet and waste conduit comprising an elongated valve housing having an inlet at one end and an outlet at the other end, a fixed sleeve extending into the housing from said inlet, and an elongated hollow member sealingly secured at one end to the sleeve and having elastically yieldable sidewall portions extending toward said outlet and tapering toward each other to form a closure therebetween at their extended ends.

2. In a system for servicing waste receptacles of marine and other vehicle-equipped sanitary facilities, a coupler connectable to the waste receptacle to be serviced, a closed waste holding tank having a check valve controlled outlet in the lower portion thereof, a closed flushing fluid holding tank having a check valve controlled inlet connectable to a source of flushing fluid, an air pump having an inlet and an outlet, an air conduit interconnecting the upper portions of said tanks, a selector valve alternatively operable to connect either said pump inlet or pump outlet to said air conduit, a selectively closable and openable valve controlling flow in said air conduit between said selector valve and the waste holding tank, a waste conduit interconnecting said coupler and the lower portion of the waste holding tank, a flushing fluid conduit interconnecting said waste conduit and the lower portion of the flushing fluid holding tank, a selectively openable and closable valve controlling flow in said flushing fluid conduit, and a check valve accommodating one way flow only to the waste holding tank from said waste conduit, said last named check valve including a valve housing having an inlet connected to said waste conduit and an outlet connected to said waste holding tank and a sleeve-like member of elastically flexible material within said housing, said member having one of its ends connected to said housing inlet and its opposite end extending toward said housing outlet, said extended end of said member having a normally pinched configuration in which the opposite sidewalls thereof are in abutting engagement with each other to form a closure against reverse flow.

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