

[54] TOILETS
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[57] ABSTRACT
 A toilet comprising a toilet bowl, a receiving chamber beneath the bowl, the receiving chamber having a bottom of bowl-shape or funnel-shape with an outlet opening at its lowest point and having an enclosing wall at least a large part of which is of filter material, a pump chamber outside the enclosing wall, and a pump arranged to recirculate liquid from the pump chamber to the bowl for flushing.

2 Claims, 3 Drawing Figures

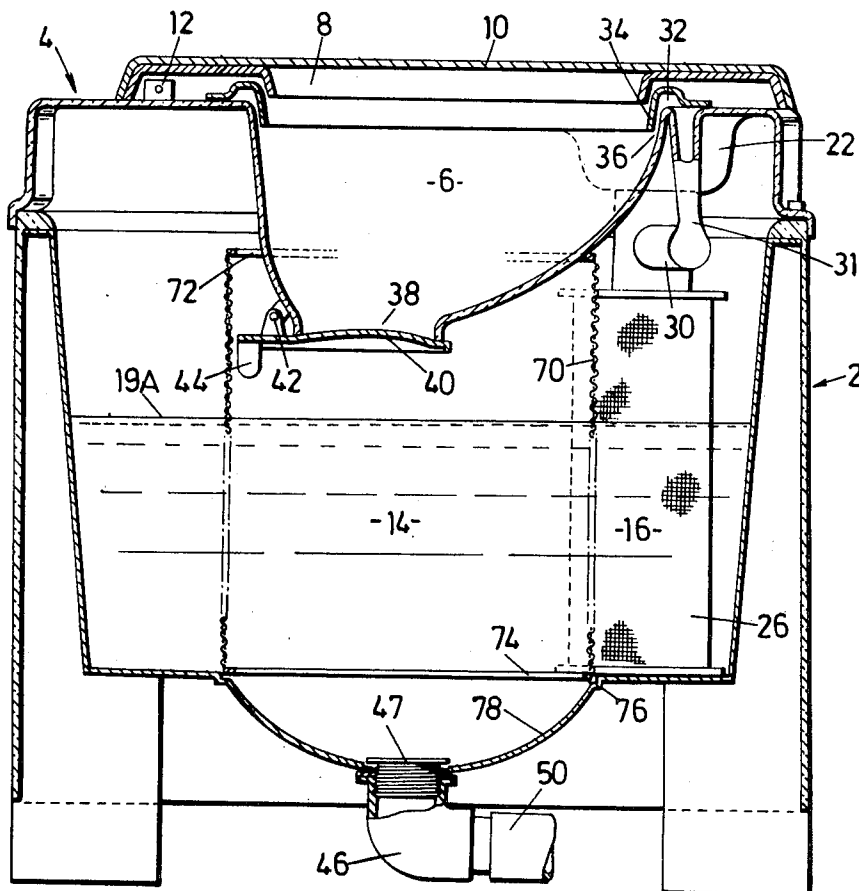
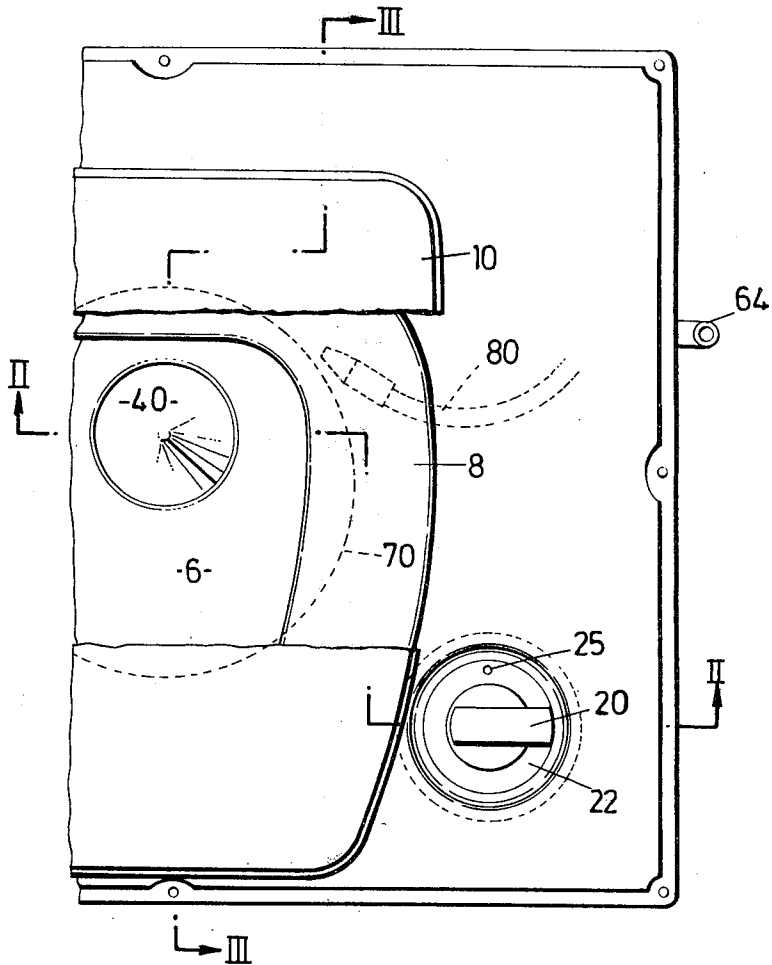


Fig. 1.



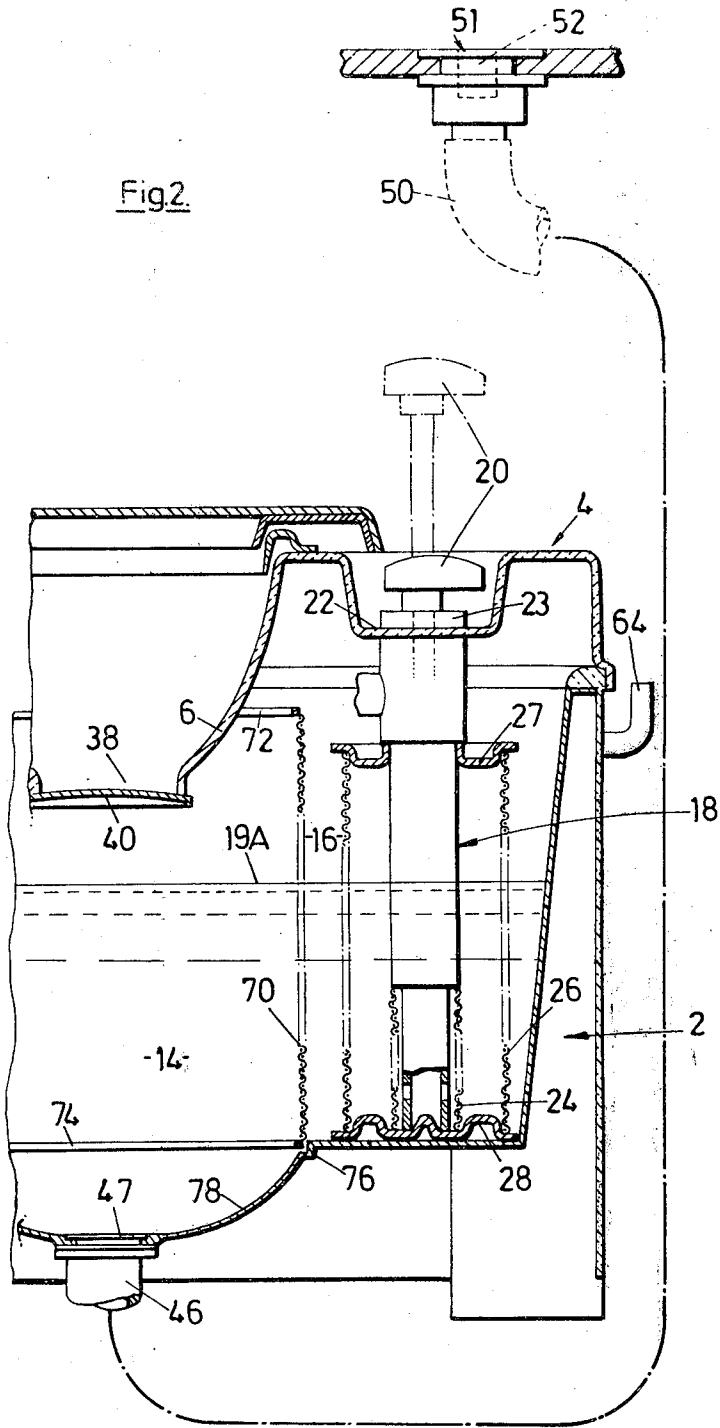
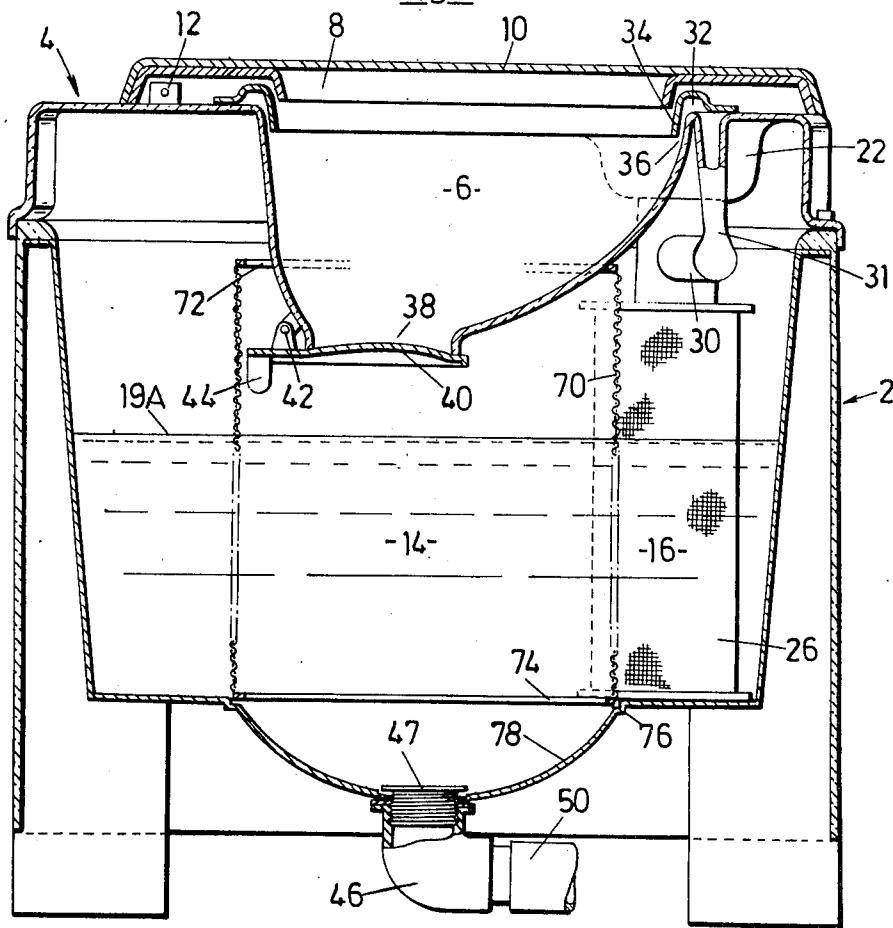


Fig. 3



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TOILETS

There is an increasing need to provide for boats operating in enclosed waters a form of toilet which does not discharge overboard, but is emptied at intervals of, say, 1 week. The present invention concerns toilets which have been primarily designed to meet this requirement, but which can be used in other situations.

A toilet according to this invention comprises a toilet bowl, a receiving chamber beneath the bowl, the receiving chamber having a bottom of bowl-shape or funnel-shape with an outlet opening at its lowest point and having an enclosing wall at least a large part of which is of filter material, a pump chamber outside the enclosing wall, and a pump arranged to recirculate liquid from the pump chamber to the bowl for flushing.

Each time the toilet is emptied, by removing the contents of the receiving chamber through the outlet opening, liquid from the pump chamber flows inwards through the enclosing wall to the receiving chamber and thence to the outlet opening. This action, in conjunction with the shape of the bottom, has been found to clean out the receiving chamber very effectively and reliably.

Preferably all, or at least the majority, of the enclosing wall is of filter material. In a most preferred arrangement the enclosing wall is a cylinder of metal gauze and the pump chamber entirely surrounds the wall.

Preferably the toilet incorporates various other features, and these are embodied in the example which will be described with reference to the accompanying drawings. In these drawings:

FIG. 1 is a plan of the toilet, with parts of a cover and seat broken away;

FIG. 2 is a section on the line II—II in FIG. 1; and FIG. 3 is a section on the line III—III in FIG. 1.

The housing of the toilet is rectangular with rounded corners, and consists of a base 2 which serves as a reservoir, and a lid 4 which includes a bowl 6. The lid and the base are each made of resin, reinforced with glass fibre. A seat 8 and a cover 10 are hinged to lugs 12 on the lid 4.

The interior of the base 2 is divided into a receiving chamber 14 and a pump chamber 16 by an enclosing wall 70 in the form of an upright cylinder of wire gauze. This acts as a primary filter. The wall has stiffening rings 72, 74 at the top and bottom, and the bottom ring 74 sits in a rebate 76.

The bottom 78 of the receiving chamber 14 has the form of a bowl, in the lowest point of which is an outlet opening, to which is fixed a 90° pipe bend 46, as described more fully below.

For use, the interior of the base, that is to say the chambers 14 and 16, is partly filled with a liquid 19A consisting of water and suitable chemicals. This liquid is disinfectant, detergent, and deodorant, and has a suitable colour. The bowl 6 is flushed by operating a pump 18 by means of a handle 20. The pump is of piston and cylinder type, and the cylinder is vertical, with its upper end fixed to the lid 4, in the centre of a depression 22 which accommodates the handle 20 when not in use. The pump is located near the front of the toilet, so as to be easily reached. The piston rod to which the handle 20 is attached emerges from the pump cylinder through a seal of a type designed to resist the adherence of liquid to the piston rod. This is in-

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dicated at 23. Any liquid which may collect in the depression 22 can drain away through a small hole 25.

The intake of the pump is at its lower end, immersed in the liquid in the pump chamber 16, and is protected by a third-stage filter 24, in the form of a cylinder of fine wire gauze. There is also a second-stage filter in the form of a larger cylinder 26 of wire gauze, which entirely surrounds the pump, and is attached to an upper disc 27 fixed to the barrel of the pump 18, and located by a lower disc 28, having a central dimple which cooperates with a projection on the bottom of the base 2. The wire gauzes are of the following gauges (in English sizes):

Filter 70	15 × 15 mesh	24 gauge
Filter 26	15 × 15 mesh	24 gauge
Filter 24	24 × 24 mesh	29 gauge

The delivery of the pump is through a hose 30 to a pipe 31 leading to a flushing passage 32 provided by a shaped member 34 which is attached to the lid 4 around the bowl, and which provides a narrow slot 36 through which liquid for flushing can be discharged all round the bowl. Sewage and flushing liquid pass from the bowl into the receiving chamber 14 through a centre opening 38 in the bottom of the bowl.

This opening is normally closed by a flap 40 which, as shown in FIG. 3, is pivoted to the underside of the bowl at 42, and acted on by an integral counterweight 44.

The majority of sewage settles as a sludge on the bottom of the receiving chamber 14, and any other solids are prevented from reaching the pump 18 by the three filters. The area of the primary filter 17 is so large that a considerable part of it can become blocked without interfering with the flow of liquid to the pump for flushing.

After a period of use, the liquid and sewage can be removed through the outlet opening and the pipe bend 46. This bend is fixed by means of a flanged bush 47 having an external thread engaging an internal thread in the bend 46. In installation, the bush is first screwed up only loosely, so that the bend 46 can be rotated into any desired direction. The bend 46 is connected to a pipe 50, and in a cabin cruiser this pipe is led by a convenient route to a deck fitting 51 shown at the top of FIG. 2. When the pipe 50 is in place, the bend 46 is then locked in position by screwing up the bush 47 fully.

The deck fitting 51 is normally closed by a plug 52. This plug can be removed by a person at a yacht harbour, who then connects the fitting to a suction plant by which the entire contents of the toilet are removed. To facilitate this action, the upper part of the pump chamber 16 has an elbow 64 which can be connected by a pipe (not shown) to a second deck fitting with removable plug, which serves as a vent. The plugs are then replaced and fresh liquid is placed in the toilet.

Note that the flange 47 is accommodated in a recess in the bottom 78, so that its upper face is flush with the bottom 78.

In a cabin cruiser, vibration caused by the engine will promote a self-cleaning action of the filters.

If desired, the enclosing wall 70 can be extended to touch the underside of the lid, so as to prevent transfer of solids from the receiving chamber to the pump

chamber if the boat heels over to a large extent, in particular when aground.

If desired, a pipe 80 may be provided which can be connected to a further deck fitting, and which terminates within the pump chamber in a flat nozzle directed tangentially at the enclosing wall 70. High pressure liquid can be delivered occasionally into the pipe 80 from a shore installation for the purpose of removing any solid residues from the wall 70.

In the example shown, the depth of the bowl-shaped bottom 78 is 2½ inches (63 mm) and its diameter is 12½ inches (308 mm). The ratio is found to give satisfactory removal of sludge and solids by the flow of liquid to the outlet opening.

In the example shown, the diameter of the cylindrical enclosing wall 70 is 12½ inches (308mm). This is found to provide adequate primary filter area, in conjunction with a vertical dimension of 9⅞ inches (232 mm) from the opening 38 in the bottom of the toilet bowl to the lower edge of the wall 70. However, it is possible to depart from these dimensions and still obtain reasonable performance. In particular, the diameter of a cylindrical enclosing wall may be greater or less than the length of the toilet bowl.

The shapes of the receiving chamber bottom 78 and of the enclosing wall 70 are the most satisfactory known to us, but the invention can be embodied in other rather less satisfactory shapes and arrangements.

For example the bottom 78 may be conical. The outlet opening need not be central, provided it is at the lowest point. The axis of the opening need not be vertical.

The wall 70 may be square or rectangular in plan, or elliptical, or oval, or even triangular or hexagonal.

The enclosing wall may have one or more non-

perforate parts. For example it may be D-shaped, consisting of a semi-cylindrical filter and a flat portion which is part of the back of the body. Or it may be rectangular, with two perforate sides, and with imperforate back and front constituted by the body. In this case the pump chamber is in two parts and there may be a duct interconnecting them.

We claim:

1. A toilet comprising a toilet bowl, a receiving chamber beneath the bowl, the receiving chamber having a bottom of bowl-shape with an outlet opening at its lowest point and having an enclosing wall at least a large part of which is of filter material, a pump chamber outside the enclosing wall, a pump of piston and cylinder type, with its axis vertical, having an intake lying at the lower end of the pump cylinder and within the pump chamber, a second-stage cylindrical filter entirely surrounding the pump and a third-stage filter protecting the intake, and means enabling the pump to recirculate liquid from the pump chamber to the bowl for flushing.

2. A toilet comprising a toilet bowl; a receiving chamber beneath the bowl, the receiving chamber having a bottom of a bowl shape with an outlet opening at the lowest point thereof and having an enclosing wall, at least a large part of said enclosing wall being of filter material; the toilet bowl having a central downwardly opening outlet aperture therein, said central aperture being located directly above the outlet opening in the receiving chamber; a pump chamber located outside of the enclosing wall; at least a large part of said pump chamber being of filter material; and a pump for recirculating liquid from the pump chamber to the bowl for flushing.

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