RECYCLING SEWAGE SYSTEM

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ABSTRACT

A recirculating sewerage system including at least one water closet, a recirculating tank including effluent receiving and pumping chambers separated by a common wall, the common wall supporting a filter for restricting the passage of bulk waste including paper products which float on the top of the received effluent from the effluent receiving chamber to the pumping chamber, a pump including a filtering element for drawing liquid effluent from the pumping chamber and for directing the drawn and filtered liquid effluent to the water closet to flush same, the means for creating turbulence proximate the upper surface of the effluent within the effluent receiving chamber adjacent the filter when the pump is actuated whereby the flow of the floating paper products from the effluent receiving chamber to the pumping chamber during actuation of the pump will be inhibited.

3 Claims, 4 Drawing Figures
RECYCLATING SEWERAGE SYSTEM

This invention relates to recirculating sewerage systems for use on vehicles such as buses, trains and planes, and for use in other structures where an unlimited source of pour water is either not available or cannot be stored in the limited environment in which the system is located.

Recirculating sewerage systems receive effluent from a water closet or the like and periodically recirculate a portion of the liquid component thereof to flush the water closet. When flush pumps are utilized which include intake filters for effecting the necessary filtration, care must be exercised to prevent bulk waste including solid sewerage and paper products such as toilet tissue and paper towels from being rapidly drawn into choking engagement with the pump inlet whereby the operation of the pump will be brought to a halt. Conventionally, recirculating tanks have included an effluent receiving chamber and a downstream pumping chamber. The pumping chamber communicates with the effluent receiving chamber through a secondary lattice-work filter which restricts the flow of the bulk waste from the effluent receiving chamber to the pumping chamber. The flush pump is located within the pumping chamber and a reservoir of liquid substantially free of bulk waste is thereby provided for the pump to assure the continued satisfactory operation of the sewerage system.

It has been found that when the flush pump is actuated the liquid level within the pumping chamber is reduced substantially below the liquid level within the effluent receiving chamber. Such result might arise from the bulk waste being pulled into temporary engagement with the secondary filter thereby creating a momentary dam between the chambers. As a result, a pressure head is created within the effluent receiving chamber which results in a portion of the effluent within the effluent receiving chamber flowing into the pumping chamber subsequent to pump actuation until the liquid levels of the two chambers are again equalized. Since such recirculating sewerage systems are often operated with an initial liquid charge which establishes a liquid level in both chambers below the top of the secondary filter, when such a pressure head is created, paper products such as toilet tissue and hand towels which float near the surface of the effluent within the effluent receiving chamber tend to slowly migrate through the secondary filter into the pumping chamber. It has been found that if these paper products have only partially migrated through the secondary filter when the recirculating sewerage system is drained, these paper products will settle and hang-up within the lattice-work elements of the secondary filter and resist conventional cleaning efforts to free them from the lattice-work element. With each subsequent cleansing the lattice-work becomes progressively clogged thereby increasingly interfering with the efficient operation of the recirculating sewerage system.

Accordingly, it is an object of the present invention to prevent clogging of the secondary filter in such a recirculating sewerage system.

Among the advantages of the present invention is the provision of a recirculating sewerage system which requires minimum servicing.

Other objects and advantages of the present invention will become apparent from the following portion of the specification and from the accompanying drawings, which illustrate in accordance with mandate of the patent statutes a presently preferred embodiment incorporating the principals of the invention.

Referring to the drawings:

FIG. 1 is a schematic representation of the components of the recirculating sewerage system made in accordance with the teachings of the present invention;

FIG. 2, is a top view, partly in section, illustrating the recirculating tank of the recirculating sewerage system schematically illustrated in FIG. 1:

FIG. 3, is an elevational view of a portion of a prior art secondary filter for the recirculating tank illustrated in FIG. 3; and

FIG. 4, is a view similar to that of FIG. 3 illustrating the secondary filter made in accordance with teachings of the present invention.

A recirculating sewerage system made in accordance with the teachings of the present invention is illustrated in FIG. 1. The system includes a water closet or a plurality of water closets 10, a recirculating tank 12 for receiving effluent from the water closet, and a plurality of flush pumps 14 for recirculating flushing medium filtered by a filter 16 to the water closet.

The recirculating tank 12 is initially primed with a charge of clean water which may either be introduced into the recirculating tank directly through a suitable access port (not shown) or indirectly by placing the charge in the water closet 14 and allowing the charge to flow into the recirculating tank. Color and odor control additives may be added to this initial charge.

The flush pumps 14 include inlet filters and have a construction similar to that of the flush pumps disclosed in U.S. Pat. No. 3,067,433 and reference may be had to that patent for the specific details of these flush pumps. The flush pumps are located within a secondary or pumping chamber 20 of the recirculating tank, which is situated downstream from a principal or effluent receiving chamber 22 of the recirculating tank and which is separated therefrom by a secondary filter element 24. Conventionally the second filter 24' (FIG. 3) was of a lattice-work construction including a plurality of horizontally and vertically spaced, vertically elongated, rectangular punched-out openings. During operation of such a system, tissue paper and paper towels became hung-up on the lattice-work thereby progressively blocking the secondary filter element 24'. The inlet manifolds 26 of the recirculating tank were oriented so that effluent would strike the upstream face of the secondary filter to forcefully break-up paper products or the like which became hung-up on the secondary filter 24'. This procedure did not satisfactorily achieve the desired goal.

In order to prevent clogging of the secondary filter by paper products, the migration of paper products therethrough is inhibited. A minor portion of the liquid which is discharged from the flush pumps 14 and which is directed to the water closet 10 is immediately diverted to a rinsing manifold 28 which extends horizontally across the top of the secondary filter within the effluent receiving chamber. The manifold includes a plurality of apertures 30 which open downwardly proximate the upstream face of the secondary filter. Liquid is accordingly forced under pressure downwardly through the apertures forming jets of liquid which create turbulence in the upper laminas of the effluent adjac-
The secondary filter element of the preferred embodiment includes a plurality of vertically extending, uninterrupted, louvers 32 which are flared out from the filter element 24. Proximate the base of each louver 32, a hole 34 is drilled through the filter element. Accordingly, no wedge-shaped crevices are available for paper products to become hung-up on during operation of the system.

After the recirculating tank is periodically drained through a discharge port 36, the secondary filter may be rinsed with a clean flushing medium from a suitable pressurized source 38 which is connected to the rinsing manifold 28 to remove any bulk waste which remains in contact therewith.

Having thus described our invention, what is claimed is:

1. A recirculating sewerage system comprising a recirculating tank including effluent receiving and filtrate compartments separated by a vertically extending common wall, at least one water closet adapted to discharge the effluent flushed therefrom into said receiving chamber, said common wall including filter means for inhibiting the passage of bulk waste from said effluent receiving chamber into said pumping chamber, a rinsing manifold extending adjacent to and along the top of said filter means and including a plurality of apertures opening downwardly proximate said filter means, flush pump means communicating with said filtrate compartment, means for conjointly directing a major portion of the pressurized filtrate discharged from said flush pump means to said water closet to flush same and a minor portion of the pressurized filtrate discharged from said flush pump means to said rinsing manifold.

2. A recirculating sewerage system according to claim 1, wherein said filter means comprises a plurality of vertically extending uninterrupted flared-out louvers.

3. A recirculating sewerage system according to claim 1, wherein each of said louvers terminate at the end thereof with a substantially circular aperture.