May 22, 1962 E. C. BAUGHMAN 3,035,274

MARINE SEWAGE PUMP AND DISPOSAL SYSTEM

Filed June 28, 1960

2 Sheets-Sheet 1

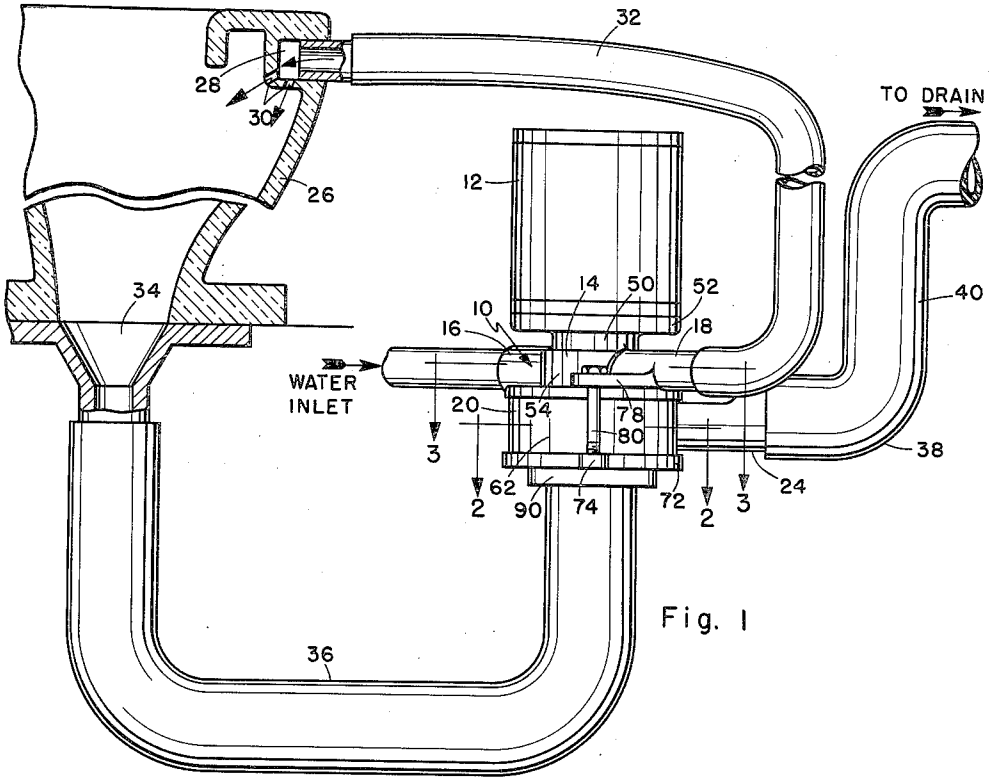


Fig. 1

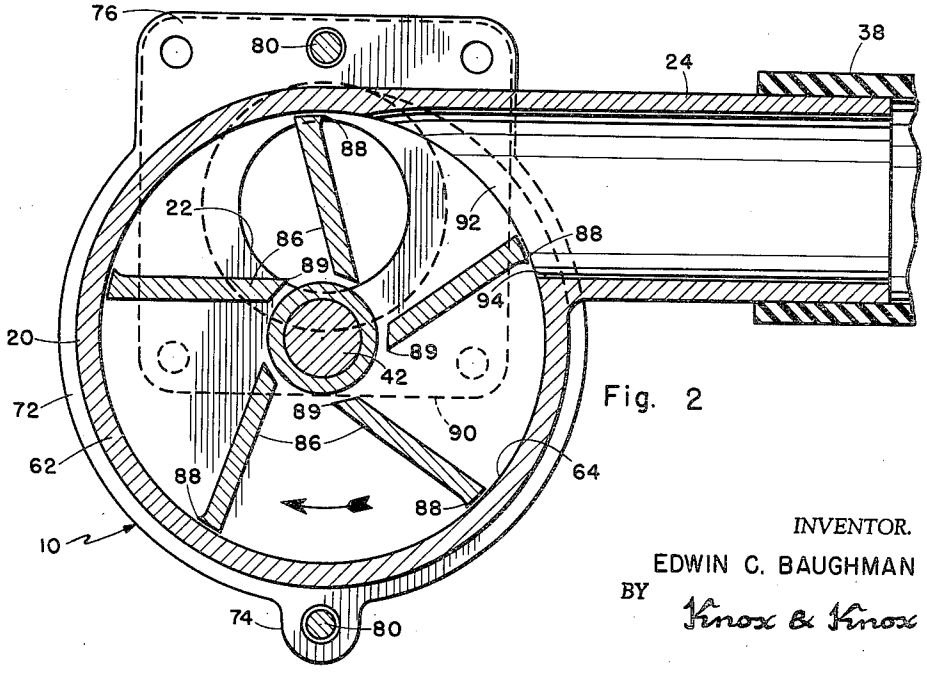


Fig. 2

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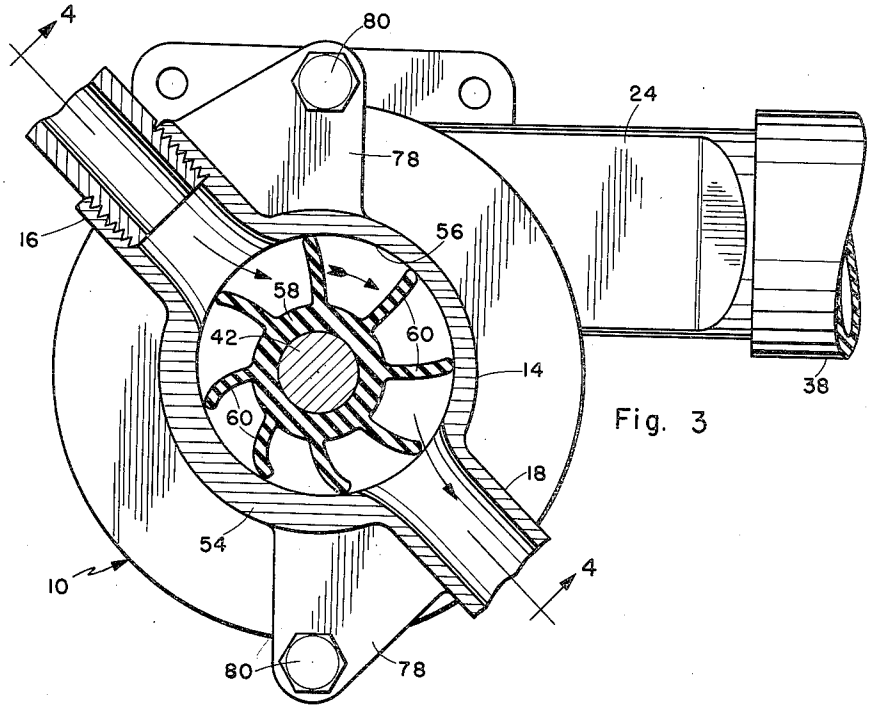


Fig. 3

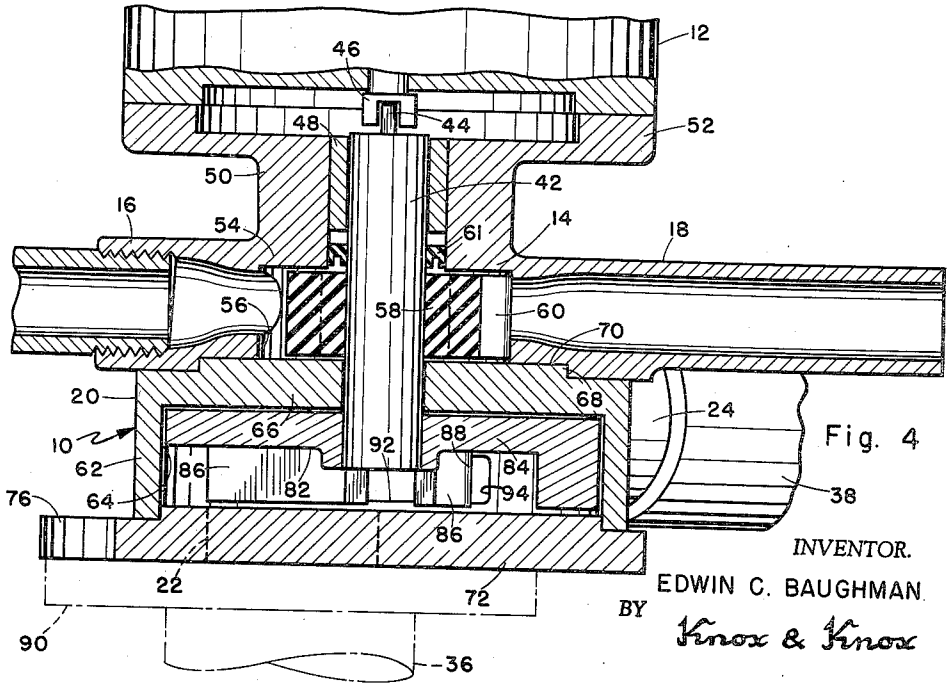


Fig. 4

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MARINE SEWAGE PUMP AND DISPOSAL SYSTEM

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3 Claims. (Cl. 4—77)

The present invention relates generally to pumps and more particularly to a marine sewage pump and disposal system.

The primary object of this invention is to provide a marine sewage pump having dual rotors driven by a single motor, one rotor providing flushing water and the other rotor removing sewage, the unit being adaptable to toilets, garbage disposal systems, or other applications requiring the disposal of liquid and solid material.

A further object of this invention is to provide a pump in which the sewage disposal rotor is designed to disintegrate solid matter with a powerful slicing action and is virtually non-jamming in normal use.

Another object of this invention is to provide a pump and disposal system incorporating a standpipe in the drain or outlet to prevent pump cavitation when starting and eliminating the need for priming.

Another object of this invention is to provide a marine sewage disposal system which is self-contained and is adaptable to many different types and sizes of vessels.

Finally, it is an object to provide a marine sewage pump and disposal system of the aforementioned character which is simple and convenient to install and operate and which will give generally efficient and durable service.

With these and other objects definitely in view, this invention consists in the novel construction, combination and arrangement of elements and portions, as will be hereinafter fully described in the specification, particularly pointed out in the claims, and illustrated in the drawings which form a material part of this disclosure, and in which:

FIGURE 1 is a side elevation view, partially cut away, of the complete system;

FIGURE 2 is an enlarged sectional view taken on the line 2—2 of FIGURE 1;

FIGURE 3 is an enlarged sectional view taken on the line 3—3 of FIGURE 1; and

FIGURE 4 is a sectional view taken on the line 4—4 of FIGURE 3.

Similar characters of reference indicate similar or identical elements and portions throughout the specification and throughout the views of the drawings.

The system includes a pump **10** driven by a motor **12**, which may be of any suitable type, such as electric, hydraulic, or even a power take-off from the vessel's propulsion unit. An electric motor powered by the electrical system of the vessel is preferred, however, since the sewage disposal system is thus more self-contained and requires no piping or mechanical connection to the vessel's existing services. The pump has a flushing portion **14**, having a water inlet **16** and an outlet **18**, and a disposal portion **20**, having a sewage inlet **22** and a drain outlet **24**. The system as illustrated is used in conjunction with a toilet bowl **26** having an upper distributing duct **28** from which flushing water is ejected through perforations **30**, said duct being connected by a pipe **32** to the outlet **18**. The toilet bowl **26** has a base outlet **34** which is coupled by a large sewage pipe **36** to the sewage inlet **22**, the drain outlet **24** leading to a drain pipe **38** having an upwardly extending standpipe portion **40** substantially above the pump **10**. It should be understood, however, that the system may also be installed in a galley below the sink for garbage disposal purposes.

The pump **10** has a single shaft **42**, the upper end of

which is provided with a tongue **44** engaging with the driving fork **46** of motor **12**, as in FIGURE 4, said shaft being freely rotatable in a bearing sleeve **48** mounted in the upper casing **50** of the pump. The motor **12** is preferably attached directly to the pump **10**, the upper casing **50** having an attachment flange **52** to which said motor is secured. The flushing portion **14** comprises a housing integral with the upper casing **50** and having a cylindrical chamber **56** disposed eccentrically relative to the shaft **42**, said shaft carrying a flushing rotor **58** having a plurality of flexible blades **60** which wipe the periphery of said chamber, as in FIGURE 3. The rotor **58** may be made of rubber, plastic, or other material with suitable flexibility and wearing qualities. Alternatively, and still within the ambit of this invention, a sliding vane type impeller may be used, or any other well known rotor means suitable for pumping water. Water is pumped as a result of the volumetric change between adjacent blades **60** rotating eccentrically in the chamber **56**, the underlying principle of such a pump being well known. The chamber **56** is sealed from the bearing sleeve **48** by a conventional sealing ring **61** around the shaft **42**.

The disposal portion comprises a housing **62** having a cylindrical chamber **64** closed by a top wall **66** through which the shaft **42** is journalled, said top wall having a large diameter alignment plug **68** which seats in a corresponding socket **70** in the lower face of the flushing portion **14**, so that the two portions are closely fitted together. The lower end of the housing **62** is closed by a bottom plate **72** on which are generally radially extending lugs **74** and **76**. The housing **54** is provided with lugs **78** through which bolts **80** are passed and threaded into lugs **74** and **76** to clamp the pump assembly tightly together. Inside the chamber **64** is a disposal rotor **82** comprising a generally flat disc **84** adjacent the top wall **66**, said disc being fixed to shaft **42** and having a plurality of axially downwardly projecting blades **86**. The blades **86** extend from adjacent the shaft **42** to the periphery of disc **82**, the blades being similarly inclined to the radial, the outer tips of said blades trailing and the inner ends being advanced with respect to the direction of rotation, as indicated in FIGURE 2. The outer tip of each blade **86** has a forwardly turned cutting edge **88** which is closely spaced from the wall of chamber **64**, and the inner ends of the blades have sharp tips **89**.

The sewage pipe **36** has an end flange **90** by which the pipe is attached to the bottom plate **72**, said sewage pipe being aligned with the sewage inlet **22** which is substantially tangentially offset to the side of the chamber **64** adjacent the outer periphery thereof. The drain outlet **24** extends generally tangentially from chamber **64**, closely adjacent to the sewage inlet **22**, as in FIGURE 2, so that the majority of the sewage entering said chamber is ejected directly into said drain outlet, with a minimum of circulation in said chamber.

Any solid matter passing through the sewage inlet **22** is sliced by the edges of the blades adjacent to the edge of the inlet opening, the non-radial angulation of said blades providing an optimized slicing action. The outlet slot **92** in the chamber **64** leading to the drain outlet **24** is of a shape approaching the rectangular, as is apparent in FIGURES 2 and 4, and presents a shoulder **94** opposing the cutting edges **88** and against which any solid matter is further sheared off by these cutting edges **88** of the rotor blades.

In installation, the pump **10** is preferably mounted below the base outlet **34** for complete drainage of the bowl **26**, or, if it is desired to retain a minimum water level in said bowl, the vertical position of the pump can be adjusted accordingly, the water seeking a level dependent on the height of the standpipe portion **40**. A water supply pipe **96**

is connected to the inlet 16 to provide water from a tank or a suitable intake below the vessel's water line, the drain pipe 38 being extended to a convenient dumping position. When the motor 12 is actuated, water is forced through the duct 28 to flush the bowl 26 and is removed through the disposal portion 20 of the pump. Since both flushing and disposal portions of the pump 10 operate together, the disposal rotor 82 commences to pump before water enters the sewage pipe 36, a situation which would normally cause cavitation and pump failure. In some pump type sewage systems priming with water is necessary to prevent such cavitation, but this is unnecessary in the present system due to the provision of a standpipe portion 40 in the drain pipe 38. Once the system has been used, a quantity of water remains in the sewage pipe 36 and the standpipe portion 40 after pumping ceases. Further operation of the pump 10 then picks up the standing water in the sewage pipe 36 and ejects it into the drain pipe 38. If all of the standing water is removed from the sewage pipe before the flushing water refills the pipe, the rotor 82 tends to cavitate and pumping pressure is momentarily lost. However, the head of water in the standpipe portion 40 flows back into the rotor 82 by gravity and primes the pump until flushing water flows through the sewage pipe 36 to sustain pumping action. Since the rotor 82 is designed primarily for pumping liquids, its efficiency as an air blower is negligible and the air pressure is insufficient to prevent backwash of water from the standpipe portion 40.

The system thus utilizes a compact, dual function pump connected to a toilet bowl, sink, or other sewage container to provide water for flushing the container and to remove water and sewage therefrom. The sewage is disintegrated and ejected through a drain, the plumbing of the system being arranged to provide automatic priming for the pump in a minimum of space, the only moving component of the system being the motor driven shaft and rotor assembly. While primarily intended for marine use, the system is also adaptable to other installations where gravity type flushing systems are impractical due to the need for constant refilling of a header tank.

The operation of this invention will be clearly comprehended from a consideration of the foregoing description of the mechanical details thereof, taken in connection with the drawings and the above recited objects. It will be obvious that all said objects are amply achieved by this invention.

It is understood that minor variation from the form of the invention disclosed herein may be made without departure from the spirit and scope of the invention, and that the specification and drawing are to be considered as merely illustrative rather than limiting.

I claim:

1. A sewage pump and disposal system, comprising: a pump having a flushing portion and a disposal portion; said flushing portion including a housing having an inlet and an outlet; a water pumping rotor in said housing; said disposal portion including a second housing having a sewage inlet opening and a drain outlet; a disposal rotor in said second housing; a single shaft connecting both of said rotors; motor means operatively connected to said shaft to drive said rotors; said second housing having an end enclosing plate; said sewage inlet opening extending generally axially through said plate adjacent the periphery of said second housing; means for disintegrating incoming sewage, said disintegrating means comprising a plurality of rigid blades extending from adjacent the center to the periphery of said disposal rotor; sail blades being angularly disposed relative to the radius of the rotor with the outer ends thereof trailing from the direction of rotation; said blades having one longitudinal edge closely spaced to said plate to pass across said sewage inlet opening and disintegrate incoming sewage, said blades having a cutting edge at their outer ends to further disintegrate said sewage; a sewage container having flushing water distributing means; a source of water connected to said first mentioned inlet; said first mentioned outlet being connected to said distributing means; and a sewage pipe connecting said container to said sewage inlet opening.

2. A sewage pump and disposal system, comprising: a pump having a flushing portion and a disposal portion; said flushing portion including a housing having an inlet and an outlet; a water pumping rotor in said housing; said disposal portion including a second housing having a sewage inlet opening and a drain outlet; a disposal rotor in said second housing; a single shaft connecting both of said rotors; motor means operatively connected to said shaft to drive said rotors; said second housing having an end enclosing plate; said sewage inlet opening extending generally axially through said plate adjacent the periphery of said second housing; means for disintegrating incoming sewage, said disintegrating means comprising a plurality of rigid blades extending from adjacent the center to the periphery of said disposal rotor; said blades being angularly disposed relative to the radius of the rotor with the outer ends thereof trailing from the direction of rotation; said blades having one longitudinal edge closely spaced to said plate to pass across said sewage inlet opening and disintegrate incoming sewage; said drain outlet being generally tangential to said second housing and having an outlet slot from the housing adjacent said sewage inlet opening; said outlet slot having a shoulder; means for further disintegrating said sewage, said means comprising cutting edges disposed on the outer and the inner ends of said blades, the cutting edges on said inner ends cutting said sewage and the cutting edges at the outer ends of said blades producing a sewage shearing coaction with said shoulder; a sewage container having flushing water distributing means; a source of water connected to said first mentioned inlet; said first mentioned outlet being connected to said distributing means; and a sewage pipe connecting said container to said sewage inlet opening.

3. A sewage pump and disposal system according to claim 2 and including a drain pipe connected to said drain outlet; said drain pipe having a standpipe portion extending upwardly substantially above said disposal rotor, so that cavitation of the rotor is prevented by backwash of water from said standpipe portion.

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