Nov. 26, 1963 C. BREER 3,112,061

BODY LIQUID COLLECTOR APPLIANCE

Filed April 27, 1960 2 Sheets-Sheet 1

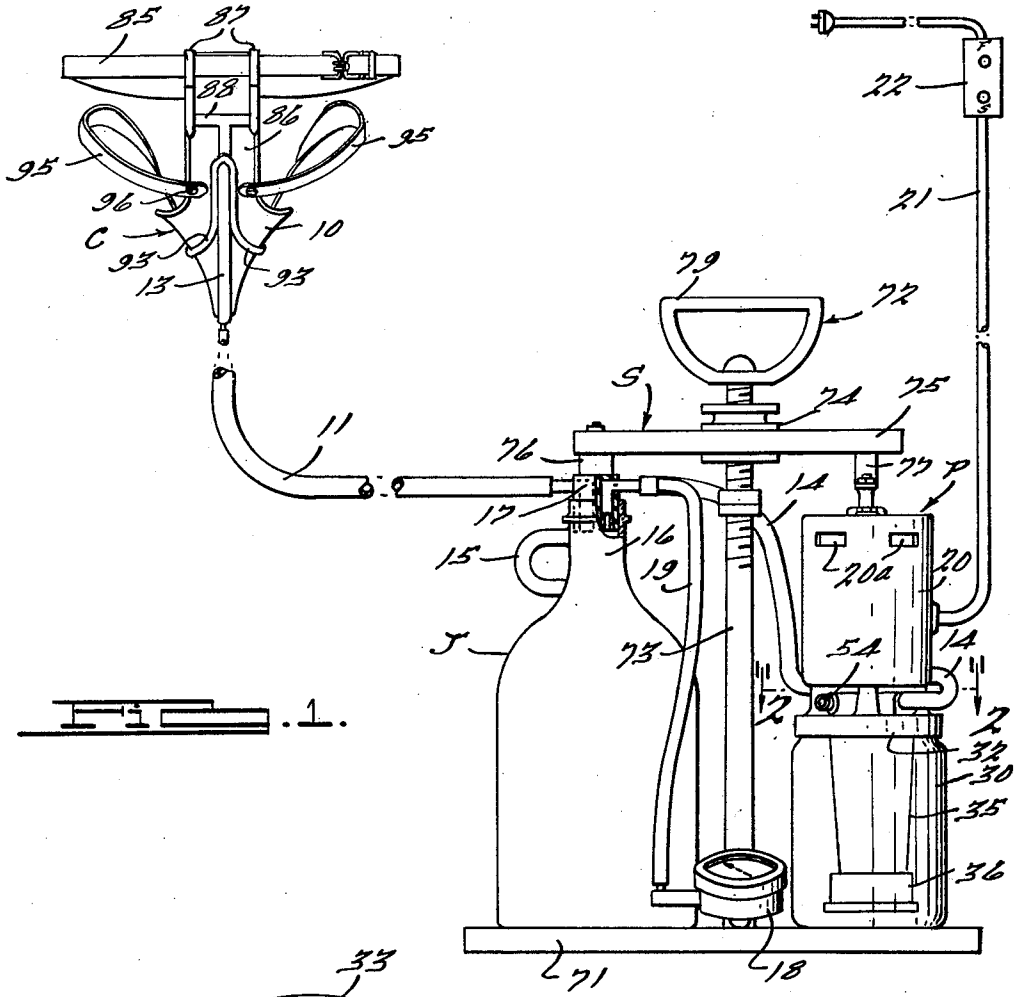


FIG. 1.

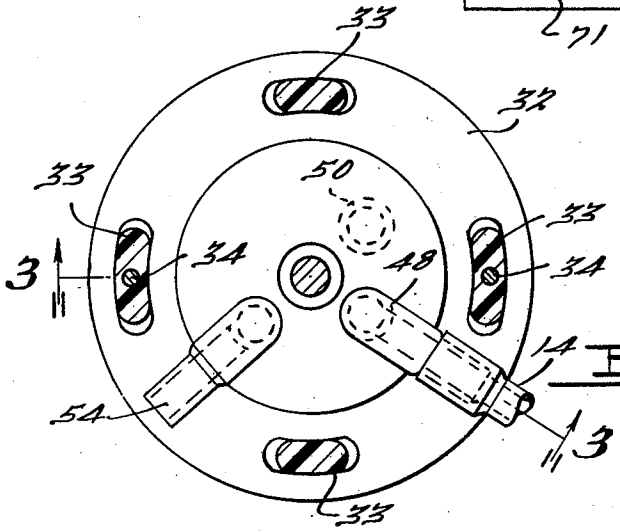


FIG. 2.

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BODY LIQUID COLLECTOR APPLIANCE

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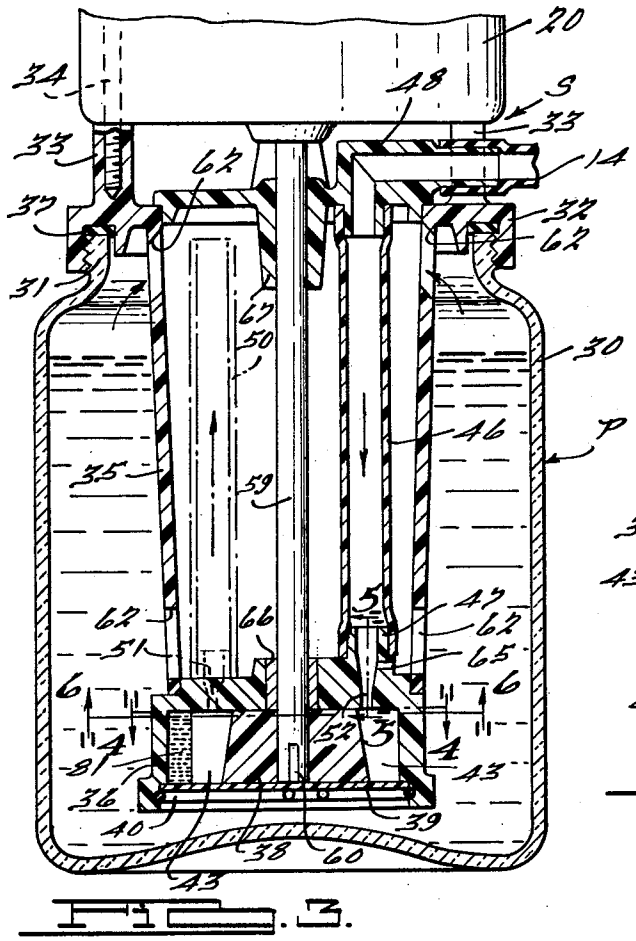


FIG. 3.

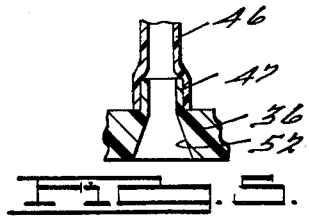


FIG. 5.

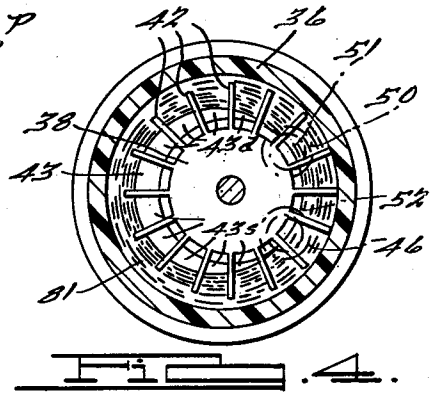


FIG. 4.

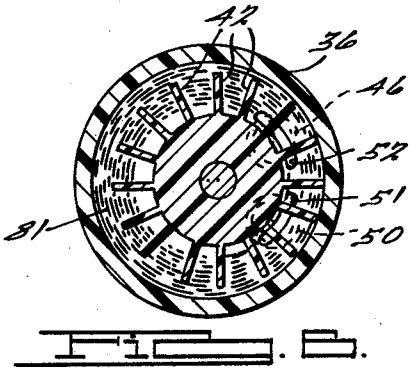


FIG. 6.

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3,112,061
BODY LIQUID COLLECTOR APPLIANCE

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Filed Apr. 27, 1960, Ser. No. 25,065
7 Claims. (Cl. 230—79)

This invention relates to a device or apparatus for the confining, collection and removal of urine and feces discharged by an invalid or an infant. This invention is concerned particularly with a novel suction pump apparatus having an improved collector bag connected thereto that can be sealingly applied to the crotch portion of the human body by means of a suction action of the pump that also acts to collect and withdraw the fluid resulting from an act of urination, defecation, or the like. This invention is an improvement on that shown in my copending application Serial No. 759,637 filed September 8, 1958, now U.S. Patent 2,944,551.

It is a primary object of this invention to provide an apparatus of this type including a pump and refuse container that are joined to a liquid collector bag that may be applied to the crotch portion of the human body and sealingly retained in position by sub-atmospheric internal pressure such that any fluid discharged into the bag will be trapped within the bag and readily removed therefrom and deposited in the refuse container by means of the pump suction source producing a sub-atmospheric pressure within the bag.

It is still another object of this invention to provide a defecation or urination control device that is easily applied to and comfortably retained in position on the crotch portion of a human being such that the user has freedom of movement and can enjoy uninterrupted rest while using this device.

It is a further object of this invention to provide a urination or defecation control device having a saddle-like collector bag adapted to be strapped to and worn on the crotch portion of the human body with said collector bag being readily connectible to an improved type of sub-atmospheric pressure source such that the sub-atmospheric pressure within the collector bag will produce a liquid tight seal between the bag and the surrounded body portion and also cause withdrawal of any fluid discharged into the bag.

It is still another object of this invention to provide an improved type of suction pump and refuse container that are arranged as a demountable unit to facilitate transportation and disassembly of the unit for cleaning and/or repair.

Other objects and advantages of this invention will become readily apparent from a reading of the following description and a consideration of the related drawings wherein:

FIG. 1 is an elevational view of a preferred embodiment of this invention;

FIG. 2 is an enlarged sectional elevational view of the pump unit taken along the line 2—2 of FIG. 1;

FIG. 3 is an enlarged sectional elevational view of the pump unit shown in FIGS. 1 and 2, the view being taken along the line 3—3 of FIG. 2;

FIG. 4 is a sectional elevational view taken along the line 4—4 of FIG. 3;

FIG. 5 is a fragmentary sectional elevational view of the pump unit port, the view being taken along the line 5—5 of FIG. 3; and

FIG. 6 is a sectional elevational view of the rotary vane pump, the view being taken along the line 6—6 of FIG. 3 looking in the direction of the arrows.

It is common knowledge among those who care for the sick and the very young that accidental or uncontrollable acts of urination or defecation are very annoying to all

parties concerned and furthermore, these acts produce objectionable bed conditions that disturb the patient or infant and prevent the attainment of the maximum amount of rest and the benefits associated therewith. This invention relates to a collector bag unit C that may be readily applied to and worn on the crotch portion of the human body without any discomfort whatever and which bag cooperates with a suction device S so that it will entrap and drain away the results of any act of urination, defecation, or the like without causing any soiling of the patient's bed garments or the bedding on which the patient is resting. The collector bag C of this device is similar to a man's athletic supporter and it is made of some waterproof fabric with raised rib edges that are preferably somewhat elastic so that the bag has a tendency to fit closely about the crotch portion of the person to which it is applied. This flexible waterproof collector bag C functions to entrap any liquid that might be emitted by a patient or infant and because the bag C is connected by a conduit 11 to a suction source P (see FIG. 1) the liquid will be drained away and deposited in an accumulator or refuse jar, tank or the like J. Thus the liquid excreted by the patient will not be in contact with the exterior skin surfaces of the crotch portion of the patient for any appreciable time whatever. This tends to prevent the development of skin irritations that sometimes result from the contact between excretion liquid and the external skin around the patient's crotch portion. Also, because the liquid is immediately drained away, there is little chance for any leakage to develop or for any odors to develop. The immediate removal of the liquid from the collector bag C after its collection prevents any uncomfortableness that might result from having the bag swell due to liquid filling of the bag interior.

This invention involves the use of a physical principle in a specific manner that is thought to be new and novel as applied to devices of this general type. It is a well-known principle that liquid will not, in and of itself, flow up hill. Likewise, liquid cannot freely flow from a low pressure chamber to a high pressure chamber. Accordingly, if liquid is collected in a collector bag, or the like, wherein the internal pressure is sub-atmospheric or relatively low, then the collected liquid cannot flow or leak out of the bag to the adjacent, relatively high pressure, atmosphere. By the connection of the aforedescribed collector bag C to a sub-atmospheric or vacuum source P, the low pressure source accomplishes two functions that are new and quite advantageous in devices of this type. First, the low pressure produced within the collector bag C causes the relatively high atmospheric pressure outside of the bag to hold the ribbed edges of the bag C in sealing engagement with the patient's body so that any urine or other liquid matter discharged into the collector bag cannot leak out of the bag. Second, the low pressure suction source P will cause immediate withdrawal of the liquid in the collector bag C after the excretion act so that the liquid may be readily discharged into an accumulator jar, reservoid, discharge trap, or the like J. This prevents any bulkiness being developed within the bag C during use. Immediate removal of the liquid also keeps the bag C relatively dry on the inside so that in the event a leak should accidentally develop, due to activity on the part of the patient, then there will be no spillage of liquid on to the adjacent bedding, undergarments. or the like.

Looking at the drawings, FIG. 1 shows the form of this invention wherein the collector bag C is connected by a conduit 11 and branch conduit 14 to a sub-atmospheric suction pump P. Intermediate the adjacent ends of the conduit sections 11 and 14 there is an accumulator jar or refuse container J. In the instance shown the jar J has a handle 15 and a pouring spout 16 that is closed off by a removable cap 17 having a pair of conduit receiving bores

extending therethrough. Conduit section **11** has one end connected to the interior of the accumulator jar J through one of the bores in cap **17**. The other end of conduit section **11** is sealingly connected to the collector bag **10** as will be presently explained. One end of the branch conduit section **14** is likewise connected to the interior of the jar J through the other bore in cap **17**. The other end of conduit section **14** is connected to the suction pump P. A pressure gauge **18** may be connected to suction conduit **14** by the branch conduit **19**.

Pump P is preferably electric motor driven by a motor **20**. The motor **20** may be a constant speed type or have a variable speed control, or at least have two speeds, so that one sub-atmospheric pressure can be produced at a relatively low motor speed to take care of the patient when he is normally resting in bed in a relaxed condition and a second higher speed to product a greater sub-atmospheric pressure to take care of the patient when he might be more active than normal. The motor **20** is shown with a control lead **21** having a control switch **22** with two contacts F and S to denote "fast" or "slow" speed depending on what degree of sub-atmospheric pressure is desired. For normal requirements pump speeds that will produce sub-atmospheric pressures of from 2 to 8 inches of mercury are satisfactory. A 3000 r.p.m., 110 volt, 60 cycle, air cooled motor has been used quite satisfactorily for pump drive. The housing for motor **10** is provided with air circulation ports **20***a* that cooperate with a motor driven fan (not shown) to circulate air through the motor for efficient operation.

The pump P (see FIGS. 2–4) is a novel form of suction pump of the rotating vane type that utilizes the maximum number of plastic parts for low cost and light weight. It is necessary that the pump P be quiet and of a type that does not require oil or grease lubrication. There is a danger of fumes or impurities being discharged into the room of the patient if oil or grease lubricants are required for either the pump P or the motor **20**. Pump P is of the submersible type where the pump runner and housing are completely submerged in water that both primes and lubricates the pump.

From FIGS. 2 and 3 it is clear that the pump P comprises a glass or plastic jar **30** having a threaded upper neck portion **31** that receives a threaded plastic cap **32**. A resilient washer **37** is used as a seal between cap **32** and neck **31**. Cap **32** has four upwardly projecting studs or legs **33** that support and have the motor **20** attached thereto by through bolts or screws **34**. Depending from the cap **32** is a tubular sleeve **35** that supports at its lower end the housing **36** for the vane type pump runner **38**. Housing **36** can be a two-piece unit with a detachable bottom plate **39** that is held in place by a snap ring **40**. Runner **38** has a plurality of radially extending blades or vanes **42**. As can be seen from FIG. 4 the pump runner **38** is eccentrically positioned within the housing runner chamber **43**.

The suction inlet to the runner chamber **43** is by way of the plastic riser pipe or tube **46** that is connected to the chamber **43** through the port **52** in the bored stem **47**. The upper end of the suction inlet tube **46** is connected through a bent nipple **48** to one end of the suction conduit **14**. Rising from the top of the pump housing **36** is another plastic pipe **50** that provides the discharge pipe for the rotary vane pump. The lower end of outlet pipe **50** is connected through the port **51** in housing **36** to the pump chamber **43**. The upper end of the outlet riser pipe **50** terminates just below the cap **32** so that the liquid discharged from pipe **50** can impinge on the cap **32** and then be deflected back into the jar **30** for recirculation through the pump. From FIG. 2 it will be noted that the cap **32** is also pierced by another bent nipple **54** that provides a vent for any air or gas that may be discharged into the interior of the jar **30**. This vent **54** is located diametrically opposite (see FIG. 2) from the pump outlet riser **50** so that there will be no danger of the pump liquid discharge being passed out of the jar **30** through the vent **54**.

From FIG. 3 it will be noted that the pump runner **38** is connected to the shaft **59** by a key **60** that may be formed as an integral part of the runner. The pump drive shaft **59** may be stainless steel or any other material that is strong and rustproof. The upper end of the drive shaft **59**, that is connected to the electric motor **20**, may be drivingly connected to the motor **20** by a detachable spline-type coupling (not shown) so that the shaft **59** can be readily separated from the motor **20** for replacement or cleaning of the pump unit and motor unit separately.

It will be noted that the tubular sleeve **35** that depends from the cap **32** and supports the pump housing **36** is slotted at its upper and lower ends as indicated by the reference numerals **62**. These slots **62** permit the water or other liquid in the jar **30** to circulate through the pump as the lubricant and priming fluid for the pump runner **38**. Also, the bored stem **47** on top of pump housing **36** is pierced by a cross-bore **65** that provides a restricted supply port for the lubricating and priming fluid for the pump runner **38**. As the pump runner **38** rotates clockwise some water is drawn into the runner chamber **43** through the feed cross bore **65** and inlet port **52** to lubricate and prime or seal the runner **38** and to replenish the water forming the liquid piston **81** that rotates concentrically within the housing **36**.

The drive shaft **59** that is connected by the key **60** to the runner **38** is journaled in a bearing **66** that is pressed into the top of the pump housing **36**. Bearing **66** can be a suitable bearing metal, or some plastic such as nylon or Teflon, or any water lubricated bearing material. The upper portion of the pump drive shaft **29** is journaled in a bearing formation **67** that is formed as an integral part of the cap **32** for the jar **30**. Obviously a bearing liner such as the bearing **66** could be used in the plastic bearing support **67** if such should be found necessary.

The pump shown particularly in FIGS. 3 and 4 is of the so-called "liquid piston" type that was generally described in Nash Patent 953,222. In such a pump the rotating vaned runner **38** causes the liquid in the pump chamber **43** to form a concentrically arranged liquid piston ring **81** for cooperation with the eccentrically mounted pump runner **38** and the inlet and outlet ports **52** and **51**, respectively. The pump chamber suction compartments **43***s* (see FIG. 4) progressively increase in size clockwise from the inlet port **52** whereas the discharge compartments **43***d* progressively decrease in size clockwise towards the discharge port **51**. With the arrangement shown, as the runner **38** rotates clockwise at high speed and causes the water in the chamber **43** to assume the shape of the liquid piston **81**, the progressively increasing volume suction chambers **43***s* develop a suction in the inlet riser **46** while the progressively decreasing volume discharge chambers **43***d* develop a discharge pressure that expels air and some water through the open upper end of the riser pipe **50**.

From the foregoing description of the electric motor driven pump unit that provides the suction device S, it is thought to be obvious that a novel water lubricated pump mechanism has been provided that is adapted to run submerged in water so as not to require lubrication and at the same time provide a very quiet, sanitary, highly efficient suction pump. The water in the jar **30** is recirculated through the rotary vane pump because of the bleed orifice **65** in the pump suction inlet port **52** and the flow ports **62** in sleeve **35**. Any liquid and air or gas drawn through the pump chamber **43** is discharged through the riser pipe **50** into the top of the jar where the air or gas can escape through the vent nipple **54** while the liquid is deflected towards the bottom of the jar **30**. The high speed, lightweight, rotor **38** that rotates in an accurately formed plastic rotor housing **36** produces a substantial

source of sub-atmospheric pressure or vacuum that is transmitted through the conduit **14** to the collector jar J. The sub-atmospheric pressure in the collector jar J is transmitted to the collector bag C worn by the patient by means of the conduit **11**.

It is important to note from FIG. 1 that suction device S that is composed of the pump mechanism P and the collector jar J is formed of parts assembled in such a manner as to provide a lightweight, easily handled and serviced item that can be moved about and assembled and disassembled with the minimum amount of effort. The jar J and the pump unit P, as well as the pressure gauge **18** are each arranged to be detachably mounted on the base plate **71** of the suction device carrier **72**. Preformed depressions may be formed in the top side of the base plate **71** to receive the bottom faces of the jars J and **30**. Extending upwardly from the base plate **71** between the jar J and the pump device P is a threaded shank carrier rod **73**. Threaded on the upper end of the rod **73** is a nut sleeve **74** that carries a beam **75**. Beam **75** has a plug **76** on the underside of one end that is adapted to engage the top face of the resilient cap **17** that closes the neck opening of the accumulator or collector jar J. The other end of the beam **75** is adapted to engage a loop or bail-like handle **77** fixed to the top of the pump motor **20**. It is thought to be obvious that when the nut sleeve **74** is screwed down on the rod **73** to bring the beam **75** into engagement with the motor handle **77** and the jar plug **76** that a rigid unitary suction assembly S is provided. Rod **73** has a D-shaped handle **79** at its upper end to facilitate handling of the suction device S. With the assembly herebefore described it is clear that on unscrewing of the nut sleeve **74** to release beam **75** from engagement with the motor handle **77** and jar plug **17** that then each of the units J and P are readily removed from the base plate **71**. The jar **30** of the pump unit P can be unscrewed from its cap **32** and the jar cleaned and the water replaced. The pump drive shaft **59** can be slipped out of engagement with the motor **20** so that when the motor tie bolts **34** are unscrewed from the cap studs **33** the motor **20** can be separated from the pump unit for ready service or replacement.

I claim:

1. A unitary self-forming, self-lubricating, motor driven, pump unit comprising a fluid filled container having an open upper end, a vertically extending electric motor supported on and closing the open upper end of said fluid filled container, a vertically extending motor driven pump shaft extending into the fluid filled container, a horizontally extending pump housing fixedly disposed in said fluid filled container beneath the fluid surface therein, said housing having an annular, horizontally extending, pump chamber therein eccentrically disposed with respect to said pump shaft, a radially vaned pump rotor disposed in said pump chamber and drivingly connected to said pump shaft, restricted port means to admit fluid from said container to said pump chamber to prime, lubricate and seal said pump rotor in said pump chamber, a pump suction port connecting the interior of said container to said pump chamber and a pump discharge port connected to said pump chamber with said discharge port opening into said container interior above the fluid surface therein.

2. A unitary, self-priming, self-lubricating, unitary, motor driven, suction pump unit comprising a fluid filled container having an open upper end, a vertically extending electric motor supported on and closing the open upper end of said fluid filled container, a vertically extending motor driven pump shaft extending into the fluid filled container, a horizontally extending pump housing fixedly disposed in said fluid filled container beneath the fluid surface therein, said housing having an annular, horizontally extending, pump chamber therein eccentrically disposed with respect to said pump shaft, a radially vaned pump rotor disposed in said pump chamber and drivingly connected to said pump shaft, restricted port means to admit fluid from said container to said pump chamber to prime, lubricate and seal said pump rotor in said pump chamber, a pump suction port connecting the exterior of said container to said pump chamber and a pump discharge port connected to said pump chamber with said discharge port opening into said container interior above the fluid surface therein, and a vent in said container above the fluid surface therein.

3. In a pump unit as set forth in claim 1 wherein the pump shaft is detachably connected to the motor.

4. In a pump unit as set forth in claim 1 wherein the pump shaft is detachably connected to the motor and the pump housing is detachably connected to the fluid filled container.

5. A self-priming, self-lubricating, unitary, motor driven suction pump unit comprising a fluid filled container having an opening in the top thereof, an electric motor unit supported on and closing the opening in the top of said container and having a vertically disposed motor driven shaft extending downwardly through said container opening, a pump unit supported in said container beneath the surface of the liquid therin, said pump unit comprising a housing having an annular horizontally extending rotor chamber therein, an annular pump rotor arranged in said chamber in an eccentric relation thereto, said rotor being drivingly connected to said shaft and having a plurality of radially extending vanes projecting outwardly therefrom with blades being of such a radial length as to seal against a peripheral surface portion of the pump chamber throughout a certain circumferential arc thereof, pump suction and discharge ports located adjacent said circumferential arc portion of said pump chamber, a bleed port in said housing to supply fluid from said container to said pump chamber for sealing the rotor vanes against the certain arc portion of the pump chamber, a vertically extending riser pipe connected to the suction port extending upwardly above the surface of the fluid in said container, and means for connecting said riser pipe to an area where a reduced pressure is desired.

6. A self-priming, self-lubricating, unitary, motor driven suction pump unit comprising a fluid filled container having an opening in the top thereof, an electric motor unit supported on and closing the opening in the top of said container and having a vertically disposed motor driven shaft extending downwardly through said container opening, a pump unit supported in said container beneath the surface of the liquid therein, said pump unit comprising a housing having an annular horizontally extending rotor chamber therein, an annular pump rotor arranged in said chamber in an eccentric relation thereto, said rotor being drivingly connected to said shaft and having a plurality of radially extending vanes projecting outwardly therefrom with blades being of such a radial length as to seal against a peripheral surface portion of the pump chamber throughout a certain circumferential arc thereof, pump suction and discharge ports located adjacent said circumferential arc portion of said pump chamber, a bleed port in said housing to supply fluid from said container to said pump chamber for sealing the rotor vanes against the certain arc portion of the pump chamber, a vertically extending riser pipe connected to the suction port extending upwardly above the surface of the fluid in said container and means for connecting said riser pipe to an area where a reduced pressure is desired, and a vertically extending riser pipe connected to said discharge port extending upwardly above the surface of the fluid in the container.

7. A self-priming, self-lubricating, unitary, motor driven suction pump unit comprising a fluid filled container having an opening in the top thereof, an electric motor unit supported on and closing the opening in the top of said container and having a vertically disposed motor driven shaft extending downwardly through said container opening, a pump unit supported in said container beneath the surface of the liquid therein, said pump unit comprising a housing having an annular horizontally

extending rotor chamber therein, an annular pump rotor arranged in said chamber in an eccentric relation thereto, said rotor being drivingly connected to said shaft and having a plurality of radially extending vanes projecting outwardly therefrom with blades being of such a radial length as to seal against a peripheral surface portion of the pump chamber throughout a certain circumferential arc thereof, pump suction and discharge ports located adjacent said circumferential arc portion of said pump chamber, a bleed port in said housing to supply fluid from said container to said pump chamber for sealing the rotor vanes against the certain arc portion of the pump chamber, a vertically extending riser pipe connected to the suction port extending upwardly above the surface of the fluid in said container and means for connecting said riser pipe to an area where a reduced pressure is desired, a vertically extending riser pipe connected to said discharge port extending upwardly above the surface of the fluid in the container, and a vent in said container above the surface of the fluid therein to provide for escape of any gas pumped into said container.

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