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[54] **ASEPTIC SUCTION DRAINAGE SYSTEM AND VALVE THEREFOR**

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[52] **U.S. Cl.** **137/205,** 137/199, 128/276

[51] **Int. Cl.** **A61m 1/00**

[58] **Field of Search** 137/205, 199, 197; 141/59, 141/51; 128/276, 277; 32/33

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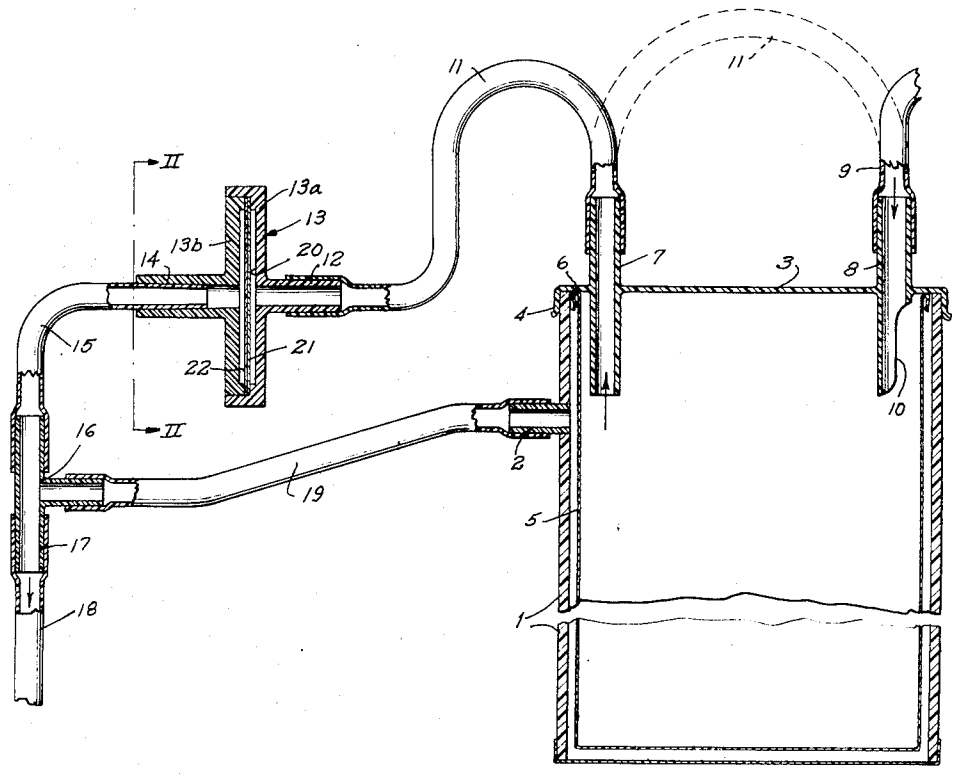
[57] **ABSTRACT**

An aseptic suction drainage system and valve therefor, embodying a drainage receiver for receiving drainage from the body of a patient after wounding of or surgery performed on the patient which, after filling to a desired extent, may be sealed so that the receiver along with its drainage contents is disposable as a unit. A foolproof valve is incorporated in the system to prevent contaminated drainage from entering the suction or vacuum system of a hospital regardless of carelessness or neglect of an attendant as to how full the drainage receiver may become, the valve automatically protecting the main vacuum system of a hospital from contamination.

5 Claims, 3 Drawing Figures



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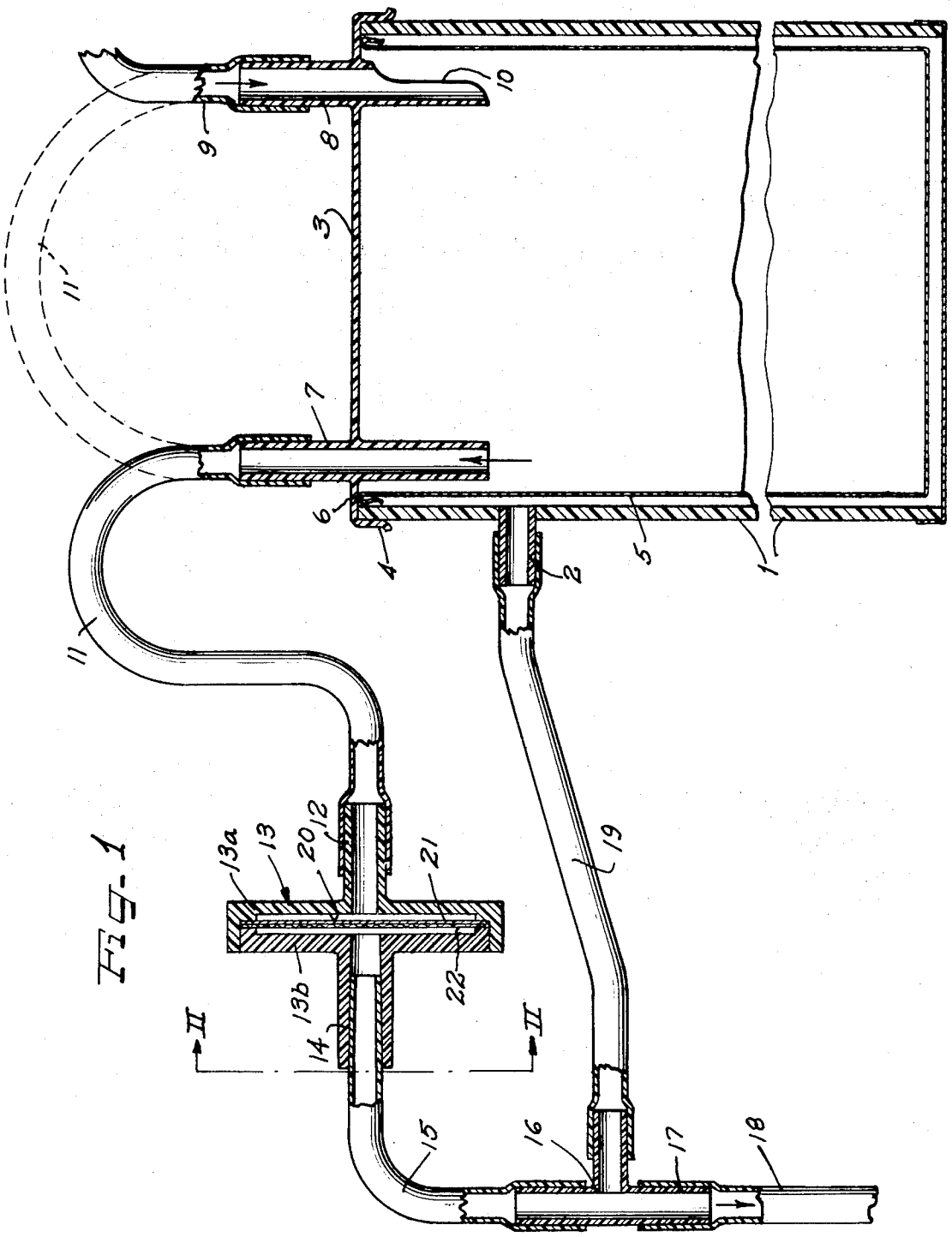

Fig. 1

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Fig-2

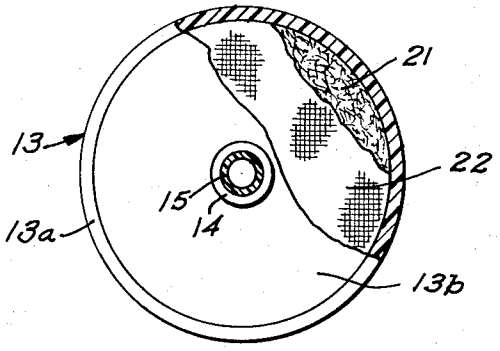
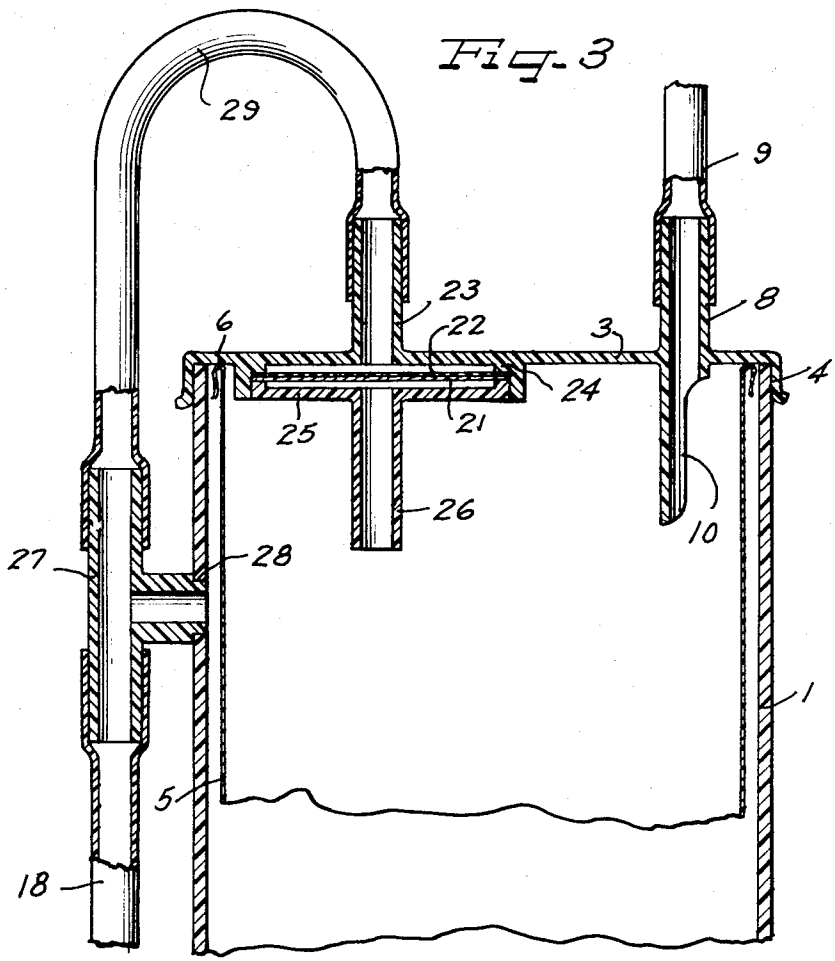


Fig-3



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ASEPTIC SUCTION DRAINAGE SYSTEM AND VALVE THEREFOR

RELATED APPLICATIONS

The invention set forth, described and claimed in the instant application is an improvement upon the invention set forth, described and claimed in our copending application entitled "Aseptic Disposable Drainage Receiver," filed Sept. 18, 1970, Ser. No. 73,313, now U.S. Pat. No. 3,685,517 issued Aug. 22, 1972 which copending application is in turn an improvement upon the structure described and claimed in our other copending application entitled "Vacuum Drainage Collecting Apparatus With Disposable Liner," filed Nov. 26, 1968, Ser. No. 778,963 now U.S. Pat. No. 3,680,560 issued Aug. 1, 1972.

SUMMARY OF THE INVENTION

The instant invention or discovery relates to a drainage collecting system embodying a flexible liner for disposition in a canister with a connection from the liner to the body of a patient and a connection from the liner to a suction source, and a branch line from the suction source to the inside of the canister but outside the liner for countervailing vacua in the canister and liner. The system also includes a hydrophobic valve in the suction line to effectively prevent any contamination of the hospital suction system in the event the liner is filled beyond a predetermined level. After filling to any desired level, the liner may be completely sealed off and disposed of as a unit along with its contaminated contents. In one embodiment of the invention, if no contaminating fluid has reached the valve, the valve may be repeatedly used, and it is not necessary to remove the branch connection from the suction line to the inside of the canister only, since the canister may be repeatedly used because it does not become contaminated.

It is customary in most hospitals to have built-in suction system extending over a plurality of floors and connected to a central suction pump, there being a connection in a wall of various selected rooms in the hospital to such built-in system. Should that system become contaminated, for example, by way of drainage from a patient's body inadvertently entering the system, an extremely expensive decontamination procedure is essential. Certain so-called disposable receivers heretofore developed, with the exception of those shown in our aforesaid copending applications, provided no means to protect the suction system of the hospital or to effectively turn off the suction system when the drainage reaches a predetermined height in the receiver. Valves with movable parts have been employed for that purpose, as evinced by our copending applications. However, there is a risk that such valves may become stuck and ineffective in the event certain parts of the valve are contacted by heavy, sticky drainage. Further, in a few rare instances, disposable drainage receivers have become ineffective owing to careless or erroneous connections and handling of the receiver at the time it is put to use.

The instant invention overcomes the disadvantages above mentioned. Incorporated in this invention is a suction line valve having no moving parts and which is hydrophobic not only to water but also to all body fluids and even to foam developed in such body fluids during drainage. The valve may be placed inside the drainage receiver or external thereto, and in the latter case, connections are such that if no drainage has reached the valve, it may be repeatedly used. The valve is sufficiently economical to warrant its disposal after only one useage. With such an arrangement, the possibility of contamination of the hospital suction system is reduced to a minimum.

Also, the instant invention is extremely economical in construction and the connections to the suction line and to the patient have been simplified and reduced to a minimum, and only one simple connection is necessary to tightly close the receiver after usage and permit its disposition along with its contents. The simplicity of the structure virtually eliminates erroneous connections, as well as adverse effects of mishandling. Further, the invention embodies a branch connection from the suction line to the interior of a canister in which the flexible drainage receiver is placed in order to countervail the vacua in the canister outside the receiver and in the receiver to prevent the bag from collapsing. That branch connection need not be changed during removal of a receiver and replacement of a new receiver in the canister.

Other objects, features and advantages of the invention will be readily apparent from the following description of certain preferred embodiments thereof, taken in conjunction with the accompanying drawings, although variations and modifications may be effected without departing from the spirit and scope of the novel concepts of the disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary vertical sectional view, with parts shown in elevation, of a suction system embodying principles of the instant invention including a hydrophobic valve in the suction line;

FIG. 2 is a sectional view taken substantially as indicated by the line II—II of FIG. 1, with parts broken away to illustrate the valve structure; and

FIG. 3 is a fragmentary vertical sectional view of another form of the instant invention, showing the safety valve within a receiver for drainage.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

By way of example, both illustrated embodiments of the instant invention are shown utilized in a system set up for the reception of suction-induced drainage from the body of a patient. In the arrangement illustrated in FIG. 1, a canister 1 is utilized, and this canister may be made of relatively rigid plastic material and is open at the top but closed at the bottom. This canister itself does not become contaminated by drainage which may be highly infectious or even contagious, and so may be repeatedly used without sterilization each time. The canister is conveniently cylindrical, although its shape is not critical, and has an imperforate side wall except for a nipple 2 which is secured within a bore in the canister wall.

The canister receives a unitary structure comprising a canister cover 3 having a depending flange 4 for air-tight engagement over the upper open end of the canister, and from which cover a flexible plastic receiver or canister liner 5 depends, the receiver being

fused or otherwise secured to the underside of the cover 3 entirely therearound as indicated at 6. The cover 3 is preferably of relatively rigid plastic material, while the liner or receiver 5 depending from the cover is preferably of flexible thermoplastic material. The securement of the upper end portion of the liner to the cover is completely airtight and positive. The liner is therefore completely sealed except for a pair of fittings 7 and 8, which may conveniently be molded integrally with the cover 3, and which project into the liner or receiver 5. The fitting 7, when the apparatus is put to use, becomes a part of the suction line, while the fitting 8 may be connected by way of a tube 9 leading to the body of a patient, and the fitting therefore becomes a part of what may be conveniently termed the patient line. Interiorly of the cover 3, the fitting 8 is substantially half cut away as indicated at 10, leaving a half tube with the convexity thereof facing the tube 7. This shaping not only directs incoming patient drainage downwardly and does not permit it to cross directly toward the fitting 7, but it also prevents syphoning if for any reason the drainage fluid rises to the lower end of the fitting.

The suction line is made up of a plurality of parts including the fitting 7 on the canister cover 3, a tube 11 leading from that fitting to a nipple 12 on a valve housing 13, and from a nipple 14 on the opposite side of the valve housing a tube 15 leads to one arm of a tee 16, the opposite arm 17 of the tee being connected by a tube 18 to a source of vacuum which may be a connection plug in a hospital room wall, or directly to a vacuum pump if emergency service is being performed. The nipple 2 secured to the canister 1 is connected by a tube 19 to the leg of the tee 16 to establish a branch connection from the vacuum line to the interior of the canister but outside the liner or receiver 5 to thus countervail the vacua inside the canister but outside the liner and inside the liner, thus preventing collapsing of the liner or receiver 5, especially at the start of an operation with a new liner in the canister.

Inside the valve housing 13 is a central cavity 20 with which both nipples 12 and 14 communicate. This cavity is formed in part by each of two members making up the housing, 13*a* and 13*b* each half carrying one of the nipples 12 or 14, respectively. The part 13*b* telescopes into the part 13a and is preferably fused thereto, the housing being made of a suitable plastic material. Fixedly held between the two parts inside the housing is a valve member 21 backed up by a supporting screen 22 on the suction side of the valve member. The valve and screen extend directly across the path between the nipples 12 and 14, as seen in both FIGS. 1 and 2. The valve member 21 is of a type capable of permitting the passage of air therethrough but impeding the passage of liquid or foam emanating from the liquid entering the receiver 5. In other words, the valve is hydrophobic as to body fluids.

It has been found that a valve member such as a disk made of material providing a porosity of between 0.4 micron and 1.0 micron will permit adequate flow rates of air at pressures equal to one atmosphere or less but will prevent the passage of liquids therethrough as viscous as water, and consequently prevent the passage of body fluids therethrough. In other words, should body fluids or foam emanating therefrom enter the fitting 7 and pass through the tube 11 and nipple 12 to the valve, the valve will, in effect, promptly plug and cut off the source of vacuum to the receiver 5, but the vacuum line on the opposite side of the valve housing is effectively prevented from contamination by the body fluid, and thus, a built-in suction system of a hospital is protected from such contamination, and any extremely expensive operation of decontamination is eliminated.

The valve disk may be formed of cellulose ester or other synthetic fibers of appropriate porosity to air and the capability of rejecting passage therethrough of body fluids or foam. To the naked eye the valve member has the appearance in general of a piece of paper. The screen 22, which is of much greater porosity than the valve member 21, effectively supports the valve member against any significant movement and prevents rupture of the valve member due to a sudden increase in the amount of suction and also against mishandling of the apparatus. The valve structure has no moving parts, and consequently cannot become stuck or otherwise rendered inoperative by sticky body fluids.

It will be noted that the valve may be used in any form of suction system designed to move liquid from a liquid source to another location regardless of the type or structure of that other location.

In operation, the instant arrangement is extremely simple and positive. It is an easy expedient to connect the suction line including the valve to the liner fitting 7 and the branch line to the nipple 2 carried by the canister, as well establish a connection to the body of the patient. The suction may then be turned on and, while in the majority of instances the drainage from the patient will not fill the receiver 5 to the inner end of the fitting 7, should the suction ever reach the fitting 7 and be carried over to the valve, the suction line therebeyond remains free and clear of contamination. Operation may be stopped at any desired time by manually turning off the suction or automatically if drainage reaches the valve. While the valve and its housing is sufficiently economical to warrant disposal after a single usage, it is not, in many cases, necessary. If the operation is stopped before the fluid has reached the inner end of the fitting 7, then the tube 11 may be removed from the nipple 12 of the valve housing and the tube 9 leading to the patient may be removed from the fitting 8. The tube 11 may then be reversed as indicated by dotted lines in FIG. 1, and placed over the fitting 8 whereby both fittings are aseptically closed, and the liner may be lifted out of the canister and disposed of along with its drainage contents. On the other hand, should drainage fluid or foam reach the valve, then operation is stopped and the tube 15 may be disconnected from the tee 16 and placed over the fitting 8 to aseptically seal the structure and then the receiver 5 may be disposed of along with its contents and the valve. It is a simple expedient to reconnect a new valve in position and connect it to the fitting 7 depending upon whether or not the valve has been disposed of. The branch connection from the suction line to the nipple 2 leading to the interior of the canister outside of the receiver 5 need not be removed at all during changing of the receiver, but only when it is desired to dispense with the use of the canister.

It will further be noted that the valve housing is preferably constructed so that it cannot erroneously be connected in the system, and to this end the nipple on one side of the valve housing may be a female nipple, **14** in the illustrated instance, and the nipple on the other side may be a male nipple, **12** in the illustrated instance. Thus, the valve housing can only be connected in the system to the various tubing with the screen in the valve housing remaining on the suction side of the valve member. The structure is so simple and the connections so few as to reduce the possibility of error on the part of the operator when changing a receiver **5** to a distinct minimum. Further, any valve having movable parts has been entirely eliminated, and the instant valve cannot be stopped from acting properly regardless of the consistency or stickiness of drainage received.

In the second illustrated embodiment of this invention, FIG. **3**, the valve structure has been located inside the receiver **5** and the valve is disposable along with the receiver and its contents. The external connections are further simplified in that it is not necessary to connect the valve in the suction line externally of the receiver and canister. In this instance, the patient line fitting **8** is the same as before described and the patient line **9** as well. A suction line fitting **23** is preferably molded integrally with the cover **3**, and internally of the cover **3** a part of the valve housing **24** may also be molded integrally with the cover. The other portion of the valve housing **25** having a depending nipple **26** is the same as the part **13***b* with the nipple **14** previously described. Within the valve housing is the valve **21** as above described with the supporting screen **22** on the suction side thereof, both the fitting **23** and nipple **26** forming a part of the suction line to the interior of the receiver **5**. In this instance, further, a tee **27** has its leg secured in the wall of the canister as indicated at **28**, and one arm of the tee is connected to the fitting **23** by a tube **29**, the other arm being connected to the aforesaid tube **18** to the source of suction.

With this arrangement, the tee being mounted in the wall of the canister, no branch countervailing connection need be made since that is already established when the tee is connected in the suction line. When it is desired to change the receiver **5**, it is simply necessary to disconnect the patient line **9**, disconnect one end of the tube **29** from the tee **27** and put that end of the tube over the fitting **8** whereupon the cover **3** along with the receiver **5** and its drainage contents, as well as the valve, may be aseptically discarded. When a new liner is placed in position, it is simply necessary to reconnect the patient line **9** to the fitting **8**, reconnect a new tube **29** to the fitting **23**, if such tube is not already attached thereto, and connect the other end of the tube **29** to the tee **27**. This arrangement of FIG. **3** simplifies connections and the valve is so economical as to warrant disposition after a single usage. Compared to the first described embodiment, in the event the valve is discarded along with the receiver **5**, it is necessary to provide a new tube **11** and a new tube **15** with proper connections to the valve housing, whereas in the embodiment of FIG. **3** a new tube **15** is not necessary.

From the foregoing, it is apparent that we have provided an extremely economical aseptic disposable receiver for drainage, embodying a minimum amount of connections on the part of the operator, and there being a positive acting valve in the system which fully protects the main suction line from any contamination.

WHAT WE CLAIM IS:

1. A suction system for draining liquid from a source, said system including a canister and a cover therefor, a flexible receiver depending from the cover, a suction line, and a suction outlet fitting and a drainage inlet fitting carried by the cover, wherein the improvement comprises,

a tube section forming a part of said suction line and having an end connected to said suction outlet fitting,

said canister having a port in the wall thereof, and

a branch connection between said suction line and said port to countervail the vacuum in said receiver with that in said canister outside said receiver, the other end of said tube section being detachable from the suction line and attachable to said inlet fitting to aseptically seal said receiver for disposition with its drainage contents.

2. The suction system of claim **1**, including

a hydrophobic valve in the suction line.

3. The suction system of claim **2**, wherein said valve is carried on the inner face of said canister cover.

4. The suction system of claim **2**, including

a housing containing said valve,

a nipple extending from each side of said housing and communicating with said valve therein,

other end of said tube section being connected to one of said housing nipples, and

a second tube section in said suction line having

one end connected to the other said nipple, whereby the other end of either said tube section may be detached and connected to said inlet fitting depending upon whether said valve is reusable or contaminated.

5. The suction system of claim **2**, wherein said valve is removably connected in the suction line and may be disposed of with the receiver and its contents if the valve is contaminated by drainage.

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