Jan. 14, 1969 E. L. KETTENBACH 3,421,510

DRAIN HAVING SHIELDED SUCTION TUBE

Filed Jan. 10, 1966 Sheet 1 of 2

Fig. 1.

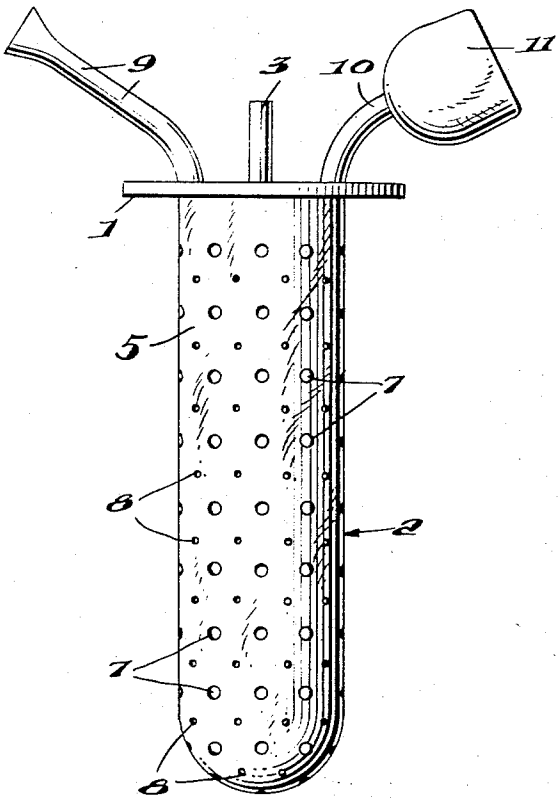

Fig. 2.

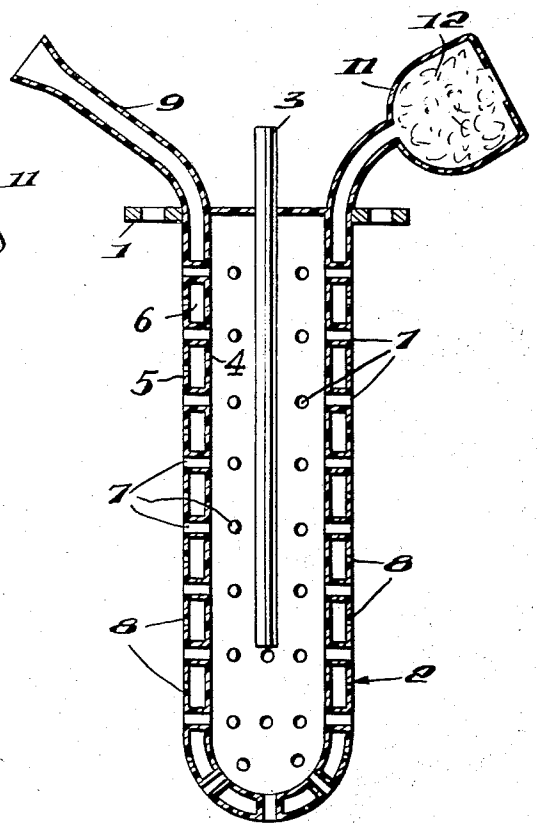

Fig. 3.

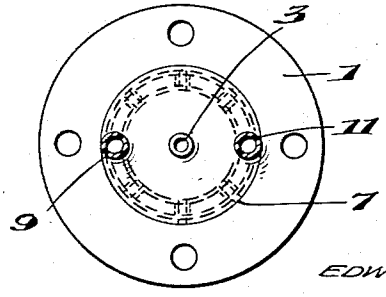

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Fig. 4.

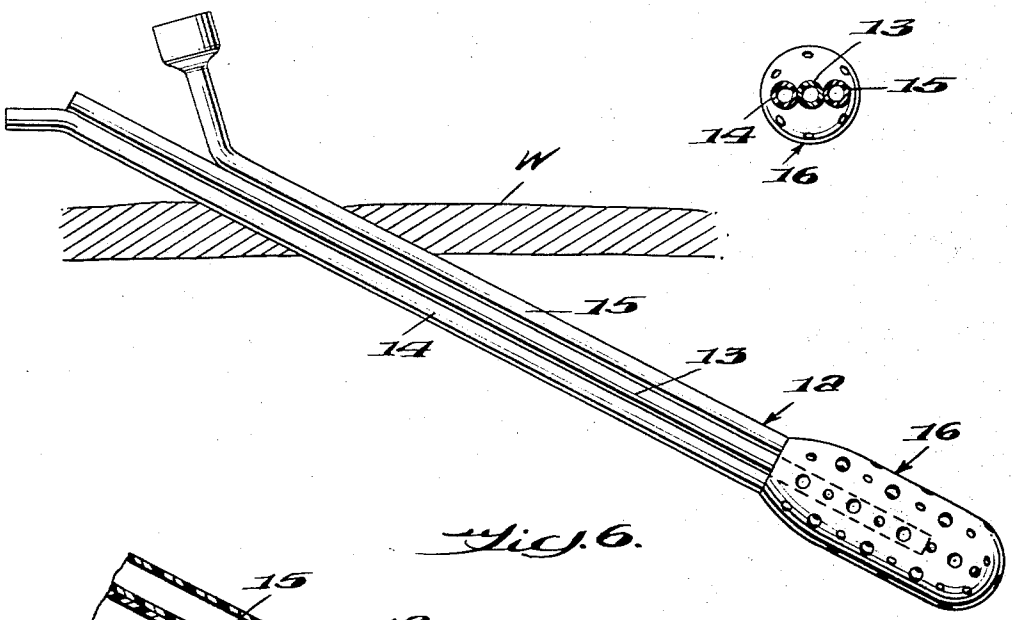
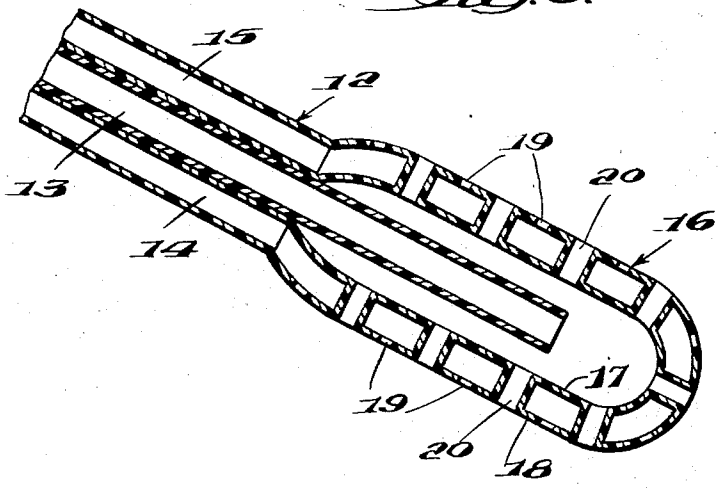


Fig. 5.

Fig. 6.



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DRAIN HAVING SHIELDED SUCTION TUBE

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Int. Cl. A61m 27/00

ABSTRACT OF THE DISCLOSURE

A suction type drain for removing fluid from a surgical incision through a suction tube. The device includes a shield that surrounds the inlet opening of the suction tube to prevent tissue from clogging the tube opening. A collar is attached to one end of the shield and the suction tube extends through the collar. The shield has a double wall construction for conducting fluid to the exterior of the shield and has conduits through the shield wall for conducting fluid to the interior of the shield where it is drawn into the suction tube opening.

This invention relates to improvements in sump drains to be used for removal of highly irritating digestive secretions from the abdomen of patients following operations.

Gastric, biliary duodenal, pancreatic, jejunal, and ileal fistulas are common in the practice of general surgery. The liquid drainage from all of these fistulas contains digestive enzymes. The quantity of drainage from these fistulas is frequently in excess of 1,000 cubic centimeters per twenty-four hours. Under present conditions it is impossible for the attending physician to estimate accurately the total amount of drainage in a given period of time. The problem of replacing the fluids—electrolytes and enzymes—lost through fistulous drainage will be greatly simplified by collection of total drainage in a bedside bottle through the use of the sump drain. The insertion of a simple suction drain into one of these fistulous tracts is highly unsuccessful, because the minute the suction is applied, a viscus (omentum, loop of small intestine, etc.) is sucked into the lumen of the drain tip, and effectively blocks all further drainage through the suction mechanism.

A sump drain also eliminates the necessity for frequent changes of dressings on the patient who is draining several liters of fluid daily. Just the cost of dressings (4 x 4 gauze, ABD pads, etc.) can become an item of major economic importance to the patient who requires numerous changes of dressings daily at $3.00 to $5.00 per dressing change. All drainage appliances in use heretofore allow these highly irritating liquids containing digestive enzymes to flow out on the patient's skin. Various types of protective creams and pastes have been used to reduce the amount of skin digestion by these enzymes. Such materials as aluminum ointment, covicone creme, etc. are applied several times daily around the drainage aperture, but in spite of these precautions a considerable of skin digestion occurs, and the patient is kept in a condition of extreme discomfort and requires frequent dressing changes.

One object of this invention is to simplify and improve sump drains for the purpose described to remove effectively liquids from the area of the incision and from the abdomen without discomfort or irritation.

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Another object of the invention is to provide a sump drain wherein the surrounding viscera are held away from the suction tip by a perforated shield which allows the liquid drainage to flow through the perforations in the shield and which permits the suction tip to withdraw the material before it can run out onto the skin.

These objects may be accomplished, according to one embodiment of the invention, by providing an elongated tube of suitable plastic material, closed at one end and having a collar at the opposite end thereof which may be attached by a belt encircling the patient's body to hold the appliance snugly in place. A suction tube extends through the collar and into the shield so as to remove the liquid drainage by suction.

The plastic shield is formed preferably of a double wall having perforations therethrough to permit the fluid to be removed to pass through the double wall to the lumen of the drain tip and without blocking the latter. The tip of the suction tube should be spaced a suitable distance from the surrounding wall of the plastic shield and from the closed end thereof for freedom of flow of the drainage liquid to the tip.

The double wall of the shield also has additional perforations through the outer wall section thereof to permit flow into and through the wall into the body cavity, either of air or water, to irrigate the body cavity and to prevent the sump drain from becoming plugged. Thus, the operator can apply suction to one end of the suction tube without building negative pressure at the other end which would cause abdominal viscera to be sucked against the drain.

Other embodiments may use the same general principle for draining remote areas of the body.

Certain embodiments of the invention are illustrated in the accompanying drawings, in which:

FIG. 1 is a side elevation of the preferred form thereof;

FIG. 2 is a longitudinal section therethrough;

FIG. 3 is a top plan view thereof;

FIG. 4 is a side elevation, showing the invention applied to a remote drain;

FIG. 5 is a cross section therethrough; and

FIG. 6 is a partial longitudinal section therethrough.

The sump drain illustrated in FIGS. 1 to 3 comprises a collar **1** to which is fixed one end of a drain shield **2**. The drain shield **2** is elongated and preferably formed of a suitable plastic material which will not be affected by body liquids or fluids. The distal end of the shield **2** remote from the collar **1** is substantially closed and the inner end thereof is sealed to the collar, but closed by the latter or by a suitable plug therein.

Extending through the collar **1** is a suction tube **3** which likewise extends throughout the major portion of the length of the shield **2** toward the distal end thereof, although the relative position of the suction tube **3** in the shield **2** may be varied as found desirable.

The extreme distal end of the suction tube **3** is open and spaced an appreciable distance from the surrounding wall of the shield **2**.

The shield **2** is provided with inner and outer walls, indicated at **4** and **5**, respectively, spaced apart with an open passageway **6** therebetween, which is open substantially throughout the area of the shield, but closed out of communication with the interior of the shield. Holes **7** extend through the double walls **4** and **5**, being formed by suitable tubular passageways that are sealed off from the

space **6**, but provide open communication from the interior of the shield to the body cavity therearound, as will be apparent from FIG. 2.

These holes **7** are relatively enlarged and are distributed over the major portion of the area of the shield for freedom of flow of body fluids into the shield for removal through the suction tube **3**, but without danger of blocking of the lumen thereof. The outer wall **6** is also provided with holes **8** therethrough which may be smaller in diameter than the holes **7** and which communicate from the space **6** outwardly into the body cavity.

The shield **2** is provided with one or more supply tubes for fluid, such as water or air, in open communication with the space and through the holes **8** into the body cavity. In the illustrated embodiment I have shown an irrigation tube **9** connected with the collar **1** and in open communication with the space **6** for the circulation of water therethrough. I have also shown an air vent tube **10** likewise connected with the collar **1** and in open communication with the space **6**.

The outer end of the air vent tube **10** has a bulb **11** thereon which may be filled with sterile cotton or other suitable means, indicated at **12**, to filter the supply of air. The tubes **9** and **10** are preferably formed of plastic and either of these may be clamped and sealed off when not required or when the other one is being used.

The sump drain may be inserted into the patient either at the time of surgery or during the immediate post operative period through a previously placed self-retaining, perforated plastic drain. The irrigation attachment would enable the doctor to inject desirable fluids to loosen viscid secretions, neutralize digestive enzymes and speed the rate of healing of the fistula.

The appliance may be constructed, if desired, with the usual long, thin, flat, solid tape drain (not illustrated but well known in the art) extending from its distal end to the desired extent. If the drain should be employed at the time of surgery, the tip of the tape would be placed at the site of the prospective origin of the fistula and thus establish a tract for drainage to follow to the base of the sump. Since the drain will penetrate serosal lined cavities, it should be made either with opaque material within the plastic or with a lead impregnated thread in its wall, making it visible with X-ray examination.

The shield is formed as a large outer tube composed of thin layers of perforated plastic of a suitable character so as not to be affected by body fluids. The shield protects the suction tube, preventing the stoppage thereof and enabling it to be used effectively to remove abdominal fluids.

The sump drain illustrated in FIGS. 1 to 3 is relatively short, being of the order of some two or three inches. It has a collar **1** with a belt attachment which will prevent its insertion into the patient to any substantial depth more than was indicated. In order to provide for drainage in a remote area where the entire shielded end of the sump is placed in something like a subphrenic abscess (as between the diaphragm and liver), an extended portion of tubing, which may be of some eight to ten inches, may be needed inside the patient's body cavity where the standard sump drain described above could not be used. The collar and belt attachment may not be required in this event and the tubular structure illustrated in FIGS. 4 and 5 may be employed as an embodiment of this invention.

This modified form is inserted through an incision formed in the body wall, generally indicated at W in FIG. 4, and should be of sufficient length to extend to the portion of the body where drainage is desirable. It should be formed of a suitable plastic material that may be molded to provide the desired degree of circulation.

As illustrated in FIG. 4, this form of sump drain comprises an elongated stem portion, indicated at **12**, either molded or stamped out of plastic so as to form two or more elongated tubes. One of the tubes is indicated

at **13** and forms the suction tube. In the illustrated embodiment, a water or irrigation tube is shown at **14** and an air vent tube is shown at **15**. These three tubes are disposed side-by-side, according to this embodiment, and may be molded or formed between sheets of plastic or of a solid mass of plastic suitably molded so as to provide the described circulating passages. The shielded tip **16** is provided on the ends of the tubes **13–15**.

The shielded tip **16** is formed with double walls **17** and **18** spaced apart for circulation of fluid or air therebetween from the respective tubes **14** and **15**. Orifices **19**, formed in the outer wall **18**, allow the fluid or air to be discharged into the body around the shielded tip **16** as described above. Enlarged openings **20**, formed in the double walls **17** and **18**, admit the body fluids into the cavity of the shielded tip **16** for discharge through the suction tube **13** in the manner described above.

This construction provides for a sufficient elongation to locate the suction area of the drain in remote areas of the body far removed from the point where the tubular structure emerges from the body wall W. It functions substantially as described, as will be evident from the foregoing description.

While the standard sump drain would be useful primarily in the abdomen, the remote sump (FIGS. 4 to 6) is used in remote areas of the body. For example, the remote sump would be useful inside the chest (thoracotomy) to drain the accumulation of serum beneath the skin flaps in a radical neck dissection or a radical mastectomy, and to drain blood and serum from a deep wound or operation in the extremity.

The remote sump drain which is designed to be placed as a suction drain inside of:

(1) Serous lined body cavities (chest and abdomen).
(2) To be used as a subcutaneous suction drain in situations where extensive skin flaps are raised as in radical neck dissection and radical mastectomy operations.
(3) To be used as a suction drain in deep traumatic or operative wounds of the extremities.

While the invention has been illustrated and described in certain embodiments, it is recognized that variations and changes may be made therein without departing from the invention set forth in the claims.

I claim:

1. A sump drain comprising a shield of thin tubular flexible material, said shield being closed at one end and having inner and outer walls defining a fluid chamber therebetween, said shield having a plurality of conduits extending through said inner and outer walls providing fluid communication between the interior and exterior of said shield, said conduits being distributed over the major portion of the area of the shield, a collar secured on the opposite end of said shield, said collar including flange means projecting radially of said shield, a plurality of supply tubes extending outwardly from said collar, said supply tubes being in fluid communication with said fluid chamber, said outer wall having a plurality of perforations spaced from said conduits, a suction tube extending into said shield through said collar and spaced from said shield inner wall, said collar sealing the interior of said shield, whereby fluid conducted through one of said supply tubes flows out of the shield through said perforations and distends said walls outwardly from said suction tube, while fluid is drawn into the shield through said conduits.

2. The sump drain according to claim **1** wherein said supply tubes are formed of flexible resilient material to allow the tubes to be temporarily closed by a clamp.

3. The sump drain according to claim **1** wherein said collar is in the form of a thin disc projecting radially outward from said shield to prevent said opposite end of the shield from being displaced into the patient's wound accidentally.

4. The sump drain according to claim **3** wherein said collar includes a thin flexible seal surrounding said suc-

tion tube and being mounted in co-planar relation with said collar disc.

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