

[54] **SURGICAL DRAINAGE TUBE**

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[51] Int. Cl. .... **A61m 27/00**

[58] Field of Search .... **128/350 R, 349 R,  
128/349 B, 240, 241, 276, 262**

[56] **References Cited**

**UNITED STATES PATENTS**

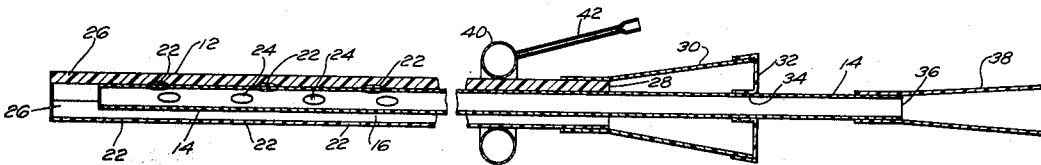
1,188,180	6/1916	Kells .....	128/350 R
3,433,215	3/1969	Silverman .....	128/262 X
2,819,718	1/1958	Goldman .....	128/350 R
3,426,759	2/1969	Smith .....	128/350 R

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[57] **ABSTRACT**

A surgical drainage tube comprising inner and outer concentric tubular portions, each having apertures adjacent their distal ends, means connecting the proximal end of the inner tube to a source of suction, and a cap closing off the proximal end of the outer tube with the inner tube extending through said cap, said cap being constructed of a penetratable self-sealing material whereby fluids may be injected through said cap to the annular chamber located between said inner and outer tubes, in order that desired fluids may be introduced to the cavity being drained, while suction is simultaneously taking place.

**3 Claims, 4 Drawing Figures**



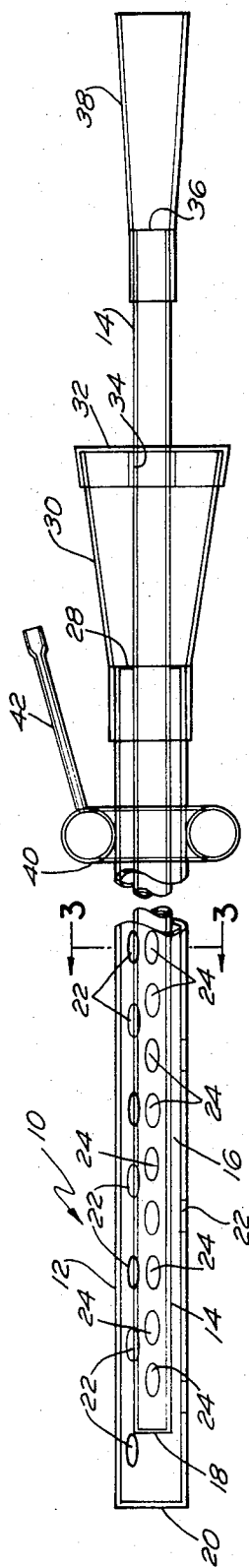


FIG. 1

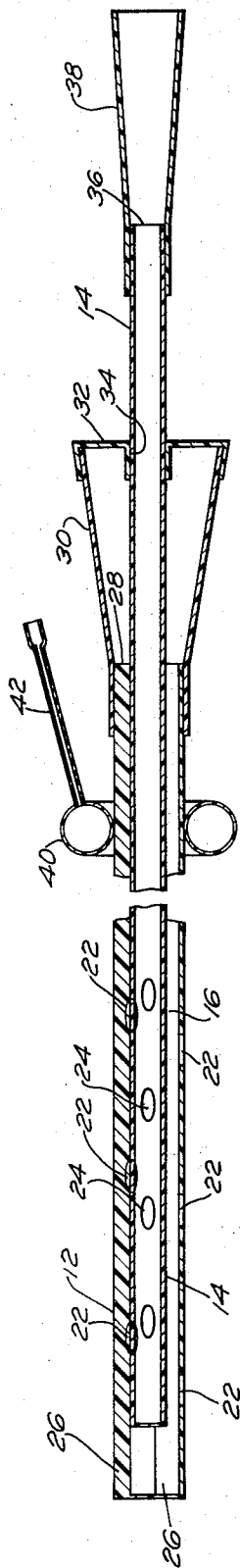


FIG. 2

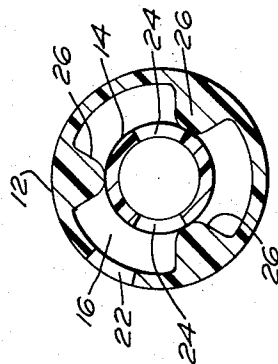


FIG. 3

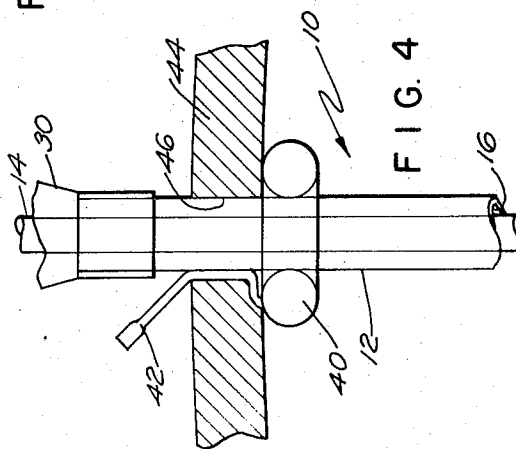


FIG. 4

## SURGICAL DRAINAGE TUBE

### BACKGROUND AND OBJECTS OF THE INVENTION

Drainage tubes are well known in the medical field and are conventionally used for draining off blood during surgical procedures, for routine post-operative drainage, for drainage of abscess cavities, etc. There are, however, certain disadvantages and problems insofar as existing drainage tubes are concerned.

First and foremost, the drainage tubes presently in use are limited to the single function of draining. Expressed differently, it is frequently desirable during the draining procedure to flush the cavity being drained with a sterile flushing solution, such as a saline solution, distilled water or the like. Furthermore, it is frequently desirable to introduce medication, such as antibiotics, to the cavity being drained. As previously mentioned, however, the existing drainage tubes are not capable of performing these additional functions.

Also, one of the problems frequently encountered in existing drainage tubes is clogging of the tube so as to impede or block the desired draining.

Accordingly, it is a primary object of the present invention to provide a drainage tube which permits the desired drainage of body cavities either during or after surgical procedures and which additionally is so constructed as to permit introduction of sterile flushing solutions and/or medications such as antibiotics either while drainage is simultaneously taking place or without any drainage taking place. Thus, in effect, the present invention provides a multipurpose drainage device.

A further object of the present invention is the provision of a drainage device of the character described wherein inner and outer concentric tubes are provided with suction being applied to the inner tube, whereby the presence of the outer tube helps prevent undesirable clogging of the device.

A further object is the provision of a drainage tube of the character described which is relatively simple and economically feasible to manufacture, but which nevertheless is highly effective, not only for drainage purposes, but also for the introduction of sterile flushing solutions and medications when desired.

Other objects, features and advantages of the invention will become apparent as the description thereof proceeds when considered in connection with the accompanying illustrative drawings.

### DESCRIPTION OF THE DRAWINGS

In the drawings which illustrate the best mode presently contemplated for carrying out the present invention:

FIG. 1 is an elevational view of a surgical drainage tube constructed in accordance with the present invention;

FIG. 2 is a sectional view thereof;

FIG. 3 is an enlarged section taken on line 3—3 of FIG. 1; and

FIG. 4 is an enlarged fragmentary view showing the inflatable cuff which forms a part of the present invention in actual use.

### DESCRIPTION OF THE INVENTION

It has been found desirable to provide a drainage tube effectively usable for a number of different surgical situations. For example, the drainage tube of the

present invention may be used to close an intestinal fistula without interfering with surgery taking place. It also may be used for draining purposes in cases of bile peritonitis following accidental extrusion of T-tube in common duct drainage. Other uses of the present invention are for intra-abdominal drainage, such as routine postoperative drainage, and sub-diaphragmatic or sub-hepatic abscess drainage. It is also effectively usable in the drainage of abscess cavities, drainage following radical mastectomy, and drainage in pneumothorax or hemothorax cases.

In addition to the drainage function in cases of the type above described, the present invention has a multipurpose construction which permits the tube to be used for infusion of antibiotic solutions or enzymes and/or for the infusion of sterile flushing solutions, such as a saline solution or distilled water. As will hereinafter become apparent, the infusion of antibiotics and/or flushing solutions may be done simultaneously while drainage is taking place, or drainage may be discontinued during such infusion, if necessary or desirable.

Referring now to the drawings, a drainage tube comprising the present invention is shown generally at 10, said tube having an outer tubular portion 12 and an inner concentric tubular portion 14. It will be noted that the diameter of inner tubular portion 14 is substantially less than the diameter of outer tubular portion 12, whereby to define an annular chamber 16 therebetween. The distal end of tubular portion 14 is open as at 18 and is spaced from the distal end of outer tubular portion 12 which is closed as at 20. Adjacent its distal end, the outer tubular portion 12 is provided with a plurality of longitudinally and circumferentially spaced apertures 22, while inner tubular portion 14 is similarly provided with a plurality of longitudinally and circumferentially spaced apertures 24.

Both of the tubular portions 12 and 14 are constructed of any suitable inert, nontoxic material, such as a soft plastic or Silastic, it being obvious that since the tube 10 is to be inserted into a body cavity, it must be flexible and pliant so as to reduce irritation and trauma to a minimum.

In order to maintain inner tubular portion 14 properly centered within outer tubular portion 12, the latter is provided with a plurality of integral, inwardly extending ribs 26 which extend longitudinally of tubular portion 12 and which engage the outer surface of inner tubular portion 14 at spaced points so as to maintain the latter properly centered, as shown most clearly in FIG. 3.

Adjacent its proximal end 28, outer tubular portion 12 has fixedly secured thereto by any suitable sealing means a tubular connector 30, the divergent end of which is covered by a penetratable, self-sealing cap 32. It will be understood that the cap 32 is secured to the end of connector 30 so as to make sealing engagement therewith, and it will further be understood that the cap 32 is constructed of a penetratable, self-sealing material, such as a pregnable latex, whereby a hypodermic needle or the like may be inserted therethrough to introduce a desired fluid to chamber 16, as will hereinafter be more fully described, but wherein when the hypodermic needle is withdrawn, the opening formed by said needle will automatically seal. As will be noted, cap 32 is provided with a central aperture 34 through which inner tubular portion 14 extends in sealing engagement. At its proximal end 36, inner tubular portion

14 has secured thereto a funnel-like connector 38 which in turn is adapted to be connected to a source of suction, not shown.

In order to prevent undesirable extrusion of the cavity being drained, there is secured to the tube 10 an inflatable rubber cuff or collar 40 having a flexible inflating tube 42 extending therefrom. As will be noted, the cuff 40 is secured by any suitable means to the outer surface of outer tubular portion 12 at a point adjacent to the proximal end of the latter, said inflatable cuff surrounding said outer tubular portion. Thus, when the tube 10 is inserted through the body wall 44 into a body cavity, the cuff 40, being deflated during the introduction of the tube 10, will offer minimum resistance to the insertion of the latter. Once the tube 10 has been fully inserted, however, the inflatable cuff 40 may be inflated from outside the body wall, since during inflation of the tube 10, the inflating tube 42 is positioned so as to extend through the opening 46 in body wall 44 to a point exteriorly thereof, as illustrated in FIG. 4. Thus, the cuff 40 may be inflated from outside the body wall to prevent inadvertent removal of the tube 10 from the body cavity. Of course, when it is desired to remove the tube 10 from the body cavity, the cuff 40 is deflated, and then the tube is withdrawn through opening 46.

With the tube 10 inserted in the body cavity, as illustrated in FIG. 4, and with the connector 38 connected to a source of suction, it will be seen that a negative pressure will be imparted to the body cavity through the apertures 24 and the apertures 22. It has been found that by locating the suction tube 14 within outer tubular portion 12, undesirable clogging of the tube 14 has been greatly minimized. It has further been found that the desired suction action is further enhanced by having the distal end of tubular portion 12 closed, while at the same time the distal end of tubular portion 14 is open.

It is frequently desirable during the drainage procedure to simultaneously flush the body cavity by introducing thereto a sterile flushing solution, such as a saline solution, distilled water, or the like. This may easily be done by introducing the flushing solution under pressure by means of a hypodermic needle or the like through sealing cap 32; whereby if the pressure of the flushing solution is maintained greater than the negative pressure of the suction, the flushing solution will be

forced out through the openings 22 to effect the desired flushing action in the body cavity. By the same token, medicinal solutions such as antibiotics or enzymes may be introduced through sealing cap 32, it being understood that if it is desired to maintain the flushing solution or the medicinal solution in the body cavity for a period of time, the source of suction to inner tubular portion 14 may be shut off.

It has also been found that introduction of a constant flow of saline solution through chamber 16 of tube 10 helps minimize clogging of the suction tube 14.

While there is shown and described herein certain specific structure embodying the invention, it will be manifest to those skilled in the art that various modifications and rearrangements of the parts may be made without departing from the spirit and scope of the underlying inventive concept and that the same is not limited to the particular forms herein shown and described except insofar as indicated by the scope of the appended claims.

What is claimed is:

1. A surgical drainage tube comprising an elongated outer tubular portion, an inner tubular portion extending coaxially therein, said inner portion being of substantially less diameter than said outer portion whereby an annular chamber exists therebetween, apertures in said tubular portions adjacent their distal end, means connecting the proximal end of said inner tubular portion to a source of suction, and a penetratable, self-sealing, disc-like cap closing off the proximal end of said annular chamber, the outer surface of said cap being exposed and readily accessible for penetration in order that fluids may be periodically and/or selectively injected under pressure through said cap to said annular chamber.

2. In the drainage tube of claim 1, an inflatable cuff secured to and surrounding the outer surface of said outer tubular portion adjacent the proximal end thereof.

3. In the drainage tube of claim 1, the proximal end of said tubular portion having a divergent conical portion, whereby the diameter of said cap is larger than the diameter of the distal portion of said outer tubular portion in order to increase the size of said cap and hence facilitate the injection of fluids therethrough.

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