

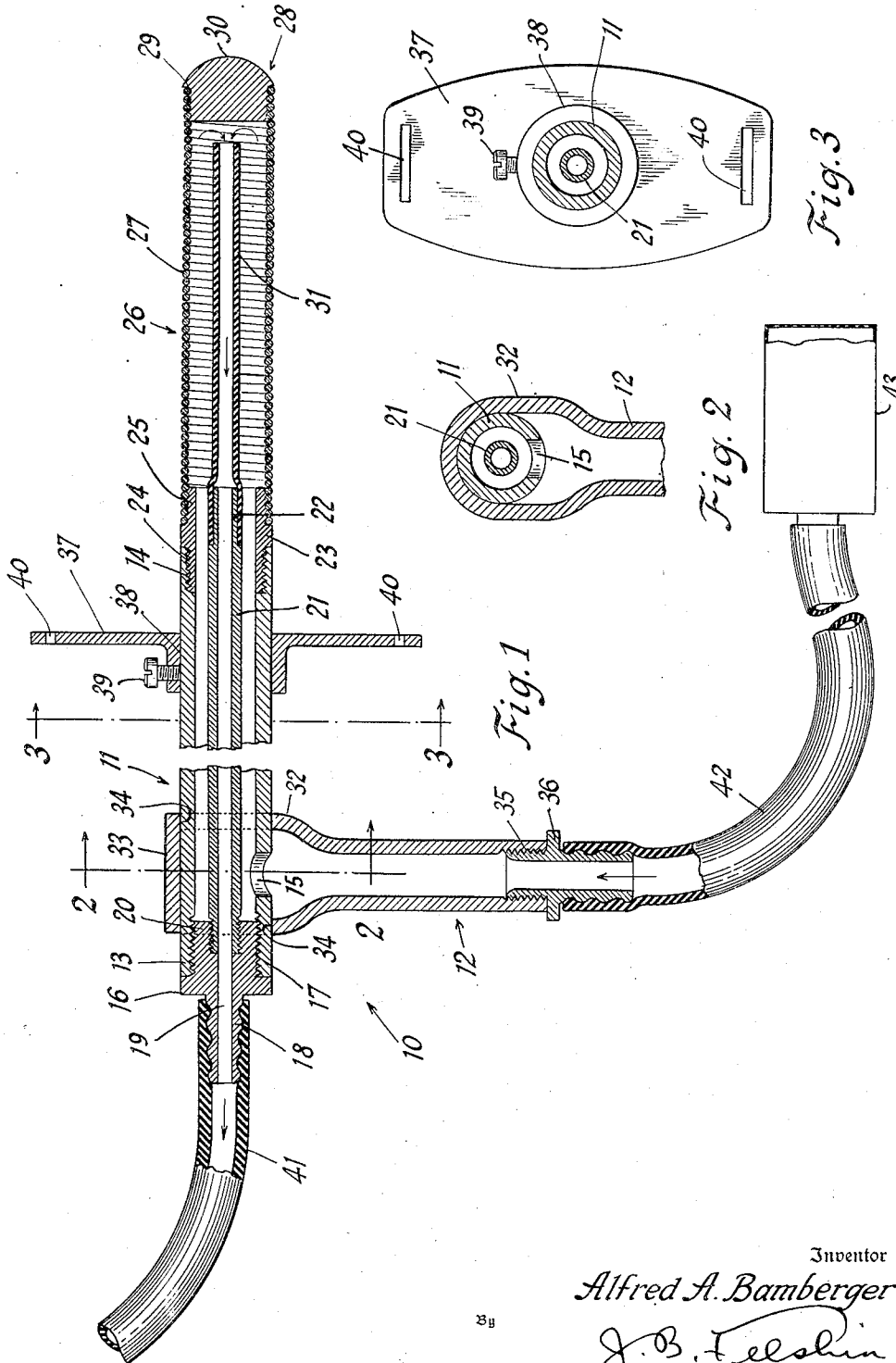
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SUMP DRAIN

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SUMP DRAIN

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This invention relates to surgical sump drains of the type used in draining fluid from a body cavity.

In the evacuation or draining of fluid from body cavities during surgical operations, the use of rigid cannulus has created several problems, particularly when vacuum is used. If the vacuum is of a high order there is a tendency for the walls of the cavity to be sucked in towards the cannula. This may be injurious to the membranes of the wall of the cavity as well as affecting the normal operation of the cannula due to the obstruction of the openings in the cannula. Similar effects are also observed when the fluid contents of that portion of the cavity immediately adjacent the end of the cannula, are removed.

A further difficulty lies in the ingress of air under uncontrolled conditions, into the cavity during its drainage. The air so drawn into the cavity may be the bearer of bacteria, dust or other deleterious foreign matter.

A further difficulty in the use of rigid type cannulus resides in their inability to penetrate to the far reaches of a body cavity and their tendency to strike organs within the cavity which may be in the path of the cannula, with possible injury thereto.

Accordingly, it is an object of this invention to provide a sump drain which comprises a flexible cannula adapted to be introduced into a body cavity and further to extend into the far reaches of the cavity without harm to any organs within the cavity.

A further object of this invention is to provide in a sump drain a flexible cannula in combination with means for producing a vacuum, together with means for introducing filtered air into a body cavity during the operation of the drain.

Another object of this invention is to provide in a surgical drain, for withdrawing fluid from a cavity in the body of a patient, a flexible cannula in combination with means for positioning said cannula on the body of the patient, said positioning means being adjustable in a manner to determine the extent of projection of the cannula into the body cavity.

Yet another object of this invention is to provide in a surgical drain, a flexible cannula together with a concentric member for admitting purified air while vacuum is applied to the cannula.

Still another object of this invention is to provide in a surgical drain a flexible cannula having a high capacity for removing fluids from a body cavity by the use of vacuum, yet being adapted

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to maintain a minimum negative pressure when the cavity runs dry, thereby reducing the danger of sucking membranes or tissues within the cavity to the walls of the cannula.

Another object of this invention is to provide a strong, durable, compact surgical drain which shall be relatively inexpensive to manufacture, easy to manipulate and which shall yet be practical and efficient to a high degree in use.

Other objects of this invention will in part be obvious and partly hereinafter pointed out.

The invention accordingly consists in the features of construction, combinations of elements, and arrangement of parts which will be exemplified in the construction hereinafter described, and of which the scope of application will be indicated in the following claims.

In the accompanying drawing, in which are shown various possible illustrative embodiments of this invention,

Fig. 1 is a cross-sectional view of the device embodying the invention;

Fig. 2 is a cross-sectional view taken on the line 2—2 of Fig. 1 and

Fig. 3 is a cross-sectional view taken on the line 3—3 of Fig. 1.

Referring now in detail to the drawing, 10 designates a surgical drain embodying the invention. The same comprises a pair of intersecting communicating tubular members 11, 12. The member 11 is internally threaded at one end 13 and is similarly threaded at its opposite end 14. The tubular member 11 is further formed with a through opening 15 in its wall adjacent the end 13, for the purpose hereinafter appearing. A shouldered fitting 16 having an externally threaded portion 17 is screwed into the end 13 of the tubular member 11. The fitting 16 comprises a nipple 18 extending axially, outwardly thereof. The fitting together with the nipple are formed with an axial bore 19. The bore 19 at the inner end of the fitting 16 has an enlarged and threaded portion 20. A tubular member 21 having an outside diameter less than that of the tubular member 11 and externally threaded at one end, is screwed into the threaded portion 20 of the fitting 16. The tubular member 21 is accordingly disposed in coaxial relation to the tubular member 11, and the outer wall of the member 11 is spaced from the inner wall of member 21 forming a cylindrical space therebetween. The tubular member 21 is slightly longer than the tubular member 11, projecting outwardly thereof, and is formed with a shouldered end portion 22 for the purpose hereinafter appearing.

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A coupling member 23 having an externally threaded end portion 24 is removably screwed into the threaded end portion 14 of the tubular member 11. The coupling member 23 is formed at its other end with a helically grooved portion 25 on which one end of a flexible tubular member 26 is engaged. The member 26 comprises successive convolutions of helically coiled wire 27 in abutting relationship, the walls of said member being pervious to the passage of fluids. Although the coils of wire 27 are in abutting relation, the walls of the member formed from the coiled wire are pervious to the passage of fluids. This is due to the roughness of the contacting surfaces of the wire, incident to the manufacture thereof. The discontinuity of contact on the curve of tangency is sufficient to permit the passage of fluids such as would be encountered in body cavities.

A closure member 28 is fitted into the other end of the flexible tubular member 26. The closure member comprises a shouldered body portion 29 which is received within the tubular member 26, and a convex end surface 30. A flexible tubing 31, having an outside diameter less than that of the flexible tubular member 26, has one end thereof removably fitted over the shouldered portion 22 of the tubular member 21. The other end of the tubing 31 extends towards the closure member 28 but terminates in spaced relation thereto. The flexible tubular member 31 is disposed in coaxial relationship with the flexible tubular member 21 and a cylindrical space is formed between the members.

The tubular member 12 comprises an enlarged portion 32 having an end wall 33, at one end thereof. The opposite walls of the enlarged portion 32 are formed with aligned openings 34 having a diameter equal to the outside diameter of the tubular member 11. The end portion 13 of the tubular member 11 is force fitted into the openings 34 of the tubular member 11, the opening 15 in the member 11 being so disposed as to extend transversely of the axis of the member 12 and providing communication between the tubular members 11 and 12. The other end of the tubular member 12 comprises an internally threaded portion 35 in which is screwed a coupling nipple 36.

A positioning plate 37 of substantially elliptical shape is mounted for slidable movement on the tubular member 11. The plate 37 is formed with a centrally located flanged opening 38 which accommodates the tubular member 11. A set screw 39 is mounted in the flange 38 to permit fixing the plate 37 in any desired position along the member 11. The plate 37 is formed with slots 40 on either end thereof, for the purpose hereinafter appearing.

The nipple 13 on the member 16 is connected to a source of vacuum by means of tubing 41. The outer end of the coupling nipple 36 is connected through tubing 42 to a filter 43 open to the atmosphere.

In using the device 10, as a surgical drain to remove fluids from a body cavity of a patient, the plate 37 is suitably adjusted on the member 11 so as to permit an adequate length of the device forward of the plate, to extend into the cavity. Straps may then be passed around the body of the patient and the ends thereof secured in the slots 40 in the plate 37 thereby fixing the position of the device with respect to the incision communicating with the cavity in the body of the patient. Upon the application of vacuum

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through the tubing 41, the fluid contents of the cavity are drawn through the pervious walls of the flexible tubular member 26 and are withdrawn through the members 31 and 21 as indicated by the arrows in Fig. 1. Simultaneously with the withdrawal of the fluid contents from the body cavity, air is drawn through the filter 43, and is conducted through the tubing 42, the tubular member 12 and through the opening 15 in the member 11, into the cylindrical space between tubular members 11 and 21, and eventually, outwardly between the pervious walls of the flexible member 26. This permits substantial neutralization of the pressure within the cavity and prevents the sucking action which would force membranes or tissues within the cavity, into obstructing contact with the pervious walls of the draining device.

The tubular member 26 has a flexibility of a high degree and accordingly is adapted to be directed in any direction within the body cavity by the surgeon, in a manner to bring its operative portions into any desired position. This is particularly desirable when organs within the body cavity are encountered, in which case, the flexible member is easily diverted from its path, thereby avoiding injury to such organs. The tubing 31 is also highly flexible so that it may conform to the flexure of the member 26.

The closure member 28 on the end of the flexible tubular member 26 permits the device to be readily inserted through the incision into the cavity and further, to guide the tubular member as it flexes, in conformity with its passage through the cavity.

The flexible member 26, together with its coupling member 23, may be replaced by similar members, of greater or lesser length, by unscrewing the coupling member 23 from the end portion 14 of the tubular member 11 and screwing in the replacement member. At the same time the flexible member 31 may be replaced by other annular members of a length appropriate to that of the selected tubular member 26.

The filter 43, which may be of the glass wool or other types well known in the art, insures that the air replacing the fluid in the body cavity, is free of dust or other filterable, deleterious matter. The ingress of air, which is determined by the amount of vacuum used to remove the fluids from the body cavity, further prevents the creation of any substantial negative pressure at the moment when substantially all the fluid has been removed from the cavity. This also avoids the sucking of the membranes or tissues within the cavity against the pervious walls of the drain, which could cause possible injury to such tissues or membranes.

The tubular member 26, and the closure member 30 may be made of stainless steel or other non-corrodible materials, which may be readily sterilized. The flexible tube 31 may be made of natural or synthetic rubber or any other suitable flexible material.

It is apparent that parts making up the device embodying the invention may be readily disassembled and assembled, thereby permitting sterilization of selected parts or replacement thereof.

It will thus be seen that there is provided a device in which the several objects of this invention are achieved, and which is well adapted to meet the conditions of practical use.

As various possible embodiments might be made of the above invention, and as various

changes might be made in the embodiment above set forth or shown in the accompanying drawing, said embodiment is to be interpreted as illustrative and not in a limiting sense. Any permissible change in the construction must fall within the purview of the claims.

Having thus described my invention I claim as new and desire to secure by Letters Patent:

1. A surgical drain comprising an outer tube and an inner tube coaxial therewith, means to fix said inner tube to said outer tube, a flexible fluid pervious tube attached to one end of the outer tube and extending therefrom, a flexible conduit attached to one end of said inner tube and disposed within said flexible tube, and communicating therewith, means to connect the outer tube with the atmosphere, and means to connect said inner tube to a source of vacuum.

2. A surgical drain comprising an outer tube and an inner tube coaxial therewith, means to fix said inner tube to said outer tube, a flexible fluid pervious tube attached to one end of the outer tube and extending therefrom, a flexible conduit attached to one end of said inner tube and disposed within said flexible tube, and communicating therewith, means to connect the outer tube with the atmosphere, and means to connect said inner tube to a source of vacuum and a positioning plate slidably mounted on said outer tube, and means to fix said positioning plate on said outer tube in various adjusted positions.

3. A surgical drain comprising an outer tube and an inner tube coaxial therewith, means to fix said inner tube to said outer tube, a flexible fluid pervious tube attached to one end of the outer tube and extending therefrom, a flexible conduit attached to one end of said inner tube and disposed within said flexible tube, and communicating therewith, means to connect the outer tube with the atmosphere, and means to connect said inner tube to a source of vacuum, a positioning plate slidably mounted on said outer tube, and means to fix said positioning plate on said outer tube in various adjusted positions, said positioning plate being provided with means to receive a strap.

4. A surgical drain comprising an outer tube and an inner tube coaxial therewith, means to fix said inner tube to said outer tube, a flexible fluid pervious tube attached to one end of the outer tube and extending therefrom, a flexible conduit attached to one end of said inner tube and disposed within said flexible tube, and communicating therewith, means to connect the outer tube with the atmosphere, and means to connect said inner tube to a source of vacuum, said flexible fluid pervious tube comprising a coil spring.

5. A surgical drain comprising an outer tube and an inner tube coaxial therewith, means to fix said inner tube to said outer tube, a flexible fluid pervious tube attached to one end of the outer tube and extending therefrom, a flexible conduit attached to one end of said inner tube and disposed within said flexible tube, and communicating therewith, means to connect the outer tube with the atmosphere, and means to connect said inner tube to a source of vacuum, said flexible fluid pervious tube comprising a coil spring and a head closing the outer end of said spring.

6. A surgical drain comprising an outer tubu-

lar member, said tubular member having internally threaded portions at either end thereof, an externally threaded fitting comprising a nipple portion extending outwardly thereof, and being formed with an axial bore, said bore being enlarged and having internally threaded portion at the inner end thereof, said fitting being screwed into one end of said outer tubular member, an inner tubular member threaded at one end and screwed into the internally threaded portion of the bore of said fitting, said inner tubular member being disposed concentrically within said outer tubular member, an externally threaded fitting screwed into the other end of said outer tubular member, said second mentioned fitting having a helically grooved end portion, a fluid pervious, flexible tubular member comprising helically wound convolutions of wire, one end of said flexible member engaging the grooved portion of said second mentioned fitting, a closure member engaging the other end of said flexible member, a flexible tubing having one end thereof attached to the other end of said inner tubular member, said flexible tubing being coaxially disposed within said flexible tubular member, a conduit formed with aligned openings, in opposite walls thereof, an end portion of said outer tubular member being mounted in the openings of said conduit, said outer tubular member being formed with an opening in a wall thereof, said opening being disposed in a manner to permit communication between said outer tubular member and said conduit.

7. A surgical drain comprising an outer tube and an inner tube concentric therewith, means to fix said inner tube to said outer tube, means to connect one of said tubes to a source of vacuum, means to connect the other of said tubes with the atmosphere, a flexible fluid pervious tube attached to one end of the outer tube and extending therefrom, and a flexible tube attached to one end of said inner tube and disposed within said flexible fluid pervious tube and communicating therewith.

8. A surgical drain comprising an outer tube and an inner tube concentric therewith, means to fix said inner tube to said outer tube, means to connect one of said tubes to a source of vacuum, means to connect the other of said tubes with the atmosphere, a flexible fluid pervious tube attached to one end of the outer tube and extending therefrom, and a flexible tube attached to one end of said inner tube and disposed within said flexible fluid pervious tube and communicating therewith, said flexible fluid pervious tube comprising a coil spring.

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