

[54] CHEST DRAINAGE SYSTEM

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[58] Field of Search. 137/205; 128/276;
141/59; 417/148, 130

[56] References Cited

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[57] ABSTRACT

Chest drainage apparatus utilizing three compartments integrally formed within a single container to define a first water-sealed fluid-receiving chamber, a second pressure regulating chamber and a third trap chamber. A control valve is provided to selectively communicate or preclude communication between the first chamber and the remaining chambers. In addition, the first compartment includes a stopcock positioned therein above the level of the water seal for a selective draining of the compartment without requiring a dismantling of the apparatus. The pressure is regulated through a vertically adjustable tube communicated with the interior of the second chamber. All three chambers include stopper closed openings which can be used for the insertion or removal of water as well as a cleaning of the interior of the chambers.

5 Claims, 4 Drawing Figures

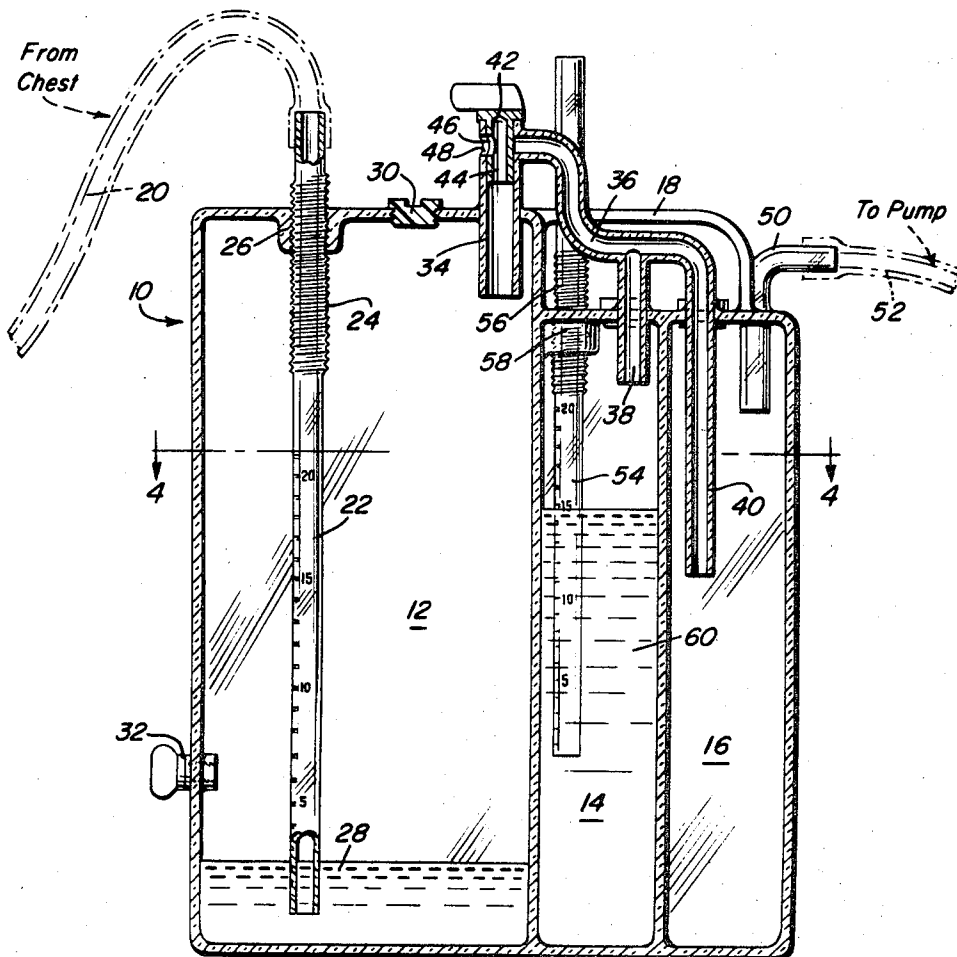


Fig. 1

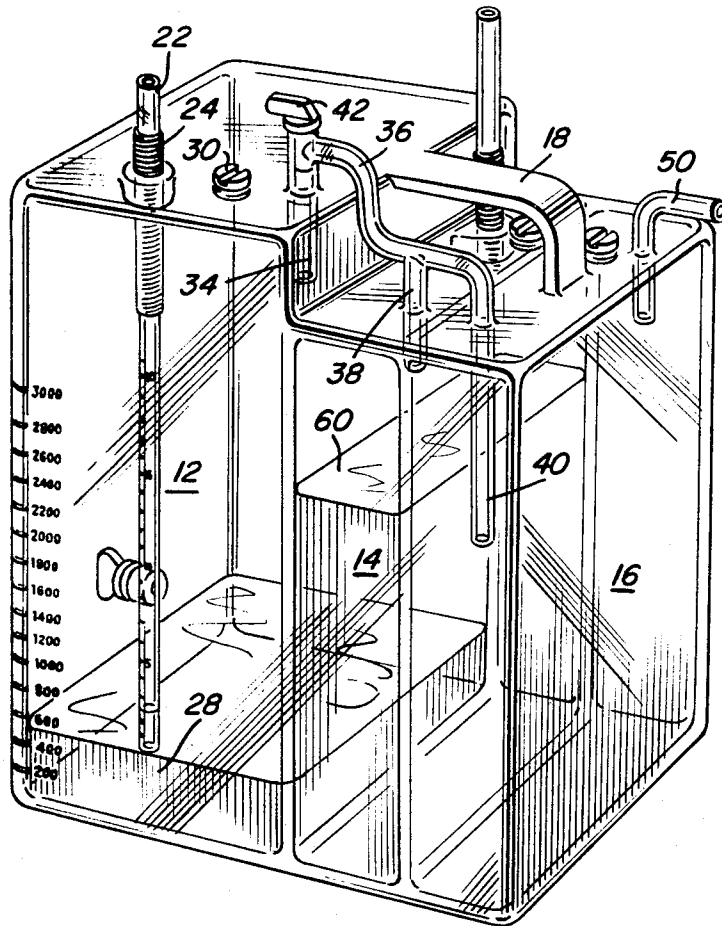


Fig. 2

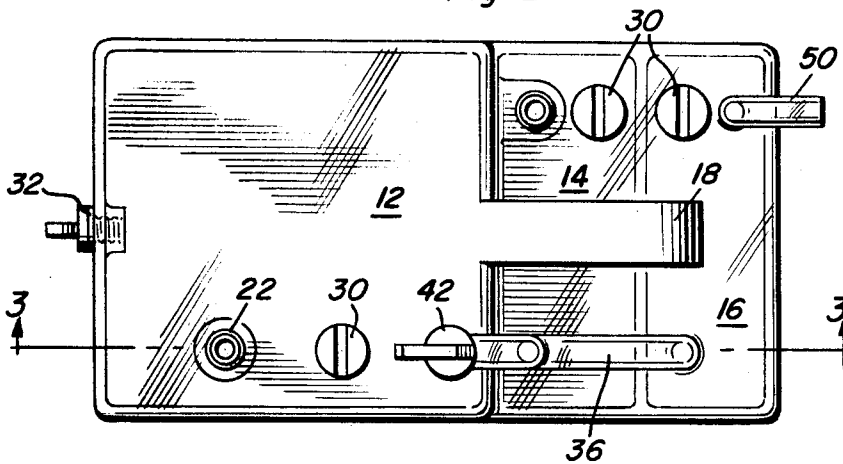


Fig. 3

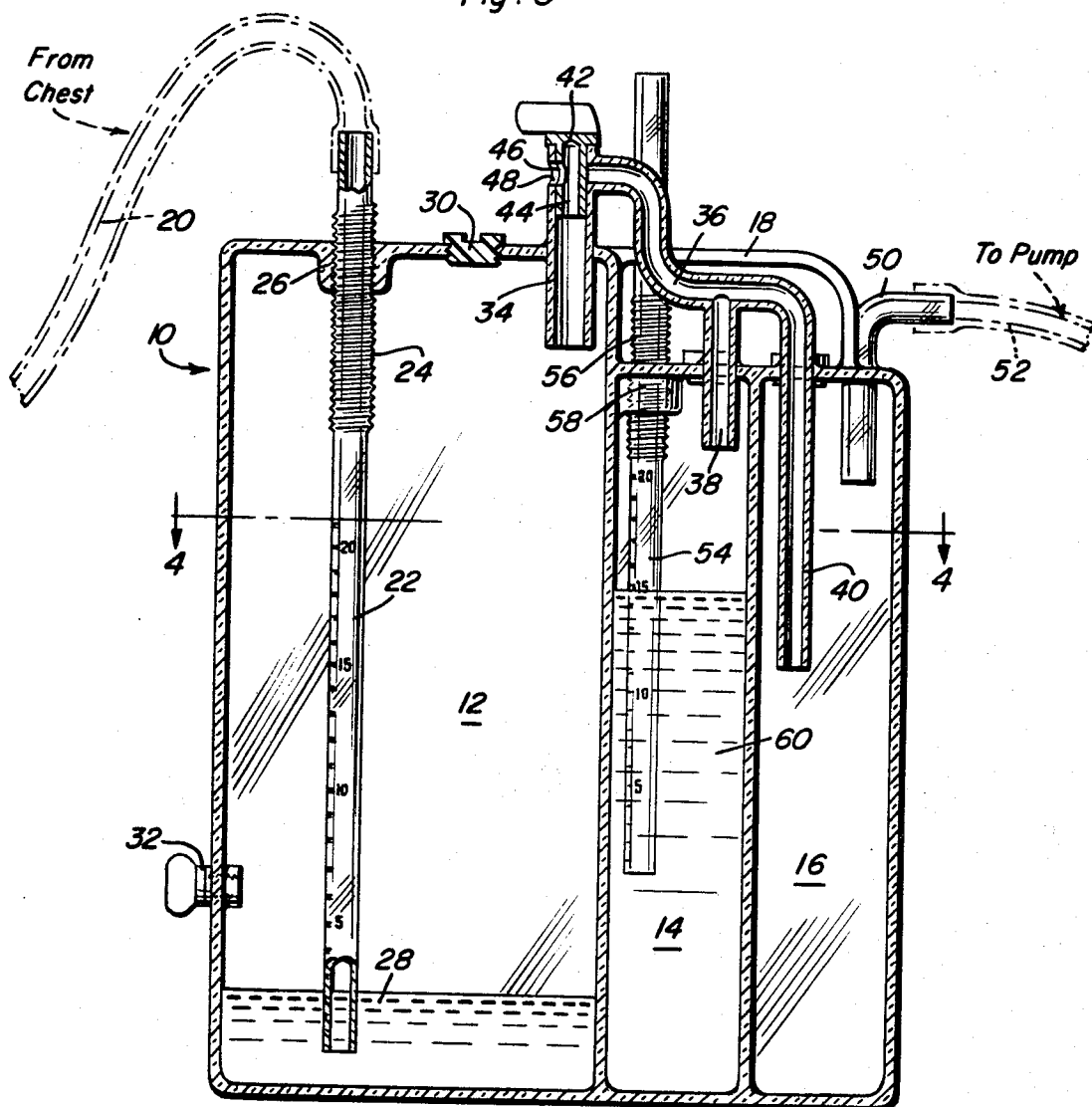
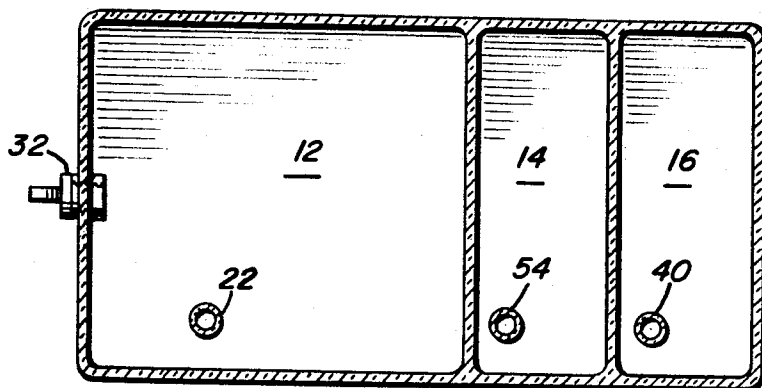


Fig. 4



CHEST DRAINAGE SYSTEM

The present invention relates to new and useful improvements in chest drainage systems, and is more particularly concerned with apparatus in the nature of a single compartmented container which incorporates the functional utility of the conventional "three bottle" system in a unique manner productive of advantages heretofore not available.

Basically, the three-compartmented apparatus of the invention utilizes a single compact container incorporating an integral handle and adjustable components which enable a variation of the level of the water seal as well as a regulation of the vacuum pressure being provided. The main fluid receiving chamber incorporates a stopcock for a selective draining thereof as required, and in addition it is communicated with the two remaining compartments through a valve unit which allows for a selective segregating of the main compartment from the remaining compartments and a venting of this main compartment to the atmosphere for use in those situations wherein only a single compartment incorporating an underwater seal is required.

Among the objects of the invention are the provision of an easily cleaned and maintained apparatus, the provision of an apparatus which can be converted from a one bottle system to a three bottle system, and the provision of apparatus which because of its simple structural nature, preferably being formed of polyethylene or similar material, can in fact be considered disposable, being utilized only once.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout.

FIG. 1 is a perspective view of the apparatus comprising the instant invention;

FIG. 2 is a top plan view thereof;

FIG. 3 is an enlarged cross-sectional view taken substantially on a plane passing along line 3—3 in FIG. 2; and

FIG. 4 is a cross-sectional view taken substantially on a plane passing along line 4—4 in FIG. 3.

Referring now more specifically to the drawings, reference numeral 10 is used to designate the single container utilized in the construction of the apparatus. This container includes three internal chambers 12, 14, and 16.

The chamber 12, which constitutes the fluid receiving chamber, is approximately three to four times as large as either of the chambers 14 and 16 which respectively constitute a pressure-regulating chamber and a trap chamber.

As will be appreciated from the drawing, the overall container 10 is of a compact rectangular configuration with the chambers incorporating common side, bottom and top walls. The chamber 12 is of a greater height than the chambers 14 and 16, thus providing a stepped top wall with the recess formed by the lower level chambers 14 and 16 accommodating an integrally formed handle 18 for an easy manipulation and/or carrying of the container 10.

The liquid receiving chamber 12 is to be directly communicated with the chest cavity through appropriate flexible tubing 20 and a rigid calibrated tube 22.

The tube 22 has the upper portion of the exterior thereof threaded as at 24 for threaded engagement within an integral apertured enlargement 26 provided in the top wall of the chamber 12. The open lower end of the tube 22 extends to a point below the level of the water seal 28. The chamber 12 is also provided with a fill opening in the top wall closed by an appropriate stopper 30. In order to provide for an emptying of the chamber 12 without requiring a shutting down of the apparatus or a loss of the underwater seal effect, an appropriate drainage plug or stopcock 32 is provided through the end wall of the chamber 12 above the level of the water sealed lower end of the tube 22. This stopcock 32 should be located at a height sufficient so as to allow for a reasonable vertical adjustment of the tube 22 while at the same time providing for an effective drainage of the chamber 12 of excess fluid.

The chamber 12 is selectively communicated with the chambers 14 and 16 through tubing which includes a first tube section 34 projecting through the top wall of the chamber 12 and communicating, toward the upper end thereof, with a cross tube section 36 which in turn directly communicates with depending tube sections 38 and 40 respectively communicated with the interior of the chambers 14 and 16 through the top walls thereof, the tube sections 34, 38 and 40 in each instance communicating with the upper portion of the respective chambers. It will be noted that the cross tube section 36 curves downwardly into the downwardly offset top portion of the container 10, thus contributing to the compact nature of the apparatus.

Inasmuch as the chamber 12 can, under certain circumstances, be used independently of the chambers 14 and 16, an appropriate two-way stopcock or valve 42 is rotatably received within the tube section 34 through the open upper end thereof. This valve 42 includes a hollow stem 44 having a lateral aperture 48 there-through which, upon a rotation of the valve 42, selectively aligns with either the corresponding end of the cross tube section 36 or an aperture 48 in the wall of the tube section 34 for a direct communication of the interior of the tube section 34 and hence the chamber 12, with the atmosphere. When the chamber 12 is thus communicated with the atmosphere, a simple one-chamber drainage apparatus is provided in conjunction with an underwater seal. Upon a rotation of the valve 42, the apparatus is converted into a three-chamber vacuum or suction drainage apparatus.

Each of the chambers 14 and 16 is also provided with a stopper closed filling hole or cleaning aperture through the top wall thereof. The trap chamber 16 additionally includes a short tube or tube section 50 through the upper wall thereof which communicates with appropriate flexible tubing 52 leading to suitable pump apparatus.

The pressure regulating chamber is provided with an elongated open-ended calibrated tube 54 having an externally threaded portion 56 which is threadedly received through an apertured enlargement 58 constituting a portion of the top wall thereof. In this manner, the height of the open lower end of the tube 54 can be easily regulated relative to the level of water 60 within the chamber 14 which in turn effectively regulates the vacuum pressure of the system. The provision of a threaded connection between the tube 54 and the chamber 14 is particularly significant in that it enables a positive fixing of the tube 54 at a predetermined level.

It will of course be appreciated that the open upper end of the tube 54 communicates directly with the atmosphere.

As will be noted from FIG. 1, the first chamber 12 is provided with liquid level calibrations. As previously indicated, it is contemplated that the entire container be formed of an appropriate plastic with the unit, because of the economical nature of the construction thereof, being disposable after a single use.

From the foregoing, it will be appreciated that a significant advance in the art has been made through the provision of a single unit drainage apparatus which, among other features, includes a positive pressure regulation, means for selectively draining the main fluid-receiving chamber without a dismantling of the apparatus or a destruction of the water seal, and means for quickly converting the apparatus from a three-chamber device to a single-chamber device.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

What is claimed as new is as follows:

1. Chest drainage apparatus comprising a three-chamber single container including a first sealing chamber, first tube means including a lower end positioned within the lower end portion of the first chamber, said first tube means extending vertically through and outward beyond said first chamber for fluid-receiving communication with a chest cavity, said first chamber being adapted to receive a water seal therein to a level above the lower end of the first tube means, second tube means extending into each of said chambers, one of said remaining chambers comprising a second liquid receiving pressure regulating chamber, a regulating tube extending vertically into said second

regulating chamber and communicating said second chamber with the atmosphere, said second chamber including an aperture therethrough receiving said regulating tube for a vertical adjustment thereof relative to said second chamber, the remaining chamber comprising a third trap chamber and a pump tube communicating with the interior of said third chamber and extending exteriorly therefrom for engagement with pump means, and valve means within said second tube means operable to selectively communicate the first chamber with the remaining chambers or with the atmosphere so as to selectively define a one-chamber drainage apparatus or a three-chamber suction drainage apparatus.

2. The apparatus of claim 1 including a selectively openable chamber draining stopcock mounted on said first chamber in spaced relation above the lower end of the first tube means for a selective draining of that portion of the first chamber above the lower end of the first tube means.

3. The apparatus of claim 2 wherein said first chamber is of a greater height than said second and third chambers, said second and third chambers including a common top wall, said first chamber including a top wall parallel to and upwardly stepped relative to the common top wall of the second and third chambers, and handle means integrally formed with said unit and overlying the second and third chambers.

4. The apparatus of claim 3 wherein each of said chambers includes a stopper closed access opening through the top thereof.

5. The apparatus of claim 1 wherein said first chamber is of a greater height than said second and third chambers, said second and third chambers including a common top wall, said first chamber including a top wall parallel to and upwardly stepped relative to the common top wall of the second and third chambers, and handle means integrally formed with said unit and overlying the second and third chambers.

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