United States Patent

Calinog

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[54] **SURGICAL DRAINAGE INSTRUMENT**

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[52] **U.S. Cl.** .....**128/347,** 128/350 R
[51] **Int. Cl.** **A61b 17/34,** A61b 27/00
[58] **Field of Search** .....128/347, 348, 349 R, 350 R

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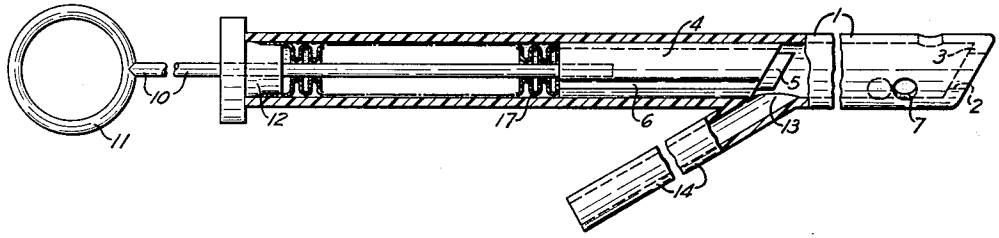
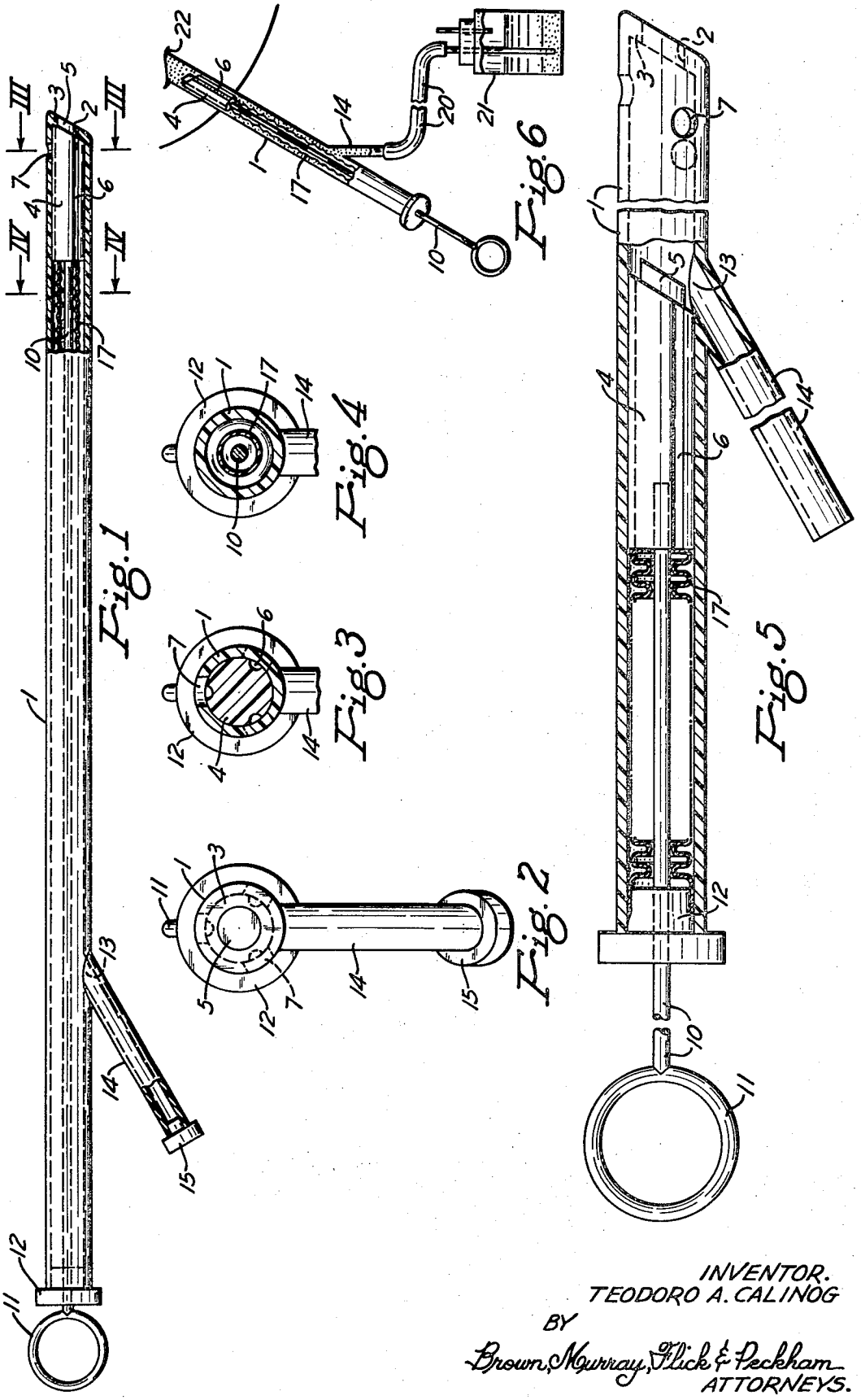
[57] **ABSTRACT**

A trocar is slidably mounted in a main tube and normally is disposed at its front end. Connected to the rear end of the trocar is a rod that extends back through the tube and out of its rear end. A tubular bellows encircles the rod and has a front end sealed to the trocar, while the rear end of the bellows is sealingly connected to the rear end of the tube. After the tube is inserted in an incision the trocar is pulled back into a position near the rear end of the tube. Directly in front of this rear portion the tube is provided with a lateral outlet opening and a discharge tube so that drainage can occur back through the two tubes.

4 Claims, 6 Drawing Figures





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SURGICAL DRAINAGE INSTRUMENT

Following surgical operations it often is necessary to insert a drainage tube in the incision. For example, after lung or heart surgery a tube is inserted in order to draw off blood clots and air and also to reestablish the negative pressure within the pleural cavity. Such tubes are likewise used in the drainage of empyema and other abnormal fluid accumulations. Sometimes such a tube is used for instillation of drugs into the pleural cavity for treating infection or for chemotherapy of cancer. One of the most common problems that is encountered is maintaining the drainage path through the tube open, especially when thick fluid-like blood clots and pus are encountered. The customary way of keeping a drainage tube open is by milking it frequently, but this is not satisfactory. Another less common, but important, problem is the instillation of drugs through the chest tubes without the danger of letting air into the pleural cavity, which is an obvious danger to the lift of the patient. Finally, there is the problem of insertion of the most commonly used tubes, that needs many different ancillary instruments.

It is among the objects of this invention to provide a surgical drainage instrument which is easy to insert in an incision, which can be freed of any obstructions quickly and in a simple manner, and which permits the instillation of drugs without admitting air to the chest cavity.

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which

FIG. **1** is a side view with parts broken away in longitudinal section;

FIG. **2** is an enlarged front end view;

FIGS. **3** and **4** are enlarged cross sections taken on the lines III—III and IV—IV, respectively, of FIG. **1**;

FIG. **5** is an enlarged fragmentary side view, with parts shown in longitudinal section; and

FIG. **6** is a reduced perspective view, again partly in section, of the instrument in operating position.

Referring to the drawings, a flexible main tube **1** made of rubber or a plastic and more or less transparent has a bevelled front end provided with a central inlet opening **2** encircled by a lip **3**. Fitting snugly within the tube, but slidable therein, is a trocar **4** which can be formed of the same material as the tube. The front end of the trocar is bevelled to the same extent as the front end of the tube and normally engages lip **3**. The trocar has a forwardly projecting reduced extension **5** that plugs the inlet **2** of the tube. The side of the trocar is provided with one or more, preferably three, grooves **6** extending from end to end. The front ends of these grooves are closed by lip **3**. Beside the front end of each of the grooves there is an inlet port **7** in the side of the tube.

To help in inserting the front end of the tube in an incision and also to enable the trocar to be retracted in the tube, the front end of a rod **10** is screwed into the rear end of the trocar. The diameter of the rod is considerably smaller than the inside of the tube so that there is a substantial space between them. The rod extends rearwardly through the tube and out of its rear end. The outer end of the rod may be provided with a pull ring **11**. The rod is slidably mounted in an axial passage through a plug **12** fitting tightly in the rear end of the tube. The trocar and rod stiffen the tube for insertion in an incision. Thereafter, by pulling on the rod

the trocar can be pulled back in the tube to an out-of-the-way position near its rear end. Directly in front of the trocar in its rear position, the main tube is provided with a lateral outlet opening **13**, from which a discharge tube **14** extends laterally and rearwardly away from the main tube. The outer end of the discharge tube normally is closed by a removable plastic or rubber stopper **15**.

Another feature of this invention is that the trocar can be moved back and forth in the main tube by means of the rod without the inside of the tube being contaminated by the rod. Accordingly, the rod is surrounded by a tubular bellows **17** of plastic or rubber that extends from the trocar to the plug **12** in the rear end of the tube. The front end of the bellows is sealed to the rear end of the trocar in any suitable manner, and the rear end of the bellows is either sealed to the plug or is clamped tightly between the plug and the encircling tube. When the trocar is in its forward position shown in FIG. **1**, the bellows, of course, is extended but when the trocar is retracted to its rear position shown in FIG. **5**, the bellows is compressed or folded in the space between the trocar and the plug. The proper rear position for the trocar can be indicated by providing the rod with a mark, or providing the inside of the main tube with a bump or restriction that the rear end of the trocar will engage. The rod then can be removed by unscrewing it from the trocar and later reinserted in order to move the trocar forward again. Since the rod is isolated by the bellows from the passage through the tube, there is no necessity for maintaining the rod sterile. Moving the trocar forward in the main tube, followed by retracting it to its rear position again, is for the purpose of loosening any blood clots or the like that may form in the tube and obstruct the passage through it.

OPERATION

After the stopper in the end of the discharge tube has been removed, that tube is connected by a flexible tube **20** with a water bottle **21** into which fluid is to drain, as shown in FIG. **6**. The front end of the main tube, by means of the trocar, then is pushed into the incision **22** in a patient's chest and between his ribs into the chest cavity. The surgeon can tell when the main tube is in the correct position because the expected fluid will enter the lateral inlets **7** in the front of the tube, flow back through the grooves **6** in the side of the trocar and then be seen between the bellows and the inside of the tube before it enters discharge tube **14** and finally enters the bottle. If air is expected, the bottle is observed for bubbling. The main tube can be fastened in place in the usual way. The rod is retracted to pull the trocar back in the main tube to its rear position directly behind the entrance to the discharge tube, and then the rod is disconnected from the trocar and laid aside for future use. The inside of the main tube now is unobstructed so that blood or any other liquid from the chest cavity can flow freely through it and into the bottle. However, as mentioned before, if the tube starts to become obstructed, the rod can be screwed back into the trocar and the latter pushed forward in the main tube to clear the passage and then retracted again. The fact that the rod is not sterile is immaterial, because it is enclosed in the bellows.

This instrument likewise can be used for instillation of drugs into the pleural cavity. After adequate drainage has occurred, the discharge tube **14** is disconnected from the bottle tube **20** and a sterile rubber stopper is inserted in the outlet of the discharge tube. This stopper is punctured with the needle of a syringe containing the drug. The syringe then can force the drug through the discharge tube into the main tube and from there into the chest. This can be repeated at intervals if necessary. This is most useful for chemotherapeutic agents for cancer therapy and antibiotics for specific type infections.

It will be seen that the instrument described herein is a multipurpose item. It can be used for both drainage and instillation of drugs. The passage through the main tube can be maintained open by moving the trocar back and forth in it. The trocar also aids in inserting the tube in the chest cavity. The danger of producing more pneumothorax in the process of inserting the tube is avoided by the plug and stopper that seal the outer ends of the tubes. When used for instilling drugs, the danger of introducing more air into the pleural cavity is avoided by injecting the drugs through the stopper in the outer end of the discharge tube.

According to the provisions of the patent statutes, I have explained the principle of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. A surgical drainage instrument comprising a main tube having front and rear ends, a trocar slidably mounted in the tube and normally disposed in the front end thereof, a rod in the tube connected to the rear end of the trocar and extending therefrom back through the tube and out of its rear end, the diameter of the rod being considerably less than the inner diameter of the tube, a tubular bellows encircling the rod inside the tube and having a front end sealed to the trocar, means sealingly connecting the rear end of the bellows to the rear end of the tube to isolate the rod from the inside of the tube around and in front of the bellows, said rod being designed for pulling the trocar rearwardly in the tube to a position near the rear end of the tube, the tube being provided with a lateral outlet opening near its rear end between the front and rear positions of the trocar, and a discharge tube joined to the main tube around said opening and extending outwardly away from it.

2. A surgical drainage instrument according to claim **1**, in which said trocar is provided in its side with a drain groove extending from end to end, and the front end of the main tube is provided with a lip engaged by the trocar and closing the front end of the groove and with a side opening beside said groove, whereby fluid entering said side opening can pass the trocar and leave said main tube through said discharge tube.

3. A surgical drainage instrument according to claim **1**, in which said connecting means includes a plug fitting tightly in the rear end of the main tube and provided with an axial passage for said rod, the rear end of said bellows encircling said plug inside the main tube and being compressed between them.

4. A surgical drainage instrument according to claim **1**, in which said rod is detachably connected to the trocar and is completely removable from said tube.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,703,899 Dated November 28, 1972

Inventor(s) Teodoro A. Calinog

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

At "[72] Inventor:" change "Teodora" to --Teodoro--.

Column 1, line 19, change "lift" to --life--.

Signed and sealed this 13th day of March 1973.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

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