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M. ROBERTS ETAL

3,261,357

EXTRACTOR FOR PERITONEAL ENTRY DEVICE

Filed Aug. 26, 1963

FIG. 1.

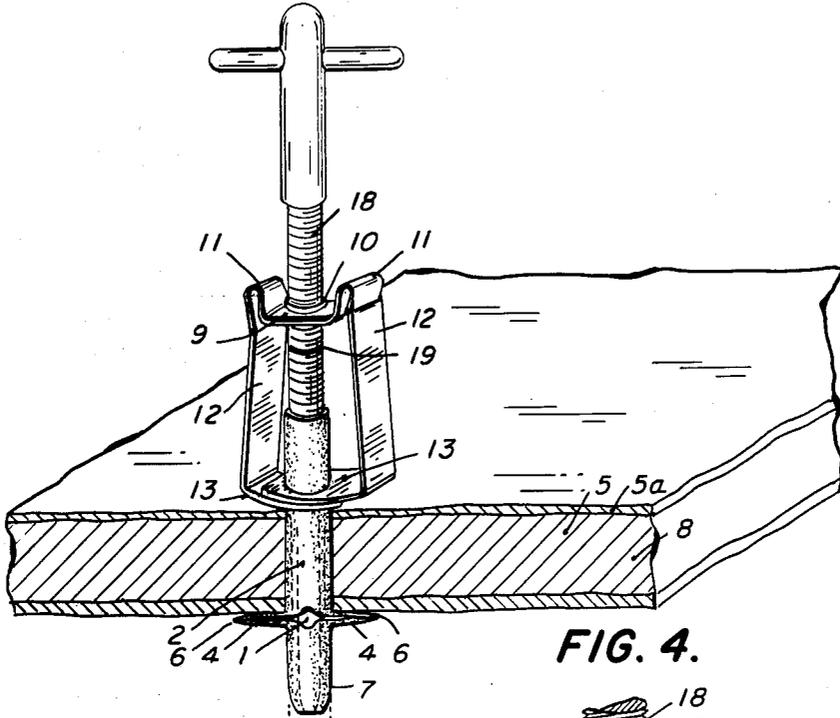


FIG. 2.

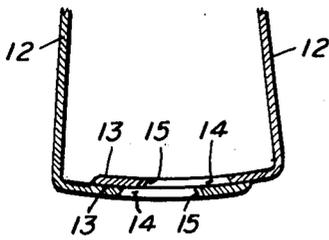


FIG. 3.

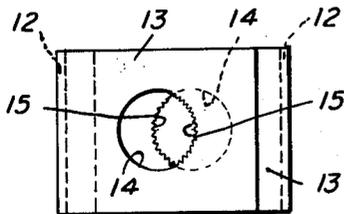
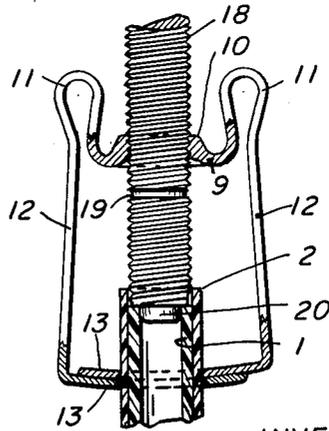


FIG. 4.



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EXTRACTOR FOR PERITONEAL ENTRY DEVICE

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7 Claims. (Cl. 128-348)

This invention relates generally to an extractor for devices inserted through the abdominal wall of patients wherein an inner member must be pushed down inside another member before the device can be removed. More particularly, this invention relates to an extractor for use in combination with an expandable wing-type peritoneal entry device. This peritoneal entry device is the subject of a separate application, Serial Number 302,110, filed August 14, 1963. The entry device is suited for any use where the peritoneal cavity must be repetitively entered, but its main use is in connection with peritoneal dialysis.

Peritoneal dialysis is a procedure used in treatment of acute and chronic kidney shutdown. To remove the undesired metabolites from the blood, the peritoneal cavity is filled with a dialyzing solution and left there from 30 to 120 minutes. During this time, dialysis takes place across the peritoneal membrane surrounding the intestines and other organs, and toxic materials including urea, creatinine, and salicylates and barbiturates when present, pass into the dialyzing solution. The dialyzing solution is then removed from the peritoneal cavity carrying with it some of the toxic materials previously present in the blood. Fresh dialyzing solution is then run into the peritoneal cavity and allowed to remain there the required length of time and then removed. This example of a batch-type dialysis is continued from 8 to 36 hours until the level of toxic substances in the blood is sufficiently lowered. By varying the specific electrolytes and their concentrations in the dialyzing solution, the blood electrolytes can be tailored to approach normal concentrations.

One of the problems in repetitive peritoneal dialysis is the lack of a simple entry device for periodically inserting a catheter through the abdominal wall of a patient. This problem is eliminated by installing the illustrated peritoneal entry device at the first dialysis and merely capping it between dialyses. Simply uncapping the device permits a catheter to be inserted without a separate trocar puncture for subsequent dialyses.

The entry device which is shown in use with the extractor is constructed of two tubes, one slideably mounted inside the other. These two tubes are joined together at one end. Near this end, the outer of the two tubes has flareable wings which are adapted to open inside the abdominal cavity. Axial motion of the two tubes relative to each other expands or retracts the lateral wings of this device. The extractor of the present invention is designed to retract the wings of the entry device by pushing the inner concentric sliding tube down inside the outer tube.

An object of this invention is to provide an extractor for use in removing an expandable wing-type peritoneal entry device from the abdominal wall of a patient.

Another object of this invention is to provide an extractor to retract the wings of a peritoneal entry device and provide a convenient handle for pulling out said device once the wings are retracted.

A further object of this invention is to provide an extractor that will retract the expandable wings of a peritoneal entry device while said wings are inside the abdominal cavity and said extractor is outside the abdominal cavity.

Other objects and advantages of our invention will be-

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come apparent from the following description of the preferred embodiment of the invention, in which:

FIGURE 1 is a perspective view of the extractor showing it extracting a peritoneal dialysis entry device from the abdominal wall of a patient;

FIGURE 2 is a cross-sectional view of the lower portion of the extractor when it is not attached to the peritoneal entry device;

FIGURE 3 is a bottom view of the lower clamping jaws of the extractor showing the clamping teeth; and

FIGURE 4 is an enlarged partially cutaway view of the extractor showing the engagement of the plunger and the peritoneal entry device.

FIGURE 1 shows an installed peritoneal entry device through the cutaway section of abdominal wall 5 with skin 5a on the outside and peritoneum 8 on the inside. The entry device has an outer tube 2 which is inserted through a round hole made through the skin 5a, abdominal wall 5 and peritoneum 8 with a trocar. Slideably mounted inside tube 2 is inner tube 1 which has a continuous, longitudinal, inner bore of sufficient size to receive a catheter. Tubes 1 and 2 are fastened together at end 7 with outer tube 2 having expandable wings 4 cut longitudinally in it. When the peritoneal entry device is inserted, the top ends of tubes 1 and 2 are longer than they are shown here, with the inner tube 1 extending out beyond outer tube 2. By pulling on inner tube 1 and pushing on outer tube 2, the wings 4 are caused to expand by creasing along fold lines 6.

While the peritoneal entry device is in the patient, a double locking nut mechanism is tightened in place against the portion of outer tube 2 extending above abdominal wall 5. The locking nut mechanism slides over the tubular members and is pushed against the skin of the abdominal wall, giving a custom fit to the patient adapted to his particular abdominal wall thickness. This locking nut mechanism and the flared wings prevent axial movement of the entry device in the abdominal wall.

With a sterile razor blade, the portion of tubes 1 and 2 extending beyond the locking mechanism is cut off and discarded. Cutting of the tubes leaves a level surface across the locking nut mechanism, and a closure cap can be screwed onto an outer thread on the locking nut mechanism. To accomplish peritoneal dialysis, the cap is removed and replaced with another cap having a hole in its top to allow entry of a catheter and having a sealing washer inside to seal around the catheter. The locking nut mechanism, the cap, and the catheter have not been shown in the drawing because they are removed from the peritoneal entry device before the extractor comes into play.

Removal of the locking nut mechanism leaves the two tubes 1 and 2 sticking up through the abdominal wall 5 a distance of about 1/2 inch, but both of these tubes have been cut off evenly. The problem in extracting the entry device is to hold outer tube 2 while forcing the tight-fitting inner tube 1 further into outer tube 2 so as to retract wings 4. The outer tube 2 is too smooth to hold firmly with the hands while forcing the inner tube down inside the outer tube, and if released, the whole device might slip into the peritoneal cavity.

This invention provides a clamping device that will firmly grip outer tube 2 and hold it from being pushed into the abdominal cavity, and also will prevent it from rotating. Coacting with this clamping device is a threaded plunger which pushes the end of inner tube 1 further into outer tube 2 so as to retract the wings 4. The clamping device includes a flat guide portion 9 and an upwardly projecting flange 10, both of which are threaded to receive plunger 13. It is also possible to have a nonthreaded plunger axially movable by manually pushing or pulling

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said plunger while it is guided by a nonthreaded hole in the flat guide portion 9. On opposite sides of the guide portion 9 arcuate spring sections 11 project upwardly and connect to side members 12. Connected to the lower end of each side member 12 is an inwardly extending jaw member 13. These jaws overlap and each has a hole 14 through its center. Preferably, these jaws are slightly convex or have a bend near their center to permit relative lateral movement with respect to each other without binding. When the spring clamp device is not positioned over the entry device, the holes 14 in the overlapping jaws 13 are not superimposed but are forced apart as in FIGURE 2 by the spring action of arcuate spring sections 11 and side members 12. The holes 14 are slightly larger than the outer diameter of the outer tube 2. Each jaw 13 has a sharp edge around hole 14 and each preferably has serrations or teeth in position to contact the surface of outer tube 2, in order to prevent axial slipping or rotation of tube 2.

In the illustrated embodiment of the present invention, the jaws are opened by an inwardly directed force applied with the fingers on side members 12 until the two holes are superimposed. It is also possible to modify the spring tension in the spring clamp device so that the side members have to be pulled apart to obtain superimposition of the two holes. In this modification, an inward pressure on side members 12 would cause an additional clamping force to that provided by the arcuate spring sections 11. A second modification would be to have the two holes superimposed when the spring sections are in their relaxed position and the clamping force provided solely by the pinching force of the fingers on members 12. Of course, in these two modifications the serrations 15 of jaws 13 would be positioned along the opposite edges of holes 14 so as to contact tube 2. Serrations also could be provided around the entire circumference of holes 14.

FIGURE 4 shows an enlarged cross-sectional view of the plunger 18 entering the peritoneal entry device. The plunger 18 is telescoped partially into outer tube 2 and is pushing downwardly on the end of inner tube 1. As can be seen, the diameter of plunger 18 is slightly smaller than the inside diameter of outer tube 2, but is larger than the inside diameter of inner tube 1. Centrally located on the end of plunger 18 is protruding guide pin 20, which extends a distance into the bore of inner tube 1 and positions the plunger so it can push inner tube 1 further into outer tube 2. A depth mark 19 is provided on plunger 18 to indicate when the plunger has completely retracted the wings of the entry device. When mark 19 is directly in line with the top surface 21 of outer tube 2, the wings have been completely retracted and the entry device can be pulled out through the hole in the abdominal wall. Alternatively, complete retraction of the wings can be felt when the plunger ceases to move easily within the clamp device. Once the wings have been retracted, removal of the peritoneal entry device is accomplished simply by pulling on the complete extractor assembly. After the entry device has been pulled out, the small entry hole in the abdominal wall is closed by sutures.

Modifications to the illustrated and described extractor for a peritoneal entry device may be resorted to within the spirit and scope of our invention.

We claim:

1. In combination:

- a. A medical device having an outer tube and an inner tube longitudinally slideable within the outer tube; and
- b. an extractor removably attached to the medical device for longitudinally sliding the inner tube relative to the outer tube, said extractor comprising
 - (1) a top plunger guide member having a guide hole,
 - (2) a movable plunger member fitted within the guide hole in said top plunger guide member,

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said plunger adapted when urged by manual force to push the inner tube further into the outer tube of said medical device,

- (3) a side member connected to each side of said top plunger guide member and extending downwardly therefrom, and
 - (4) a laterally movable spring biased clamping jaw extending inwardly and connected to each of said side members at a location spaced from the top plunger guide member, each clamping jaw having an opening through which the medical device extends, said jaws having gripping means surrounding the outer tube against rotary and axial movement as said plunger pushes the inner tube further into the outer tube.
2. An extractor for a medical device as set forth in claim 1 wherein said plunger is threaded along its lower portion and has a smooth upper portion fitted with a handle member normal to the axis of said plunger, and the guide hole in said plunger guide member is threaded to receive said plunger.
 3. An extractor for a medical device as set forth in claim 1 wherein said top guide member has an upturned flange surrounding the hole in said guide member.
 4. An extractor for a medical device as set forth in claim 1 wherein said plunger has a circumferential mark, said mark aligning with a top of the outer tube to indicate how deeply the inner tube has been pushed into the outer tube.
 5. An extractor adapted to axially move an inner tube and an outer tube of a peritoneal entry device relative to each other, said extractor comprising:
 - a. a spring clamping assembly including:
 - (1) an upper plunger guide portion having a vertically tapped hole,
 - (2) an arcuate spring portion extending outwardly from each side of said plunger guide portion,
 - (3) side spring portions extending downwardly from each arcuate spring portion,
 - (4) a clamping jaw extending inwardly from each side spring portion, each of said jaws overlapping the other and having a hole near its center, said jaws having serrations about at least a portion of the periphery of these holes,
 - b. a screw plunger threadingly received within the tapped hole of said upper plunger guide portion of the spring clamping assembly, comprising:
 - (1) a threaded shaft member,
 - (2) a protruding guide pin extending axially from one end of said shaft, and
 - (3) handle means connected to the opposite end of said shaft.
 6. An extractor adapted to axially move an inner tube and an outer tube of a peritoneal entry device relative to each other, said extractor comprising:
 - a. a spring clamping assembly including:
 - (1) an upper plunger guide portion having a vertically tapped hole,
 - (2) an arcuate spring portion extending outwardly from each side of said plunger guide portion,
 - (3) side spring portions extending downwardly from each arcuate spring portion,
 - (4) a clamping jaw extending inwardly from each side spring portion, each of said jaws overlapping the other and having a hole near its center, said jaws having projecting sharp edges about at least a portion of the periphery of these holes,
 - b. a screw plunger threadingly received within the tapped hole of said upper plunger guide portion of the spring clamping assembly, comprising:
 - (1) a threaded shaft member,
 - (2) a protruding guide pin extending axially from one end of said shaft, and
 - (3) handle means connected to the opposite end of said shaft.

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7. An extractor adapted to axially move an inner tube and an outer tube of a peritoneal entry device relative to each other, said extractor comprising:

a. a spring clamping assembly including:

(1) an upper plunger guide portion having a vertically tapped hole and a supporting flange surrounding this hole, 5

(2) an arcuate spring portion extending outwardly from each side of said plunger guide portion,

(3) side spring portions swingably movable about said arcuate spring portion and extending downwardly from each arcuate spring portion, 10

(4) a clamping jaw extending inwardly from the lower end of each side spring portion, each of said jaws overlapping the other and having a slight convex arc along its lateral dimension to permit said overlapping jaws to laterally move relative to each other without binding, each of said jaws having a clamping hole near its center and serrations about at least a portion of the periphery of this hole, 15

b. a screw plunger threadingly received within the tapped hole of said upper plunger guide portion of the spring clamping assembly, comprising: 20

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(1) a shaft member threaded along its lower portion and having a smooth upper portion,

(2) a handle member perpendicular to the axis of said shaft member connected to the smooth upper portion of said shaft member, and

(3) a protruding guide pin extending axially from the lower threaded end of said shaft member.

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