

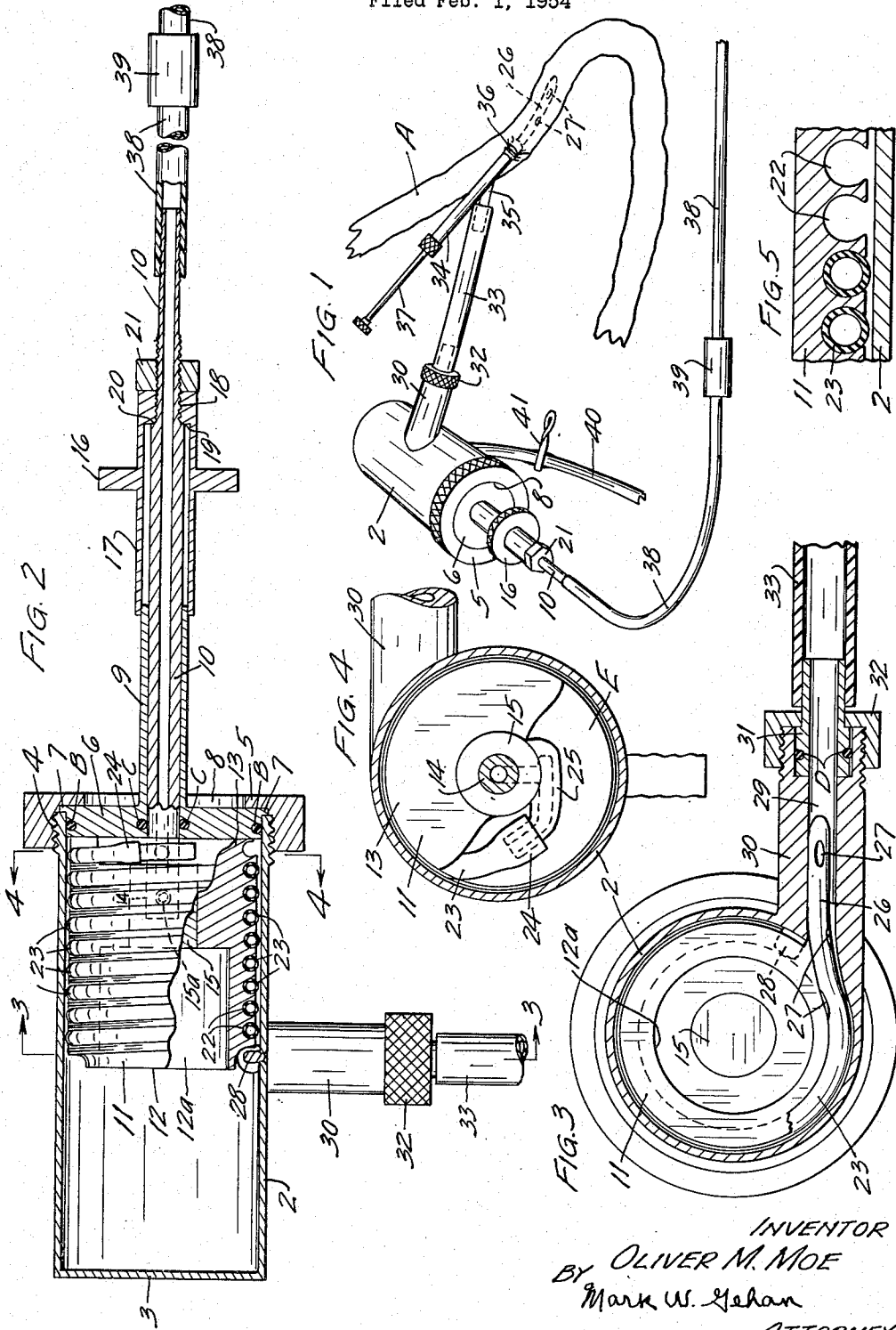
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SURGICAL INSTRUMENT

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SURGICAL INSTRUMENT

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This invention relates to surgical procedures, and provides a novel surgical instrument useful in the performance of certain of such procedures. Although it has thus far chiefly been put to use in the surgical technique known as aseptic decompressive suction enterotomy, the instrument of this invention, and the principle employed in it, both have application and usage in other surgical procedures and techniques where an objective may be to relieve distention in an organ of the body.

In the past twenty years or so, mortality resulting from intestinal obstruction has materially decreased. One important reason for this improvement has been more general use of a relatively new technique for reducing intestinal distention before serious damage occurs. This technique comprises the application of suction to an indwelling duodenal tube to remove fluid matters from the bowel and thereby relieve distention producing pressure therein. In operations or procedures where this technique is employed, an incision is first made in the abdomen of the patient. An intestinal loop near the conjectured site of obstruction is then separated from adjacent intestinal coils and held with surgical clamps, after being stripped. A pursestring suture is placed, and an incision is made in the bowel wall adjacent the clamps. A trochar is then thrust into the intestinal incision and the pursestring suture tied. A length of rectal tubing, accommodated within the trochar, is worked through the trochar and into the intestine, to a point adjacent the point of obstruction. In the technique as previously employed, a portion of the rectal tubing was enclosed within a length of penrose tubing, and by manipulating the rectal tubing through the penrose tubing the former could aseptically be threaded into the intestine, but only with some difficulty. The leading tip of the rectal tubing was provided with a plurality of small apertures, and vacuum was applied to the end of the tubing lying outside the patient's body, whereby the content of the intestine could be withdrawn to relieve the distention therein. Means was provided for breaking the vacuum should the need to do that arise.

Although, as indicated, use of the technique above mentioned, has met with success and has reduced mortality, there have, nevertheless, been some problems existing in its usage, principally because there has heretofore been no satisfactory piece of equipment by which the rectal tubing (which might be up to six or eight feet in length) could quickly and easily be worked into the intestine. The requisite flexibility of that tubing made its manipulation difficult, and complicated the problem of threading it into the intestine as far as was sometimes necessary. Furthermore, the difficulty in inserting the tube in the intestine necessitated the unsatisfactory procedure of clearing said tube within the bowel (rather than removing it therefrom) when said tube became clogged in use, as it frequently did. Under the technique heretofore employed, the tube was freed of clogging material by applying positive pressure, rather than vacuum, to the external end of the tube, without removal of the tube from the patient. This was done, despite the obvious desirability of not forcing foreign matter back into the intestine, because of the difficulty which would have been experienced in reinserting the tube after it had been freed of the obstructing substance.

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It is a principal object of the present invention to provide an instrument where the above mentioned defects, and others which will appear as this description proceeds, can be remedied.

Referring now to the drawings:

Figure 1 is a perspective view of my instrument, showing it in use upon a section of intestine, A.

Figure 2 is a cross-sectional view of the instrument, with a portion of the inner mechanism thereof also shown in cross-section.

Figure 3 is a cross-sectional view along the lines 3—3 of Figure 2.

Figure 4 is a cross-sectional view along the lines 4—4 of Figure 2.

Figure 5 is a fragmentary view of the peripheral surface of the reel, with rectal tubing carried in the groove upon said surface.

Reference character 2 designates a cylindrical chamber which serves as a housing for the operating mechanism of the instrument, as hereinafter described. One end 3 of said housing 2 is closed. The other end thereof is open and is provided with peripheral threads 4 over which threaded cover 5 can be secured. Fitting 6, having rim 7, lies partially within the open end of housing 2 with said rim 7 extending over the sidewalls of said housing to prevent fitting 6 from passing entirely into the housing. O ring B is employed to secure a moistureproof fit between member 6 and housing 2. Fitting 6 is held in position, as above set forth, by cover 5 threaded onto housing 2. Cover 5 is apertured as at 8 and tubular extension 9 on fitting 6 extends through said aperture. Extension 9 accommodates tube 10, said tube being rotatable within the extension. Reel 11 lies within housing 2 and is rotatable therewithin. End 12 of said reel is hollowed out at 12a to lighten the weight thereof. End 13 of said reel is also hollowed out but to a lesser extent. Tip 14 of tube 10 is fitted with block 15 which fits snugly within the hollowed out portion of end 13 on reel 11. Said block 15 is secured on tip 14 so that it will not rotate in respect thereto, and block 15, likewise, is affixed within said hollowed out portion of reel 11 by set screw 15a so that it will not rotate in respect to that member. Thus, when tube 10 is turned, reel 11 will also turn.

Tube 10 (and reel 11) may be rotated in respect to housing 2 by means of dial-like member 16 on member 17. Said member 17 comprises a sleeve-like fitting which is turned onto external threads 18 on tube 10, until inner shoulders 19 upon said member 17 come into abutment with shoulders 20 on tube 10. Nut 21 is tightened down against member 17. By means of this arrangement, when dial member 16 is turned, member 17, nut 21, tube 10, and reel 11 will all turn with it. O ring B is provided on fitting 6 so that tube 10 will be wiped clean of any moisture as it is withdrawn from housing 2 through extension 9, in the manner to be hereinafter described.

Continuous helical groove 22 is formed about the circumference of reel 11. In cross section, this groove is spheroidal in configuration. A length of rectal tubing 23 is carried within said groove. One end 24 of this tube is affixed to hollow connector 25 which in turn is mounted on block 15 on tube 10. Portion E of the end face of said reel is cut back to make room for the attachment of said hose to said connector. A drainage connection is thus provided between tubing 23 and tube 10. The other end 26 of tubing 23 is free, and is provided with holes 27. The inner surface of housing 2 is formed with lug 28 which projects inwardly into groove 22. Said lug serves the dual function of (1) guiding tubing 23 out of groove 22 and into bore 29 and (2) causing reel 11 to move toward the end of housing 2 as tube 10 is turned in a clockwise direction. The engagement of

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said lug with groove 22 will similarly cause reel 11 to move toward the open end of housing 2 when tube 10 is turned in a counterclockwise direction.

As tube 10 is turned in clockwise direction, tubing 23 progresses outwardly through bore 29 formed in member 30, which latter member is welded or otherwise permanently affixed to housing 2. In order to insure moistureproofness, I prefer to provide intermediate connecting piece 31 with O ring D on the end of member 30. Said connecting piece is secured in position by nut 32 threaded onto the end of member 30. Flexible tubing 33 is attached to the tip of connecting piece 31. This tubing extends to trochar 34 and is secured over fitting 35 thereon. Trochar 34, in turn, is affixed to the outer membranes of intestine A by pursestring suture 36.

Tubing 23, as tube 10 is turned, will advance from bore 29, through connecting piece 31, through flexible tubing 33, through trochar 34, and into intestine A. By further turning of dial 16, said tubing may be caused to advance any desired length into intestine A.

Trochar 34, which forms no part of this invention, is used to puncture the innermost wall of the bowel just prior to the time it is desired to perform the decompressive technique. The bottom tip of plunger 37 on trochar 34 is formed with a cutting member thereon. When said plunger is depressed, said cutting member will make an incision of sufficient size to permit the entry of tubing 23 into intestine A.

In use of my apparatus, mild vacuum is applied to hose 38, which is attached to the exterior end of tube 10. The vacuum acts through tube 10 and tubing 23 to withdraw extraneous matter from intestine A through holes 27 in said tubing 23. Said hose 38 is provided with a rotatable sleeve connector 39 whereby the portion of said hose lying most closely adjacent housing 2 may rotate, when dial 16 is turned, without the necessity of the whole length of said hose 38 having to rotate.

If, during use, tubing 23 should become clogged with some body or substance, it can be retracted until it is entirely back within housing 2. Flexible tubing 33 can then be temporarily pinched off and negative pressure, applied on drain hose 40, rather than on hose 38. This pressure will draw from tubing 23 any clogging material which may have become lodged therein. The material thus removed will pass out from housing 2 through said tube 40 which is mounted on the bottom of the housing.

In normal use of my instrument (i. e. when tubing 23 is not being cleared of clogging substance) hose 40 will be closed by clamp 41.

It will of course be apparent that the precise construction above described can be modified in many particulars without departing from the spirit of the invention, and the mechanical details shown and described herein are intended only to illustrate one embodiment of the invention and should not be construed as a limitation on the structure which may be employed. I do not intend to limit myself except as by the claims appended hereto.

What I claim is:

1. A surgical instrument comprising a reel, said reel having a length of flexible tubing helically wound upon it, said reel and tubing being contained within a housing of substantially greater length than said reel, means external of said housing for rotating said reel therein, said reel moving longitudinally of said housing as it is caused to rotate therein, said housing being provided with an outlet bore, said flexible tubing passing through said outlet bore as said reel is rotated, and means for creating negative pressure within said flexible tubing.

2. A surgical instrument comprising a reel, the peripheral surface of which is provided with a helical groove, a length of flexible tubing carried within said groove, one end of said tubing being apertured, a housing for said reel, said reel being rotatable within said housing, said housing being of substantially greater length than said reel to afford longitudinal movement of said reel within

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said housing, a rigid tubular member affixed to one end of said reel and projecting outwardly therefrom through said housing, said tubular member being both longitudinally slidable and rotatable in relation to said housing, the inner surface of said housing being provided with a member in engagement with said helical groove whereby when said rigid tubular member is caused to rotate in relation to said housing, said reel will move longitudinally of said housing as well as rotating therein, said housing having an outlet bore, the apertured end of said flexible tubing being adapted to pass out of said housing through said outlet bore as said reel is caused to rotate, said rigid tubular member being connected to said flexible tubing to provide for transmission of negative pressure applied on said tubular member to said flexible tubing.

3. A surgical instrument comprising a reel, the peripheral surface of which is provided with a helical groove, a length of flexible tubing carried within said groove, one end of said tubing being apertured, a housing for said reel, said housing being of substantially greater length than said reel and having an outlet bore associated therewith and extending therefrom, means whereby said reel may simultaneously be caused to rotate within said housing and move longitudinally of said housing, means being provided for guiding the apertured end of said flexible tubing out of said groove and into said outlet bore when said reel is caused to rotate in one direction within said housing, at least a portion of the length of said flexible tubing passing out of said outlet bore as said reel rotates in one direction, said flexible tubing being retractable into said groove by rotation of said reel in the other direction, hollow connector means attached to said flexible tubing and projecting out of said housing, said hollow connector means being adapted for attachment to a vacuum pump for application of negative pressure to said flexible tubing.

4. A surgical instrument comprising a reel and a housing for said reel, said reel having affixed to its one end a rigid tubular member, said member projecting outwardly through one end of said housing and being rotatable and slidable in relation therewith, said reel being rotatable within said housing by rotation of said tubular member externally of said housing, an outlet bore and a fluid drainage tube opening off said housing, the peripheral surface of said reel having a helical groove formed in it, said groove carrying within it a length of flexible tubing, one end of said tubing being apertured, a lug member on the inner surface of said housing for guiding the apertured end of said flexible tubing into said outlet bore, said lug member engaging said helical groove whereby said reel will be caused to move longitudinally of said housing as it rotates therein, said rigid tubular member being connected to said flexible tubing in such manner that negative pressure exerted through said tubular member will act to create negative pressure in said flexible tubing.

5. A surgical instrument comprising a reel, the peripheral surface of said reel having a helical groove formed upon it, said groove being spheroidal in cross-sectional configuration and carrying within it a length of flexible tubing, said reel and said tubing being contained within a housing at least one and one-half as long as said reel, said reel being both rotatable and longitudinally movable within said housing, an outlet bore opening off said housing, a lug member affixed to the inner surface of said housing in engagement with said helical groove, means for rotating said reel, said lug member guiding said flexible tubing through said outlet bore and causing said reel to advance in said housing when said reel is caused to rotate, and means for creating negative pressure in said flexible tubing.