

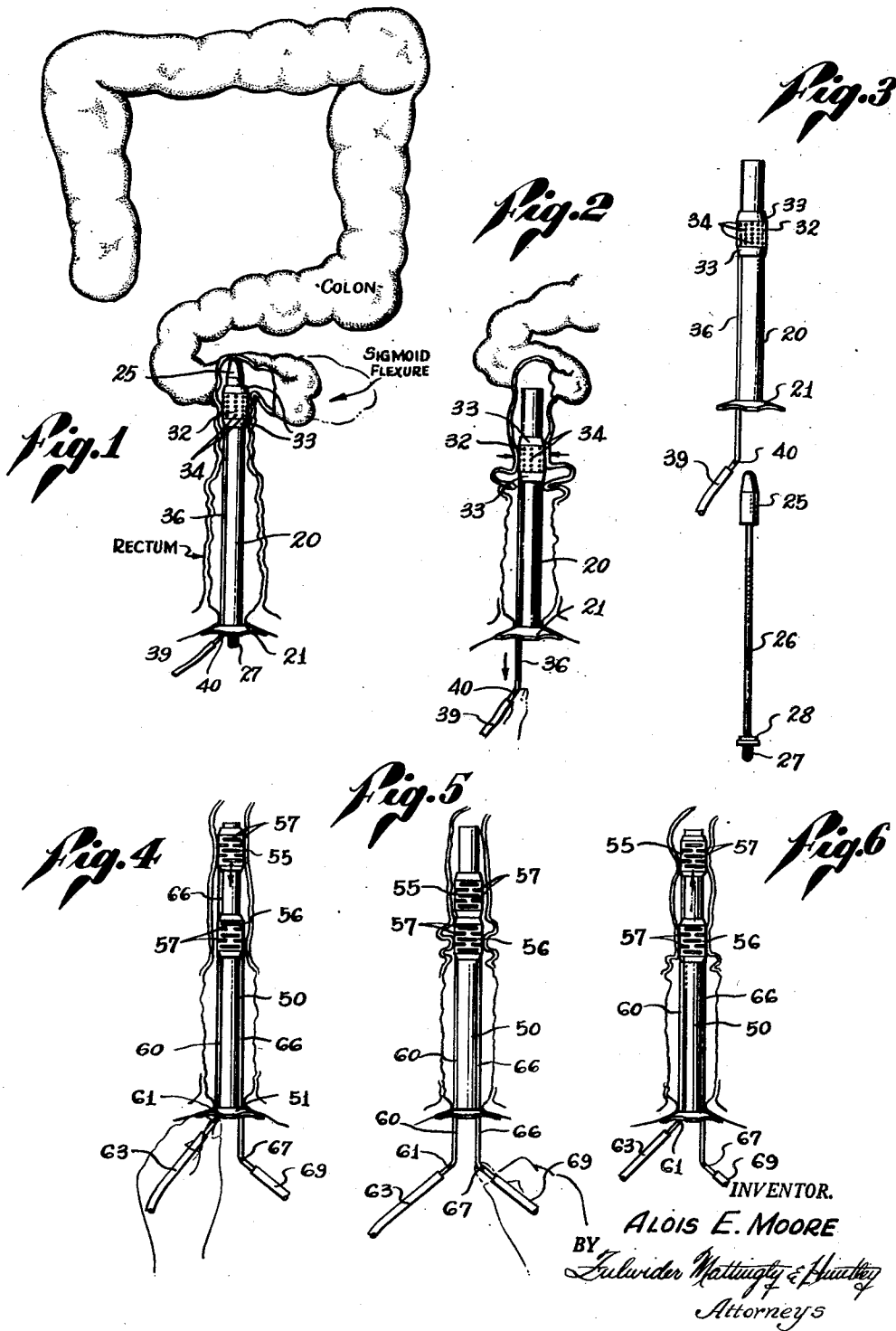
Oct. 23, 1956

A. E. MOORE
SIGMOIDOSCOPE WITH SUCTION ATTACHMENT FOR
IMMOBILIZING ADJACENT TISSUE

2,767,705

Filed Oct. 8, 1954

2 Sheets-Sheet 1



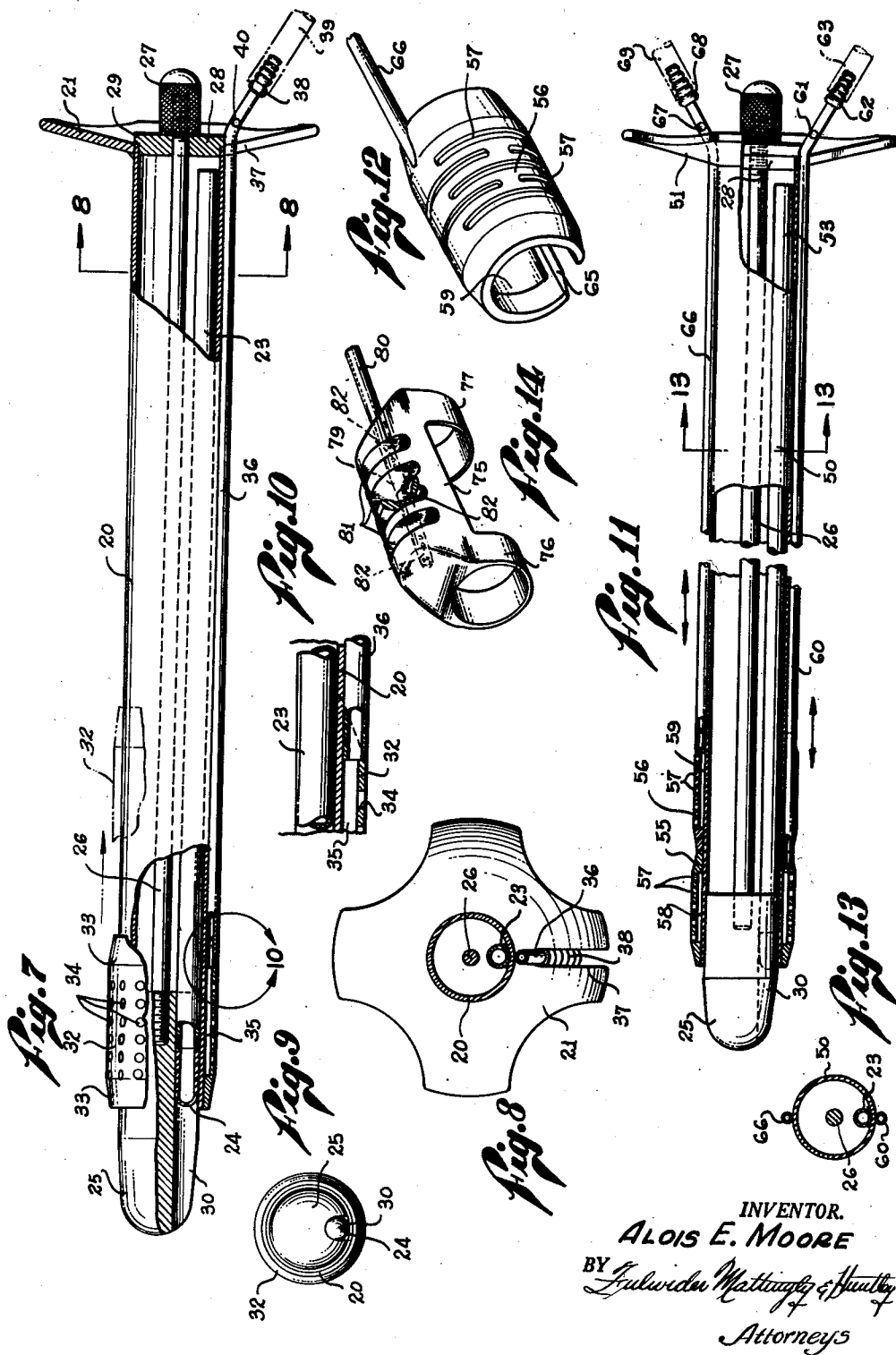
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**SIGMOIDOSCOPE WITH SUCTION ATTACHMENT
FOR IMMOBILIZING ADJACENT TISSUE****Alois E. Moore, San Diego, Calif., assignor to Technical
Oil Tool Corporation, a corporation of California****Application October 8, 1954, Serial No. 461,107****5 Claims. (Cl. 128—4)**

This invention relates generally to examining the intestinal tract for medical diagnosis and treatment and more particularly to a novel method and apparatus for examining the sigmoid flexure in the human body.

Internal examination of a portion of the sigmoid flexure by means of a sigmoidoscope is a well known procedure, but its use has heretofore been limited to examining a partial section of the sigmoid. To determine the condition of the upper portion of the sigmoid, resort has been made to X-rays, and surgical explorations which often fail to give a complete picture. Furthermore, surgical treatment of the upper portion of the sigmoid has only been accomplished by means of major surgery.

These limitations on the examination and treatment of the sigmoid flexure are due to the fact that it is not possible to insert a sigmoidoscope directly into the upper regions of the sigmoid flexure. In fact, passage of the sigmoidoscope more than a short distance beyond the top of the rectum is not ordinarily possible, and this allows examination of only a limited portion of the sigmoid in relation to its total length.

This invention contemplates pulling the sigmoid flexure down over the end of a suitable examining and treatment scope. Since the sigmoid is positioned in a loose fold and is quite flexible, it is possible to place the sigmoid under traction, pulling it down over the end of the instrument so that the lower portion has a loose telescoped relationship to the exterior of the instrument. As each section of the sigmoid wall passes the upper end of the instrument, it is examined and any necessary treatment is done. The lower portion of the sigmoid folds upon itself, and by continuing to successively pull down sections of the sigmoid, substantially all of its interior wall surface may be examined and treated. Thus, the invention provides a method for examining and treating the upper regions of the sigmoid as has not heretofore been possible.

The preferred apparatus for performing this method of treatment and examination has a tubular main body or housing which is inserted through the rectum into the lower end portion of the sigmoid. The tubular body or scope is of such a size as to permit visual observation therethrough, and also the passage of operating and treatment instruments. In order to pull the sigmoid over the end of the instrument it is necessary to provide means which engage with the interior surface of the sigmoid wall and are operable to cause a downward pulling force to be exerted thereon. While other means may be used, it is preferable to utilize suction operated means for so engaging with the sigmoid. The suction means are easily controlled by the surgeon performing the examination so as to cause the sigmoid to be engaged, moved upwardly or downwardly, and released, as desired.

With the foregoing in mind, it is a major object of this invention to provide a method and apparatus for examining and treating the upper regions of the sigmoid.

Another important object of the invention is to provide a sigmoidoscope which uses traction on the bowel to pull the sigmoid down over the end of the scope in a generally

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telescoping relationship, for examination of the upper regions thereof.

It is also an object of the invention to provide a sigmoidoscope having easily operated and accurately controllable means for moving the sigmoid relative to the scope.

A further object of the invention is to provide a sigmoidoscope having suction operated means for moving the sigmoid relative to the scope.

A still further object of the invention is to provide a sigmoidoscope of the character described which is designed to permit complete visual observation of the sigmoid, and the manipulation of the instruments for the treatment thereof.

It is yet another object of the invention to provide a sigmoidoscope of simple and compact construction which will give good service and can be economically manufactured.

These and other objects of the invention will become apparent from the following detailed description of preferred and modified forms thereof, and from an inspection of the accompanying drawings in which:

Figure 1 is a perspective view showing a preferred form of the invention inserted into the intestinal tract in operating position;

Figure 2 is a view similar to Figure 1 showing the sigmoid engaging means pulled rearwardly through a partial retraction stroke;

Figure 3 is a view of the preferred device illustrating the removal of the obturator therefrom;

Figure 4 is a partial perspective view of a modified form of the invention in operating position;

Figure 5 is a view similar to Figure 4 showing the engaging and holding sleeves both partially retracted;

Figure 6 is a view similar to Figure 4 showing one sleeve holding the sigmoid in position while the other sleeve is moved upwardly to be positioned for another stroke;

Figure 7 is a side elevation partially in section of the preferred device;

Figure 8 is a cross section taken along the line 8—8 of Figure 7;

Figure 9 is a front elevation of the preferred device;

Figure 10 is an enlarged sectional detail in the area 10 of Figure 7;

Figure 11 is a side elevation partially in section of the modified form of device;

Figure 12 is a perspective detail of the rear sleeve in the modified device;

Figure 13 is a cross section taken along the line 13—13 of Figure 11; and

Figure 14 is a perspective detail of another modified form of sleeve.

Referring now to the drawings, the broad principles of the invention can be seen from an inspection of Figures 1 and 2. The lower intestinal tract is shown diagrammatically therein, and is seen to include the colon which is joined to the sigmoid flexure and thence to the rectum. The sigmoid flexure, so called because of its general S shape, hangs from the colon in a loose fold and is of substantial length if extended fully. It is conventional practice to examine the lower internal portion of the sigmoid by means of a sigmoidoscope which is inserted into the body through the rectum and upwardly into the sigmoid. Such a scope then permits inspection and treatment of the sigmoid area surrounding the upper end of the scope.

However, the physical structure of the body limits the distance of insertion of the sigmoidoscope, and it has heretofore been usually possible to examine only a short section at the lower end of the sigmoid. This invention provides a method and apparatus for inspecting the upper regions of the sigmoid, wherein such inspection is accomplished by pulling the sigmoid down over the end of

the sigmoidoscope. The sigmoid wall tissue which is quite flexible telescopes or gathers around the instrument, as indicated in Figure 2, and as each succeeding section thereof passes the upper end of the instrument it is accessible for examination and treatment. By continuing to exert traction on the sigmoid and pulling it downwardly in this manner, substantially the entire length of the sigmoid may be inspected. As can be appreciated, the examination and treatment is accomplished without major surgery as would otherwise be required. The details of the method of pulling the sigmoid downwardly can best be understood from a consideration of Figure 7 wherein a preferred form of instrument is shown.

The instrument is formed with a tubular main body or housing 20 which is open at both ends and is of a size to permit visual inspection therethrough. At the rear end of body 20 is an enlarged flange 21 which is secured rigidly in place and is dished rearwardly a slight amount. Flange 21 acts as a stop to limit the insertion of the instrument into the body. Tubular body 20 is provided interiorly with a guide tube 23 that as shown herein extends longitudinally for substantially the entire length of the body and is adapted to accommodate a light source. The rear end of guide tube is open to receive a conventional light stick therein, and has a transparent head or front end portion 24 which permits the light rays to emanate outwardly through the front end of main body 20 for illuminating the surrounding area. Guide tube 23 is secured rigidly in place by welding or soldering to the interior wall of body 20, as is best seen in Figure 8. This construction is, of course, subject to modification if a rearwardly positioned light is used for illumination.

To facilitate insertion of the instrument into the rectum and sigmoid, it is desirable that an obturator be positioned on the front end thereof for gently easing aside the tissue encountered. For this reason, an obturator nose 25 is provided and is adapted to be slidably inserted through scope tube 20 to project forwardly from the front end thereof. Nose 25 is of rounded tapered shape and is threadedly mounted on the end of an elongated control rod 26 which extends rearwardly through scope tube 20. On the rear end, rod 26 has a handle 27 and adjacent thereto an enlarged flange or hub 28 which is adapted to seat against the rear end of tube 20. A projecting annular shoulder 29 on hub 28 engages the end surface of tube 20 to limit the forward movement of rod 26 and at the same time close the tube. The obturator nose 25 is fitted in the instrument only during its insertion into the body, and once the instrument is in place, the entire obturator assembly is removed so that the interior of the scope tube is open. In order that obturator nose 25 may pass slidably over the light guide tube 23, the nose is formed with an elongated slot 30 therein that is shaped to fit around the guide tube as is best seen in Figure 9. To the extent described, the instrument is generally similar to a conventional sigmoidoscope and as can be understood, is subject to considerable modification.

In order to practice the invention it is necessary to engage the sigmoid and exert traction thereon causing it to be pulled downwardly over the end of the main scope tube 20. As each section passes over the front end of the scope it is examined and any necessary treatment or surgery accomplished. The open interior of the instrument provides a space for the manipulation of the normal surgical instruments, such as knives, snares and the like.

It is preferred to engage and pull down the sigmoid by suction means and a desirable structure for accomplishing this utilizes an external sleeve 32 which is slidably mounted on the main scope tube 20 and may be reciprocated back and forth therealong. Sleeve 32 is relatively thin and may have inwardly tapered front and rear portion 33.

An important feature of the use of sleeve 32 is that the shape of the instrument has been found to be of distinct advantage in passing the instrument through the bowel. The increase in size of the instrument because of sleeve 32 makes the diameter thereof more closely approximate the natural size of the bowel which is collapsed and folded back upon itself. While the sleeve 32 does not actually distend the bowel, the fact that it is of approximately the same diameter allows the sleeve to slide more easily through the bowel without hanging up or wedging into the folds thereof. This advantage is of course independent of the use of traction to pull the intestine downwardly over the instrument.

On the exterior surface of sleeve 32 are a plurality of spaced ports or apertures 34, which in this form of the device are small circular openings spaced at suitable intervals throughout the circumference of the sleeve. All of the ports 34 open inwardly into a common chamber 35 which is defined between the surface of scope tube 20 and a central wall portion of sleeve 32 which is spaced outwardly therefrom.

Connected to the rear end of sleeve 32 is an elongated vacuum line or tube 36 which is rigidly affixed to the sleeve and is slidable relative to the scope tube 20. The rear end of line 36 projects beyond flange 21 and passes slidably through a slot 37 formed therein as is best seen in Figure 8. The front end of line 36 is opened inwardly into chamber 35, as is seen in Figure 10, and the rear end is provided with a suitable fitting 38 for connection to a vacuum suction hose 39 which is in turn connected to a vacuum or suction pump as is normally available in an operating room or to a hand operated rubber bulb.

The reduced pressure in chamber 35 effected by line 36, causes the mucosa or tissue of the sigmoid adjacent the ports 34 to be pulled inwardly against the surface of sleeve 32 and to be held tightly thereon as the sleeve is moved. As sleeve 32 is moved rearwardly along scope tube 20, the sigmoid wall engaged thereagainst thus pulls the entire sigmoid downwardly and over the end of scope tube 20. The section of sigmoid preceding sleeve 32 is caused to gather or telescope around tube 20 as is illustrated in Fig. 2.

Suction line 36 is preferably of rigid metal tubing so that it serves both as a suction connection and as a mechanical link for moving the sleeve 32 reciprocally along tube 20. Near its rear end line 36 has an open control port 40 which controls the application or release of vacuum to sleeve 32. This may be done conveniently by the thumb of the surgeon as is illustrated in Figure 2. When port 40 is open it provides a sufficient vent so that little or no vacuum is pulled through line 36, and sleeve 32 is disengaged from the sigmoid wall for relative movement therewith. When port 40 is closed by the thumb, the vacuum is applied to sleeve 32 and the sigmoid wall is firmly engaged. While other means may be employed for engaging the sigmoid, it has been found that the use of suction causes no pain or discomfort to the patient and is thus very desirable. Other more complex means for controlling the application of the suction may, of course, be used if desired.

In the use of the instrument, the sleeve 32 is engaged with the sigmoid wall by closing port 40 and applying vacuum. A short section of the sigmoid is pulled down over the end of the scope by moving the sleeve 32 rearwardly. Appropriate examination and treatment of the sigmoid wall area near the upper end of the scope tube is then conducted, and a further section is pulled down. This is accomplished by opening port 40 to release the vacuum and returning sleeve 32 to its forward position on the scope tube. The vacuum is then reapplied and the sleeve pulled rearwardly for another short distance. In actual operation, these pulls will average about 5 cms., and by repeating the procedure, it is possible to examine 20 or more cms. of the length of the sigmoid beyond that

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ordinarily reached by the use of a conventional sigmoidoscope.

In Figures 4 through 6 and 11 through 13 a modified form of the instrument is illustrated. This modified form has the same principles of operation as the preferred form, but provides a somewhat different construction which may be advantageous under some circumstances. As is seen in Figure 11, the instrument has an elongated tubular body or housing 50 fitted with an enlarged rear flange 51, and open at both the front and rear ends. Removably mounted within tube 20 is an obturator assembly which is the same as that in the preferred form and serves the same purpose. This assembly includes an obturator nose 25, control rod 26, handle 27 and rear closure flange or hub 28. Also mounted within tube 50 is a light guide tube 53 which is similar to guide tube 23.

In this form of the invention, a pair of external sleeves are slidably mounted upon tube 50. The purpose of this construction is to provide means for holding the sigmoid relative to the tube while one or the other of the sleeves is moved relative thereto. Each sleeve may serve as a means for engaging the sigmoid and moving or holding the same relative to the main scope tube 50. To this end there is provided a front sleeve 55 and a rear sleeve 56 which are both free for reciprocation along the length of tube 50. An alternate form of port construction is used, wherein elongated slotted ports 57 extend partially around the circumference of the sleeves and are spaced longitudinally apart as is best seen in Figure 12. This form of port 57 has a larger surface area and may provide for a tighter engagement with the sigmoid. Both sleeves 55 and 56 have a central wall section spaced outwardly from the surface of tube 50 to define therewith central chamber 58 and 59, respectively. All of the ports 57 in sleeve 55 open into chamber 58 while those in sleeve 56 open into chamber 59.

Front sleeve 55 is connected to a suction line 60 which is rigidly secured thereon and extends slidably along the bottom of tube 50 as seen in Figure 13. At its rear end line 60 has a control port 61 and a fitting 62 for connection to a suitable vacuum or suction hose 63. As can be appreciated, the action of sleeve 55 in engaging and pulling the sigmoid under the control of port 61 is the same as that of the previously described suction sleeve. The operation of rear sleeve 56 is likewise similar, but its construction is different.

In order that sleeve 56 may be movable relative both to tube 50 and collar 55, it must pass slidably along suction line 60. As is seen in Figure 12 sleeve 56 is therefore not formed as a complete ring, but has a longitudinal slot 65 in the bottom thereof so as to fit slidably over line 60. Chamber 59 is terminated short of slot 65 along both sides so that it does not open outwardly into the slot. A suction line 66 is rigidly secured to the top of sleeve 56 and extends slidably along tube 50. Near its rear end line 66 has a control port 67 and at the end a fitting 68 for connection to a suction hose 69. By the use of control ports 61 and 67 it can be seen that either one or both of the sleeves 55 and 56 may be made to engage with the wall of the sigmoid.

In Figures 4 to 6 the operation of the double sleeve instrument is seen. After the scope 50 is in place, the sleeves 55 and 56 are moved into the relative position shown in Figure 4. Vacuum is then applied to front sleeve 55 to engage the sigmoid wall, and this sleeve is pulled rearwardly along tube 50 to the position shown in Figure 5. During this time no vacuum is applied to sleeve 56 and the sigmoid wall may slide easily over it to gather in natural loose folds. Examination and treatment of the accessible portion of the sigmoid is then conducted.

To examine a further section of the sigmoid, it is necessary to return sleeve 55 forwardly so that it may engage with a subsequent section of the sigmoid wall. During such forward movement of sleeve 55 it is desirable that the

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sigmoid be held relative to tube 50 so that it cannot ride forwardly with the sleeve. Sleeve 56 performs this function when vacuum is applied thereto, by holding the adjacent section of the sigmoid fixed relative to tube 50 while sleeve 55 moves forwardly as seen in Figure 6. It can thus be appreciated that whenever difficulty is encountered in engaging and releasing the sigmoid, the modified form of the invention will be quite advantageous.

In Figure 14 there is shown another modified form of sleeve which may be used with either of the two types of instruments just described. This sleeve has an elongated offset body 75 which extends longitudinally and is formed integrally with a front ring or flange 76 and a rear ring 77. The rings 76 and 77 are of a size to fit slidably around the scope tube 20 so that body 75 projects from the surface of the tube to form in effect a segmental sleeve which is adapted for engagement with a portion of the mucosa or tissue of the intestinal wall. In cross section body 75 is of semi-elliptical shape with the outer surface and the end corners of body 75 rounded off as illustrated, so that it may slide easily relative to the intestine as has been previously described in connection with the other forms of sleeves.

Extended longitudinally through body 75 is a bore 79 which is adapted to receive the end of a suction line 80, that is of rigid metal construction and extends rearwardly along the scope tube 20. A series of deep slots 81 are cut into the outer surface of body 75 in parallel spaced relationship and in planes extending perpendicular to the axis of the scope tube 20. The bottoms of slots 81 intersect with the bore 79 so as to expose a portion of tube 80 and in such exposed portions the latter has small perforations 82. The slots 81 thus form suction slots which cover approximately 25 percent of the circumference of the scope tube rather than being spaced all around the circumference as in the other forms of the device. It has been found by tests that such an offset sleeve may be advantageous for use when difficulty is encountered in making the bowel adhere to the complete sleeve due to internal air pockets. It can be appreciated that considerable modification of sleeve shape might however be made while retaining the principle of the partial suction slots.

While there are thus shown and described in considerable detail, preferred and modified forms of the invention other modifications may be made without departing from the scope of the invention. Therefore, the invention is not to be considered as restricted to the foregoing details except as defined in the appended claims.

I claim:

1. A sigmoidoscope which includes: an open ended elongated tube; an annular internally open sleeve slidably and removably mounted on said tube and movable lengthwise thereof, said sleeve having a plurality of ports thereon opening outwardly from a chamber within said sleeve; and suction means connected to said sleeve chamber to engage the intestinal wall inwardly against said ports when said sleeve is moved along said tube, for pulling said intestinal wall down over the end of said tube for examination of the upper regions thereof.

2. A sigmoidoscope which includes: an open ended elongated tube; an annular internally open sleeve slidably and removably mounted on said tube for movement lengthwise thereof, said sleeve having a plurality of spaced ports opening outwardly from an inner chamber for engaging the intestinal wall thereagainst; and a suction line connected to said sleeve and having a hand releasable control port therein for controlling the suction in said sleeve, said suction line extending rearwardly along said tube and acting to slide said sleeve along said tube from a forward position to a rearward position whereby to pull said intestine down over the end of said tube for examination of the upper regions thereof.

3. A sigmoidoscope which includes: an open ended elongated tube having an external flange at the rear end thereof and a fully open forward end, said tube being

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adapted to receive an obturator therein for closing the forward end; a sleeve slidably and removably mounted on the exterior of said tube, said sleeve having an inner annular chamber open fully on the inner side for cleaning and a plurality of spaced ports opening outwardly therefrom; and a suction line connected to said sleeve and having a hand releasable control port therein for controlling the suction in said sleeve, said suction line extending rearwardly along said tube and acting to slide said sleeve along said tube from a forward position to a rearward position whereby to pull said intestine down over the end of said tube for examination of the upper regions thereof.

4. A sigmoidoscope which includes: an open ended elongated tube; an annular engaging sleeve slidably mounted on said tube for movement lengthwise thereof, said sleeve having a plurality of spaced ports opening outwardly from an inner chamber for engaging the intestinal wall thereagainst; an annular holding sleeve slidably mounted on said tube, said holding sleeve having a plurality of spaced ports opening outwardly from an inner chamber for engaging the intestinal wall thereagainst; suction means connected to said engaging sleeve and controllable to apply or release the suction therein; and suction means connected to said holding sleeve and controllable to apply or release the suction therein.

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5. A sigmoidoscope which includes: an open ended elongated tube; an annular engaging sleeve slidably mounted on said tube for movement lengthwise thereof, said sleeve having a plurality of spaced ports opening outwardly from an inner chamber for engaging the intestinal wall thereagainst; a holding sleeve slidably mounted on said tube, said holding sleeve having a plurality of spaced ports opening outwardly from an inner chamber for engaging the intestinal wall thereagainst; a suction line connected to said engaging sleeve and having a hand releasable control port therein for controlling the suction in said engaging sleeve, said suction line extending rearwardly along said tube and being movable to slide said engaging sleeve rearwardly and forwardly; and a suction line connected to said holding sleeve and having a hand releasable control port therein for controlling the suction in said holding sleeve.

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