April 21, 1964 W. REYNOLDS, JR 3,129,706

SURGICAL RETRACTOR

Filed Nov. 13, 1962 2 Sheets-Sheet 1

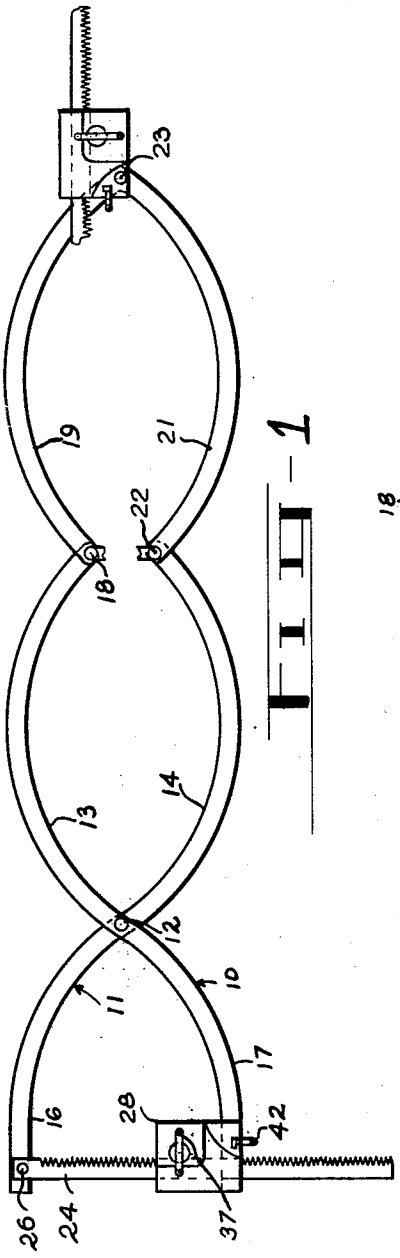

FIG. 1

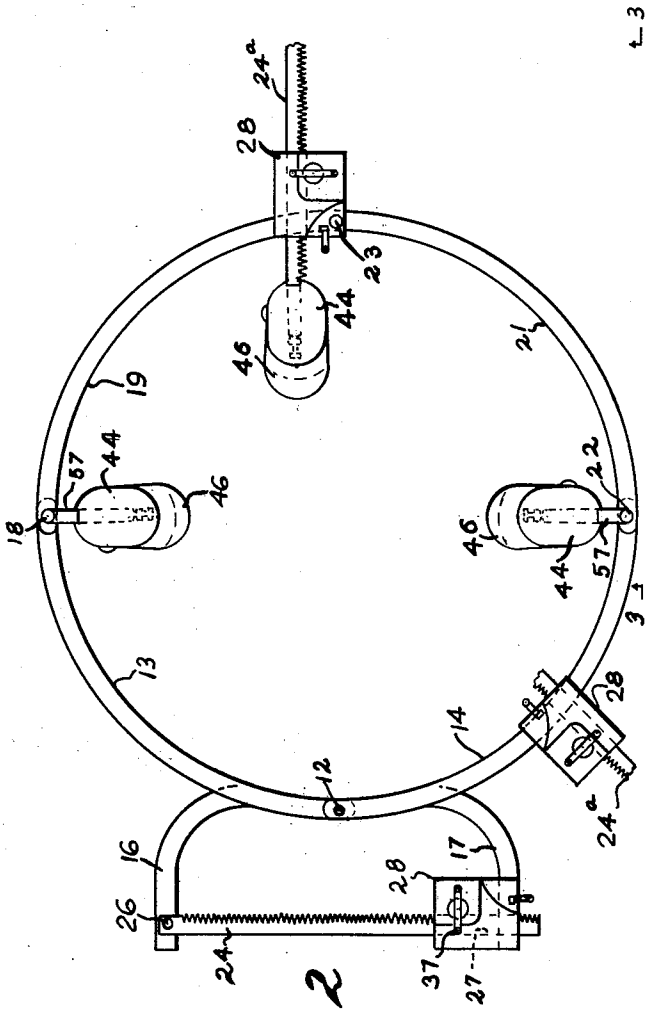

FIG. 2

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SURGICAL RETRACTOR

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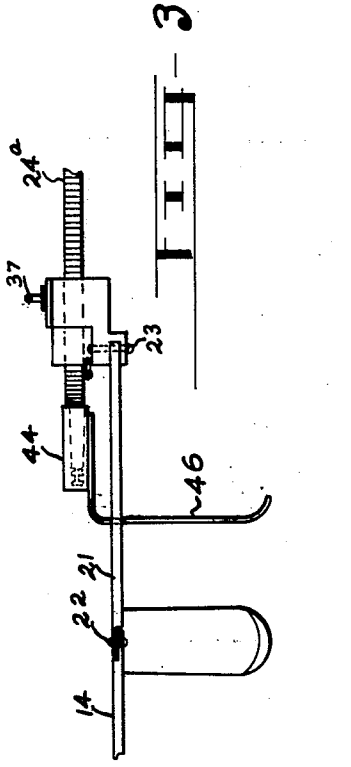

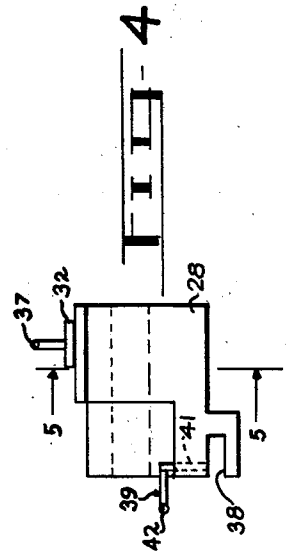

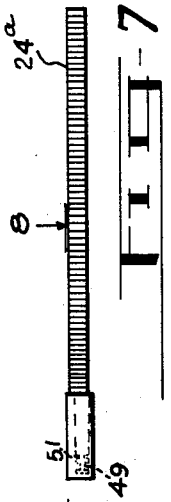

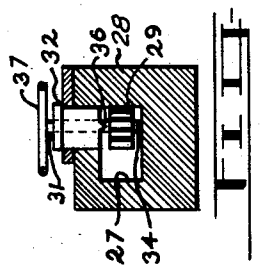

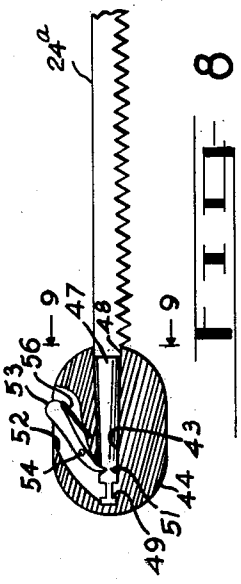

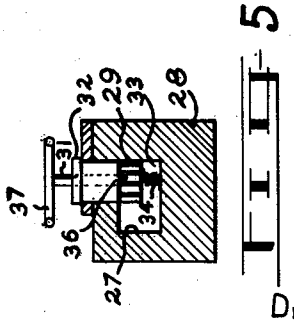

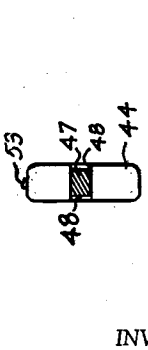

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SURGICAL RETRACTOR

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3 Claims. (Cl. 128—20)

This invention relates to a surgical retractor assembly of the general type which is placed in an incision made in a patient, such as the area for abdominal surgery.

An object of my invention is to provide a surgical retractor assembly which shall include individual retracting elements which are operated and positioned independently to maintain the various organs away from a particular area of the surgery.

Another object of my invention is to provide a surgical retractor which shall include improved means for setting the retracting elements and the amount of tension applied to the abdominal wall, together with automatic locking means which prevents the retractor assembly from collapsing while in use.

Another object of my invention is to provide a surgical retractor of the character designated in which the individual retracting elements may be added or removed with a minimum of effort and without the necessity of removing the entire unit or portions other than the retracting elements.

A further object of my invention is to provide a surgical retractor assembly of the character designated in which the individual retracting elements may be removed or inserted during surgery without affecting the position or operation of the other retracting elements already in place.

A still further object of my invention is to provide a surgical retractor which shall be extremely simple of construction and manufacture and one which is easily sterilized and maintained in a clean condition at all times.

Heretofore, it has been the usual practice to employ surgical retractor assemblies which embody either rigid supporting members or members which collapse completely upon the release of a thumb setting or the like. That is, with adjustable, ring-type supporting members, it has been the usual practice to collapse the entire assembly for insertion or removal of individual retracting elements. Accordingly, it has been difficult to add or remove retracting elements during surgery.

Briefly, my improved surgical retractor assembly comprises a supporting member adapted to surround the incision made in a patient. A plurality of brackets are mounted on the supporting member in position to support elongated racks transversely of the supporting member. The individual retracting elements are attached to the rack inwardly of the supporting member and the rack is moved to selected positions by a pinion. Releasable drive means is provided to hold the pinion against rotation while in one position and to drive the pinion while in another position whereby the retracting element is held in selected positions.

Surgical retractor assemblies embodying features of my invention are illustrated in the accompanying drawings, forming a part of this application, in which:

FIG. 1 is a top plan view, partly broken away, showing the mechanism which surrounds the incision made in a patient, the assembly being shown in collapsed position and the individual retractor elements being omitted, for the sake of clarity;

FIG. 2 is a top plan view, partly broken away, showing the apparatus in extended position and showing the manner in which the individual retractor elements may be mounted on the supporting member;

FIG. 3 is a fragmental, sectional view taken generally along the line 3—3 of FIG. 2;

FIG. 4 is an enlarged, side elevational view of the rack supporting bracket;

FIG. 5 is a sectional view taken generally along the line 5—5 of FIG. 4 showing the pinion in locked position;

FIG. 6 is a vertical sectional view corresponding to FIG. 5 showing the pinion in released position;

FIG. 7 is a side elevational view of the rack which carries the retractor element;

FIG. 8 is an enlarged, fragmental view taken generally along the line 8—8 of FIG. 7; and,

FIG. 9 is a sectional view taken generally along the line 9—9 of FIG. 8.

Referring now to the drawings for a better understanding of my invention, I show a pair of crossed members 10 and 11 which are pivotally connected to each other by a pivot pin 12 to define inwardly extending arms 13 and 14 and outwardly extending arms 16 and 17. Pivotally connected to the inner end of the inwardly extending arm 13 by a pivot pin 18 is an inwardly extending arm 19. In like manner, an inwardly extending arm 21 is pivotally connected to the inner end of the arm 14 by a pivot pin 22. The outer ends of the arms 19 and 22 are pivotally connected to each other by a pivot pin 23. The inwardly extending arms 13, 14, 19 and 21 thus define a closed supporting member which is adapted to surround an incision made in a patient.

To move the assembly from the collapsed position shown in FIG. 1 to the extended position shown in FIG. 2, I attach one end of a rack 24 to the free end of the arm 16 by a pivot pin 26. The other end of the rack 24 passes through a suitable opening 27 provided in a bracket 28. As shown in FIGS. 5 and 6, a pinion 29 is mounted within the bracket 28 in position to mesh with the rack 24 as it passes through the opening 27. The pinion 29 is mounted non-rotatably adjacent the lower end of a shaft 31 which is mounted for rotation in a suitable bearing member 32. The pinion 29 and the bearing member 32 are mounted within a round, vertically extending opening 33 whereby the pinion 29 is adapted for axial movement with the shaft 31. The bearing member 32 is mounted non-rotatably within the bracket 28 whereby the shaft 31 and the pinion 29 rotate relative thereto.

The pinion 29 and the shaft 31 are urged upwardly toward the bearing member 32 by suitable resilient means, such as spring 34. The lower end of the bearing member 32 carries a depending projection 36 which is adapted to engage between the teeth of the pinion 29 whereby the pinion is locked against rotation while the pinion is in the position shown in FIG. 5. Preferably, a depending projection 36 is provided at opposite sides of the bearing member in position to engage the teeth of the pinion 29. However, it will be apparent that any number of such depending projections 36 may be provided. To depress the shaft 31 whereby the pinion 29 moves out of engagement with the depending projections 36 and to provide means for rotating the shaft 31, I provide an operating handle 37 adjacent the top of the shaft 31. While I have shown the shaft 31 as being adapted for manual rotation, it will be apparent that suitable power means may be employed to rotate the shaft, such as an electric motor or the like.

From the foregoing, it will be seen that upon depressing the shaft 31, the pinion 29 moves from the position shown in FIG. 5 to the position shown in FIG. 6 whereby it is disengaged from the depending projections 36. Accordingly, the pinion 29 is free to rotate upon rotation of the handle 37. Upon rotation of the pinion 29, the rack 24 is moved relative to the bracket 28. Accordingly, the outwardly projecting arms 16 and 17 may be moved from the collapsed position shown in FIG. 1 to the ex-

tended position shown in FIG. 2 or any intermediate position which might be desired.

As shown in FIG. 4, the bracket 28 is provided with an outwardly opening slot 38 for receiving the end of the arm 17 which is secured in place by a lock member indicated generally at 39. The lock member 39 is provided with a threaded portion 41 which engages a suitable threaded opening in the bracket 28 whereby the lock member 39 may be rotated into engagement with the adjacent surface of the arm 17. A suitable operating handle 42 is provided on the lock member 39 for rotating the same.

Similar brackets 28 are secured to the arms 13, 14, 19 and 21, as the case may be, to support the retracting members in a manner now to be described. That is, the slot 38 receives selected ones of the arms 13, 14, 19 or 21 whereby the bracket 28 is firmly attached thereto. Where the bracket 28 is attached to the inwardly extending arms, as shown in FIG. 2, the guideway or opening 27 receives an elongated rack 24^a which meshes with the pinion 29, as described hereinabove. As shown in FIG. 2, the brackets 28 support the racks 24^a whereby the racks extend inwardly of the supporting member defined by the arms 13, 14, 19 and 21.

The inner end of the rack 24^a is generally round, as viewed in cross section, whereby it is adapted to telescope into a round opening 43 provided in a member 44 which carries a depending retracting member 46, as shown in FIG. 3. The portion of the rack 24^a adjacent and outwardly of the round portion of the rack 24^a is generally square, as viewed in cross section, as shown in FIG. 9, whereby the square portion is adapted to engage detents 48 carried by the member 44 when the rack is in the position shown in FIGS. 8 and 9. However, upon moving the rack 24^a outwardly of the member 44, the detents 48 disengage the out of round portion 47 whereby the member 44 is adapted for free rotation at the end of the rack 24^a. To hold the member 44 in selected axial positions relative to the rack 24^a, I provide axially spaced recesses 49 and 51 adjacent the end of the rack member 24^a. A passageway 52 is provided in the member 44 for receiving a latch member 53 which is mounted for pivotal movement on a pivot pin 54. The inner end of the latch member 53 is adapted to engage selected ones of the recesses 49 and 51 whereby the member 44 is held in selected axial positions relative to the rack 24^a. Secured to the member 44 and projecting outwardly into engagement with the latch member 53 is a leaf spring member 56 which urges the inner end of the latch member 53 into selected ones of the recesses 49 and 51 whereby the member 44 is attached positively to the rack 24^a.

If desired, the members 44 which carry the depending retracting members 46 may be supported by elongated support members 57 which are connected directly to the supporting member, such as by connection to the pivot pins 18 or 22, as shown in FIG. 2. Also, the elongated members 57 can be connected to the pivot pins 12 and 23, if desired.

From the foregoing description, the operation of my improved surgical retractor will be readily understood. The assembly is moved to the collapsed position, as shown in FIG. 1 whereby the pivot pins 18 and 22 are adjacent each other and the depending retractor members 46 are in position to enter the incision made in the patient. That is, the arms 13, 14, 19 and 21 define a closed supporting member which encircles the incision. The retracting members 46 are mounted about the arms 13, 14, 19 and 21 and locked in the desired positions by the lock members 39. Preferably, the retracting members 46 carried by the pivot pins 18 and 22 are positioned adjacent the center of the incision while other retractor elements are positioned adjacent opposite ends of the incision. Upon depressing the handle 37, the pinion 29 which meshes with the rack 24 is moved downwardly from the position shown in FIG. 5 to the position shown in FIG. 6 whereby the pinion 29 disengages the depending projections 36. Accordingly, the rack 24 is moved relative to the bracket 28 by rotating the handle 37 while it is in the depressed position. Upon the release of the handle 37, the spring 34 immediately moves the pinion 29 into engagement with the depending projections 36 whereby the pinion and the rack 24 are locked in position automatically. The arms 16 and 17 may thus be moved outwardly away from each other to any desired position or to the fully extended position shown in FIG. 2.

The individual retracting members 46 carried by the racks 24^a may be moved to selected positions by depressing the handles 37 of the brackets 28 associated with the racks 24^a. Since the operation of these rack members is substantially the same as the operation of the rack member 24, no further description thereof is deemed necessary.

From the foregoing, it will be seen that I have devised an improved surgical retractor which may be locked automatically in selected positions relative to the incision. Also, by providing individual holding means for the retractor elements, the individual retractor elements may be added or removed at will and without distributing the retractor elements already in use. Also, by providing self-locking means which assures positive location of the retractor elements at all times, there is no accidental release of the retractor elements and at the same time the retractor elements may be adjusted without removing the same from the apparatus. Furthermore, by providing the self-locking units which are accurately controlled by a single operating handle, the retractor elements may be adjusted to selected positions by the use of a single hand.

While I have shown my invention in several forms, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What I claim is:

1. A surgical retractor comprising:

(*a*) a supporting member adapted to surround an incision made in a patient,

(*b*) at least one bracket adapted for attachment to said supporting member,

(*c*) an elongated rack,

(*d*) guide means carried by said bracket supporting said rack transversely of said supporting member,

(*e*) a pinion carried by said bracket in position to engage and move said rack to selected positions,

(*f*) a retracting element having an opening therein for receiving the end of said rack inwardly of said supporting member,

(*g*) the inner portion of said opening and the inner portion of said rack being generally round as viewed in transverse cross section whereby said retracting element is adapted for rotation relative to said rack while in one axial position relative to said rack,

(*h*) there being an out of round portion on said rack adjacent and outwardly of said inner, round portion adapted to engage a part of said retracting element to limit rotation of said retracting element relative to said rack while said out of round portion is moved axially into engagement with said part of the retracting element,

(*i*) means to hold said retracting element selectively in said one axial position relative to said rack and in another axial position relative to said rack to position said out of round part in engagement with said part of the retracting element, and

(*j*) releasable drive means for said pinion disposed to hold said pinion against rotation while in one position and to drive said pinion while in another position whereby said retracting element carried by the rack is held in selected positions.

2. A surgical retractor as defined in claim 1 in which the means to hold the retracting element selectively in said one axial position and said another axial position relative to said rack comprises:

(*a*) a releasable latch member carried by said retracting element,

(*b*) there being axially spaced recesses in said rack disposed to receive said latch member to hold said retracting element in selected positions, and

(*c*) resilient means urging said latch member into engagement with selected ones of said recesses.

3. A surgical retractor as defined in claim 1 in which the bracket is detachably connected to said supporting member whereby it may be moved to selected positions relative to said supporting member.

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