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Jascalevich

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[54] THORACIC INLET RIB RETRACTOR

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[52] **U.S. Cl.** **128/20,** 269/328, 254/98, 287/91, 287/100

[51] **Int. Cl.**.....**A61b 17/02,** B66f 3/08, B25g 3/38

[58] **Field of Search** 128/20; 254/98; 269/328; 287/14, 91, 100

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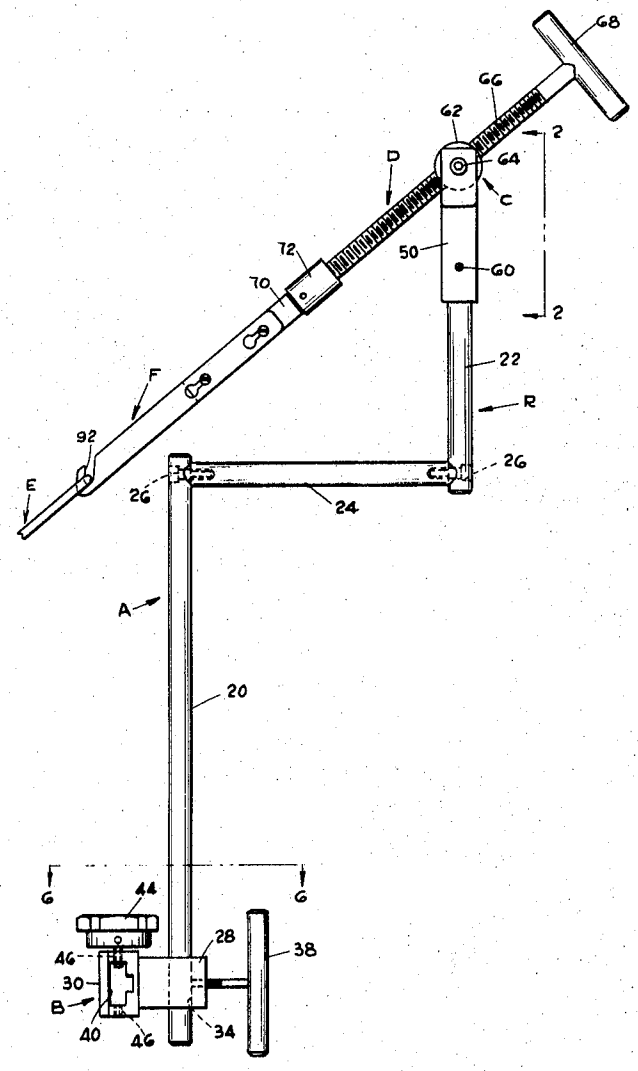
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[57] **ABSTRACT**

A rib retracting instrument for mounting on a surgical table employs a rigid, elongated boom member provided with swivel means at the top of the boom member. The swivel means is rotatable about a first axis parallel to the length of the boom member and about a second axis which is perpendicular to the first axis. A manually operable retracting member is connected to the swivel means to rotate therewith in all planes. The retracting member extends through the swivel means for linear movement with respect thereto, the retracting member being adjustable to self-retained position.

15 Claims, 12 Drawing Figures



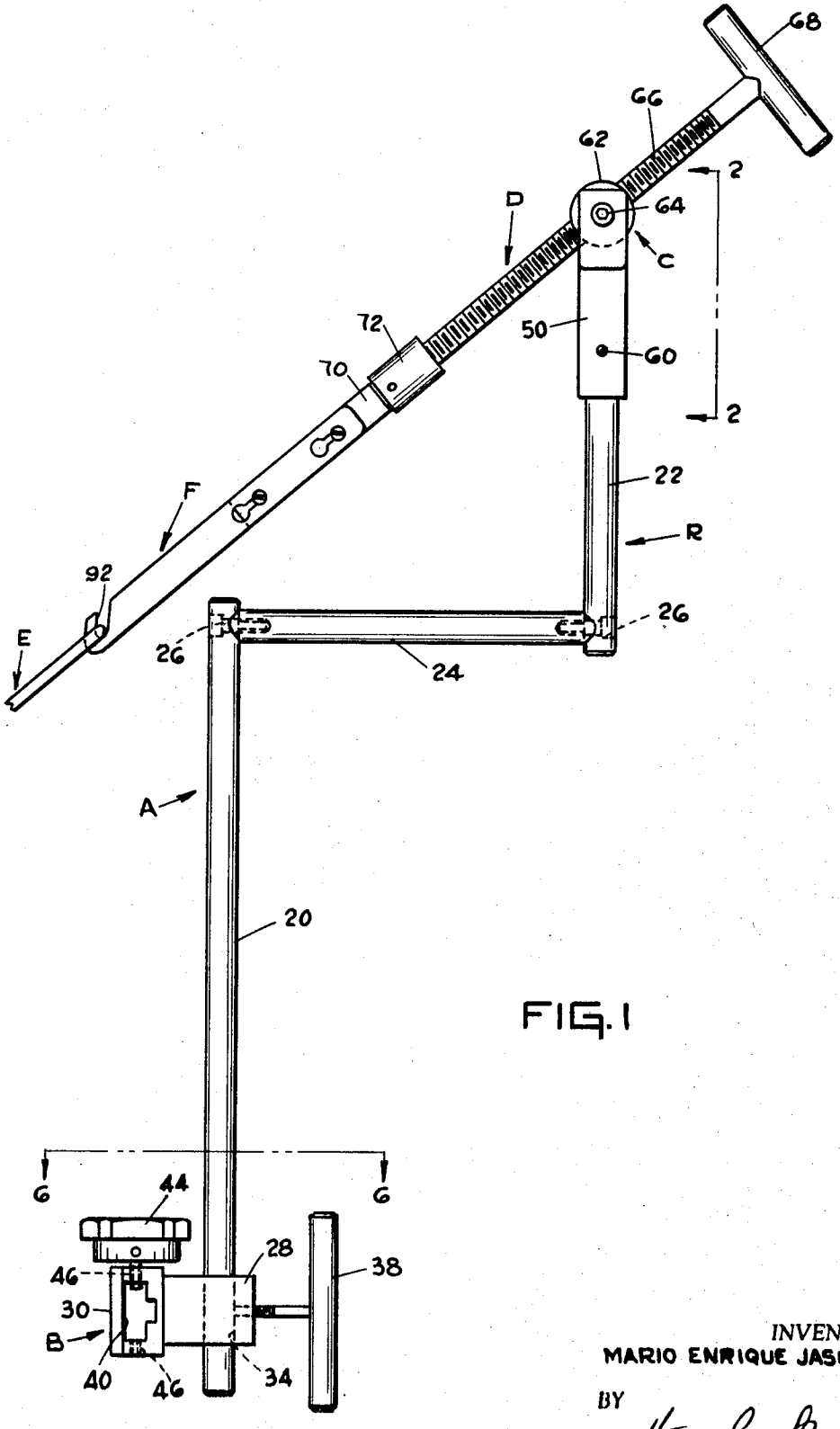


FIG. 1

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FIG. 2

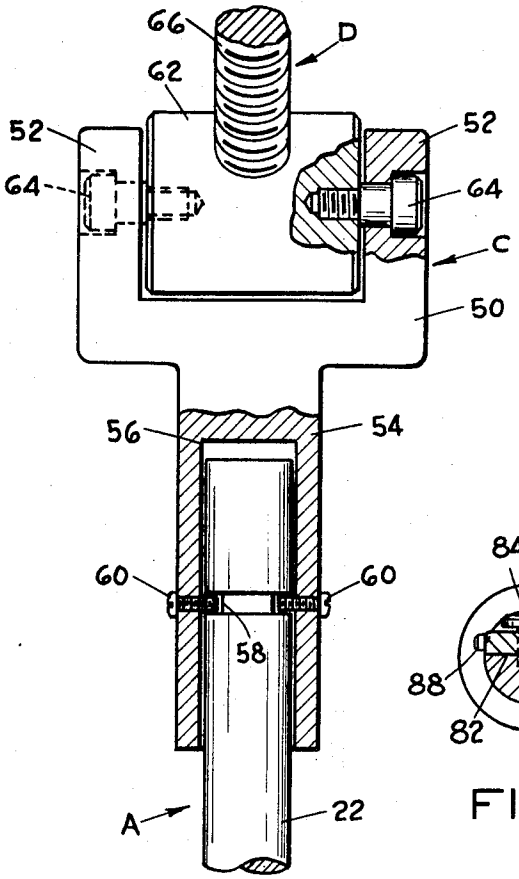
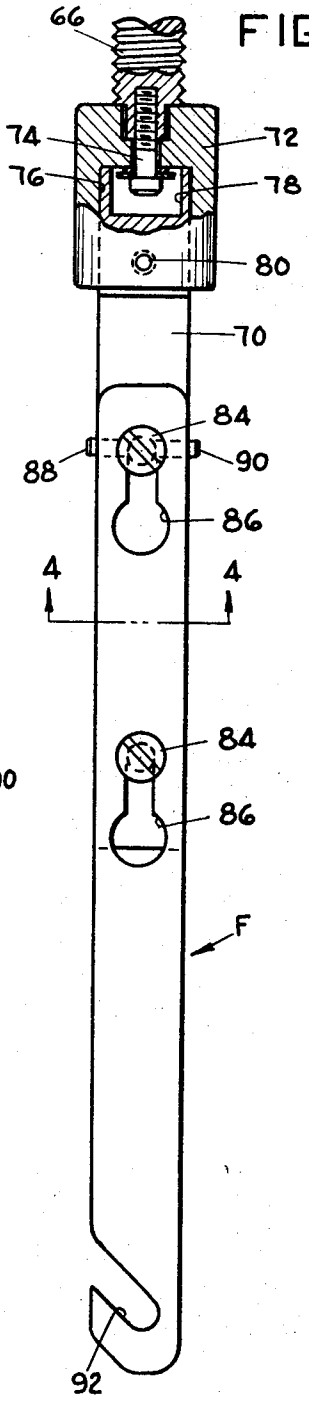


FIG. 3



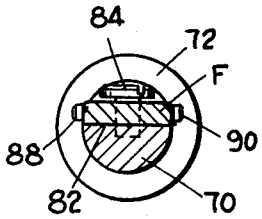


FIG. 4

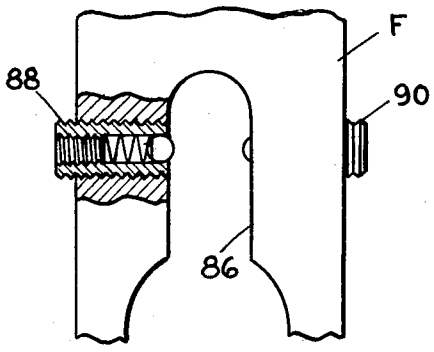


FIG. 5

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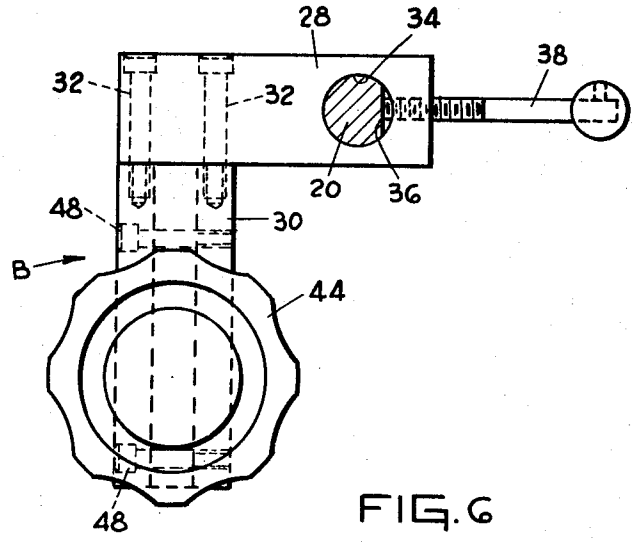


FIG. 6

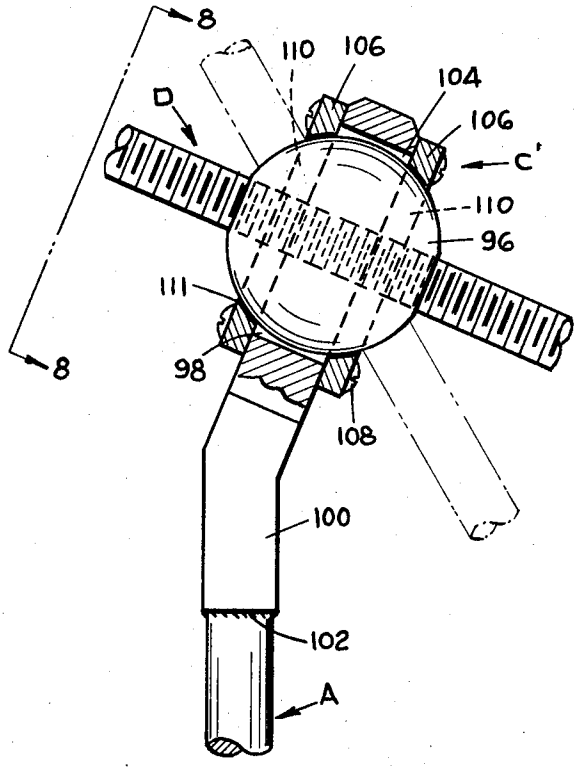


FIG. 7

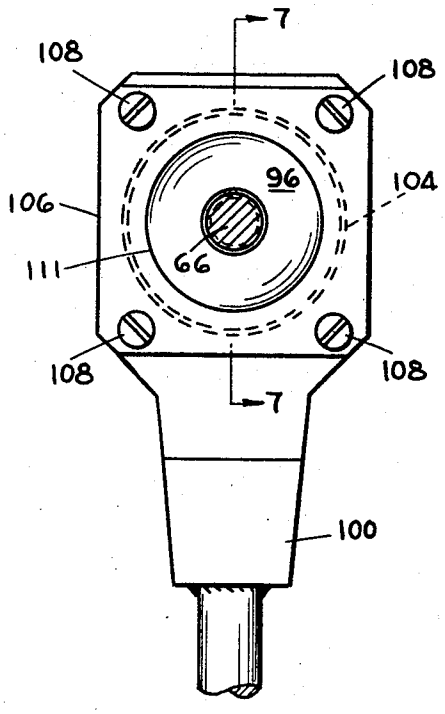


FIG. 8

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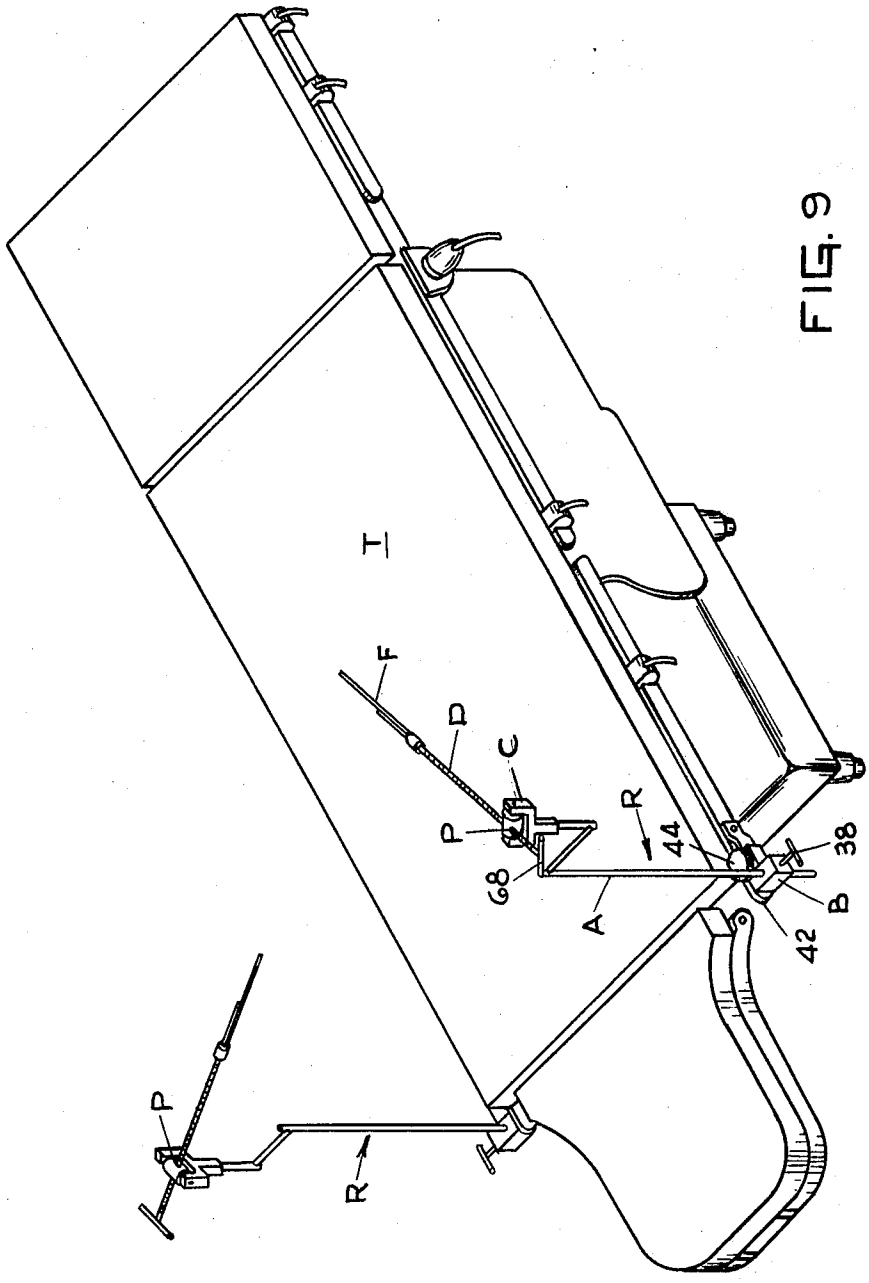


FIG. 9

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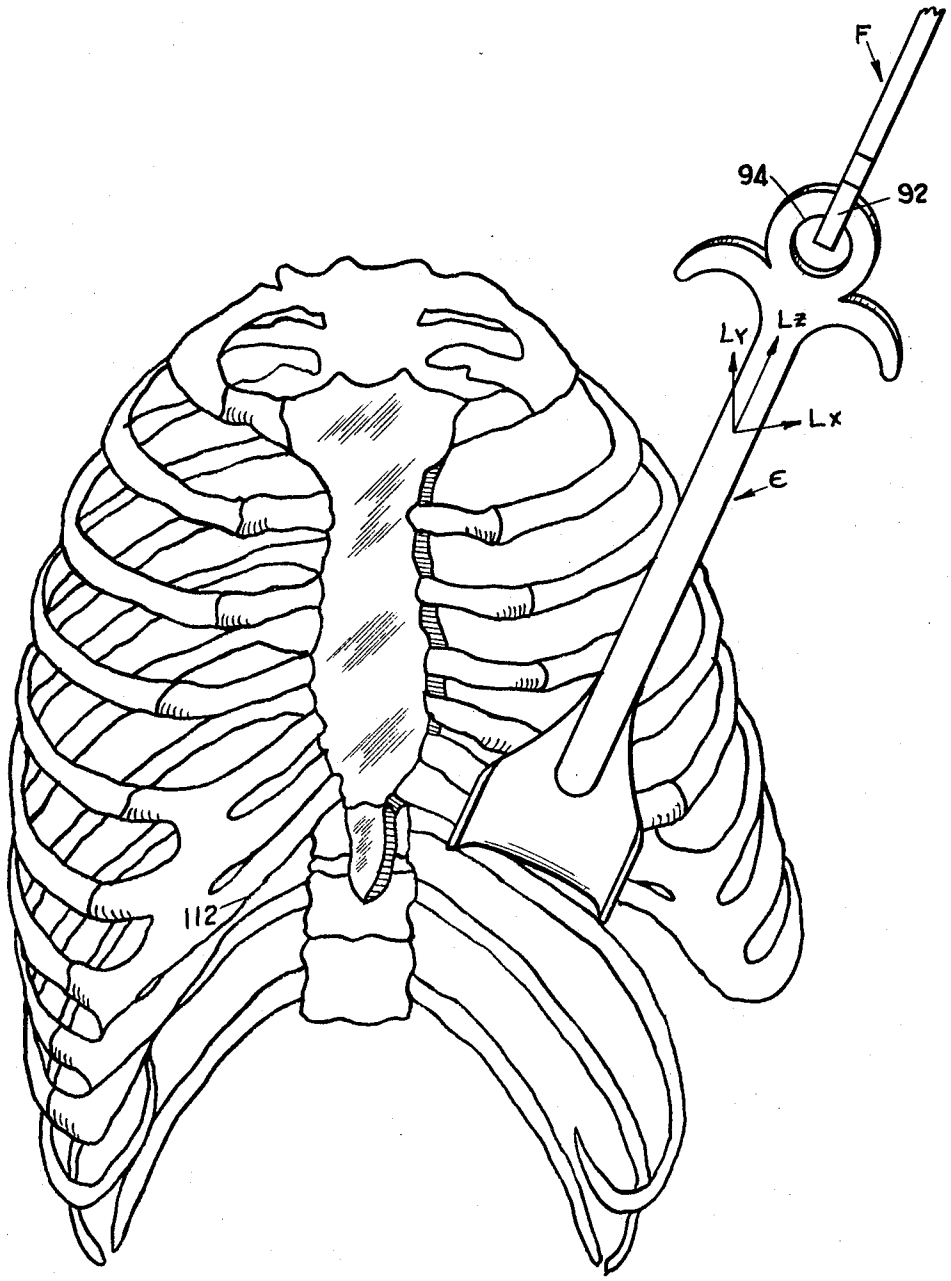


FIG. 10

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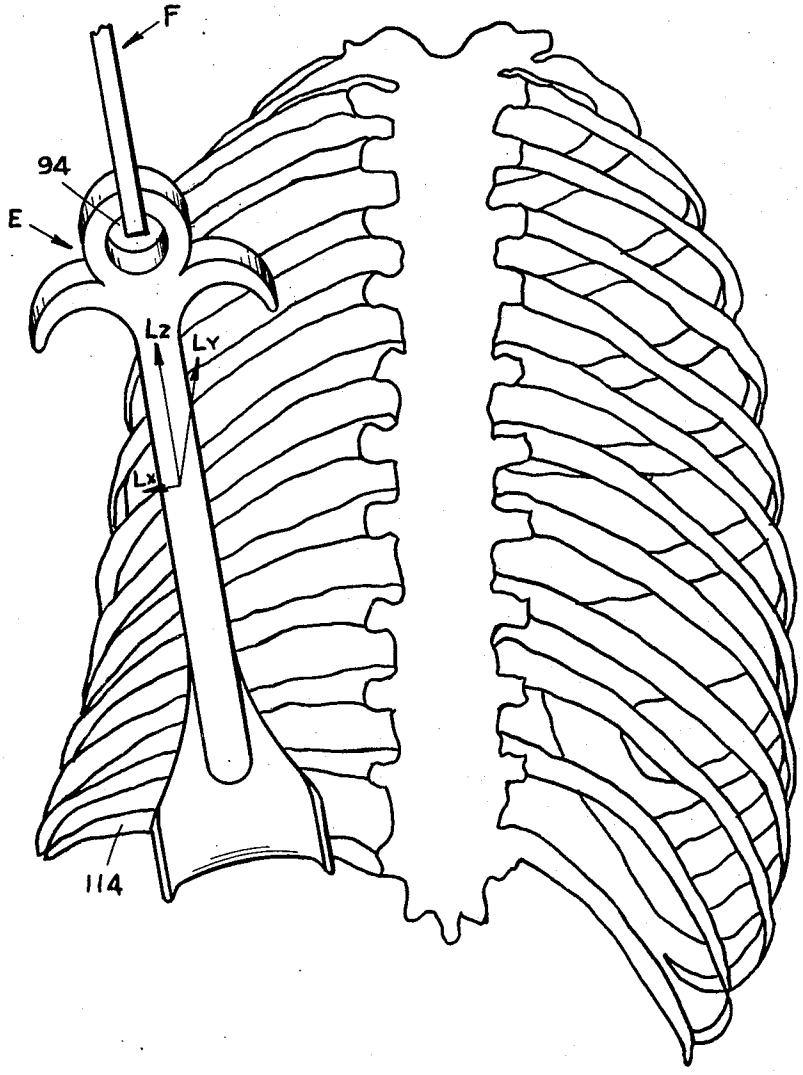


FIG. 11

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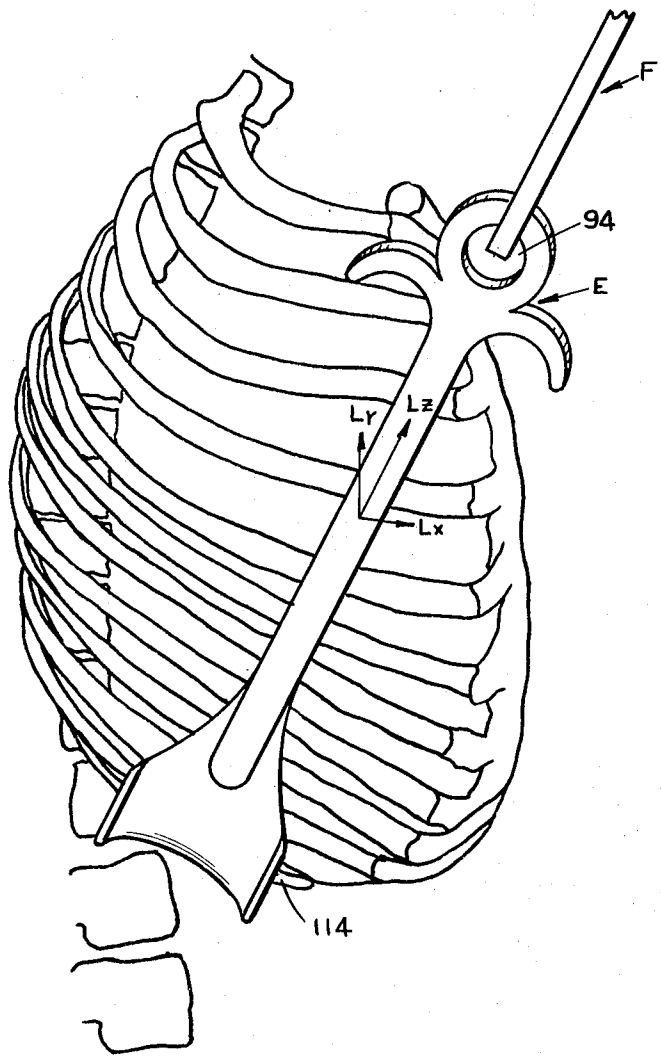


FIG. 12

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THORACIC INLET RIB RETRACTOR

The invention relates to an instrument for retracting the ribs at the thoracic inlet portion of the anatomy to enlarge the otherwise confined and restricted area presented to the surgeon who must operate in the thoraco-abdominal region.

BACKGROUND OF THE INVENTION

A number of serious and delicate surgical operations, which require a substantial amount of time, are performed within the limited confines of the thoraco-abdominal region. The space or area within which the surgeon must work is severely limited by the barrier provided by the ribs which surround this region.

In the upper right portion of the thoraco-abdominal region there are the liver, the gall bladder and all of the delicate bile channels that lie deep beneath the liver and the gall bladder. The pancreas is in the central portion of this region, this organ lying deep and posteriorly. In the left upper portion or quadrant are the spleen, the tail of the pancreas, the stomach and two surgery-prone parts of the anatomy that are associated with the stomach and which require delicate surgery; that is, the esophagus and the vagus nerves. Vagotomies are being perfomed with increasing frequency to mitigate the effect of ulcers. The esophagus passes through a small opening in the diaphragm which forms the top or ceiling of the thoraco-abdominal region, and it is in this area that hernias sometimes develop to cause diaphragmatic herniations. The repair of diaphragmatic hernias and vagotomies are two operations which are extremely difficult to perform because the operative areas are very deep within the thoraco-abdominal region. Where the patient is unduly obese, these areas may be so deep that it is too dangerous to perform the operations. To reach the organs, nerves and areas referred to above, the patient lies upon his back on the surgical table in what is termed the anterior position.

To perform surgery upon the kidney and the adrenal gland which lies on the top of the kidney, the patient must lie upon the surgical table in what is termed in the lateral position.

To reach the kidney and the adrenal gland it also is sometimes necessary that the patient lie face down on the surgical table in what may be termed the posterior position. It is in such position that access also may be had to the aorta and vena cava, and the deeply seated splanchnic nerves, which control the functions of several organs in the abdomen. A splanchnicectomy to cut such nerves may be required.

In addition, in the recent past it has become possible to graft entire organs, for example, the pancreas, the liver and many other organs within the thoraco-abdominal region. For these time-consuming operations the surgeon is confronted with the formidable problem caused by the deep approach necessary within an area encircled or surrounded by the ribs.

In order to expand the opening at the thoracic inlet to enable the surgeon to operate within the thoraco-abdominal region, the usual practice has been, and still is, to manually retract the costal margin or the last ribs at the patient's side or back. An assistant surgeon holding a Balfour blade or the like, sometimes one blade in each hand depending upon the kind of operation to be performed, must pull upon or apply tension to the hand retractors or blades hooked around the costal margin or end rib or ribs. To satisfactorily enlarge the opening leading into the thoracic-abdominal region, it is necessary that the line of retraction be in an upward direction to lift the costal margin or the end ribs. Traction to lift frequently must be accompanied by a vector or component of retraction directed either toward the side of the table or toward the head of the table, or in both such directions, thereby requiring lines of retraction in what may be termed the X and Y directions; that is, the lateral and longitudinal directions of the horizontal plane, coupled with retraction in the Z direction or a lifting action in the vertical plane.

Many of the operations referred to above require several hours. The assistant surgeon applying retraction manually simply is unable to apply the necessary retraction continously and with the desired uniform and constant level of tension. No matter how strong the assistant surgeon may be, the physical requirements demanded are beyond human endurance. He becomes fatigued, thereby releasing tension on the blades upon which he has been pulling. As a result, the delicate viscera beneath the hooked end of the retractor blade may be injured, and due to the "shoveling effect," it becomes necessary at times to remove a perfectly good organ which was not the objective of the operation. The substantial force of retraction should be applied solely to the ribs; separation for the delicate viscera should be accomplished by the gentle hand of the surgeon rather than by a rigid retractor member or blade. Moreover, in performing his duty to retract the ribs, the assistant surgeon cannot avoid presenting some measure of interference to the operating surgeon.

A number of mechanisms have been proposed to overcome the problems of physically applying retraction by a person. In one prior art apparatus, a ring shaped frame is mounted on brackets secured to each side of the surgical table. The ring shaped frame has a plurality of retractor blades mounted thereon in a manner to permit the blades to be moved outwardly in a horizontal plane parallel to the plane of the table. The frame and the retractor blades mounted thereon are positioned directly over the patient at the area to be retracted. The use of this apparatus requires a special technique for draping the patient, and a preoperative set-up of the apparatus. The apparatus is not suitable for rib retraction where the operation requires that the patient lie in the lateral position. Moreover, the frame is located immediately over the patient where it obstructs the operative field.

Another apparatus which has been proposed to replace the application of retraction by an assistant surgeon comprises an arch shaped assembly having opposite downwardly extending arms connected to each side of the surgical table and a cross-bar extending between the arms across the table. A blade support is slideably mounted on the cross-bar, and a retractor blade is connected to the support to permit adjustment of the blade in a longitudinal direction and locking it in retracted position. The necessity to position the device to extend immediately over the chest of the patient and to encompass the patient between the device and the surgical table interferes with the surgeon's operative field. The device must be mounted on the table only

after the patient is upon the table. Moreover, when it may be necessary to make adjustments of the position of the blade or blades while the operation is being performed, an undue amount of time is consumed to change the position of the blade support along its cross-bar and to adjust the position of the blade with respect to its support.

In another mechanical device for retracting the costal margin, a pair of angled shafts are mounted in spaced relation upon a ratchet bar. Each shaft has a retractor blade connected thereto to engage opposite sides of the costal margin at its base. The device operates on the principle that the costal arch possesses a variable angle, and pressure outward at the base, near the ninth cartilage, opens up the angle of the arch. The angled shafts on the ratchet bar are moved apart and secured in their displaced positions to furnish the lateral, outward pressure at the base. The essential lifting action is indirect, and therefore of limited extent. Also, the lifting action is limited by the difference in individuals' body structures. This device cannot be used where the operation requires that the patient lie on the table in either posterior or lateral positions. Also this instrument intrudes to a certain extent upon the operative field.

In another device, a turret is mounted on the top of a vertically extending rod having means at its lower end for connection to the side of a surgical table. The turret is mounted on the rod for rotation about a single axis only, the longitudinal axis of the rod. A rigid, manually operable arm extends through the turret and has a retractor blade hinged to its outer end to permit raising and lowering of the blade. Only up and down pivoting of the blade with respect to the end of the arm is permitted by the hinge arrangement. A slotted bar and pivoted connecting link extend between the top of the turret and the hinged retractor for locating the end of the retractor in position, and means is provided at the turret end of the slotted bar to secure the retractor in such position. This apparatus, which is designed for the retraction of the abdominal wall, rather than the costal margin or end ribs, is rather complicated in construction and expensive to manufacture. From the functional standpoint, and for the purpose of retracting ribs at the thoracic inlet, this device would not furnish the desired line of retraction so essential for the satisfactory operation of a mechanical device to retract the costal margin and the end ribs when the patient must be positioned on the table in the posterior or lateral positions, as well as the anterior position. Moreover, this device is constructed so that it must extend over the patient, and therefore interferes with the surgeon's field of operation.

SUMMARY OF THE INVENTION

In accordance with the invention, a mechanical rib retractor is provided which comprises a rigid, elongated boom member, means at the lower end of the boom member to connect it to the side of a surgical table, and swivel means at the top of the boom member which is rotatable about a first axis parallel to the length of the boom member and for rotation about a second axis perpendicular to the first axis. The swivel means is rotatable in all planes, and in all combination of such planes. In effect, the swivel means provides a universal mounting on top of the boom member. A rigid, manually operable retracting member is connected to the swivel means for rotation therewith in all planes, and for movement linearly with respect to the swivel means to adjusted, retained position. Due to the universal mounting of the linearly movable retracting member, retraction may be applied in all desired directions, that is, laterally outward toward the side of the surgical table (the X direction), longitudinally toward the head of the table (the Y direction), and upward (the Z direction). The manually operable member is adapted to have a rib-engaging retractor blade connected thereto.

Due to the construction of the instrument, the line of retraction is applied from a point located a substantial distance above the patient and at the side of the table. Preferably, the point of retraction is from a high point beyond the side of the table. Only the retractor blade in engagement with the costal margin or end rib is in the operative field of the surgeon. Due to the universal mounting of the linearly movable retracting member, the retractor blade connected thereto is self-adjustable to each individual's rib structure. The instrument is suitable for engagement with the costal margin when the patient is in the anterior position, and the end ribs at the thoracic inlet when the patient is in the posterior position or lateral position. The surgery table need not be initially prepared; it may be prepared at any time, and even during surgery. No special technique in draping is required; the regular or usual technique is used. There is not need for a pre-operative set-up; set-up may be made at any time before or during surgery. Most important, the instrument of the invention is completely unobtrusive to the operating team and affords a completely unobstructed operative field. The device of the invention is operable by the anesthetist or by a nurse, thereby eliminating the necessity for an assistant surgeon and the utilization of only his inadequate physical prowess. As will subsequently appear, the device of the invention is of simple construction, easy to operate and inexpensive to manufacture.

The structure of an instrument made in accordance with the invention, its advantages, and the improved results furnished thereby will be apparent from the following description of a preferred embodiment thereof, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevational view of a thoracic inlet rib retractor made in accordance with the invention;

FIG. 2 is an enlarged view of the swivel means and associated manually operable retracting member taken partly in cross-section, approximately in the plane of line 2—2 of FIG. 1;

FIG. 3 is a view, partly in cross-section, showing the relationship of the manually operable retracting member to an extension member, and the manner in which a blade supporting member may be releasably connected to the extension member;

FIG. 4 is a cross-section taken approximately in the plane of line 4—4 of FIG. 3;

FIG. 5 is an enlarged partial view of the blade supporting member, a portion thereof being shown in cross-section to illustrate means for releasably connecting such member to the extension member;

FIG. 6 is a view taken approximately in the plane of line 6—6 of FIG. 1 showing in greater detail the means for connecting the lower end of the instrument's boom member to a surgical table;

FIG. 7 is a view, partly in cross-section, illustrating another embodiment of the swivel means and its related manually operable retracting member, this view being taken approximately in the plane of line 7—7 of FIG. 8;

FIG. 8 is a view taken approximately in the plane of line 8—8 of FIG. 7;

FIG. 9 is a perspective view of a surgical table having a pair of instruments made in accordance with the invention connected to the sides of the table;

FIG. 10 illustrates the function of the instrument of the invention as it retracts the costal margin, this view, for clarity in illustration, showing only the patient's rib cage in the anterior position;

FIG. 11 illustrates the manner of operation of the instrument when the patient is in the posterior position; and

FIG. 12 shows the manner of operation of the instrument when the patient is in the lateral position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1–6, and in accordance with the invention generally, the thoracic inlet rib retractor R comprises a rigid, elongated boom member A, means B at the lower end thereof for connecting the boom member to a surgical table T (FIG. 9), swivel means C at the top of the boom member for rotation about a first axis parallel to the length of the boom member and for rotation about a second axis perpendicular to the first axis. A rigid, manually operable retracting member D is connected to the swivel means C to allow the retracting member to rotate together, or as a unit, with the swivel means about the first and second axes. The retracting member D is connected to the swivel means to furnish linear movement of the retracting member to adjusted, retained position.

In greater detail, the boom member A is made of a strong rigid material and has substantial length. For example, the boom member may be made of stainless steel rod approximately five-eighths inch in diameter and having an overall length of approximately 32 inches. Although the boom member may be of continuous, linear length, it is preferred, as illustrated, to make the boom member with a first vertical portion **20**, and a second vertical extending portion **22** laterally offset from the first portion. An intermediate horizontally extending portion **24** is connected to the top of the bottom portion **20** and the bottom of the top portion **22** by screws **26** extended through the vertically extending portions and threaded into the ends of the horizontally extending portion **24**. This laterally offset arrangement of the portions of the boom member is preferred because with the instrument R mounted on a surgical table T, as shown in FIG. **9**, it has been found preferable to locate the connection of the retracting member D to the swivel means C at a point laterally outward of the side of the table, as well as at a substantial distance above the plane of the table. By such location of the point of connection P of the retracting member D to the swivel means C, suitable lines of retraction are afforded for any required position of the patient—anterior, lateral or posterior, and the operative field is unobstructed.

Any suitable means B may be used to releasably connect the instrument R to the side of a surgical table. The means B is constructed for the adjustable connection thereto of the boom member to locate the swivel means C at the desired distance above the surgical table.

As shown in FIGS. **1** and **6**, the means B comprises two segments **28** and **30** secured to one another at a right angle by a plurality of screws **32** extended through counter-sunk bores in the segment **28** and threaded into the segment **30**. The segment **28** is provided with a vertical hole or bore **34** through which the portion **20** of the boom member is extended. The boom portion **20** is provided with a flat side **36** for engagement by the end of a hand actuated set screw **38**. The vertical position of the swivel means C is adjusted by loosening the set screw, raising or lowering the boom member A, and tightening the set screw.

As shown in FIG. **1**, the segment **30** of the mounting means or bracket B is provided with an opening **40** extended therethrough having a shape or contour to permit the bracket to be slipped over a side bar **42** on the surgical table (FIG. **9**) in mating engagement therewith, following which the connecting means or bracket is releasably secured in place by a set screw **44** having a knob at the outer end thereof. To permit the bracket to be mounted on either side of a surgical table, the segment **30** is provided with threaded openings **46** on the top and bottom sides so that the set screw **44** may be threaded into either side for engagement with the side bar **42**. While this arrangement permits mounting a single instrument on either side of the surgical table, it is preferred that the table be equipped with two instruments R, one on each side of the table as shown in FIG. **9**, to permit the second instrument to be used if necessary without any loss of time to remove the single instrument from one side of the table and mounting it on the other side. It will be understood that for certain kinds of operations it is desirable that retraction be applied from both sides. For ease of manufacture, the segment **30** is made of three plates secured to one another by screws **48** (FIG. **6**) extended through aligned tapped holes in the areas above and below the opening **40**.

As illustrated in FIGS. **1** and **2**, the swivel means C is mounted on the top of the boom member A for rotation in all planes. In this embodiment of the invention, the swivel means comprises a bifurcated member **50** having a pair of spaced arms **52** and an integral downwardly extending base portion **54**. As shown in FIG. **2**, the base portion is provided with a central bore **56** within which the upper end of the boom member A is positioned with a slight amount of clearance. The bifurcated member **50** is connected to the boom member so that the member is rotatable about the longitudinal axis of the boom member. As shown, the boom member is made with an annular groove **58** and the wall of the base portion **54** has tapped holes extending through opposite sides thereof in alignment with the groove **58**. Pivot pins in the form of screws **60** are extended through the tapped holes with the ends of the screws within the groove. This manner of connection of the parts secures the bifurcated member to the top of the

boom member and allows the bifurcated member to rotate about the longitudinal axis of the boom member. A cross member **62** is positioned between the spaced arms **52** and is pivotally connected to the arms by opposite end threaded pivot pins **64** extended through countersunk holes in the arms and threaded into the cross member. The cross member is rotatable about the axis provided by the opposite pivot pins **64**, such axis of rotation being perpendicular to the longitudinal axis of rotation of the bifurcated member **50** about the boom member.

The manually operable retracting member D is connected to and extends through the swivel means C for rotation as a unit with the swivel means and for primary linear movement with respect to the swivel means. As shown in FIG. **1** and **2**, the manually operable retracting member comprises a screw member **66** having a handle **68** at its outer end. The screw member extends through the cross member **62** which is provided with an internal, matingly threaded bore. The screw member is made of strong, rigid rod stock, for example, one-half inch in diameter, and preferably with a thread pitch of approximately 20 threads per inch to permit fine linear, self-retained adjustment of the screw member with respect to the swivel means.

To eliminate torque which would be imparted to a rib-engaging retractor blade connected to the screw member, the inner end of the screw member **66** has a rigid extension member **70** connected thereto by means allowing the extension member to rotate about its longitudinal axis, also around the longitudinal axis of the screw member. As best shown in FIG. **3**, a hub **72** is provided with a bore through which a pivot pin **74** having a threaded end is extended and threaded into the lower end of the screw member **66** for the rotatable connection of the hub to the screw member. The hub is provided with a larger counter-bore **76** extending into its opposite end to accommodate the head of the pivot pin, a washer under the head, and to receive the end of the extension member **70**. The end of the extension member is provided with a recess **78** to accommodate the head of the pivot pin **74** and the washer. The extension member is fixed to the rotatable hub by a set screw **80** whereby the extension member is rotatable about the longitudinal axis of rotation provided by the pivot pin **74**.

A retractor blade E, such as a Balfour blade or the like, may be directly connected to the extension member **70**. It is preferred, however, to provide an intermediate blade supporting member F between the retractor blade and the screw member's rotatable extension **70**. By using an intermediate blade support member, only such member and the retractor blade E require sterilization. The blade supporting member F, also the retractor blade, may be made of rigid, stainless steel stock. It is sometimes desirable to X-ray the patient during the operation. The retractor blade E may be made of rigid, transparent, plastic material to allow X-raying.

As shown in FIGS. **3**, **4** and **5**, the blade supporting member F is made of flat stock so that the underside thereof will lie against an adjacent flat side **82** of the extension member **70** for rotation therewith. The blade supporting member is releasably connected to the extension member. Suitable releasable connection means may comprise, as shown, a pair of longitudinally spaced screws **84** threaded into the extension member **70** with the heads of the screws spaced above the surface **82** a sufficient amount to allow the thickness of the member F to be positioned under the heads with a slight amount of clearance. As shown in FIG. **3**, the blade supporting member F is provided with spaced slots **86** therethrough each formed at one end with an opening sufficiently large to clear the head of the screw and with a longitudinally extending portion slightly wider than the shank of the screw to thereby allow the member F to be moved to the position shown in FIG. **3**, where the member F is held in place. The member F is removed by sliding it toward the enlarged portions of the slots and lifting it away.

To assure that the blade supporting member F is held in place, such member is provided with a resiliently mounted connector **88** cooperable with the shank of one of the screws **84**. As shown in FIG. **5**, such connector may take the form of a spring mounted ball plunger housed within the central bore of an externally threaded housing screwed into a threaded bore extended through one side of the blade supporting member F. A part **90** is threaded through the opposite side of the member so that the nose thereof extends slightly into the necked down portion of the slot **86** opposite to and in alignment with the spring mounted ball plunger. The end of the blade supporting member F is provided with a hook **92** over which the apertured end **94** of a suitable retractor blade E, such as a Balfour blade, may be connected, as shown in FIGS. **10**, **11** and **12**.

Due to the described connection of the extension member **70** to the screw member **66**, the connection of the blade supporting member F to the extension member, and the connection of the blade E to the member F, the blade is movable linearly along the longitudinal axis provided by the rigid screw member, extension member and blade supporting member. Also, the articulated connection of the blade to the rotatable blade supporting member facilitates hooking its curved end about the costal margin or rib initially, following which straight line retraction is furnished by turning the handle **68** of the screw member (righthand thread) in counter-clockwise direction.

Instead of the swivel means constructed as hereinbefore described, swivel means C' as shown in FIGS. **7** and **8** may be provided at the top of the boom member A to furnish a universal mounting for the linearly movable, manually operable retracting member D. A ball **96** is provided with a threaded bore therethrough, the screw member **66** being threaded in and extending through the bore. As shown, and for convenience and ease of manufacture, it is preferred that the socket **98** for the ball be furnished by a socket member **100** welded at **102** to the top of the boom member and a pair of plates. The socket member preferably is angled and made of flat stock. A hole **104** is formed in the member having a diameter slightly larger than the diameter of the ball. The ball **96** is held in place by a pair of apertured plates **106** fastened by screws **108** to each side of the socket member **100**. As illustrated, the plates **106** are each provided with an opening **110** in alignment with the hole **104**. The periphery of each opening **110** is curved in conformity with the curvature

of the ball to furnish a slight amount of clearance. As shown, the ball is retained in the socket because the diameter of the outer peripheral edge **111** of each opening **110** is smaller than the diameter of the ball; the location of the apertured plates **106** in the assembly prevents the ball from leaving the socket.

Functionally, the arrangement shown in FIGS. **7** and **8** furnishes the same kind of universal mounting for the manually operable retracting screw **66** as hereinbefore described in connection with FIGS. **1–6**. By turning the screw member (righthand thread) in counter-clockwise direction, the screw member is moved linearly with respect to the ball in retracting direction. The previously described arrangement may be used to eliminate the application of torque upon the retractor blade E connected to the screw member. Rotation of the screw member in clockwise direction releases the tension being applied by the retractor blade when hooked about the costal margin or an end rib at the thoracic inlet.

To retract the costal margin, designated **112**, on the left side of the patient as shown in FIG. **10**, only one retractor R mounted on the left side of the table oriented from the head of the table, as shown in FIG. **9**, need be used. Actually, though the surgeon may be operating upon an organ on the patient's left side, it is preferred that retraction be applied to both sides of the costal margin, whereby an instrument R would be mounted on each side of the table. Retraction is shown only on one side in FIG. **10** to illustrate the accordion effect, or the manner in which the ribs are moved together, when the costal margin is retracted.

After the incision or incisions have been made to expose the costal margin and the thoraco-abdominal region, and the height of the point P (FIG. **9**) has been adjusted to the individual patient's body structure by raising or lowering the boom member A by the releasable connection furnished by the set screw **38**, the blade E having its aperture **94** hooked on the hook **92** of the blade support member F has its opposite end hooked around the costal margin **112**. By turning the handle **68** of the screw **66** in the proper direction, tension is applied along the line of retraction Lz as shown in FIG. **10**. Due to the location of the point of connection P of the screw member to the swivel means, C or C′, the lifting action along the line of retraction Lz is accompanied by a line of retraction Lx directed laterally toward the side of the surgical table and a line of retraction Ly directed longitudinally toward the head of the table. As a result, retraction in all directions is furnished to best enlarge the thoracic inlet to enable the surgeon to operate under optimum conditions. If additional tension or retraction is needed, the anesthetist at the head of the table or a nurse simply grasps the handle **68** and makes an addition turn or turns on the screw member, thereby placing additional tension on the retractor blade E and the costal margin **112** about which the blade is hooked. The screw member **66** remains in adjusted position until the handle **68** is turned.

As will be evident from FIG. **10**, only the retractor blade E is in the surgeon's field of operation. The primary line of retraction is in the direction of Lz, which is at a substantial inclination or angle from the horizontal plane; lifting of the costal margin is accomplished from the relatively high and remote point P. Due to the articulated connection of the retractor blade E to the blade supporting member F, and the absence of torque upon the blade supporting member, the curved end of the retractor blade about the costal margin initially adjusts itself to the individual patient's body structure following which retraction is applied linearly. The mounting of the instrument upon the surgical table, and the adjustment of the height of the swivel means, and the point P, above the table are so simple and readily accomplished that the instrument may be made ready for use within a minimum amount of time, and at any time including during the operation.

With the patient in the posterior position as shown in FIG. **11**, a retractor blade E connected to the end of the instrument has its free end hooked around the end rib **114** at the thoracic inlet as shown. This view shows but one retractor blade, and therefore one instrument is used to retract the ribs on the patient's right side. The showing of one retractor blade illustrates the accordion effect imparted to the ribs when retraction is applied by the instrument. It will be understood that if the operation requires retraction on both sides, a pair of instruments would be used, one on each side of the table. The manner of use and operation of the instrument of the invention is the same as above described with regard to the anterior position. When the patient is in the posterior position, it is desirable that the lifting action along the line of retraction Lz be accompanied by a substantial component of retraction longitudinally toward the head of the table, or in the direction Ly. As indicated in FIG. **11**, substantial retraction in the longitudinal direction also is furnished by the instrument by virtue of the high and laterally offset location of the connection P of the manually operable retracting member D to the swivel means C or C′. In the posterior position, the only element in the surgeon's operative field is the retractor blade.

Where the operation requires that the patient be in the lateral position upon the surgical table, only one instrument R is needed. The instrument is mounted on the left or right side of the table depending upon which side of the thoracic rib inlet must be retracted. As shown in FIG. **12**, wherein the patient lies on the table on his left side, and retraction is applied to the patient's right side, the line of retraction Lz to lift is accompanied by the desirable substantial components of retraction in the direction Lx directed toward the side of the table and the direction Ly directed longitudinally toward the head of the table. The manner of use and operation of the instrument is the same as hereinbefore described in connection with the anterior position as shown in FIG. **10**.

It is believed that the advantages and improved results furnished by the thoracic inlet rib retractor of the invention will be apparent from the foregoing detailed description thereof. Various changes and modifications may be made without departing from the spirit and scope of the invention as sought to be defined in the following claims.

I claim:

1. A thoracic inlet rib retractor comprising an elongated boom member, means at one end thereof adapted for connecting the boom member to a surgical table, swivel means at the opposite end of the boom

member for rotation about a first axis parallel to the length of the boom member and for rotation about a second axis perpendicular to the first axis, and a screw member having a handle at one end thereof, the swivel means having a threaded bore, the screw member extending through and in mating engagement with the threaded bore.

2. A thoracic inlet rib retractor according to claim 1 including a rigid extension member connected to the other end of the screw member, the extension member being connected to the screw member by means allowing the extension member to rotate about its longitudinal axis.

3. A thoracic inlet rib retractor according to claim 2 including a rigid blade supporting member rotatable with the extension member, the blade supporting member and the extension member having cooperable means for the releasable connection of the blade supporting member to the extension, the blade supporting member having means at the outer end for the connection of a retractor blade thereto.

4. A thoracic inlet rib retractor according to claim 1 wherein the boom member comprises a first vertically extending portion and a second vertically extending portion laterally offset with respect to the first portion, the upper end of the first portion being connected to the lower end of the second portion by an intermediate horizontally extending portion, the swivel means being located at the top of the second portion.

5. A thoracic inlet rib retractor according to claim 1 wherein the means at said one end of the boom member for connecting the boom member to a surgical table includes means for adjusting and releasably securing the boom member to adjust the position of the swivel means above a surgical table.

6. A thoracic inlet rib retractor according to claim 1 wherein the swivel means comprises a bifurcated member having a pair of spaced arms and a downwardly extending base portion having an internal bore, said one end of the boom member being positioned within the bore, the base portion being connected to the boom member to allow the bifurcated member to rotate about the axis provided by the boom member, a cross member extending between and pivotally connected to said arms, the screw member extending through the cross member.

7. A thoracic inlet rib retractor according to claim 6 including a rigid extension member connected to the other end of the screw member, the extension member being connected to the screw member by means allowing the extension member to rotate about its longitudinal axis.

8. A thoracic inlet rib retractor according to claim 7 including a rigid blade supporting member rotatable with the extension member, the blade supporting member and the extension member having cooperable means for the releasable connection of the blade supporting member to the extension, the blade supporting member having means at the outer end for the connection of a retractor blade thereto.

9. A thoracic inlet rib retractor according to claim 6 wherein the boom member comprises a first vertically extending portion and a second vertically extending portion laterally offset with respect to the first portion, the upper end of the first portion being connected to the lower end of the second portion by an intermediate horizontally extending portion, the bifurcated member being located at the top of the second portion.

10. A thoracic inlet rib retractor according to claim 9 wherein the means at said one end of the boom member for connecting the boom member to a surgical table includes means for adjusting and releasably securing the boom member to adjust the position of the bifurcated member above a surgical table.

11. A thoracic inlet rib retractor according to claim 1 wherein the swivel means comprises a socket provided at said one end of the boom member and a ball within the socket, the screw member extending through the ball.

12. A thoracic inlet rib retractor according to claim 11 including a rigid extension member connected to the end of the screw member opposite the handle coaxially of the screw member, the extension member being connected to the screw member by means allowing the extension member to rotate relative to the screw.

13. A thoracic inlet rib retractor according to claim 12 including a rigid, elongated, blade-supporting member releasably connected at one end thereof coaxially to the extension member and rotatable therewith the blade supporting member having means at the other end for the connection of a retractor blade thereto

14. A thoracic inlet rib retractor according to claim 11 wherein the boom member comprises a first vertically extending portion and a second vertically extending portion laterally offset with respect to the first portion, the upper end of the first portion being connected to the lower end of the second portion by an intermediate horizontally extending portion, the ball and socket being located at the top of the second portion.

15. A thoracic inlet rib retractor according to claim 14 wherein the means at the lower end of the boom member for connecting the boom member to a surgical table includes means for adjusting and releasably securing the boom member to adjust the position of the ball and socket above a surgical table.

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