

[54] **MULTIPLY ADJUSTABLE SURGICAL RETRACTOR**

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[58] Field of Search **128/20**

[56] **References Cited**

UNITED STATES PATENTS

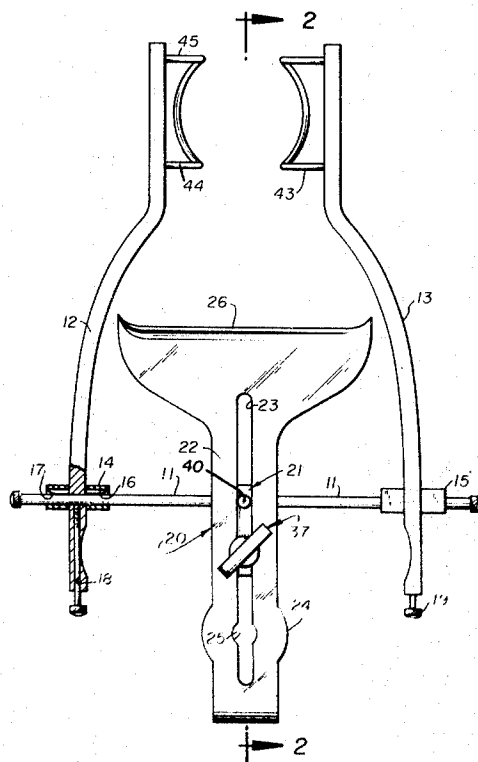
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[57] **ABSTRACT**

A multiply adjustable surgical retractor particularly well adapted for abdominal surgery comprising a single mounting shaft carrying a pair of opposed arms slidably mounted thereon and movable in a common plane, the free end of each of the arms carrying a depending, incision engaging hook, and a central arm mounted on the shaft slidably movable along the shaft, pivotal about the axis of the shaft and extensible transversely to the axis of the shaft, and an incision engaging blade on the free end of the central arm, the central arm being engaged to the shaft by means of a clamp which is adapted to fix the position of the central arm relative to the shaft when desired.

7 Claims, 4 Drawing Figures



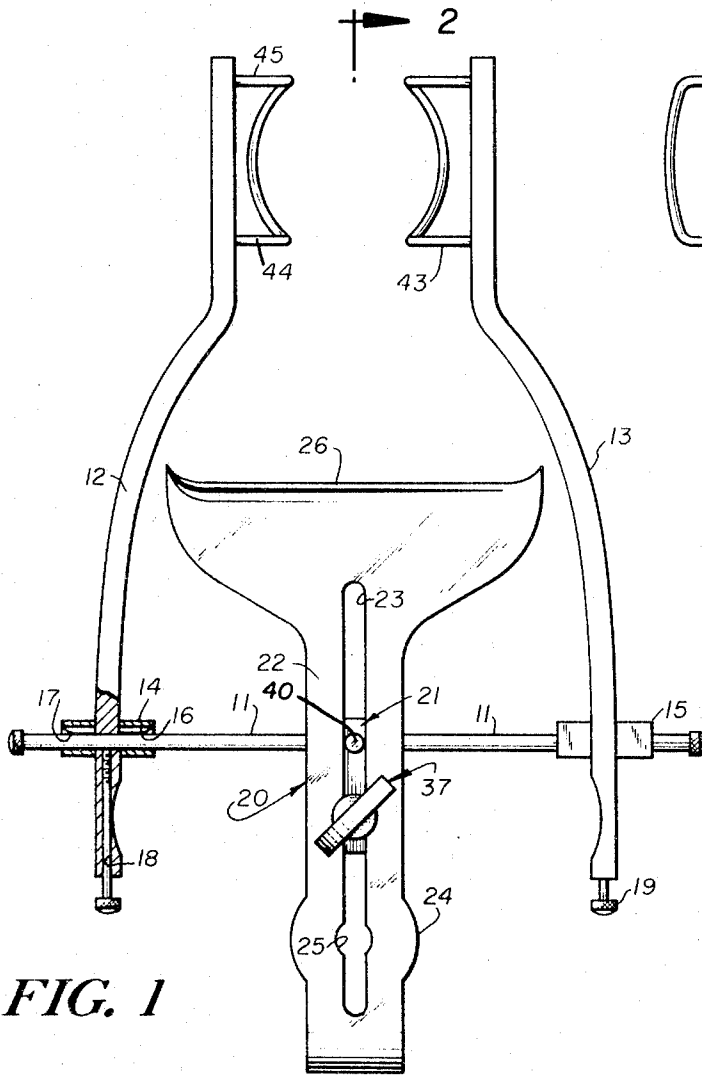


FIG. 1

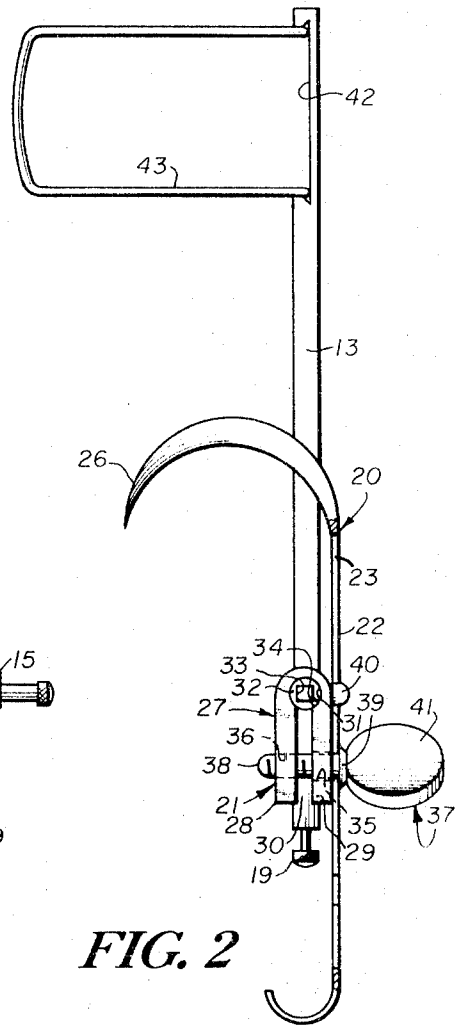


FIG. 2

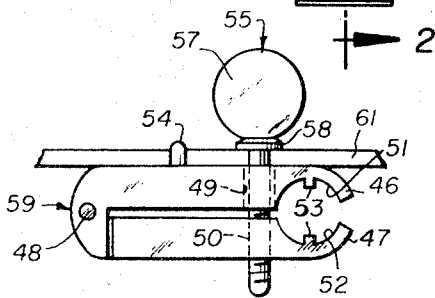


FIG. 3

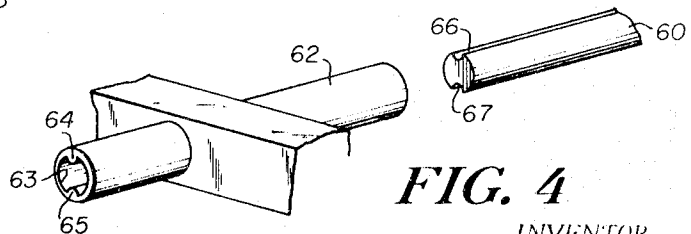


FIG. 4

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MULTIPLY ADJUSTABLE SURGICAL RETRACTOR

BACKGROUND OF THE INVENTION

In abdominal surgery, it is necessary to apply a retractor to the incision to spread and maintain the tissue surrounding the incision. Most retractors for abdominal incisions are engageable only with the tissue of the abdominal wall. However, it is frequently desirable to engage tissue and organs within the abdominal cavity at a distance from the abdominal wall.

In order to safely engage deep tissue and organs, the retractor must be multiply adjustable quickly and easily from without the body.

Most abdominal surgical retractors include a pair of opposed arms movable toward and away from each other, each of the arms carrying a depending, tissue engaging hook. The opposed hooks are adapted to engage the tissue at the incision spreading the incision apart, transverse to its longitudinal axis.

An intermediate or central arm also carries a depending hook, generally broader than the hooks on the aforesaid opposed arms. The blade or hook on the central arm spreads the incision near one of its terminal ends.

However, no existing abdominal retractors provide means for depressing or extending the blade on the central arm deep within the abdominal cavity to retract deep lying tissue and organs.

It is among the objects and advantages of the present invention to provide an abdominal surgical retractor having means for extending a wide blade or hook on an arm into the abdominal cavity to engage deep lying tissue and organs, retracting the organs to a desired position by moving the arm in any one or a combination of three planes of space and then fixing the arm in the desired position from without the abdominal cavity and incision.

Another object of the present invention is to provide a surgical retractor as aforesaid in which a single thumb screw loosens the central arm for adjustment in all three planes of space and fixes the arm on a mounting shaft when the desired position has been achieved.

Yet another object of the present invention is to provide a surgical retractor as aforesaid which may be quickly and easily dismantled for thorough sterilization and which may be quickly and easily assembled during surgery.

SUMMARY OF INVENTION

A multiply adjustable surgical retractor comprising a mounting shaft, a pair of arms mounted on the shaft, at least one of the arms being movable axially along the shaft, a tissue engaging hook depending from the free end of each of the arms, a central arm mounted on the shaft intermediate the first said arms, a retractor blade mounted on the free end of the central arm, the central arm being movable axially along the shaft, pivotal about the axis of the shaft, and extensible transverse to the axis of the shaft, and means for locking the central arm on the shaft against all said movement simultaneously.

PREFERRED EMBODIMENT OF THE INVENTION

The objects and advantages aforesaid as well as other objects and advantages may be achieved by the surgical retractor claimed herein, a preferred embodiment of which is illustrated in the drawings in which:

FIG. 1 is a top plan view of the retractor;

FIG. 2 is a side elevational, cross-sectional view of the retractor taken along line 2-2 in FIG. 1;

FIG. 3 is a side elevational view of a central arm and an alternate form of clamp for mounting the central arm on a mounting shaft;

FIG. 4 is a view in perspective of an alternate shaft and collar for the clamp illustrated in FIG. 3.

Referring now to the drawings in detail and in particular to FIGS. 1 and 2, the surgical retractor comprises a mounting shaft 11 having a generally rectangular cross-sectional configuration. A pair of arms 12 and 13 are slidably mounted on the shaft 11. Each of the arms 12 and 13 is provided with a rigidly attached, axially elongated generally rectangular collar respectively 14 and 15. The internal passage 16 in the collar 14 or 15 is provided with a resilient friction plate 17. The friction plate 17 engages the shaft 11 thereby providing controlled slidable movement of the arms 12 and 13 along the shaft 11. However, the friction plate 17 does not positively retain the arms 12 and 13 in position on the shaft 11.

Each of the arms 12 and 13 is provided with an axial, internally threaded bore 18 adapted to receive a threaded thumb bolt 19. The end of the thumb bolt 19 engages the shaft 11 for positively locking the arms 12 or 13 in position on the shaft 11.

By reason of the fact that the shaft 11 has a generally rectangular cross-sectional configuration as does the passage 16 in the collars 14 and 15, the arms 12 and 13 move axially along the shaft 11 in opposition to each other in the same plane.

A central arm 20 is mounted on the shaft 11 by means of a clamp 21. The central arm 20 comprises a flat, elongated body member 22 having an elongated, generally longitudinal, transverse slot 23. The body member 22 has a radial enlargement 24 in proximity to one end thereof. Similarly, the slot 23 contains a radial, circular enlargement or hole 25 at the radial enlargement 24. An arcuate, depending tongue or blade 26 is formed on the body member 22 at the end opposite the radial enlargement 24. The tongue or blade 26 is both vertically arcuate and horizontally arcuate on both the internal and external faces thereof.

The clamp 21 comprises a U-shaped body portion 27 defining a pair of closely spaced apart legs 28 and 29. The slot 30 between legs 28 and 29 connects with a circular opening 31. A cylindrical passage or bore 31 receives a split, cylindrical plug 32 having a rectangular passage 33. An opening 34 extends between the rectangular opening 33 and the external surface of the plug 32.

The leg 29 is provided with a bore 35. Similarly, leg 28 is provided with a threaded bore 36 which is in axial registration with the bore 35. A thumb screw 37 having a threaded shaft 38 extends downwardly through the bore 35 and is threadably engaged in bore 36.

The body member 22 of the central arm 20 is mounted on top of the clamp 21 in contact with leg 29. The threaded shaft 38 extends downwardly through the slot 23 therein. The thumb screw 37 is provided with

a radial enlargement 39 having a diameter greater than the width of the slot 23 but slightly smaller than the diameter of the radial enlargement or hole 25 therein. The leg 29 of the clamp 21 is also provided with an upstanding post 40 which extends through the slot 23 in the central arm 20.

In operation, the shaft 11 is passed through the rectangular opening 33 in the cylindrical plug 32 of clamp 21. The rectangular opening 33 is dimensioned to snugly receive the shaft 11 but permit the clamp 21 to slide thereon when the thumb screw 37 is not tightened. The winged thumb member 41 of the thumb screw 37 fits through the slot 23 in the central arm 20, the radial enlargement 39 on the thumb screw 37 passing through the hole 25. The body portion 22 of the central arm 20 then lies on top of the leg 29 of the clamp 21, the post 40 extending upwardly through the slot 23. The threaded shaft 38 of the thumb screw 37 and the post 40 maintain the central arm 20 with its longitudinal axis, generally perpendicular to the longitudinal axis of the shaft 11. When the thumb screw 37 is loose, the cylindrical plug 32 may rotate within the bore 31 in the clamp 21 while, at the same time, the shaft 11 may slide through the passage 33 in the plug 32. This provides simultaneous movement of the arm 20 along the axis of the shaft 11 as well as pivotal or rotational movement of the arm 20 around or about the axis of the shaft 11. Moreover, the arm 20 is simultaneously extendible or retractable transverse to the axis of the shaft 11 by sliding along the slot 23. When the thumb screw 37 is tightened, the body member 22 of the central arm 20 is held tightly against the top of leg 29 by means of the radial enlargement 39 on the thumb screw 37. Simultaneously legs 28 and 29 are drawn together thereby compressing the split plug 32 in the cylindrical bore 31 of the clamp 21. This action tightly, frictionally engages and positively locks the plug 32 and hence the clamp 21 against movement along the shaft 11 as well as rotationally about the shaft 11 by means of rotation of the plug 32. If desired, any convenient mechanism may be employed to positively retain the plug 32 in the bore 31 of the clamp 21 as for instance, mating internal groove and pins inside of the bore 31 and on the external surface of the plug 32. However the plug 32 may be retained in the bore 31 merely by friction since the normal frictional engagement between the loosened rectangular bore 33 and the shaft 11 is substantially less than the normal frictional engagement between the split plug 32 and the bore 31. For purposes of sterilization, it is frequently desirable to be able to completely disassemble the clamp 21 including removal of the plug 32 from within the bore 31.

The free ends of the arms 12 and 13 opposite the collars 14 and 15 are provided with a dove-tailed recess 42. A generally U-shaped, depending hook 43 is detachably mounted to the free ends of each of the arms 12 and 13 by means of offset legs 44 and 45 which seat within the dove-tailed groove 42. The hook 43 is sufficiently resilient to permit compression so that the offset legs 44 and 45 may be slipped into the dove-tailed groove 42 from beneath. The particular shape and size of the hooks 43 is a matter of choice.

In operation, the arm 12 is mounted on the shaft 11 by passing it through the opening 16 in collar 14. The clamp 21 is then mounted on the shaft 11 by passing the shaft 11 through the rectangular passage 33 in the

split cylinder 32. The second arm 13 is then mounted on the shaft 11 in the fashion similar to arm 12. The central arm 20 is then mounted on the clamp 21 as described above, but the thumb screw 37 is not tightened. The hooks 43, 43 are intruded into the incision and the arms 12 and 13 spaced away from each other a desired distance. If it is necessary to positively lock the arms 12 and 13 in position, the threaded thumb bolts 19 are tightened to lock the collars 14 and 15 onto the shaft 11.

The central arm 20 is then positioned with respect to the three planes in space as desired with the tongue or blade 26 thrust deeply within the abdominal cavity if necessary. When the central arm has been hand-positioned to a desired location, it is fixed in all three planes of space simultaneously by tightening the thumb screw 37. The surgical retractor is now in position and surgery may proceed. If it is necessary to make adjustments during surgery, the thumb bolts 19 may be loosened selectively to slide the arms 12 or 13 along the shaft 11. Similarly, the thumb bolt 37 on the clamp 21 may be loosened to reposition the central arm 20 in any one or more of the three planes of space simultaneously and then quickly locked in position by retightening thumb screw 37.

An alternate form of clamp is illustrated in FIG. 3 and comprises a pair of flat legs 46 and 47 which are hingedly secured together at one end thereof of each by pin 48. Leg 46 is provided with a slot 49 having its long axis generally parallel to the axis of legs 46 and 47. Leg 47 is provided with a threaded bore 50 in general axial registration with the slot 49.

The opposed faces of legs 46 and 47 are each provided with semi-circular hemispherical grooves 51 and 52 in opposition to each other to define generally a cylindrical bore 53. The top of leg 46 is also provided with an upstanding pin 54 positioned generally along the axis of leg 46. A thumb screw 55 having a threaded shaft 56 extends downwardly through the slot 49 and is threadably engaged in the bore 50. The threaded thumb screw 55 is similar in design to thumb screw 37 having a wing 57 and a radial enlargement 58.

The alternate form of clamp 59 as illustrated in FIG. 3 is adapted to receive a shaft 60 having a circular cross-sectional configuration. In operation, when the thumb screw 55 is loose, the clamp 59 may be slid along the shaft 60 as well as rotated around its longitudinal axis. Similarly, an arm 61 identical in configuration to the arm 20 and mounted to the clamp 59 in the same fashion may be extended or retracted transverse to the axis of the shaft 60. When the thumb screw 55 is tightened, the legs 46 and 47 of clamp 59 are tightly locked around shaft 60 fixing both the clamp to the shaft locking it against movement along the shaft and rotation about the shaft as well as locking the arm 61 to the clamp 59.

In the event that it is desirable to employ a circular shaft, means should be provided for securing the arms 12 and 13 against rotation about the shaft. This may be accomplished by an alternate form of collar 62 illustrated in FIG. 4 having an internal, cylindrical passage 63 and a pair of internal, generally opposed longitudinal ribs 64 and 65 which are adapted to slidably engage longitudinal grooves 66 and 67 on the shaft 60. This will insure that the arms 12 and 13 will move toward and away from each other along shafts 60 in the same

plane providing what is frequently desired rigidity in the retractor.

The foregoing description is merely intended to illustrate an embodiment of the invention. The component parts have been shown and described. They each may have substitutes which may perform a substantially similar function; such substitutes may be known as proper substitutes for the said components and may have actually been known or invented before the present invention.

What is claimed is:

1. A multiply adjustable surgical retractor comprising,

- a. a mounting shaft, a pair of arms mounted on the shaft at least one of the arms being movable latitudinally along the shaft,
- b. a tissue engaging hook depending from the free end of each of the arms,
- c. a central arm mounted on the shaft intermediate the first said arms,
- d. a retractor blade mounted on the free end of the central arm,
- e. the central arm being movable latitudinally along the shaft, pivotal about the axis of the shaft and extensible transverse to the axis of the shaft,
- f. means for locking the central arm on the shaft against all said movement simultaneously, and
- g. means for positively restraining the central arm from pivoting toward either of the first said arms.

2. A multiply adjustable surgical retractor comprising,

- a. a mounting shaft, a pair of arms mounted on the shaft at least one of the arms being movable latitudinally along the shaft,
- b. a tissue engaging hook depending from the free end of each of the arms,
- c. a central arm mounted on the shaft intermediate the first said arms,
- d. a retractor blade mounted on the free end of the central arm,
- e. the central arm being movable latitudinally along the shaft pivotal about the axis of the shaft, and extensible transverse to the axis of the shaft,
- f. means for locking the central arm on the shaft against all said movement simultaneously,
- g. a clamp mounting the central arm to the shaft and providing means for locking the central arm against said movement, said clamp comprising,
- h. a generally u-shaped body member defining a pair of opposed legs spaced apart by a slot, the body member having a bore communicating with the slot,
- i. a split plug rotatably mounted in the bore, the plug having an opening through which the shaft extends, and
- j. means for drawing the legs toward each other, constricting the bore sufficiently to lock the plug sufficiently to lock in turn the shaft against axial movement with respect to the clamp.

3. A multiply adjustable surgical retractor comprising,

- a. the structure in accordance with claim 2 in which
- b. the central arm is slidably mounted on one leg of the clamp, and
- c. the said means for drawing the legs of the clamp toward each other simultaneously locks the central

arm to the clamp against movement transverse to the shaft.

4. A multiply adjustable surgical retractor comprising,

- a. the structure in accordance with claim 3 in which
- b. the central arm has an axial slot,
- c. the leg of the clamp upon which the central arm is mounted has a transverse bore communicating with the said slot,
- d. the opposite leg of the clamp has a threaded bore in general axial registration with the said transverse bore,
- e. a thumb-screw extending through the slot in the central arm and the said transverse bore and threadably engaged to the threaded bore, and
- f. a radial enlargement on the thumb-screw lying above the central arm and engageable thereto upon tightening the thumb-screw in the threaded bore to lock the central arm against movement transverse to the shaft.

5. A multiply adjustable surgical retractor comprising,

- a. the structure in accordance with Claim 1 and
- b. a collar on each of said arms, each collar having a passage shaped in dimension to slidably receive the shaft, and
- c. resilient means associated with each collar frictionally engageable between the collar and the shaft restraining each collar against slidable movement along the axis of the shaft.

6. A multiply adjustable surgical retractor comprising,

- a. the structure in accordance with claim 2 and
- b. the central arm having an elongated, longitudinal, transverse slot,
- c. an upstanding pin on the leg of the said body member adjacent to the said central arm normally extending through the said slot therein,
- d. said means for drawing opposed legs of the body member together being bolt means threadably engaged to the leg of the body member most distant from the central arm, the bolt means extending through said slot and the arm of the body member adjacent to the central arm,
- e. the pin and bolt means being spaced apart along the slot,
- f. abutment means associated with the bolt means compressibly engageable with the central arm upon drawing the arms of the clamp member together to secure the said central arm against longitudinal movement in the direction of the slot, rotatable movement about the shaft and latitudinal movement in the direction of the axis of the shaft simultaneously.

7. A multiply adjustable surgical retractor comprising,

- a. a mounting shaft, a pair of arms mounted on the shaft at least one of said arms being movable latitudinally along the shaft,
- b. a tissue engaging hook depending from the free end of each of said arms,
- c. clamp means movably mounted on the shaft, the clamp means being pivotal about the axis of the shaft and latitudinally movable along the axis of the shaft simultaneously,
- d. a central arm mounted on the clamp means spaced away from the shaft,
- e. the central arm being extensible on the clamp means transverse to the axis of the shaft, and
- f. means for simultaneously securing the central arm to the clamp means and the clamp means to the shaft against relative movement with respect to each other.