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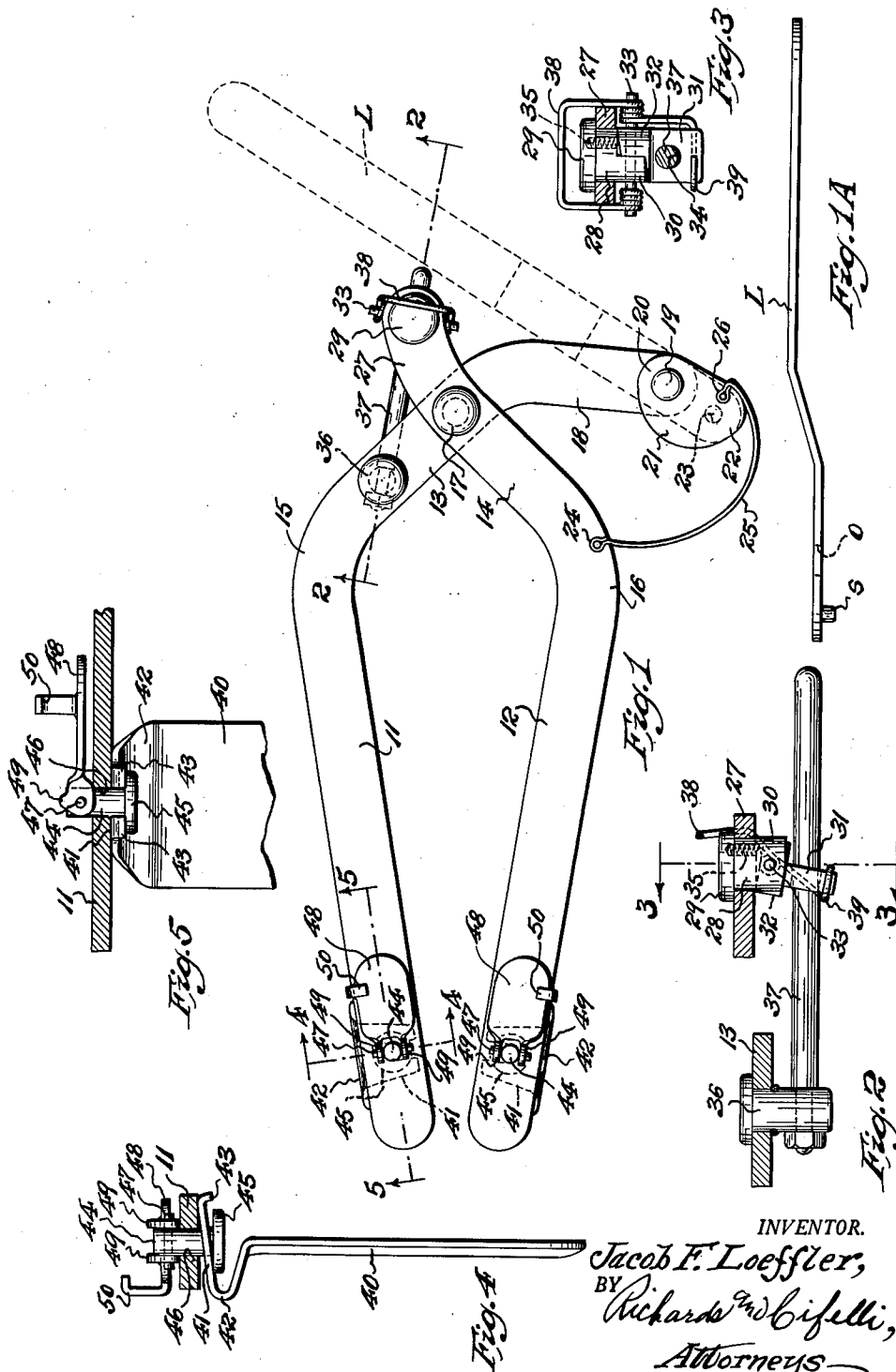
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ADJUSTABLE SURGICAL RETRACTOR

Filed Aug. 17, 1960

2 Sheets-Sheet 1



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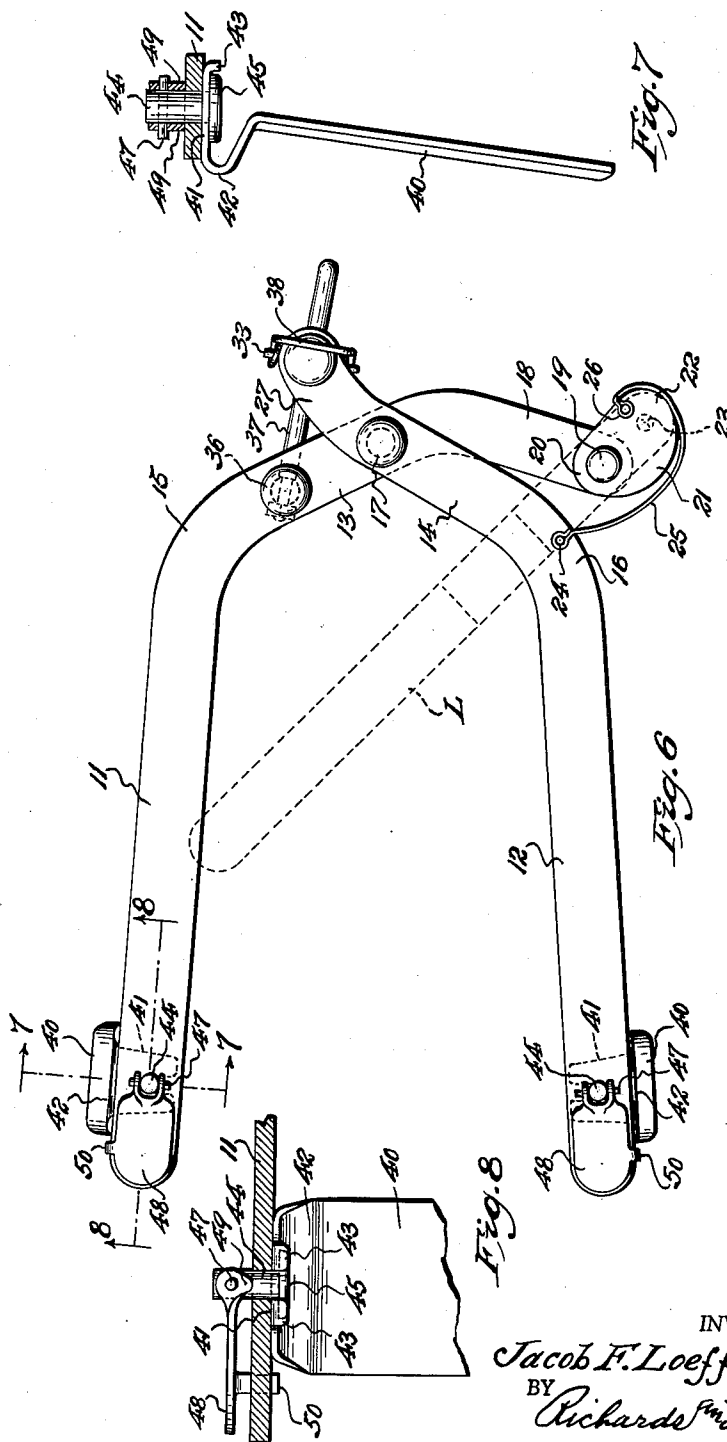
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2 Sheets-Sheet 2



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**ADJUSTABLE SURGICAL RETRACTOR**  
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8 Claims. (Cl. 128—17)

This invention relates to retractors for surgical use, and although especially well adapted for use in connection with performance of operations in the region of the thorax of the human body, is nevertheless also usable in connection with the performance of abdominal and pelvic surgery; and this invention has reference, more particularly to an improved incisional and bone retractor having retractor blades which are adapted to be entered through an incision so as to engage the margins thereof and underlying bordering parts, including adjacent ribs when present, whereby to spread open and hold open such parts, and thus to give the operating surgeon unimpeded access to body organs to be operated upon.

The invention has for an object to provide an adjustably expandible surgical retractor having improved means for manipulating the same to effect a desired span or spread of incision marginal portions and bordering parts, so that the surgeon can sense exerted pressure of retractor expansion and limit said pressure to a safe degree, whereby injury to the spread parts can be avoided.

The invention has another object to provide a simplified and improved releasable means for holding the expanded retractor against collapse; said holding means being adapted to automatically adjust its holding effect according and in correspondence to any degree of expansion to which the retractor may be moved, without necessity for manual locking manipulation of the holding means per se; manipulation of said holding means being required only for release of the same to permit collapse of the retractor.

The invention has for a further object to provide novel retractor blade members, including means for mounting the same on the retractor frame parts in an initial position which facilitates insertion thereof through an incision, and thereafter locking the same to the retractor frame in final position which assures against accidental outward displacement thereof from the incision opening.

The above and other objects will be understood from a reading of the following description of this invention in connection with the accompanying drawings, which show an illustrative embodiment thereof, in which drawings:

FIG. 1 is a plan view of a surgical retractor according to this invention, shown in its initial collapsed condition.

FIG. 1A is a side view of a detachable lever member by which expanding movement can be imparted to the retractor.

FIG. 2 is a fragmentary longitudinal sectional view, taken on line 2—2 in FIG. 1, showing the automatic holding means by which the retractor is held in an expanded condition against accidental collapse; and FIG. 3 is a transverse vertical sectional view, taken on line 3—3 in FIG. 2; these views being drawn on an enlarged scale.

FIG. 4 is a transverse vertical sectional view, taken on line 4—4 in FIG. 1; and FIG. 5 is a fragmentary longitudinal sectional view, taken on line 5—5 in FIG. 1; these views showing the initial position of a retractor blade and being drawn on an enlarged scale.

FIG. 6 is a plan view of the surgical retractor shown in an expanded condition.

FIG. 7 is a transverse vertical sectional view, taken on line 7—7 in FIG. 6; and FIG. 8 is a fragmentary longitudinal sectional view, taken on line 8—8 in FIG. 6;

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these views showing the final locked position of a retractor blade and being drawn on an enlarged scale.

Referring to the drawings, wherein like characters of reference denote corresponding parts, the retractor, according to this invention, comprises a pair of frame bars 11 and 12 which respectively terminate in inwardly and angularly extending rear end portions 13 and 14 integrally connected therewith by respective elbow sections 15 and 16. The rear end portion 13 of frame bar 11 underlaps the rear end portion 14 of frame bar 12, and at their point of intersection are pivotally connected together by a pivot pin 17, so that said frame bars can be swung one toward the other to a collapsed condition (see FIG. 1), or swung one away from the other to an expanded condition (see FIG. 6). Formed integral with the frame bar 11, to extend from its rear end portion 13, outwardly and angularly from the pivotal connection thereof with the rear end portion 14 of frame bar 12, is an arm 18. Pivotaly mounted on the free end of said arm 18, by an upstanding pivot stud 19 carried by the latter, is the inner end portion 20 of a cam piece 21. The outer end portion 22 of said cam piece 21 is provided with an opening or socket 23. So mounted on said arm 18 of frame bar 11, the cam piece 21 lies in the plane of the frame bar 12. Suitably connected in fixed attachment to the frame bar 12, is one end 24 of a flexible tie member 25, preferably comprising a spring metal strip. The opposite end portion of said tie member 25 extends around the outer or free end portion 22 of the cam piece 21, and is suitably connected, by an end 26 thereof, in fixed attachment to said outer or free end portion of the cam piece 21. By imparting rotary movement to the cam piece 21, draft is exerted upon the tie member 25, whereby the frame bars 11 and 12 can be swung apart and thus spread to expand the retractor, all in manner and by means hereinafter more particularly set forth.

Means is provided for automatically locking the frame bars 11 and 12 against collapse from any expanded or spread apart positions to which they are moved in use. The means for this purpose comprises an arm 27 that extends outwardly from the pivoted end of the frame bar 12, as an integral part thereof. Mounted in the free end portion of this arm 27, in swiveling relation thereto about a perpendicular axis, is a knuckle member 28, having an annular flange or head 29 to seat upon the upper face of said arm 27, so that the knuckle member depends from the underside of said arm. The lower free end of said knuckle member is diametrically cut away to provide a dependent half section or hinge portion 30. Supported by said knuckle member 28, to depend therefrom, is a tiltable lock piece 31, the upper end portion of which is diametrically cut away to provide a half section or hinge portion 32, the diametric face of which is opposed to the diametric face of the hinge portion 30 of the knuckle member 28. The hinge portions 30 and 32 are pivotally connected by a transverse pivot pin 33, whereby the lock piece 31 can be tilted or canted to an inclined relation to the axis of the knuckle member 28 and inwardly toward the frame bar 11. The lock piece is provided with an opening 34 extending therethrough from the inner face to the outer face thereof. The lockpiece is yieldably urged to its upwardly tilted or canted position by a compression spring 35 which is mounted in a cavity with which the knuckle number 28 is provided, and which is disposed parallel to the axis of the knuckle numbers in outwardly offset relation to the pivot pin 33. Said spring 35 thrusts against the upper end of the lock piece hinge portion 32 with lock piece tilting effect. Mounted in connection with the frame bar 11, in suitably spaced away relation to its pivotal connection with the frame bar 12, is

a pivoting stud 36 which depends from the underside of frame bar 11. Affixed to this pivoting stud 36, for outward extension therefrom, in a plane parallel to the planes of the frame bars, is a lock bar 37. This lock bar extends through the opening 34 of the lock piece 31.

Means is provided for manually retracting the lock piece 31 from its tilted locking and normal gripping relation to the lock bar 37, whereby to release the locking means so as to permit collapse of the frame bars 11 and 12 from an expanded condition thereof. This means comprises a release lever 38 which is pivotally supported by the pivot pin 33 by which the lock piece 31 is hinged to the knuckle member 28, the lower arm 39 of said release lever being adapted to engage or embrace the lower end of the lock piece 31 (see FIGS. 2 and 3).

Each frame bar is adapted to support at least one retractor blade which is adapted to be entered in an incision cavity to engage and hold back the cavity sides in spread apart relation, when the retractor is expanded in use. According to this invention, a novel construction of retractor blade and means for mounting the same on a frame bar of the retractor is provided. Each said retractor blade comprises a blade body 40 of suitable size and shape, which is formed at its upper end with a transversely seating fork 41. This seating fork is upwardly and rearwardly inclined relative to the perpendicular plane of the blade body, and is connected to the latter by an outwardly offset elbow connection 42. The free ends of the seating fork 41 terminate in down turned keeper lugs 43, for purposes subsequently referred to.

The means for attaching this retractor blade body to a frame bar comprises a knuckle stud 44, having a diametrically enlarged flange or head 45 at its lower end to engage and support the seating fork 41 of the retractor blade body. The knuckle stud 44 extends upwardly through an opening 46 in the frame bar, so as to be rotatably and axially movable relative to said frame bar. Pivotally connected to the upper end of the knuckle stud 44, by a transverse pivot pin 47, is a cam lever 48, which overlies the upper or top face of the frame bar. This cam lever 48 is provided, at its pivoted end, with a cam formation 49. The cam lever 48 is also provided, adjacent to its free end, with a laterally offset lock down hook 50.

When the cam lever 48 is swung inwardly to released position (see FIGS. 1, 4 and 5), the cam formation 49 thereof is inoperative, and the knuckle stud 44 moves axially downward to space its head 45 away from the underside of the frame bar. When the knuckle stud is in this position, the angular fork 41 of the retractor blade body 40 can be inserted and engaged around the knuckle stud 44, so as to be between the underside of the frame bar and the head 45 of said knuckle stud, whereby the retractor blade body is suspended from the frame bar in a plane perpendicular to the plane of the latter. When the retractor blade body is thus initially positioned, the insertion thereof into an incision cavity, while the retractor is in collapse condition, is facilitated.

The retractor blade body, as thus initially attached to a frame bar, can be easily inserted into an incision cavity, and thereafter the retractor can be expanded to spread the incision cavity. This having been done, the cam lever 48 is swung outwardly to its operative position (see FIGS. 6, 7 and 8), thus engaging the cam formation 49 with the top face of the frame bar. In such operative position, the cam formation 49 exerts an upward pull upon the knuckle stud 44, which draws the latter upward, thus lifting its head 45 against the work 41 of the retractor blade body, and thereby pressing and binding said fork against the under face of the frame bar in parallel relation thereto, thereby, at the same time, swinging outward the retractor blade body 40 to an outwardly and downwardly inclined position against the sides of the incision cavity engaged thereby. Such disposition of the

retractor blade body tends to resist accidental outward displacement or withdrawal of the same from the expanded incision cavity. In this manner, not only is the retractor blade body advantageously positioned within the incision cavity, but is also locked to the frame bar against accidental detachment therefrom, while said blade body is nevertheless free to rotate the knuckle stud 44, whereby to allow the blade body to readily adjust itself to the walls of the incision cavity. When the cam lever 48 is operatively position as described, it can be locked against accidental displacement from such position by engaging its lock down hook 50 around a margin of the frame bar. When the fork 41 of the blade body 40 is abutted against the underside of a frame bar, the keeper lugs 43 of the fork 41 will lap the head 45 of the knuckle stud 44 (see FIGS. 7 and 8), thus preventing accidental detachment of the retractor blade body from its connected and support relation to and by the frame bar.

In the use of the retractor of this invention, an incision to be spread having been made by the surgeon, the retractor is collapsed to bring its frame bars 11 and 12 together (see FIG. 1), and the retractor blade bodies 40 are attached to the respective frame bars in their initial perpendicular dependent relation thereto (see FIG. 4), so that easy insertion of the same into the incision cavity can be effected.

The collapsed retractor having been applied to the incision cavity to be expanded, the retractor is ready to be expanded so as to spread open the incision cavity. Means is provided to cause expanding movement of the retractor. This means comprises a lever member L (shown in FIG. 1A), the same having an opening O for reception of the pivot stud 19 by which the cam piece 21 is pivoted to arm 18 of frame bar 11, and a dependent coupler stud S adapted to be engaged in the socket 23 of said cam piece 21. The operative application of said lever member L to the collapsed retractor is indicated by broken lines in FIGS. 1 and 6. As operatively applied, the lever member L is fulcrumed on the pivot studs 19 and its coupler stud S is entered in the socket 23 of the cam piece 21. When thus applied to the retractor, the lever member L can be manipulated by the surgeon to rotate the cam piece 21 in counterclockwise direction. When the cam piece is so rotated, draft is transmitted through the tie member 25, which is operative to cause the frame bars 11 and 12, and the retractor blades carried thereby, to swing apart (see FIG. 6), thus spreading apart the walls of the incision cavity with which said retractor blade bodies are engaged. The advantage of such spreading manipulation of the retractor frame bars is that the surgeon can feel or sense the degree of spreading pressure exerted by the retractor upon the body parts engaged thereby, including ribs, e.g. when the latter are engaged, and consequently it is easy for the surgeon to gauge such pressure, and to limit the same to a safe degree, so that excessive pressure with possible injury to the spread parts can be avoided.

When the retractor has been expanded to the desired degree, its spread apart frame bars are automatically locked against collapse by the grip of the tilted lock piece 31 upon the lock bar 37. The retractor having been expanded, the retractor blade bodies 40 can be locked to the frame bars, and outwardly and downwardly inclined to holding engagement with the sides of the incision cavity, by swinging over to operative positions the cam levers 48, as and for the purposes already above described. The manipulating lever member L can now be removed, and the surgical operation can be proceeded with.

Upon completion of the surgical operation, in connection with which the retractor is used, and it is desired to collapse and remove the retractor from the incision cavity, the release lever 38 can be manipulated to swing back the lock piece 31 from its normal tilted and operative position, whereby to release the grip thereof, upon the

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lock bar 37, so that the latter can slide freely outwardly through the opening 34 of the lock piece, and thus free the frame bars 11 and 12 from resistance to in swinging movement and consequently allowing the retractor to be closed to an initial collapsed condition.

Having now described my invention, I claim:

1. A surgical retractor comprising pivotally joined relatively movable frame members for supporting retractor blades adapted to be entered into an incision cavity to spread open the same, means for expanding said frame members comprising an outwardly extending arm projecting from the pivoted end of one frame member, a pivot stud carried by said arm, a cam piece rotatably mounted on said pivot stud, a flexible tie member connected by one end to the free end portion of said cam piece and by its opposite end to the other frame member, a lever member detachably applicable to said pivot stud, said lever member and cam piece having cooperative means to couple the same, whereby said cam piece can be operatively rotated by said lever member to expand said frame members, and releasable means to automatically hold the expanded frame members against collapse, said latter means comprising an outwardly extending arm projecting from the pivoted end of said second mentioned frame member, a rotatable knuckle member dependent from said last mentioned arm, a spring tilted perforate lock piece pivotally supported by said knuckle member, a lock bar pivotally connected with said first mentioned frame member to extend through said lock piece, whereby to be gripped thereby and held against movement in frame member collapsing direction, and manipulatable means to release said lock piece from its gripping engagement with said lock bar.

2. A surgical retractor according to claim 1 wherein the manipulatable means to release the lock piece comprises release lever means pivotally supported by the knuckle member and engaged with said lock piece.

3. A surgical retractor comprising pivotally joined relatively movable frame members, retractor blade means respectively attached to respective frame members and adapted to be entered into an incision cavity to spread open the same when the frame members are expanded, said retractor blade means each comprising a blade body provided at its upper end with a transverse fork member upwardly and rearwardly inclined relative to the perpendicular plane of the blade body, means for attaching the blade body in dependent relation to a frame member comprising a knuckle stud extending upwardly through a frame member in rotatable and axially movable relation thereto, said knuckle stud having an enlarged head at its lower end to loosely engage the fork member of the blade body in straddling relation to the knuckle stud and inclined to the plane of said frame member, whereby to initially suspend said body perpendicular to the plane of said frame member, and a cam lever pivotally connected with the upper end of said knuckle stud and movable, by engagement with the frame member, to lift said knuckle stud, whereby to bind said fork member between the head thereof and the frame member in parallel plane to the latter, and thereby swing the blade body from an initial position perpendicular to the plane of the frame member to an outwardly and downwardly inclined position relative to said frame member.

4. A surgical retractor according to claim 3, wherein the cam lever is provided with lock down means engageable with the frame member to thereby hold said cam lever against accidental displacement from its operative position which locks the blade body to the frame member.

5. A surgical retractor comprising pivotally joined relatively movable frame members, means for expanding

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said frame members comprising an outwardly extending arm projecting from the pivoted end of one frame member, a pivot stud carried by said arm, a cam piece rotatably mounted on said pivot stud, a flexible tie member connected by one end to the free end portion of said cam piece and by its opposite end to the other frame member, a lever member detachably applicable to said pivot stud, said lever member and cam piece having cooperative means to couple the same, whereby said cam piece can be operatively rotated by said lever member to expand said frame members, releasable means to automatically hold the expanded frame members against collapse, retractor blade means respectively attached to respective frame members and adapted to be entered into an incision cavity to spread open the same when the frame members are expanded, said retractor blade means each comprising a blade body, provided at its upper end with a transverse fork member upwardly and rearwardly inclined relative to the perpendicular plane of the blade body, means for attaching the blade body in dependent relation to a frame member comprising a knuckle stud extending upwardly through a frame member in rotatable and axially movable relation thereto, said knuckle stud having an enlarged head at its lower end to loosely engage the fork member of the blade body in straddling relation to the knuckle stud and inclined to the plane of said frame member whereby to initially suspend said blade body perpendicular to the plane of said frame member, and a cam lever pivotally connected with the upper end of said knuckle stud and movable, by engagement with the frame member to lift said knuckle stud, whereby to bind said fork member between the head thereof and the frame member in parallel plane to the latter, and thereby swing the blade body from an initial position perpendicular to the plane of the frame member to an outwardly and downwardly inclined relation to said frame member.

6. A surgical retractor according to claim 5, wherein the cam lever is provided with lock down means engageable with the frame member to thereby hold said cam lever against accidental displacement from its operative position which locks the blade body to the frame member.

7. A surgical retractor according to claim 5, wherein the releasable means to automatically hold the expanded frame member against collapse comprises an outwardly extending arm projecting from the pivoted end of the second mentioned frame member, a rotatable knuckle member dependent from said last mentioned arm, a spring tilted perforate lock piece pivotally supported by said knuckle member, a lock bar pivotally connected with said first mentioned frame member to extend through said lock piece, whereby to be gripped thereby and held against movement in frame member collapsing direction, and manipulatable means to release said lock piece from its gripping engagement with said lock bar.

8. A surgical retractor according to claim 7 wherein the cam lever of each retractor blade means is provided with lock down means engageable with the frame member to thereby hold said cam lever against accidental displacement from its operative position which locks the retractor blade body to the frame member.

#### References Cited in the file of this patent

#### UNITED STATES PATENTS

|           |             |                |
|-----------|-------------|----------------|
| 2,450,194 | Glaser      | Sept. 28, 1948 |
| 2,493,598 | Rozek       | Jan. 3, 1950   |
| 2,670,731 | Zoll et al. | Mar. 2, 1954   |
| 2,751,902 | Loeffler    | June 26, 1956  |
| 2,893,378 | Cooper      | July 7, 1959   |