

Jan. 23, 1962

A. SAMPSON

3,017,637

SURGICAL SUTURING INSTRUMENT

Filed July 10, 1959

2 Sheets-Sheet 1

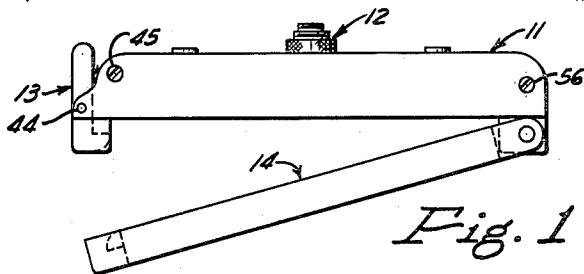


Fig. 1

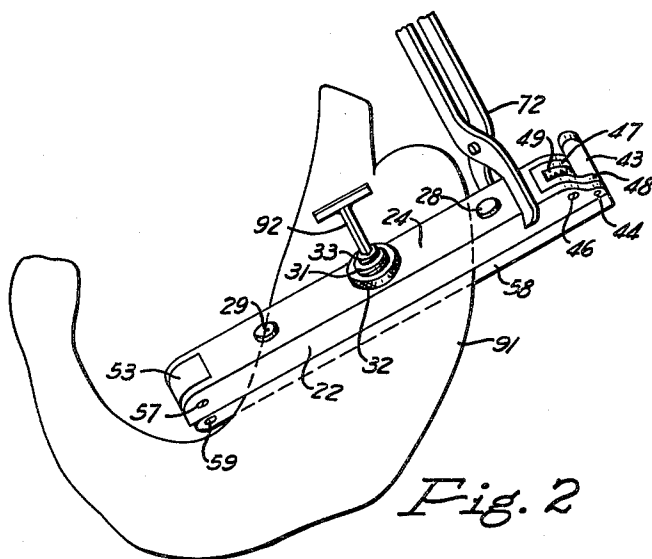


Fig. 2

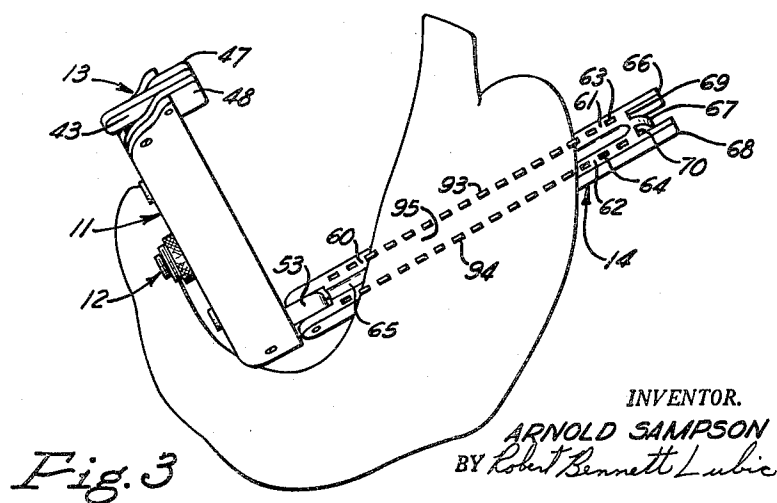


Fig. 3

INVENTOR.
ARNOLD SAMPSON
BY Robert Bennett Lubie

ATTORNEY

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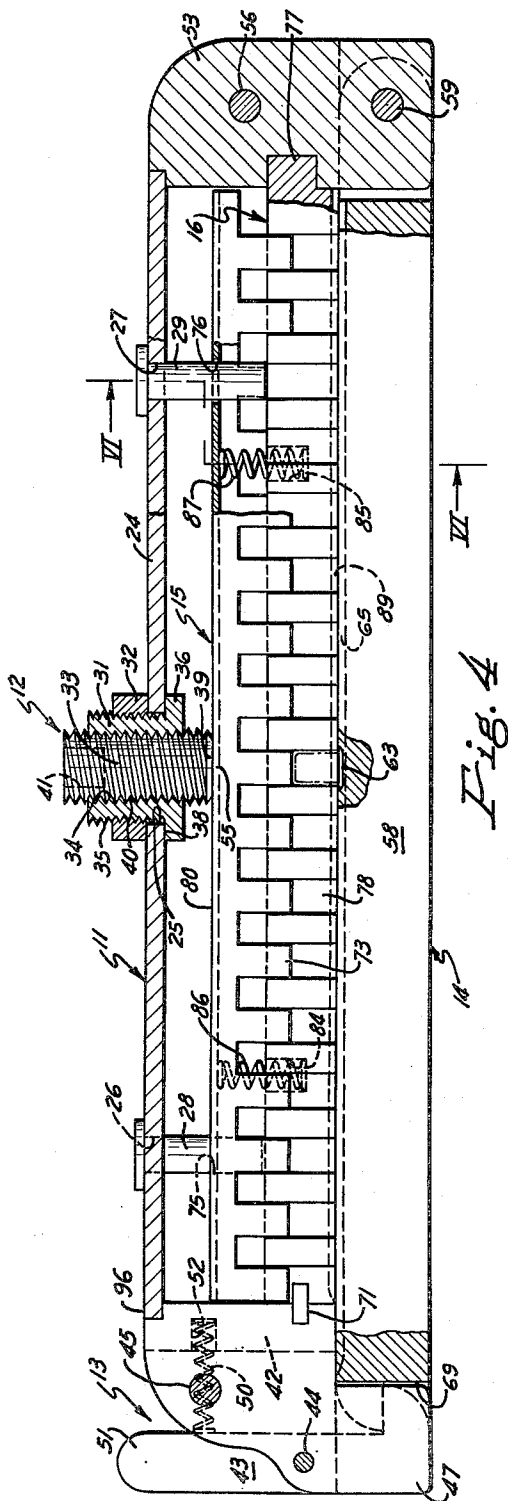


Fig. 4

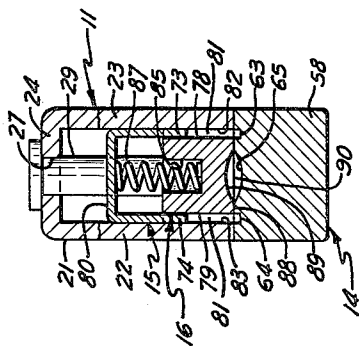


Fig. 5

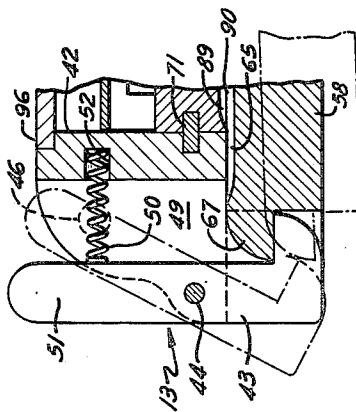


Fig. 6

INVENTOR.
ARNOLD SAMPSON
BY Robert Bennett Lurie

ATTORNEY

1

3,017,637

SURGICAL SUTURING INSTRUMENT

Arnold Sampson, Churchill, Pa.
(3445 Ridgewood Drive, Pittsburgh, Pa.)

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4 Claims. (Cl. 1—50)

My invention relates to an improved surgical suturing instrument and, more specifically, to a manually operated multiple stapling device adaptable to subtotal gastrectomies (bisections of the stomach) by the simultaneous insertion of a multiple number of staples longitudinally along two parallel rows.

Initially, subtotal gastrectomies were performed by manually stitching two seams across the stomach to provide a path for the transection thereof without interference from the contents therein. Subsequently, various wire stitching apparatus were developed.

Although a definite improvement over the manual stitching process in subtotal gastrectomies, these wire stitching instruments suffer from several inherent disadvantages. None of these instruments presently available have proved suitable where a relatively high bisection of the stomach is required. This occurs where the lesion of the stomach to be removed lies high upon the stomach wall or where an extensive resection is desirable as in a more effective gastrectomy for peptic ulcers. Because of the construction of these older instruments, they are not adaptable to a high positioning across the stomach or to a positioning at any angle desired. This is important not only where a high resection of the stomach is required, but also where, although still in the experimental stage, it is deemed propitious to preserve that portion of the stomach bordering what is known as the lesser curvature thereof while removing as much of the greater curvature area as possible. This it is believed may prove very important in subtotal gastrectomies for ulcers because of the construction of the stomach. The region bordering the perimeter of the lesser curvature aforesaid is comprised of approximately 50% acid bearing cells and this percentage increases laterally across the stomach to a point of 100% acidity on the greater curvature perimeter. In an operation for ulcers, it would be highly desirable to lessen the recurrence thereof by decreasing the amount of acid bearing cells. Therefore, any operation whereby the greater part of the lesser acid bearing region can be retained and, reciprocally, the greater part of the higher acid bearing region removed, could prove of significant value since it is known that the amount of acid in the stomach has a direct effect upon an ulcerated condition. The above desired result can be accomplished by transecting the stomach at approximately a 45° angle from a low position on the lesser curvature to a point near the upper end of the greater curvature. Because of the length, bulkiness and awkwardness of the older instruments, it is impossible to adapt them to a position for suturing along the aforescribed 45° angle path as required in this experimental operation. The subject invention being small, compact and highly maneuverable, is adaptable to any type of anatomical suturing and can be positioned around the stomach at any point with ease no matter how high or at what angle.

In addition to ease of positioning the subject invention is an improvement over the older instruments in this field due to its simplified working mechanism. The staples in the older instruments are actuated by gear type mechanisms which have a tendency to wear down and become ineffective with frequent use. The staples in the subject invention are actuated by a hammer device which is more durable and thus will not wear down or out as fast.

Other details, objects and advantages of the subject in-

2

vention will become apparent as the following detailed description of a present preferred embodiment thereof proceeds.

In the accompanying drawings are illustrated a present preferred embodiment of the subject invention in which—
FIGURE 1 is a side elevational view of the instrument in opened position.

FIGURE 2 is a perspective view showing the instrument closed around a stomach with a key inserted in the actuating mechanism and a clamping device enclosing the instrument.

FIGURE 3 is a perspective view showing the opened instrument after the staples have been actuated into the stomach.

FIGURE 4 is a broken away detailed side elevation view of the instrument in closed position.

FIGURE 5 is a fragmentary detail view, broken away, to show the locking member.

FIGURE 6 is a cross-sectional view taken along line VI—VI of FIGURE 4.

The subject instruments, a suturing clamp, broadly comprises an upper member containing the staple actuating mechanism and adapted for positioning on one side of the stomach, a lower jaw member, against which the staples are compressed, pivoting on one end of the upper jaw member and adapted for positioning on the opposite side of the stomach from said upper jaw member, and a locking member suitably shaped on the opposite end of said upper and lower jaw member from the pivot and adapted to firmly securing the aforesaid members together in substantially parallel planes. Means are provided for conveniently actuating these members into substantially parallel planes.

The stapler actuating mechanism broadly comprises a guide with slots for containing staples, a hammer device with vertical teeth substantially aligned above the aforesaid slots for depressing the staples contained therein out of said slots and against the lower jaw member, and a threaded bolt member for actuating said hammer device. Means are provided for actuating the bolt member.

More specifically the upper jaw member 11 in FIGURE 1 comprises an inverted U-shaped bar in cross section 21 (FIGURE 6) with two side walls 22 and 23 connected by a top wall 24. The top wall has a large, centrally located, opening 25 (FIGURE 4) and two smaller openings 26 and 27 on either side thereof. Two vertical direction rods 28 and 29 are positioned within the two smaller openings and rigidly suspended therefrom.

The threaded bolt member 12 in FIGURE 1 is comprised of a sleeve 31, a locknut 32 and an adjusting screw 33 as shown in FIGURES 2 and 4. The sleeve 31 is cylindrical in shape with internally 34 and externally 35 threaded surfaces and positioned vertically within the central opening 25 in the upper jaw's top wall 24. The sleeve 31 has a wide flanged pedestal lower end 36 which provides an extension of the threaded inner surface 34 and is adapted to positioning on the under surface 38 of the upper jaw's top wall 24. The hollow cylinder shaped locknut 32, is threadably positioned around the sleeve 31 so that the sleeve is firmly secured in the upper jaw opening 25 between its lower flanged end 36 and said locknut 32. A partially hollow cylinder shaped adjusting screw 33 with a solid lower end 39 and a threaded external surface 40, is threadably positioned within the sleeve 31 and adapted to spiral journalling therein by the insertion of a turning device, such as a key 92 (FIGURE 2), within its hollow 41.

The locking member 13, as shown in FIGURE 5, more specifically comprises a latch bracer 42 and a dog's leg latch 43. The latch bracer 42 is positioned at one end 96 of the upper jaw 11 by a pivot pin 44 and two screws

on either side thereof 45 (FIGURE 4) and 46 (FIGURES 2 and 5). The bracer end opposite the upper jaw has two claws 47 and 48 (FIGURES 2 and 3) suspended therefrom with a vertical cleavage 49 between. The latch 43 is positioned vertically within said cleavage 49, on the pivot pin 44, and adapted to lock around one end of the lower jaw member 14 (FIGURE 1) by means of a compression spring 50 positioned between the upper end of the latch 51 and a recess 52 in the latch bracer 42.

The lower jaw member 14 more specifically comprises a hinge attachment 53 (FIGURE 4) positioned at the end of the upper jaw 11 opposite the locking member 13, by two screws 56 and 57 on either side thereof and an elongated rectangular anvil bar 58 adapted to pivot upon said hinge attachment 53 by a pivot pin 59 inserted therein. The upper surface of the anvil bar 60 (FIGURE 3) has two parallel ridges 61 and 62, each containing a longitudinal series of indentations 63 and 64, for receiving and clinching staple prongs, and a longitudinal groove 65 (FIGURE 6) in between. The anvil bar end opposite the pivot it tri-pronged 66, 67 and 68, thus creating two slots 69 and 70 between said prongs. The middle prong 67 serves as a curved latch shoulder upon which the latch 43 is hooked when the lower 14 and upper jaw 11 members are clamped into substantially parallel planes as shown in FIGURE 2. The slots between the prongs 69 and 70 are adapted to receive the two latch bracer claws 47 and 48 when the instrument is locked in place and thus laterally enforce the locking mechanism 13.

The hammer device 15, as shown in FIGURES 4 and 6, contains a series of vertical teeth 73 and 74 on either side thereof folded downward and perpendicular to its horizontal plane 80. There are two openings 75 and 76 in the horizontal surface 80 of the hammer device 15 aligned so that the two suspended vertical direction rods 28 and 29 are positioned therein as guides for any reciprocal motion of said hammer device 15.

The staple guide 16 (FIGURES 4 and 6) is firmly positioned below and parallel to the hammer bar 15 by a slotted connection 77 with the hinge attachment 53 at one end and a keyed connection 71 with the latch bracer 42 at the other. There are a series of longitudinal slots 78 and 79 on each side of the guide 16 forming a series of staple-aligning openings 81 in conjunction with the inner surfaces 82 and 83 of the upper jaw's side walls 22 and 23. These staple-aligning openings are aligned directly below the hammer device's teeth 73 and 74 so that these teeth are easily received in the staple-aligning openings 81 when the hammer device 15 is depressed. On the upper surface of the guide are two recesses 84 and 85 in which two compression springs 86 and 87 are recessed for elevating the hammer device 15 when the latter is not depressed by the adjusting screw 33 upon the guide 16. The under surface 88 of the guide 16 has a longitudinal groove 89 opposite the milled groove 65 on the upper surface of the anvil bar 58, providing a predetermined space 90 between the upper 11 and lower jaw 14 members when these are latched together so that the clamped stomach tissue 91 is firmly secured without injurious crushing thereof.

Prior to the operation for which this instrument is adapted the staple-aligning openings 81 are loaded with U-shaped snug fitted clinch staples of any suitable ductile and non-corrosive material, such as silver, silver alloy, plastics or the like. The upper jaw 11 and lower jaw 14 are then brought together either side of the stomach 91 in substantially parallel planes as shown in FIGURE 2, by clamping means 72 thus causing the latch 43 to hook around the curved latch shoulder 67 and lock said members in this position. A turning device such as a key 92 is then inserted within the hollow 41 of the adjusting screw 33 and twisted so that the adjusting screw 33 is spirally depressed thus exerting pressure with its solid lower end 39 against the center of the hammer device 55 (FIGURE

4) and in turn depressing the hammer device 15 against the compression springs 86 and 87 and the guide 16. In this manner the two rows of hammer teeth 73 and 74 are driven into the staple-aligning openings 81 and against the up-turned yokes of the U-shaped staples forcing the staples down through the stomach 91 and against the indentations 63 and 64 on the upper surface 60 of said anvil bar 58 wherein, the prongs of said staples are caused to turn inward so as to clinch around the stomach tissue 91 through which they have penetrated. The clamping device 72 is then once more applied to free the latch 43 from the latch shoulder 67 so that the instrument can be opened and removed from the stomach 91 leaving two parallel rows of sutures 93 and 94 which provide a path 95 for transecting the stomach 91. The turning device 92 is then twisted in reverse so that the adjusting screw 33 is spirally actuated upward, thus relieving the pressure against the compression springs 86 and 87 and, in turn, permitting them to elevate the hammer device 15. The staple-aligning openings 81 are now free for reloading in preparation for another operation.

While there are above disclosed but a limited number of embodiments of the structure, process and product of the invention herein presented, it is possible to produce still other embodiments without departing from the inventive concept herein disclosed, and it is desired therefore that only such limitations be imposed on the appended claims as are stated therein, or required by the prior art.

Having disclosed my invention, I desire to claim it as follows:

1. A stomach suturing instrument for stapling tissue comprising a clamp having a pair of elongated jaws, means pivotally connecting said jaws on one end, means for automatically locking said jaws in closed relation at the other end, one of said jaws having a pair of staple-aligning openings with a longitudinal groove between said openings extending from said pivotal connection to immediately adjacent said locking means, the other of said jaws having a longitudinal series of indentations with a corresponding longitudinal groove between said indentations and screw actuated means for driving staples through said aligning openings into said indentations.

2. In a suturing instrument as claimed in claim 1 wherein one of said jaws comprises an elongated bar, inverted U-shaped in cross section having two side walls connected by a top wall for housing of the screw actuating and staple driving means.

3. In a suturing instrument as claimed in claim 1 wherein said screw actuating means comprise a cylindrical sleeve, internally and externally threaded, with a wide flanged lower end, a cylindrical locknut threadably positioned around the external surface of said sleeve and a partially hollow cylindrical adjusting screw, threadably positioned within said sleeve and adapted to spiral journaling therein when actuated by any turning device inserted within its holes.

4. In a suturing instrument as claimed in claim 1 wherein said staple driving means comprise an elongated hammer bar, below and adjacent to the screw actuating means, having a series of longitudinally positioned vertically hung teeth on either side thereof and perpendicular thereto and adapted to insertion into said staple-aligning openings upon pressure from said screw actuating means.

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