

March 14, 1944.

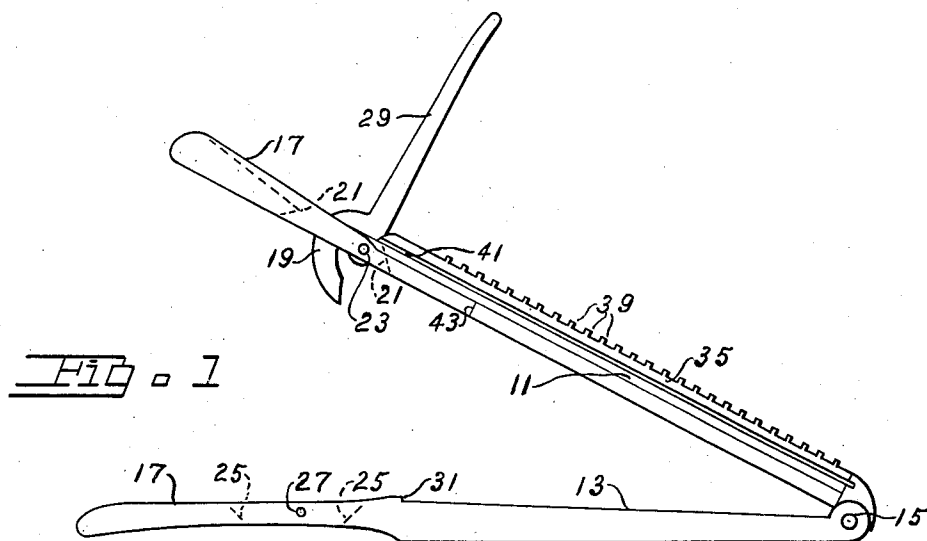
G. A. WILSON ET AL

2,344,071

SURGICAL STITCHING APPARATUS

Filed Oct. 5, 1942

2 Sheets-Sheet 1



March 14, 1944.

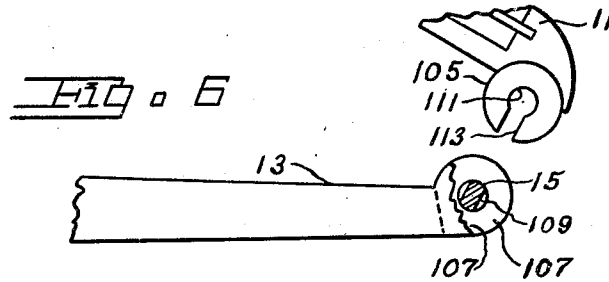
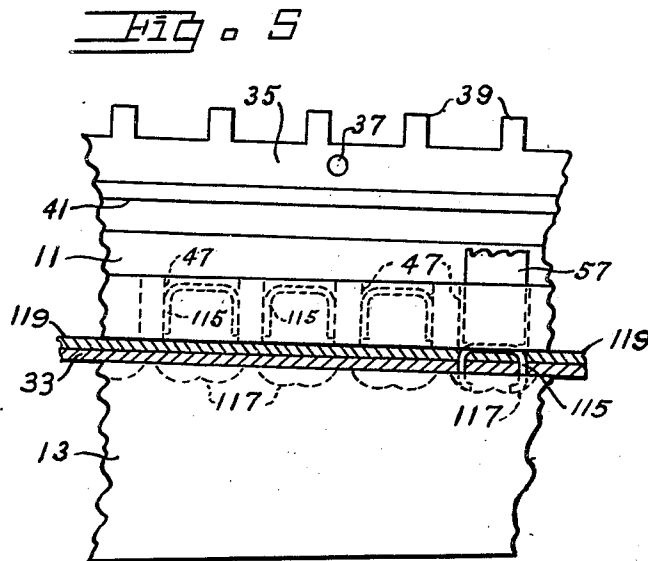
G. A. WILSON ET AL

2,344,071

SURGICAL STITCHING APPARATUS

Filed Oct. 5, 1942

2 Sheets-Sheet 2



INVENTORS.
GERALD A. WILSON
LYMAN E. SPENCER
BY *J. D. Hicks*
THEIR ATTORNEY

UNITED STATES PATENT OFFICE

2,344,071

SURGICAL STITCHING APPARATUS

Gerald A. Wilson and Lyman E. Spencer,
Detroit, Mich.

Application October 5, 1942, Serial No. 460,740

4 Claims. (Cl. 1—49.1)

Our invention pertains to surgical apparatus and more particularly stitching apparatus for stitching together dissected tissues.

It is an object of our invention to provide improved stitching apparatus which will make stitches evenly snug from one end of an incision to the other.

It is also an object of our invention to provide the combination of a clamp for clamping together tissue to be dissected and a stitching head movably associated with one of the clamp members providing reliable and positive operation, and improved visibility and the parts of which are of a simplified, rugged construction convenient to assemble or separate.

It is a further object of our invention to provide an improved stitching head or carriage for such apparatus.

Further objects and advantages are within the scope of my invention such as relate to the arrangement, operation and function of the related elements, to various details of construction and to combinations of parts, elements per se, and to economies of manufacture and to numerous other features as will be apparent from a consideration of the specification in conjunction with the drawings disclosing a form of my invention, in which:

Fig. 1 is a side elevational view of the clamp in opened position, the stitching head being removed;

Fig. 2 is a side elevational view showing the clamp closed with the stitching head in operative position on the upper clamp member;

Fig. 3 is a cross-sectional view taken on line 3—3 of Fig. 2;

Fig. 4 is a cross-sectional view taken along line 4—4 in Fig. 3;

Fig. 5 is a greatly enlarged fragmentary view of short portions of the two clamping members in clamped relation, showing the space provided therebetween, staples, a stapling plunger, and the staple guiding slots and clinching surfaces being represented by dotted lines; and

Fig. 6 is an enlarged fragmentary detail view, partially broken away and sectioned, to show the quick detachable clamp joint.

Referring more particularly to Fig. 1 of the drawings, our surgical stitching apparatus comprises a clamp for holding together the dissected tissues which are to be stitched together. The clamp, which is shown open in Fig. 1 consists of a pair of clamp members 11 and 13 hinged together at one end on a pivot pin 15 for relative pivotal movement. The opposite ends of the

clamp members are suitably shaped to provide convenient handles 17 to be gripped for swinging the members together and closing the clamp to secure the edges of tissues therebetween.

A latch 19 is provided in a slot 21 centrally disposed in the handle end of the upper clamp member 11 where it is pivotally journaled upon a pivot pin 23. The latch 19 extends toward the lower clamp member 13 and, when the clamp is closed, it projects into a slot 25 centrally disposed in the handle end of the lower clamp member where it engages around or under a latch pin 27. A lever 29 extends from the latch 19 and projects from the upper clamp member in a convenient position for manipulation.

After the clamp members have been manually gripped together lever 29 and the latch 19, which are initially in the dotted line position as shown in Fig. 2, are rotated counter-clockwise to the full line position so that the latch passing under the pin 27 secures the clamp together.

An abutment 31 rises from the end of the lower clamp member 13 adjacent the handle and engages the adjacent side of the other clamp member 11 providing a predetermined space 33 between the two pivoted clamp members, when these are latched together as shown in Fig. 2, so that clamped tissues are firmly secured without injurious crushing. The pivot 15 at the other or hinged end of the clamp is so made that the space 33 is uniform throughout the length of the clamp.

Secured along the upper portion of one side of the upper clamp member 11 is a rack tooth strip 35 which is secured snugly by rivets 37 in a recess in the upper left-hand corner of the cross section, as shown in Fig. 3. The rack teeth 39 project from the strip 35 above the upper side of the upper clamp member 11. Guide grooves 41 are cut in both opposite sides of the upper clamp member 11 extending therealong from the pivot end and opening at the end adjacent the handle. Secured on and extending along opposite sides of the lower portion of the upper clamp member 11 are a pair of staple retaining strips 43 secured as by welding, and each having staple receiving slots 47 in the side adjacent the clamp. The slots 47 are of a cross-section elongated lengthwise of the clamp and are uniformly spaced and arranged in pairs on opposite sides of the clamp member, as shown in Figs. 3, 4 and 5.

A stitching head 50 is slidably mounted upon the upper clamping member 11. This head 50 comprises a body 51 having side plates 53 secured to the opposite sides of the body by conveniently

removable knurled nuts 54 on the opposite ends of screws 55 extending therethrough. The upper edges of the side plates 53 are preferably arranged to be even with the upper side of the body 51, and the lower edges of the side plates project substantially below the body for extending in guiding relation along the opposite sides of the upper clamp member 11 whereon the stitching head is movably disposed in operation. Guide pin screws 56 are passed threadably through the lower extending portions of the side plates 53 into the guide grooves 41 in the opposite sides of the clamp member 11. The stitching head is conveniently installed upon the handle end of the upper clamp member 11 with the guide pins 56 in the guide grooves 41, which grooves are cut open toward the handle end for this purpose.

A pair of plungers 57 are slidably disposed on opposite sides of the head in grooves 59 cut in the inside surfaces of the side plates. To provide for reliable operation with a minimum number of parts, the plungers 57 are preferably the legs of an integral U-shaped member which is inverted in the head. The up-turned yoke 60 thereof is engaged by a suitable cam 61 which is secured, as by a screw 63, on a shaft 65 extending rotatively through a shaft bracket 67 up rising from the upper side of the body. The shaft bracket 67 has a pedestal flange 69 secured on the body by screws 71. The shaft 65 is rotated manually by means of a crank 73 attached on the upper end of the shaft by a screw 75. As shown, the cam 61 is preferably cut axially on a cylindrical shell and the cam surface engages a roller 77 which is disposed in a slot 79 and journaled on a pin 81 in the yoke 60 of the plungers to provide for light operation with a minimum of friction. A compression spring 83 reacting between the bottom of the yoke 60 and the upper portion of the body 51 elevates the plungers 57.

As the crank 73 is turned manually, the cam 61 is rotated and depresses the plungers 57 once in each revolution. The lower ends of the plungers pass down into the respective pairs of staple retaining slots 47 in succession.

In order to advance the head along the clamp and to accurately position it to insert the plungers 57 into each pair of staple slots 47, the rotatable shaft 65 passes down through an aperture in the body 51 of the head, as shown in dotted lines in Fig. 3. The lower end of the shaft 65 carries a kicker 85 secured or integral thereon and rotating in a recess 87 in the head and just above the upper side of the clamp member 11, as shown in Fig. 4. The kicker 85 is of a suitable shape and length for engaging the spaced rack teeth 39 one-by-one to advance the head one tooth for each revolution of the shaft.

To hold the head firmly in each advanced position while the plungers are being depressed, a detent disk 89 is pressed through an aperture 91 so positioned in one of the side plates that the detent rides over the rack teeth 39 and lodges in the space between two teeth just as the plungers are in alignment with a pair of slots.

The detent disk 89 is continuously pressed toward the rack teeth 39 by a compression spring 93 engaging the outer edge of the disk which is provided with a tubular member 95 for receiving the end of the spring. The outer end of the spring 93 reacts against an adjusting cap 97 which adjustably screws on a tubular detent socket 99 having a flange 101 secured to the side plate. The detent socket 99 is provided with a pair of slots 103 in diametrically opposite posi-

tions for receiving and slidably guiding the edges of the detent disk 89.

Fig. 6 shows the quick detachable pivot joint which provides for quick and convenient assembly or separation of the two clamp members. The pivoted end of the upper clamp member 11 is provided with a hinge ring 105 of a suitable thickness to be inserted between a pair of members 107 extending in spaced relation from the end of the lower clamp member 13, and one of which is shown broken away in Fig. 6. The pivot pin 15 passes through the spaced members 107 and has on the intermediate portion two flattened areas 109 on opposite sides having the effect of providing a reduced diameter. The hinge ring 105 is provided with a bearing aperture 111 of suitable size to rotatively journal the full diameter of the journal pin 15. A pivot pin receiving slot 113, having a width equal to the reduced diameter or thickness of the pivot pin, is cut through one side of the hinge ring 105 into the bearing aperture. The slot 113 and the flattened pivot pin 15 are so positioned as to be out of aligned relation when the clamp members 11 and 13 are in clamping position. The two clamp members may be quickly hinged together, or separated, by turning the two parts to the position wherein the flattened or reduced diameter of the pivot pin 15 is aligned with the slot 113 in the hinge ring 105.

In operation, the staple slots 47 are loaded with snug fitting clinch staples 115, as shown dotted in Fig. 5, and of any suitably ductile and non-corrosive material, such as silver, a silver alloy, plastics, or the like. The two clamp members having been pivotally joined together, the edges of the tissues 119 of incision to be joined are clamped between the two clamp members. Because of the rigid clamp having the pivot at one end and handles and latch at the other end, and also because of the uniform space 23 provided between the clamp members, the tissues are clamped with a uniform pressure and the clamp members are not bowed out of shape.

The stitching head 50, is slidably applied upon the upper clamp member 11 with the guide screw pins 55 entering the guide grooves 41 in opposite sides with the crank 73 turned to a suitable position to elevate the plungers 57 and to turn the kicker 85 to a disengaging position. The stitching head is pushed along the clamp to the pivot end. The arrangement of the two rows of staple slots is such as to be clearly visible and it can be conveniently ascertained if the slots have all been correctly loaded with staples. Also the operation of the apparatus can be clearly observed.

The crank 73 is manually turned rotating the shaft 65, the plunger actuating cam 61, and the kicker 85. While the spring pressed detent disk 89 is lodged between two rack teeth and holds the head, the cam depresses the two plungers 57 which simultaneously enter staple slots 47 on opposite sides of the clamp. As a plunger 57 enters a staple slot 47, the staple 115, which was previously loaded therein, is pushed toward the lower clamp member 13, piercing the clamped tissues and entering the clinching depressions 117 in the lower member, as represented by dotted lines in Fig. 5. This causes the staple ends to be turned under, and is continued clinching the staples and securing the tissues 119 together. As the plungers 57 are elevated, the kicker 85 advances the stitching head 50 one space, where the head is again held by the spring pressed detent disk 89 between the next pair of rack teeth

39. The cam 61 again depresses the pair of plungers 57 into the next pair of staple slots 47, and this operation is successively repeated until the stitching head has advanced to the handle end. By releasing the latch lever 29, the clamp is conveniently removed.

The stitching head is conveniently removed from the clamp and the clamp members are easily separated. Also it will be apparent that the parts of the head are conveniently separable so that the instrument may be cleansed and sterilized.

Although we have shown and described a certain specific embodiment of our invention, we are fully aware that many modifications thereof are possible. Our invention, therefore, is not to be restricted except insofar as necessitated by the prior art.

We claim:

1. Surgical stitching apparatus comprising, two elongated clamp members pivotally joined at one end for clamping together dissected tissues along the edges of an incision to be stitched, a row of staple slots aligned along each side of one of the clamp members, each of the staple slots being elongated parallel to the elongated dimension of the clamp member and of a size suitable for receiving a clinch staple, a stitching head for stitching tissues, cooperatively engaging means on said head and on one of the pivoted clamp members for holding the head slidably thereon, a pair of plungers movably disposed in the head, said plungers being shaped and positioned in each side of the head for driving staples through adjacent slots, position determining surfaces on the clamping member carrying the head for posi-

tioning the head and plungers in alignment with the staple slots, and manually operative means on said head for actuating the plungers and for controlling the movements of the head along said clamping means.

2. Surgical stitching apparatus in accordance with claim 1, and further characterized by the staple slots being arranged in evenly spaced pairs on opposite sides of the clamp member, the pair of plungers being the legs of a U-shaped member, and the manually operative means including a cam engaging the yoke of the U for simultaneously reciprocating the pair of plungers.

3. In a stitching head for use on a surgical clamp for stitching tissues held in the clamp, a body member, two side plates secured one on each side of the body, a pair of plungers, a guide recess slidably mounting one of the plungers in each side of the head, a manually rotative shaft, means journalling the shaft on the head, and cam means actuated by the shaft for depressing the plungers.

4. In a stitching head for use on a surgical clamp for stitching tissues held in the clamp, a body member, two side plates secured one on each side of the body, an inverted U-shaped element comprising, a pair of extended plungers and an interconnecting yoke, a guide recess slidably receiving one of the plungers in each side of the head, a manually rotative shaft rising vertically above the body, means journalling the shaft on the head, and cam means actuated by the shaft for engaging the yoke and depressing the plungers.

GERALD A. WILSON.
LYMAN E. SPENCER.