

Jan. 29, 1963

F. L. ROSE ET AL  
SURGICAL INSTRUMENT

3,075,199

Filed Nov. 2, 1960

3 Sheets-Sheet 1

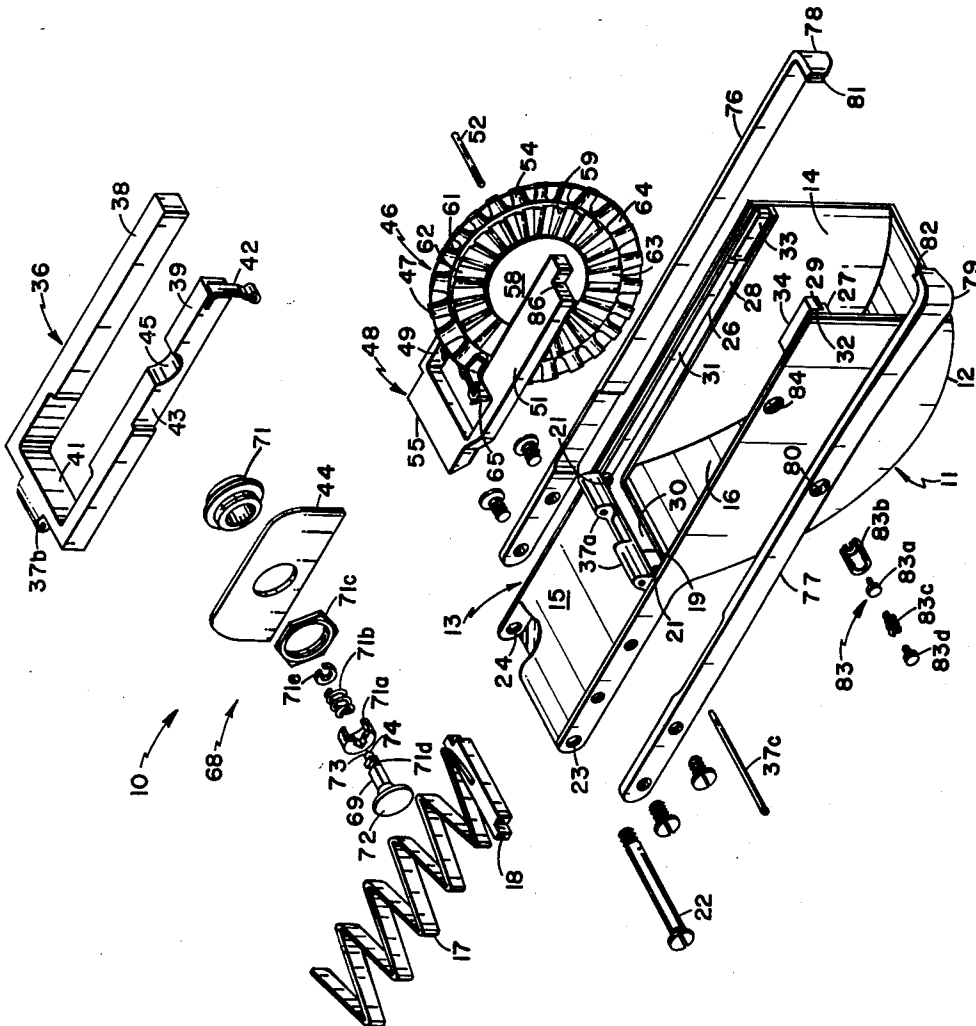


Fig 1

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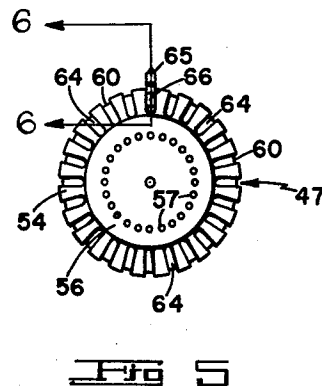
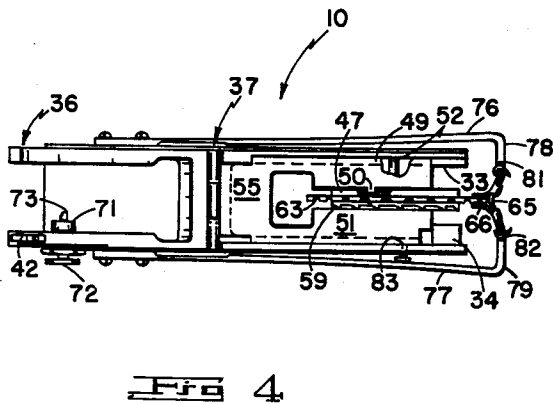
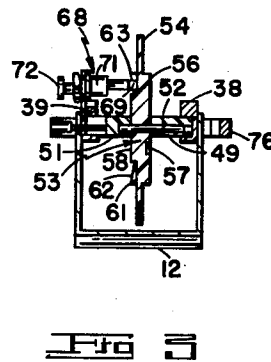
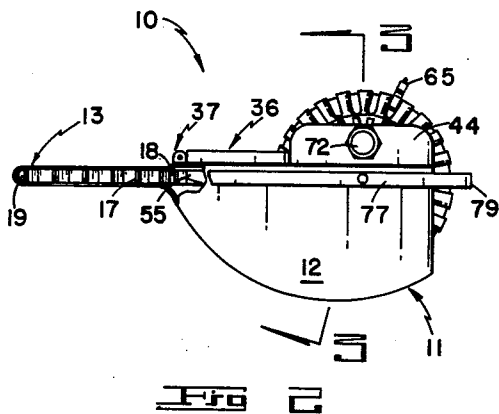
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3 Sheets-Sheet 3

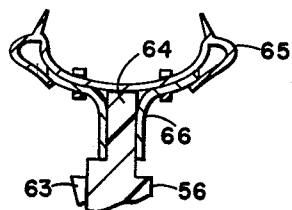


Fig 6

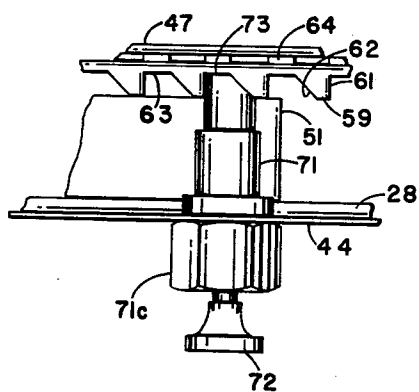


Fig 7

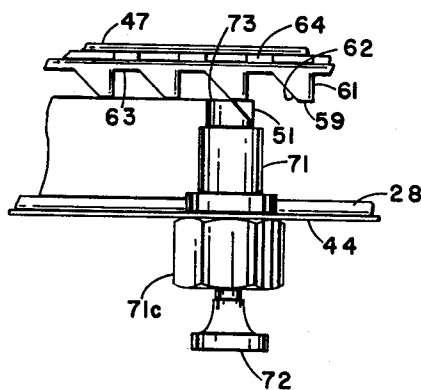


Fig 8

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3,075,199

## SURGICAL INSTRUMENT

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Filed Nov. 2, 1960, Ser. No. 66,779  
17 Claims. (Cl. 1—349)

This application relates to surgical instruments and, in particular, to a semi-automatic dispenser of surgical clips. In many surgical procedures, metal surgical clips or ligatures have replaced skin sutures in closing wounds or incisions made in the skin during major surgery.

The surgical clips used today come in several shapes and forms. The most popular form is commonly referred to as a "spur" type clip, and it is fully described in the Schulman Patent 2,232,142. It will be noted that this form of surgical clip contains a pair of outwardly extending tabs which are separated when the clip is applied to a wound. See FIGURES 3 and 6 in the Schulman patent. This form of clip is popular because it can be removed by merely bringing the tabs together with a forceps. In so doing, the prongs of the clip are removed from the skin.

Currently, these spur clips are applied by hand one at a time and the process is quite time consuming. The existence of the tabs—which is precisely why these clips are so popular—has heretofore, made it difficult to design a practical semi-automatic dispenser.

It is an object of this invention to provide a semi-automatic surgical clip dispenser which:

(1) Dispenses spur type surgical clips.

(2) Holds and dispenses surgical clips, one at a time, with a minimum of delay.

(3) Includes indexing means for automatically feeding one surgical clip at a time to a dispensing position.

(4) Includes a surgical clip holder that can be easily removed from the dispenser and is of such a nature that it may be disposed of in favor of a replacement holder.

(5) Dispenses and indexes in a single actuation.

(6) Accommodates many forms and sizes of clips used in surgical procedures by means of easily interchangeable clip holders.

(7) Is simply constructed, inexpensive to manufacture, has a minimum of moving parts, is easily operated with a finger and thumb of one hand, is compact, and pleasant in appearance.

In accordance with the invention, the surgical clip dispenser for applying surgical clips to a wound, comprises a clip holder rotatably mounted within the dispenser. The clip holder includes spaced means for engaging and holding surgical clips. The surgical clip dispenser also includes a housing including means for releasably engaging the clip holder. Actuating means for dispensing a surgical clip and applying the dispensed surgical clip to a wound is also provided. The surgical clip dispenser also includes indexing means cooperating with the aforementioned actuating means for bringing surgical clips to a dispensing position, one at a time.

The novel features that we consider characteristic of the invention are set forth in the appended claims; the invention itself, however, both as to its organization and method of operation, together with additional objects and advantages thereof, will best be understood from the following description of a specific embodiment when read in conjunction with the accompanying drawings, in which:

FIGURE 1 is an exploded representation of a surgical clip dispenser embodying the principles of the present invention;

FIGURE 2 is a side view of the FIGURE 1 surgical clip dispenser;

FIGURE 3 is a sectional view taken along line 3—3 of FIGURE 2;

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FIGURE 4 is a top view of the FIGURE 1 dispenser with its cover opened;

FIGURE 5 shows one side of a disc used to engage and hold surgical clips;

FIGURE 6 is a sectional view taken along line 6—6 in FIGURE 5;

FIGURE 7 is a fragmentary top view showing details of the indexing means; and

FIGURE 8 is a second top fragmentary view showing the indexing means partially through an indexing procedure.

Referring to FIGURES 1, 2, and 4, in particular, there is represented a surgical clip dispenser 10 embodying the principles of the present invention. The surgical clip dispenser 10 comprises a housing 11 which includes an arcuate portion 12 and a rectangular extension 13. The arcuate portion 12 includes two perpendicular openings identified for purposes of this application as the vertical opening 14 and the horizontal opening 16. See FIGURE 1.

The extension 13 is box-like in construction and extends from the arcuate portion 12 with its top surface 15 in the plane of the horizontal opening 16.

As seen in FIGURES 1 and 2, a spring assembly comprising a spring 17 and a restraining element 18 fits within a compartment 19 defined by the walls of the extension 13. The restraining element 18 abuts against a pair of stops 21 located at the junction of the extension 13 and the horizontal opening 16. The spring assembly is retained within the extension 13 by a screw 22 which passes through a clearance hole 23 and is threaded into a complementary threaded hole 24 at the free end of the extension 13.

A pair of L-shaped rails 26 and 27 are secured horizontally, as by soldering, to the inside surfaces of the arcuate portion 12. See FIGURES 1 and 3. The horizontal surfaces 28 and 29 of the rails 26 and 27, respectively, are in the same plane with an inside surface 30 of the extension 13. The vertical legs 31 and 32 of the rails 26 and 27, respectively, extend toward the marginal edges defining the horizontal opening 16, but fall short of this edge by a small amount. See FIGURE 1.

A pair of stops 33 and 34 are secured to the rails 26 and 27 at the junction of the vertical opening 14 and the horizontal opening 16. The stops 33 and 34 are preferably rectangular and stop 34 extends outwardly from rail 27. See FIGURE 4.

The surgical clip dispenser 10 also includes a cover 36 which is pivotally mounted to the extension 13 by means of a hinge 37 (FIGURES 1 and 4) comprising hinge portions 37a on the extension 13, 37b on the cover 36, and pin 37c.

The cover 36 is generally U-shaped and includes arms 38 and 39 joined at one end by a bight 41. The spacing between the arms 38 and 39 is enlarged adjacent to the bight 41 in order to provide adequate clearance for the surgical clips to pass through, as will be shown hereinafter. The arm 39 includes a depending latch 42 which is adapted to engage the stop 34 and rail 27 and secure the cover 36 to the arcuate portion 12 of the housing 11.

The arm 39 also includes a slot 43 on the forward outer edge. The slot 43 is provided to accommodate a bracket 44 which is secured therein in any convenient manner such as soldering. A depression 45, also on arm 39, is provided for clearance for a housing 71 on an indexing means, to be described.

The surgical clip dispenser 10 also includes a disc assembly 46 comprising a disc 47 rotatably mounted to a disc holder 48. The disc holder 48 is shaped generally in the form of a U having arms 49 and 51 separated just enough to allow the disc 47 to rotate therebetween. The disc holder 48 also includes an enlarged separation

between arms 49 and 51 adjacent to bight 55, to permit surgical clips to pass therebetween. See FIGURE 1. The disc 47 is mounted to the disc holder 48 by means of a pin 52 passing from arm 49 through the disc 47 into arm 51 substantially as shown in FIGURE 3.

As seen in FIGURE 4, the arm 49 includes a projection 50, spaced inwardly from the axis of rotation of the disc 46, as represented by the pin 52. Disc 47 comprises a hub 53 (FIGURE 3) with a ring 54 extending outwardly from the hub 53. One side 56 of the hub, shown in FIGURE 5, includes a circular configuration of equally spaced depressions 57. These depressions 57 coact with the projection 50 to form a simple detent mechanism for positioning the disc.

The second side 58 of the hub 53 comprises a series of radially extending spaced teeth 59 which terminate at the interior edge of the ring 54. The teeth 59 comprise a transverse surface 61 extending outwardly and perpendicular to the plane of the disc 47, and a sloping surface 62 inclining inwardly in a counterclockwise direction from the transverse surface 61. It will be noted, in FIGURE 1 particularly, that there is a space 63 between adjacent teeth 59. There are an equal number of teeth 59 and depressions 57.

As seen in FIGURES 3 and 5, the annular ring 54 comprises a relatively thin cross section and includes spaced slots 64 formed by a periodic reduction in the thickness of the annular ring 54. The radial length of slots 64 is smaller than the width of ring 54, forming recesses 60. See FIGURE 5.

It will be noted that the annular ring 54 extends partially into the enlarged separation between arms 49 and 51 adjacent to the bight 55 of the disc holder 48. Surgical clips 65, as seen in FIGURES 1 and 2, extend a short distance beyond the end of the annular ring 54 and, therefore, also pass through the aforementioned enlarged separation. The aforementioned enlarged separation adjacent to bight 41 in the cover 36 is also provided for clearance.

The disc assembly 46 is inserted into the dispenser 10 by placing the disc holder 48 on the horizontal surfaces 28 and 29 of the rails 26 and 27, respectively, between the stops 33 and 34 and stops 21. It will be noted in FIGURE 2 that the bight 55 engages the restraining element 18 on the spring 17 and partially depresses the spring 17. It will also be noted that the width of the bight is reduced (FIGURE 1) to clear the stops 21, when the disc assembly is moved towards the rear against the spring 17.

Referring to FIGURE 5, there is depicted a surgical clip 65 mounted to ring 54. It will be noted that the slots 64 are inserted in the space between tabs 66 (FIGURE 4) and secured thereby. A portion of the clip is seated in the recess 60 to further prevent movement of the clips 65 out of the slots 64.

The surgical clip dispenser 10 also includes indexing means which rotates the disc 47 to feed one surgical clip 65 at a time into a dispensing position. As will be seen hereinafter, a surgical clip 65 is dispensed and indexed in a single actuation of the surgical clip dispenser 10. The indexing means comprises the teeth 59 and a finger assembly 68, best seen in FIGURES 1 and 3, which includes spring loaded finger 69 extending through housing 71 and terminating in an enlarged head 72 for manual manipulation. The free end 73 of the finger 69 is chamfered so that a sloping surface 74 (FIGURES 1, 7 and 8), which is parallel to the sloping surface 62 of the teeth 59, is developed.

The finger 69 fits into sleeve 71a and a spring 71b is slid over it. The finger 69 and spring 71b are secured in the sleeve 71a by means of a washer 71e being inserted in a slot 71d adjacent to the free end of finger 69. Sleeve 71a is then secured to housing 71 by solder or other suitable means. The housing is then inserted through bracket 44 and is secured thereto by nut 71c.

Normally, the free end 73 sits in the space 63 (FIGURES 7 and 8) between adjacent teeth 59. When the disc assembly 46 is moved to the rear, along the rails 26 and 27, the sloping surface 74 of finger 69 slides over the sloping surface 62 into the next clockwise space 63. See FIGURE 8. When the disc assembly 46 is permitted to move forward, the force of the free end 73 of the finger 69 against the transverse surface 61 causes the disc to rotate counterclockwise and thereby carry a clip into a dispensing position. It is obvious that the angular spacing between depressions 57 on the side 56 of the disc 46 is equal to the angular separation between spaces 63 bracketing a tooth 59. The action of the projection 50 in a depression 57 prevents unintended rotation of the disc 47.

The actuating means of the surgical clip dispenser 10 comprises a pair of leaf spring actuators 76 and 77 secured at one end to the sides of the extension 13 shown in FIGURES 1 and 4. The actuators 76 and 77 are terminated at their free ends by a pair of inwardly extending jaws 78 and 79 which, in turn, are terminated in concave surfaces 81 and 82 respectively. The concave surfaces 81 and 82 engage and hold a surgical clip 65 during the time that the clip is being applied to a wound and dispensed from the surgical clip dispenser 10. See FIGURE 4.

The act of applying a surgical clip to a wound involves simply pressing the actuators 76 and 77 toward each other by means of a thumb and a finger of one hand. As the surgical clip begins to collapse, and bend, under the pressure of the actuator, the collapse of surgical clip 65 causes the tabs 66 to move against the disc 47 causing the disc assembly 46 to move against the action of spring 17 into compartment 19 of the extension 13. After the clip 65 has been applied to the wound and pressure released from the actuators 76 and 77, the disc assembly 46 moves forward toward the jaws 78 and 79 and, in the manner described heretofore, indexes and feeds a new clip into position between the jaws 78 and 79.

It will be noted that actuator 77 includes a spring loaded pin assembly 83. Referring to FIGURE 1, it is seen that pin assembly 83 comprises a pin 83a which is normally seated in a sleeve 83b. A spring 83c is placed on the pin 83a and secured in position by means of a cap 83d which is secured in any suitable way to sleeve 83a. The pin assembly 83 is then inserted in hole 80 of actuator 77 and secured thereto as by soldering. The pin assembly is positioned adjacent to hole 84 in the adjacent wall of the arcuate portion 12.

When the actuators 76 and 77 have been moved toward each other to apply and dispense a surgical clip 65, and the disc assembly 46 has been moved rearwardly, the pin 83 extends into a slot 86 at the front of arm 51 of disc holder 48. See FIGURE 1. In this position it will not permit the disc assembly 46 to move forward until the jaws 81 and 82 of the actuators 76 and 77 are spaced away from the dispensed surgical clip and are separated by a sufficient distance to provide adequate clearance for the next clip being moved into a dispensing position.

Summarizing briefly the operation of the clip dispenser 10, clips are dispensed by merely depressing actuators 76 and 77. The indexing means respond to the release of the actuators 76 and 77 to move a new clip into position to be dispensed. The rate at which clips are dispensed is determined by the user and can be quite high.

An important consideration in the present invention is the detachable mounting of the disc assembly 46 in the housing 11. It can be inserted or removed without disassembling the housing or loosening parts therefrom which are not intended to be loosened in the normal course of operating the surgical clip dispenser 10.

To load the surgical clip dispenser or to provide additional clips, it is merely necessary to raise cover 36, lift out disc assembly 46, insert a replacement on the rails

26 and 27, close the cover, and continue the clip procedure. Accordingly, for purposes of this invention the term "detachable mounting" is defined as a mounting for an easily removable, replaceable or temporarily secured part.

The various features and advantages of the invention are thought to be clear from the foregoing description. Various other features and advantages not specifically enumerated will undoubtedly occur to those versed in the art, as likewise will many variations and modifications of the preferred embodiment illustrated, all of which may be achieved without departing from the spirit and scope of the invention as defined by the following claims.

We claim:

1. A surgical clip dispenser for applying surgical clips to a wound comprising: a disc including spaced means for engaging and holding surgical clips; a housing including means for rotatably mounting said disc; a cover connected to said housing for detachably securing said disc in said housing; and means for dispensing a clip from said disc to a wound.

2. A surgical clip dispenser as described in claim 1 in which said spaced means are located on the periphery of said disc.

3. A surgical clip dispenser for applying surgical clips to a wound comprising: a disc including spaced means for engaging and holding surgical clips; a housing including means for rotatably mounting said disc; means, including indexing means for rotating said disc a predetermined amount; and means for dispensing a clip from said disc to a wound.

4. A surgical clip dispenser as described in claim 3 in which said housing also includes means for detachably mounting said disc to said housing.

5. A surgical clip dispenser for applying surgical clips to a wound comprising: a disc including spaced means on periphery of the disc for engaging and holding surgical clips; a housing including means for rotatably mounting said disc; actuating means for dispensing a clip from said disc to a wound when manipulated; and indexing means responsive to the manipulation of said actuating means and said disc for rotating said disc a predetermined amount.

6. A surgical clip dispenser for applying clips to a wound comprising: an assembly including a disc holder and a disc having spaced means for engaging and holding surgical clips mounted to the disc holder; a housing for slidably mounting said assembly; actuating means adapted to engage a clip for dispensing said clip from the clip dispenser to a wound and thereby sliding said assembly relative to said housing; and indexing means responsive to the sliding movement of said assembly for rotating the disc a predetermined amount.

7. A surgical clip dispenser as described in claim 6 in which said housing includes, in addition, means for detachably mounting said assembly to said housing.

8. A surgical clip dispenser for applying surgical clips to a wound comprising: an assembly including a disc holder, and a disc including spaced means for engaging and holding surgical clips mounted to the disc holder; a housing including means for slidably mounting said assembly; actuating means adapted to engage a clip for dispensing said clip and thereby reciprocating said assembly away from and toward said actuating means; and indexing means responsive to the reciprocating movement outside assembly for rotating the disc a predetermined amount, whereby a new clip is carried to said actuating means.

9. A surgical clip dispenser as described in claim 8 which includes, in addition, means for preventing the disc from rotating until there is adequate clearance for a succeeding clip at said actuating means.

10. A surgical clip dispenser as described in claim 8 which includes means for preventing an unintentional rotation of said disc.

11. A surgical clip dispenser as described in claim 10 in which said last mentioned means comprises spaced depressions on said disc and a projection on said disc holder coacting with said depressions.

12. A surgical clip dispenser for applying surgical clips to a wound comprising: a disc including spaced slots around the periphery thereof for engaging and holding surgical clips, said disc including, on one face thereof, equally spaced radially extending teeth; a means for rotatably mounting said disc, said disc and mounting means comprising an assembly; a housing including an opening and a pair of opposing rails secured adjacent to and parallel to the opening, said assembly being adapted to seat on said rails and slide thereon; a cover pivotally secured to said housing and providing adequate clearance for said disc being adapted to detachably mounting said assembly in said housing; a spring loaded finger assembly positioned on said cover and adapted to engage said one side of said disc, the finger normally being seated between adjacent teeth adapted to slide over the teeth; actuating means comprising a pair of opposed arms adapted to bridge a surgical clip mounted to said disc and to dispense the clip by compressing it, thereby reciprocating said assembly on said rails whereby said finger slides over a tooth into an adjacent slot and rotates said disc when said actuating means is released.

13. A surgical clip holder assembly comprising: a disc having spaced means around its periphery for engaging and holding surgical clips; a disc holder for rotatably mounting said disc; and cooperating means on said disc holder and said disc for preventing unintentional rotation of said disc.

14. A surgical clip holder assembly as described in claim 13 in which said last mentioned means comprises a circular distribution of depressions on one face of said disc and a complementary projection on said disc holder.

15. A surgical clip holder assembly comprising: a disc having spaced slots, formed by periodically reducing the thickness of said disc adjacent to its periphery for engaging and holding surgical clips; a disc holder comprising a U-shaped member having first and second arms joined by a bight; and means interconnecting said disc and said disc holder for rotatably mounting said disc between the first and second arms.

16. A surgical clip holder assembly comprising: a disc having spaced radial slots around its periphery for engaging and holding surgical clips; and a disc holder for rotatably mounting said disc.

17. A surgical clip dispenser for applying surgical clips to a wound comprising: a disc including spaced slots comprising areas of reduced thickness on the periphery of said disc for engaging and holding surgical clips; a housing including means for detachably and rotatably mounting said disc; and means for dispensing a clip from said disc to a wound.

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