

[54] **CLIP FOR BLOOD VESSEL**  
 [76] Inventor: **George Kees, Jr.**, Box 113,  
 Alexandria, Ky. 41001  
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 [52] U.S. Cl. .... **128/325**, 24/253, 29/229,  
 29/243.56, 29/268  
 [51] Int. Cl. .... **A61b 17/12**, A44b 21/00  
 [58] Field of Search ..... 24/139, 253, 254;  
 81/5.1 R, 425 R; 29/229, 243.56, 268;  
 128/325, 346

2,876,778 3/1959 Kees, Jr. .... 128/346  
 3,344,649 10/1967 Wood ..... 81/425  
 3,598,125 8/1971 Cogley ..... 128/346  
 3,613,683 10/1971 Kees, Jr. .... 128/325

**FOREIGN PATENTS OR APPLICATIONS**

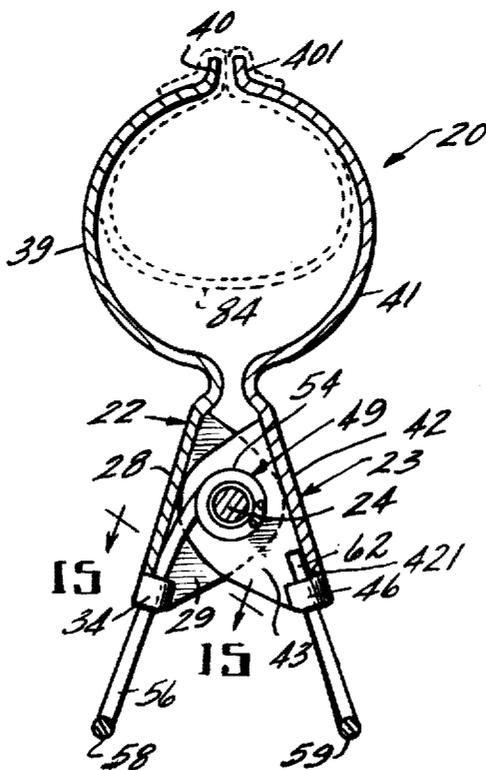
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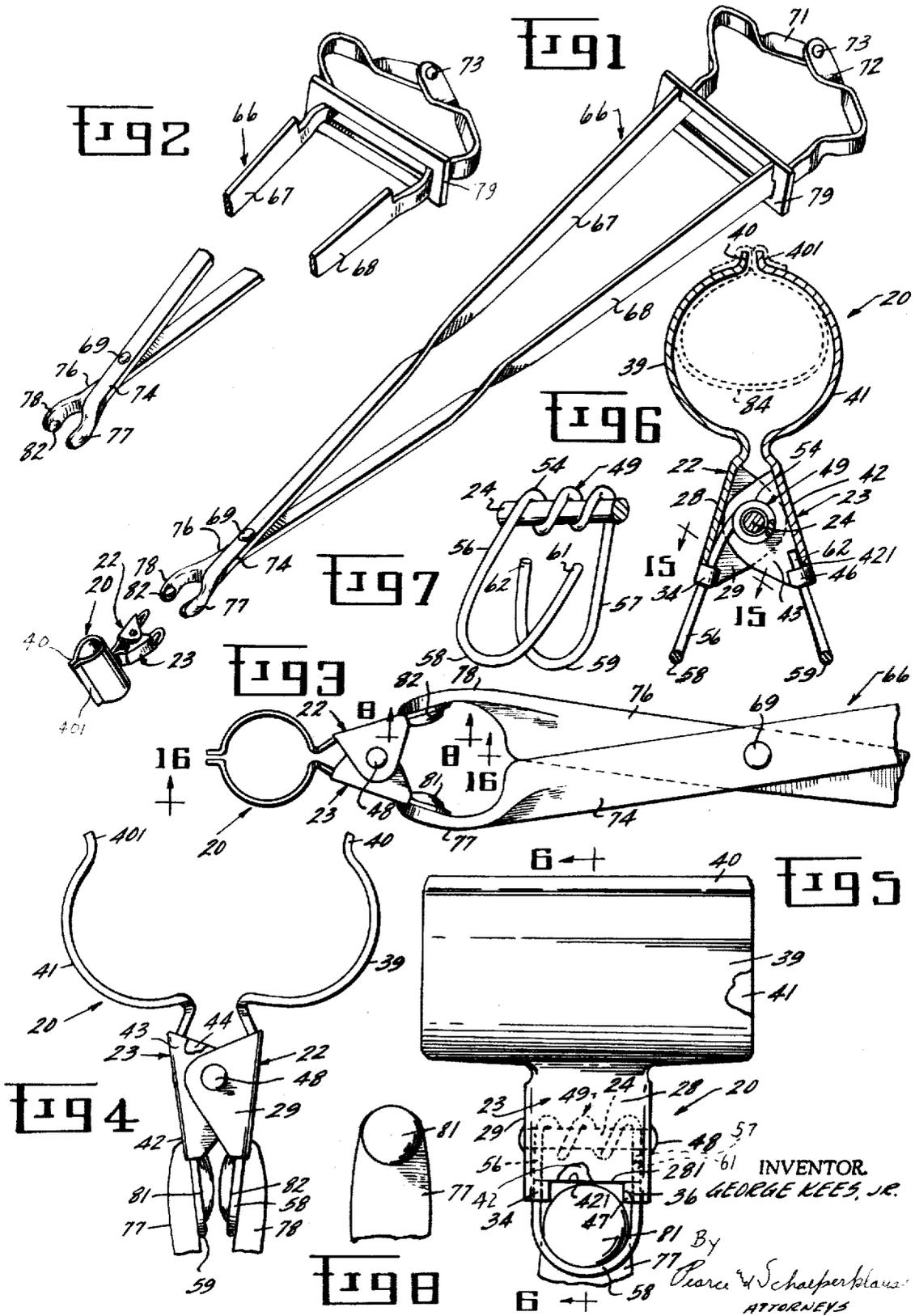
*Primary Examiner*—Channing L. Pace  
*Attorney, Agent, or Firm*—James W. Pearce; Ray F. Schaeperklaus

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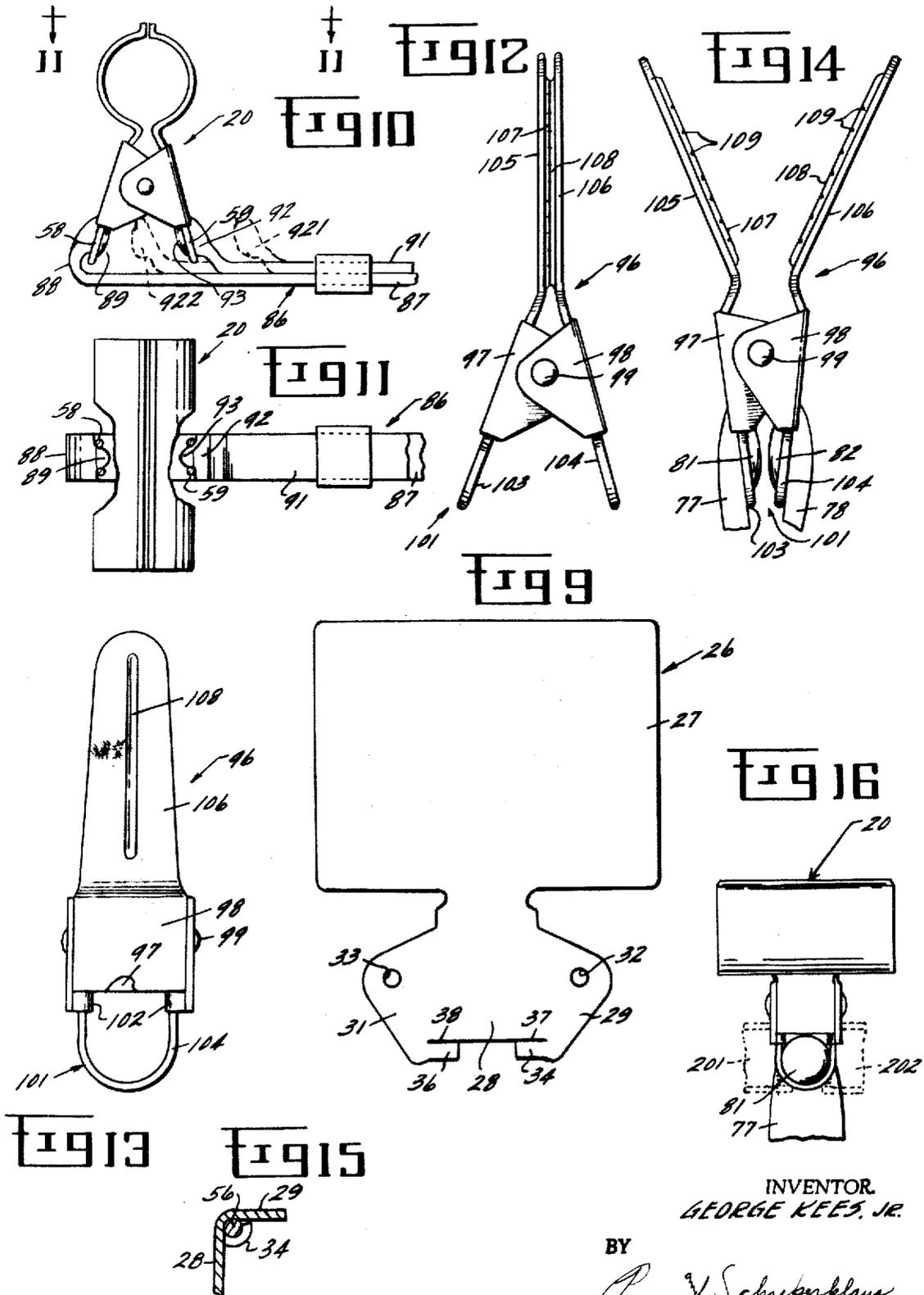
[57] **ABSTRACT**  
 A clip for positioning on a blood vessel including clip half-portions pivotally connected by an elongated spring member which urges the clip half-portions to a closed position. Loop portions of the spring extend outwardly from the clip half-portions to receive bosses of a clip-operating tool for urging the clip to open position. The clip can be swung about an axis through the bosses to selected angular positions.

**6 Claims, 16 Drawing Figures**





INVENTOR.  
GEORGE KEES, JR.  
By  
Charles W. Schaeperklau  
ATTORNEYS



INVENTOR.  
GEORGE KEES, JR.

BY  
*Pearce V Schaeferklau*  
ATTORNEYS -

## CLIP FOR BLOOD VESSEL

This invention relates to aneurysm occluding clips and hemostatic clips. More particularly, this invention relates to spring operated clips.

Aneurysm occluding clips and hemostatic clips often have to be precisely positioned upon a blood vessel inside a body cavity in a very restricted location and must be held open while being positioned and then must be released after being fitted in place. Instruments for inserting such clips are shown in my U.S. Pat. No. 2,876,778 and Kees and Hickmann application Ser. No. 830,267 filed June 4, 1969 now U.S. Pat. No. 3,613,683.

An object of this invention is to provide a clip which can be held firmly in various positions by a clip-applying tool.

A further object of this invention is to provide such a clip in which portions of a spring which urges the clip to closed position form sockets for dome-shaped bosses on arms of the clip-applying tool so that the clip can be rotated or swung to various positions while being held by fingers of the tool.

Briefly, this invention provides a clip structure in which clip half-portions are pivotally mounted on a pivot about which a wire spring is wound. Portions of the wire spring adjacent end portions thereof engage portions of the clip half-portions and urge the clip half-portions to swing toward clip-closed position. End portions of the wire spring are formed into loops which extend outwardly of the clip half-portion into position for receiving dome-shaped boss elements on arms of a clip-operating tool. Tabs on the clip half-portions engage the spring wire adjacent the loops so that, when the loops are urged toward each other, the clip half-portions swing therewith to a clip open position.

The above and other objects and features of the invention will be apparent to those skilled in the art to which this invention pertains from the following detailed description and the drawings, in which:

FIG. 1 is an exploded perspective view showing a clip applying tool together with an aneurysm clip constructed in accordance with an embodiment of this invention, the tool and clip being shown in released position;

FIG. 2 is a fragmentary perspective view of the tool of FIG. 1 in position for gripping the clip;

FIG. 3 is an enlarged plan view showing the clip of FIG. 1 and a portion of the tool of FIG. 1 with the clip being held by the tool in clip gripping position;

FIG. 4 is an enlarged plan view of the clip of FIG. 1 showing the clip in fully open position, a fragmentary portion of the tool of FIG. 1 being shown in association therewith;

FIG. 5 is a view in side elevation of the clip of FIG. 1, a fragmentary portion of a jaw of the tool being shown in association therewith;

FIG. 6 is a view in section taken on the line 6—6 in FIG. 5, a graft member being shown in association with the clip in dashed lines;

FIG. 7 is a perspective view of a pivot pin and a spring member of the clip of FIG. 1 in assembled relation but removed from other portions of the clip;

FIG. 8 is a view taken in the direction of the arrows 8—8 in FIG. 3 showing one of the clip-holding jaws of the tool, the clip being omitted for clarity;

FIG. 9 is a plan view of a blank for forming one of the clip half-portions of the clip of FIG. 1;

FIG. 10 is a plan view of the clip of FIG. 1 in association with jaws of another clip-applying tool, alternate positions of one jaw of the tool being shown in dot-dash and double-dot-dash lines;

FIG. 11 is a view taken in the direction of the arrows on the line 11—11 in FIG. 10, portions of the clip being omitted for clarity;

FIG. 12 is a view in side elevation of a hemostatic clip constructed in accordance with another embodiment of this invention, the clip being shown in closed position;

FIG. 13 is a plan view of the clip shown in FIG. 12; FIG. 14 is a view in side elevation of the clip shown in FIGS. 12 and 13 in open position, a fragmentary portion of a clip applying tool being shown in association therewith;

FIG. 15 is a view in section taken on the line 15—15 in FIG. 6; and

FIG. 16 is a view in section taken on the line 16—16 in FIG. 3, alternate positions of the clip being shown in dashed lines.

In the following detailed description and the drawings, like reference characters indicate like parts.

In FIGS. 4, 5, and 6 is shown an aneurysm clip 20 constructed in accordance with an embodiment of this invention. The clip 20 includes clip half-portions 22 and 23 which are pivotally mounted on a pivot pin 24. The clip half-portion 22 is formed from a blank 26 (FIG. 9) which includes a main portion 27 and an arm or tongue 28. Sidewise-extending wing portions 29 and 31 extend outwardly on opposite sides of the tongue 28. Openings 32 and 33 are formed in the wing portions 29 and 31, respectively. Inwardly directed tabs 34 and 36 are formed on the tongue 28. The tabs 34 and 36 are separated from the main portion of the tongue 28 by slits 37 and 38, respectively. As shown in FIGS. 4 and 5, the wing portions 29 and 31 are formed or folded inwardly at right angles to the main portion of the tongue 28 so that the openings 32 and 33 (FIG. 9) are aligned for receiving the pivot pin 24. The main portion 27 (FIG. 9) of the blank is formed to a jaw of generally arc-shape as shown in FIG. 4 at 39 with an edge portion 40 being bent outwardly to engage flatwise on edge portion 401 of the clip half-portion 23. The clip half-portion 23 is formed from a blank generally similar to the blank already described and includes an arc-shaped main or jaw portion 41 (FIG. 6), a tongue 42, wing portions 43 and 44, and tabs 46 and 47 (FIG. 5). When the clip half-portions are assembled on the pivot pin 24, heads 48 on opposite ends of the pin hold the portions of the clip in assembled relation.

A wire spring 49 (FIGS. 5, 6, and 7) urges the clip half-portions to the closed position shown in FIG. 1 in which the edge portions 40 and 401 of the jaws 39 and 41, respectively, are held firmly in engagement. A central portion 54 (FIG. 7) of the wire spring 49 is helically wound about the pivot pin 24. Outwardly extending arm portions 56 and 57 of the spring engage the tongue portions 28 and 42 of the clip half-portions 22 and 23, respectively, for urging the jaws together. Half-circular loops 58 and 59 are formed on the spring arms 56 and 57, respectively. Tip end portions 61 and 62 of the loops 58 and 59 extend parallel to the arms 56 and 57, respectively.

As shown in FIG. 15, the tab 34 of the clip half-portion 22 is turned around the arm 56 so that the arm 56, the loop 58, and the tongue 28 move inwardly and outwardly together. The tab 46 (FIG. 6) of the clip half-portion 23 is similarly turned around the tip portion 62 of the loop 59, causing the tongue 42 to move inwardly and outwardly with the loop 59. In a similar fashion, the tab 36 is turned around the tip 61 (FIG. 5) and the tab 47 is turned around the arm 57 so that, as the wire loops 58 and 59 are moved toward each other, the clip half-portions swing with the wire loops in a direction to open the jaws.

The clip 20 can be opened by use of a tool 66 (FIGS. 1 and 2) which includes resilient arms 67 and 68 pivotally connected by a pivot pin 69. Flanges 71 and 72 of the arms 67 and 68, respectively, are pivotally connected at a pivot pin 73. Inward squeezing of the arms 67 and 68 causes fingers 74 and 76 of the arms 67 and 68, respectively, to swing inwardly advancing clip-holding jaws 77 and 78 (FIG. 3) of the fingers 74 and 76, respectively toward each other. An annular slide 79 (FIGS. 1 and 2), which is mounted on and spans the arms 67 and 68, can be moved from a position shown in FIG. 1 in which the arms 67 and 68 are released and the clip-holding jaws are open to a position shown in FIG. 2 in which the slide engages the arms 67 and 68 and holds the arms 67 and 68 in a position for the clip-holding jaws to engage and hold the clip 20 in partly open position, as shown in FIG. 3. The tool structure described to this point is similar to the tool structure shown in my aforementioned U.S. Pat. No. 2,876,778.

As shown in FIGS. 3 and 4, the jaws 77 and 78 carry dome-shaped bosses or protuberances 81 and 82, respectively, which are receivable in the loops 59 and 58. The bosses 81 and 82 are substantially aligned along a line extending cross-wise of the axis of the tool 66. When the clip 20 is held by the clip holding jaws 77 and 78 of the fingers 74 and 76 with the bosses 81 and 82 received in the loops 58 and 59, as shown in FIG. 3, the clip can be swung about the axis of the bosses 81 and 82 as shown in FIG. 16 as from the full line position shown at 20 to the positions shown in dashed lines at 201 and 202. When the clip 20 is to be used, it is held by the tool in the FIG. 3 position and can be swung to the most convenient angular position for insertion into a body cavity for mounting on an artery or the like (not shown). As shown in FIG. 5, the loop 58 cooperates with an edge portion 281 of the tongue 28 to form a socket for one of the protuberances. The loop 59 similarly cooperates with an edge portion 421 (FIG. 6) of the tongue 42 to form a socket for the other protuberances. The arms 67 and 68 are pushed further inwardly to cause the clip holding jaws 77 and 78 to advance to the FIG. 4 position to fully open the clip 20, and the clip 20 can be positioned and then released to close by releasing pressure on the arms 67 and 68 and moving the slide 79 to the FIG. 1 position. As shown in FIG. 6, the clip 20 can carry a strip 84 of grafting material which is mounted on the clip edge portions 40 and 401 and can be held in position on the artery by the clip.

In FIGS. 10 and 11, the clip 20 is shown in association with a clip applying tool 86, only a portion of which is shown. The tool 86 can be generally of the form shown in the aforementioned application Ser. No. 830,267. The tool 86 includes a first arm 87 which carries a jaw 88 provided with a dome-shaped boss 89 and a second arm 91 slidably mounted on the first arm, the

second arm carrying a jaw 92 provided with a dome-shaped boss 93. The second arm can slide along the first arm in face-to-face relation therewith between a clip released position in which the jaw thereof is indicated in dot-dash lines at 921 through the clip holding position shown in full lines to a clip-open position indicated in double-dot-dash lines at 922. The portion of the tool not shown in the drawings can be similar to what is shown in the above identified application Ser. No. 830,267. The bosses 89 and 93 are aligned along a line parallel to the arms 87 and 91 and to the direction of sliding of the second arm 91 and can receive the loops 58 and 59 of the clip 20. The clip 20 can be swung about this line to the most convenient position for insertion.

In FIGS. 12, 13, and 14 is shown a hemostatic clip 96 constructed in accordance with another embodiment of this invention. The clip 96 includes half-portions 97 and 98 pivotally mounted on a pivot pin 99 with a spring 101 urging the clip to the closed position shown in FIG. 12. The spring can be of the same form as the spring already described, and tabs 102 attach portions of the spring 101 to tongue portions of the clip half-portions in the manner already described. Loop portions 103 and 104 of the spring 101 can receive the bosses 81 and 82 of the tool jaws 77 and 78 as shown in FIG. 14. Jaws 105 and 106 of the clip are provided with lengthwise ribs 107 and 108, respectively, which engage in flatwise relation as shown in FIG. 12. Grooves 109 (FIG. 14) are formed in the ribs so that the jaws 105 and 106 can firmly grip a blood vessel (not shown) to close the blood vessel. The clip 96 can be swung about the axis of the bosses 81 and 82 to position it for most convenient insertion into place.

The clip constructions illustrated in the drawings and described above are subject to structural modification without departing from the spirit and scope of the appended claims.

Having described my invention, what I claim as novel and desire to secure by letters patent is:

1. A clip for positioning on a blood vessel which comprises a pair of clip half-portions, means pivotally connecting the clip half-portions, an elongated spring member between the clip half-portions, the spring member including loop portions adjacent ends thereof and a central portion adjacent the means pivotally connecting the clip half-portions, the loop portions extending outwardly of the clip half-portions on one side of the pivot means to receive bosses of a clip-operating tool for urging the clip to open position, means on each clip half-portion attached to the spring member adjacent an associated one of the loop portions to cause each clip half-portion to swing with the associated one of the loop portions and jaws on the clip half-portions on the other side of the pivot means, the spring member urging the clip half-portions to jaw closed position.

2. A clip as in claim 1 wherein the means pivotally connecting the clip half-portions is a pivot pin and the central portion of the spring member is wrapped around the pivot pin, the loops being on arms extending outwardly from the central portion of the spring.

3. A clip as in claim 1 wherein the jaws engage flatwise.

4. A clip as in claim 1 wherein the jaws include half-cylindrical portions adapted to surround a blood vessel.

5. A device in accordance with claim 1 characterized by the fact that each clip half-portion cooperates with

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the pivotal connecting means at two respective axially spaced locations for pivoting about the axis thereof, and spring member limit the loop portions to swing about the axis of the pivotal connecting means in parallel relation to the diametral axial plane thereof.

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6. A device according to claim 1 in which the outwardly extending loop portions and adjacent portions of the clip half-portions define apertures for receiving clip operating tool bosses cooperatively engaged by said portions of loop and clip half-portions.

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UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,802,437 Dated April 9, 1974

Inventor(s) George Kees, Jr.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 4, line 61, "thb" should be -- the --;

Column 5, line 3, after "and" insert -- that means on the clip half-portion attached to the --.

Signed and sealed this 10th day of September 1974.

(SEAL)  
Attest:

MCCOY M. GIBSON, JR.  
Attesting Officer

C. MARSHALL DANN  
Commissioner of Patents