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CANNULAR SURGICAL INSTRUMENT

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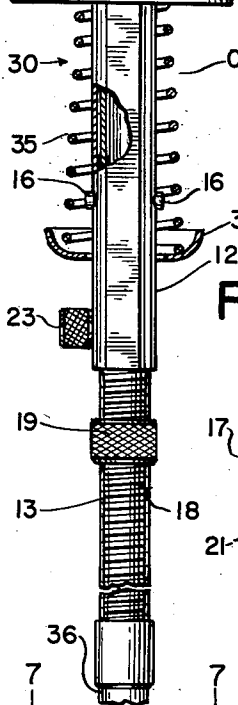
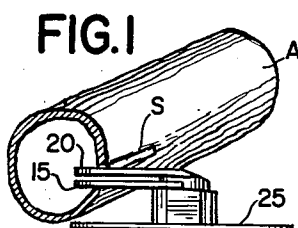


FIG. 1

FIG. 2

FIG. 3

FIG. 4

FIG. 5

FIG. 6

FIG. 7

FIG. 8

FIG. 9

FIG. 10

FIG. 11

FIG. 10

FIG. 11

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CANNULAR SURGICAL INSTRUMENT

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12 Claims. (Cl. 128—348)

This invention relates to surgical instruments and more particularly to an improved cannular surgical instrument that is adapted to be readily placed and retained in communication with a body cavity or a blood vessel, such as an artery.

While the instrument of this invention may be advantageously employed in performing various surgical procedures, it is especially useful in carrying out procedures of the character described in my copending application Serial No. 526,509, filed August 4, 1955, and entitled "Surgical Procedure and Apparatus for Use in Carrying Out the Same." The instrument of this invention is intended primarily for connection to relatively large blood vessels, such as principal arteries or veins.

An important object of the invention is to provide an improved cannular surgical instrument that is adapted to be easily and quickly placed and retained in communication with a body cavity or a blood vessel, such as a principal artery or vein.

Another important object of the invention is to provide a cannular surgical instrument that may be readily assembled, connected at a selected location, or dismantled as required, without the use of tools.

Another object of the invention is to provide an instrument of the character indicated having its parts so constructed and arranged that, when the instrument is operatively connected to a blood vessel, it so engages the wall thereof as to minimize or completely eliminate bleeding at the juncture of the instrument and the blood vessel.

A further object of the invention is to provide a cannular surgical instrument that is simple in design, that is durable in construction, that is reasonable in manufacturing cost, that is adapted to be sterilized and that is capable of performing its intended functions in an effective and trouble-free manner.

The enumerated objects and other objects, together with the advantages of the invention, will be readily understood by persons trained in the art from the following detailed description and the accompanying drawing which respectively describe and illustrate a preferred form of cannular surgical instrument embodying the invention.

In the drawing:

Fig. 1 is a view in side elevation of an instrument constructed in accordance with the invention associated with an artery but prior to being connected thereto, certain parts of the instrument being broken away and other parts being shown in cross section for better illustration;

Fig. 2 is a front elevation view of the instrument shown in Fig. 1, the parts being in another relative position and operatively connected to the artery;

Fig. 3 is a fragmentary elevational view of portions of a pair of conduits employed in the instrument and shown in one relative axial and angular position;

Fig. 4 is an exploded view of the instrument shown in Fig. 1;

Fig. 5 is a view taken along line 5—5 of Fig. 4;

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Fig. 6 is a view taken along line 6—6 of Fig. 4;

Fig. 7 is a view taken along line 7—7 of Fig. 2;

Fig. 8 is a view taken along line 8—8 of Fig. 4;

Fig. 9 is a view taken along line 9—9 of Fig. 4;

Fig. 10 is a view taken along line 10—10 of Fig. 4; and

Fig. 11 is a view of the instrument in elevation showing certain parts in still another relative position, other parts being omitted for better illustration.

Referring now to the drawing, wherein like reference characters denote corresponding parts throughout the several views, a cannular surgical instrument embodying the invention is generally indicated by the letter C and is shown in Figs. 1 and 2 in association with an artery A that has a longitudinal slit S. The instrument comprises a first conduit 12 and a second conduit 13 that is positioned in the first conduit. The conduits are preferably made of a suitable metal and are relatively slideable and rotatable to the extent allowed by devices that will be described further along herein.

Conduit 12, as best shown in Figs. 4 and 8, is formed with a pair of oppositely disposed flat outer surfaces 14. Secured to the upper end of conduit 12 and projecting laterally to one side thereof is a member 15 that is preferably in the form of a plate having rounded corners and edges to avoid damage to body tissue with which it comes in contact during use. Conduit 12 carries a pair of diametrically opposed support pins 16 and is provided, adjacent its lower end, with a double bayonet slot 17 of generally inverted U-shape.

Conduit 13 is threaded at its lower end, as indicated at 18, to receive a knurled adjusting nut 19. This conduit, as in the case of conduit 12, carries at its upper end a laterally projecting plate member 20 which is preferably of the same size and configuration as plate member 15. When the conduits are in the relative position shown in Fig. 1, plate member 20 is aligned with and overlies plate member 15. When the parts are in the relative position shown in Fig. 2, plate members 15 and 20 project in opposite directions and their upper and lower surfaces are substantially flush.

Removably secured to conduit 13 is a stop element 21 (Fig. 4) which consists of a threaded shank 22, a knurled head 23 and an annular part 24 intermediate the shank and the head. Shank 23 engages threads in an opening (not shown) in conduit 13 and part 24 registers with slot 17. The cooperative relationship of stop element 21 and slot 17 limits rotational movement of conduit 13 relative to conduit 12 to an angle of 180°.

A backing member or plate 25, best shown in Fig. 9, has an opening 26 and a pair of oppositely disposed notches 27 that merge with opening 26. It will be observed that opening 26 is defined in part by a pair of spaced parallel rectilinear inner edges 28. Backing plate 25 is freely slideable along conduit 12. Inner edges 28 of the backing plate coact with corresponding flat outer surfaces 14 of the conduit to prevent relative rotation of the backing plate and the conduit.

The instrument includes a resilient means 30 that is mounted on conduit 12 and that normally and yieldingly urges backing plate 25 toward plates 15 and 20. This means comprises a dished support ring 31 which is coaxial, slideable and rotatable with respect to conduit 12. Support ring 31 has a circular central opening 32 and a pair of interior notches 33 which merge with opening 32. The support ring is so configured as to provide a pair of seats 34. Notches 33 and seats 34 are on corresponding diameters of the support ring that are 90° apart. A compression spring 35 is coaxial with the conduits and bears at its opposite ends against backing plate 25 and support ring 31.

When support ring 31 is in the position shown in Fig. 2 relative to conduit 12, pins 16 register with and en-

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gage corresponding seats 34 thereby maintaining the ring in the illustrated position. To remove the support ring at the time of dismantling the instrument, the ring is first moved upwardly a slight distance against the action of spring 35 to disengage the pins from the seats. The support ring is next turned 90° to align notches 33 thereof with pins 16. The support ring may then be moved downwardly past the pins. Similarly, notches 27 in backing plate 25 permit that plate to be moved downwardly past pins 16.

For the purpose of outlining the manner of using the illustrated embodiment of the invention, it is first assumed that the instrument is assembled and that its parts are in the relative position shown in Fig. 1 with the lower end of conduit 13 connected to a flexible conduit 36 that is adapted to be placed in communication with other apparatus or another portion of the artery (not shown). It will be observed that the relative axial and angular position of conduits 12 and 13 is such that plate member 20 is directly above and overlies plate member 15. Support ring 31 is disposed below pins 16, allowing spring 35 and backing plate 25 to assume the illustrated positions.

Artery A is closed on each side of the region of slit S by means of surgical clamps (not shown) prior to forming the slit. The instrument is manipulated so as to insert plate members 15 and 20 into the artery by way of slit S and introduce the upper ends of both conduits 12 and 13 into the artery. Conduit 13 is then moved upwardly relative to conduit 12 as allowed by stop element 21 and slot 17 and is rotated relative to conduit 21 for approximately 180° as allowed by the stop element and the slot. This causes plate member 20 to be swung through 180° and project in a direction opposite to that of plate member 15 (Fig. 2). Support ring 31 is then moved upwardly relative to the conduits to the position shown in Fig. 2 thereby loading compression spring 35 and moving backing plate 25 upwardly to the position shown in that view. This effects retention of the instrument in communicating relationship with the artery and forms an adequate seal to prevent loss of blood at the junctures of plates 15, 20 and 25 and the slit but permits blood flow from the artery through conduit 13. Adjusting nut 19 is now moved from the position shown in Fig. 1 to that shown in Fig. 2 to maintain plate members 15 and 20 in the position shown in Fig. 2.

Upon completion of the connection between instrument C and artery A, the surgical clamp downstream of the instrument or both clamps are removed allowing flow of blood from the artery through conduit 13. The above outlined procedure may be performed very quickly and with a minimum loss of blood as will be evident to persons trained in the art.

From the foregoing, it is thought that the construction, operation, and advantages of the herein described invention will be apparent to those skilled in the art, without further description; and, it will be understood that various changes in the size, shape, proportion and minor details of construction may be resorted to without departing from the spirit, or sacrificing any of the advantages of the invention.

I claim:

1. In a cannular surgical instrument that is adapted to be placed in communication with a body cavity or a blood vessel, such as an artery, a first conduit, a first member secured to and projecting to one side of the first conduit, a second conduit in the first conduit, said conduits being relatively slidable and rotatable, a second member secured to and projecting to one side of the second conduit, one of the members overlying the other member, said members being adapted to be inserted into an artery through an aperture formed therein, said members being adapted upon predetermined rotation of one of the conduits relative to the other conduit to bear against the in-

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ner surface of the artery in the region of said aperture, and a backing member carried by and slideable along the first conduit, said backing member being adapted to bear against the outer surface of the artery in the region of said aperture.

2. In a cannular surgical instrument that is adapted to be placed in communication with a body cavity or a blood vessel, such as an artery, a first conduit, a first member secured to and projecting to one side of the first conduit, a second conduit in the first conduit, said conduits being relatively slideable and rotatable, a second member secured to and projecting to one side of the second conduit and overlying the first member, said members being adapted to be inserted into an artery through an aperture formed therein, said members being adapted upon predetermined rotation of the second conduit relative to the first conduit to bear against the inner surface of the artery in the region of said aperture, and a backing member carried by and slideable along the first conduit, said backing member being adapted to bear against the outer surface of the artery in the region of said aperture.

3. A surgical instrument according to claim 2 wherein the first and second members comprise plates and the backing member comprises a plate having an opening through which the first conduit extends.

4. In a cannular surgical instrument that is adapted to be placed in communication with a body cavity or a blood vessel, such as an artery, an upstanding first conduit, a first member secured to the upper end of the first conduit and projecting laterally to one side thereof, a second conduit in the first conduit, said conduits being relatively slideable and rotatable, a second member secured to the upper end of the second conduit and projecting laterally to one side thereof, said second member overlying the first member, said members being adapted to be inserted into an artery through an aperture formed therein, said members being adapted upon predetermined rotation of one of the conduits relative to the other conduit to project in substantially opposite directions, and a backing member carried by and slideable along the first conduit, said backing member being disposed below the first member.

5. In a cannular surgical instrument that is adapted to be placed in communication with a body cavity or a blood vessel, such as an artery, an upstanding first conduit, a first member secured to the upper end of the first conduit and projecting laterally to one side thereof, a second conduit in the first conduit, said conduits being relatively slideable and rotatable, a second member secured to the upper end of the second conduit and projecting laterally to one side thereof, said second member overlying the first member, said members being adapted to be inserted into an artery through an aperture formed therein, said members being adapted upon predetermined rotation of one of the conduits relative to the other conduit to project in substantially opposite directions, a backing member carried by and slideable along the first conduit, said backing member being disposed below the first member, and means mounted on the first conduit and engaging the backing member, said means normally and yieldingly urging the backing member toward the first member.

6. A surgical instrument according to claim 5 wherein said means comprises a support removably secured to the first conduit and a compression spring intermediate and bearing against the support and the backing member.

7. In a cannular surgical instrument that is adapted to be placed in communication with a body cavity or a blood vessel, such as an artery, an upstanding first conduit, a first member secured to the upper end of the first conduit and projecting laterally to one side thereof, a second conduit slideable and rotatable in the first conduit, a second member secured to the upper end of the second conduit and projecting laterally to one side thereof, said second member overlying the first member, said members being adapted

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to be inserted into an artery through an aperture formed therein, said members being adapted upon predetermined rotation of the second conduit relative to the first conduit to project in substantially opposite directions, means limiting rotational movement of the second conduit relative to the first conduit to an angle of approximately 180°, and a backing member carried by and slideable along the first conduit, said backing member being disposed below the first member.

8. A surgical instrument according to claim 7 wherein said means comprises an element carried by the second conduit and registering with a slot in the first conduit.

9. In a cannular surgical instrument that is adapted to be placed in communication with a body cavity or a blood vessel, such as an artery, an upstanding first conduit, a first member secured to the upper end of the first conduit and projecting laterally to one side thereof, a second conduit slideable and rotatable in the first conduit, a second member secured to the upper end of the second conduit and projecting laterally to one side thereof, said second member overlying the first member, said members being adapted to be inserted into an artery through an aperture formed therein, said members being adapted upon predetermined rotation of the second conduit relative to the first conduit to project in substantially opposite directions, first means limiting rotational movement of the second conduit relative to the first conduit to an angle of approximately 180°, a backing member carried by and slideable along the first conduit, said backing member being disposed below the

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first member, and second means mounted on the first conduit and engaging the backing member, said second means normally and yieldingly urging the backing member toward the first member.

10. A surgical instrument according to claim 9 wherein the first means comprises an element carried by the second conduit and registering with a slot in the first conduit, and the second means comprises a support removably secured to the first conduit and a compression spring intermediate and bearing against the support and the backing member.

11. A surgical instrument according to claim 9 wherein the first and second members comprise plates and the backing member comprises a plate having an opening through which the first conduit extends.

12. A surgical instrument according to claim 9 wherein the first and second members comprise plates, the backing member comprises a plate having an opening through which the first conduit extends, the first means comprises an element carried by the second conduit and registering with a slot in the first conduit, and the second means comprises a support removably secured to the first conduit and a compression spring intermediate and bearing against the support and the backing member.

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