

Oct. 27, 1959

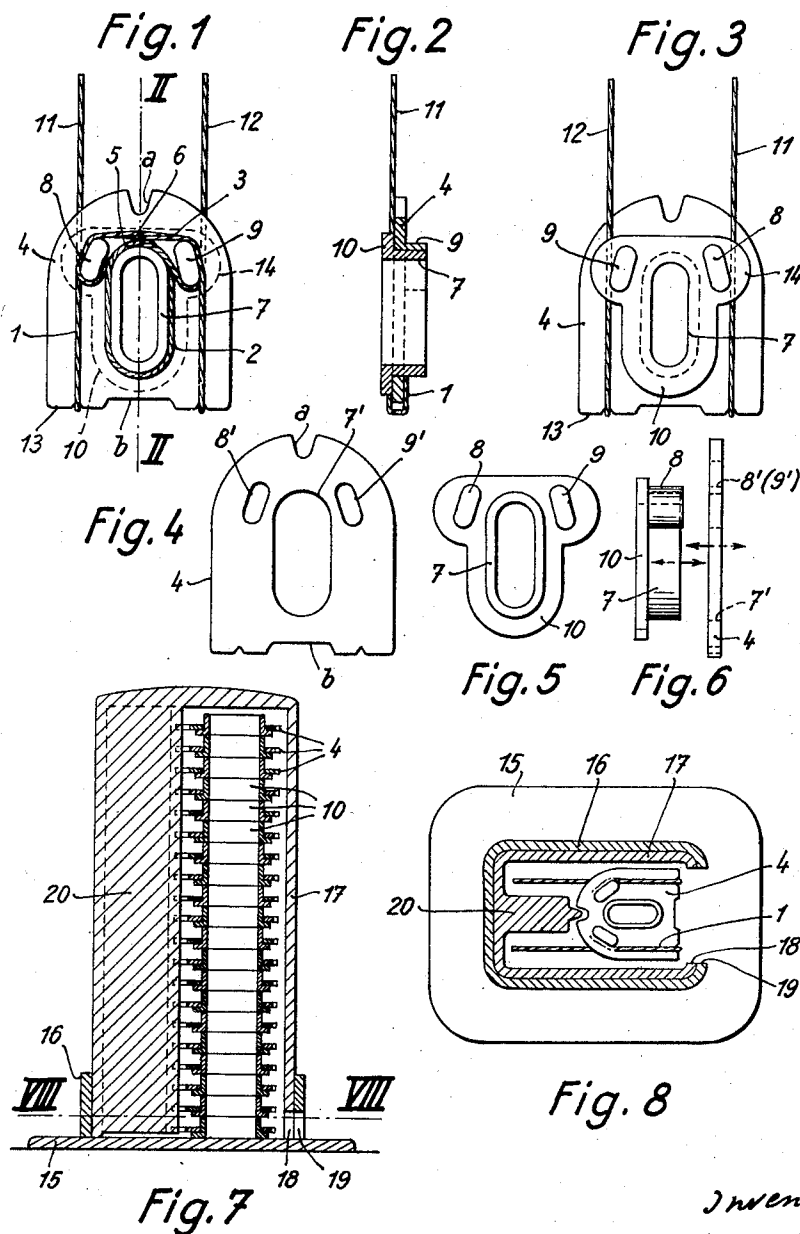
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2,910,066

THREAD FOR THE PRODUCTION OF KNOTTED LIGATURES, MORE ESPECIALLY
FOR SURGICAL PURPOSES AND PARTICULARLY FOR THE LIGATURING
OF BLOOD VESSELS DURING OPERATIONS

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Fig. 9

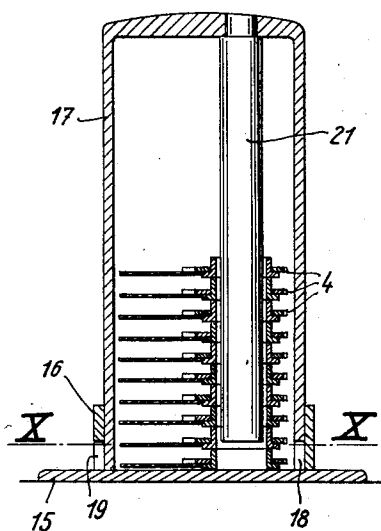


Fig. 11

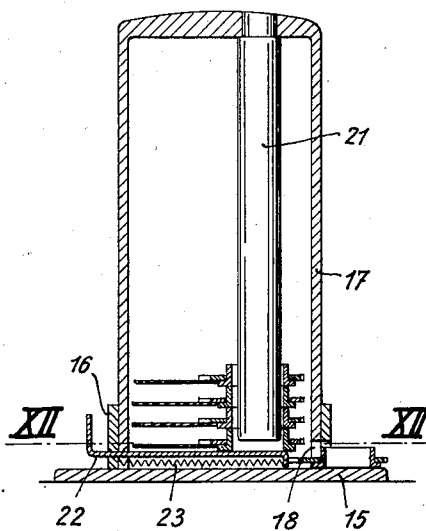


Fig. 10

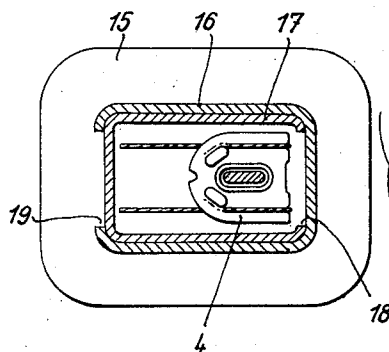
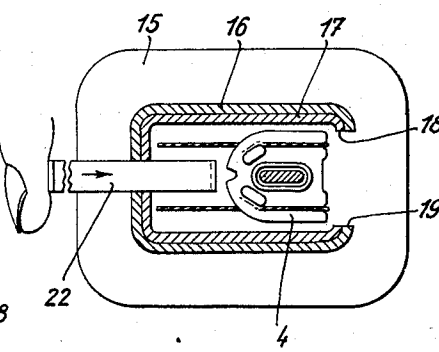


Fig. 12



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Fig. 13

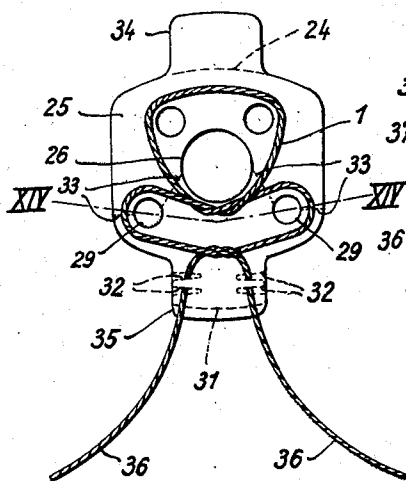


Fig. 15

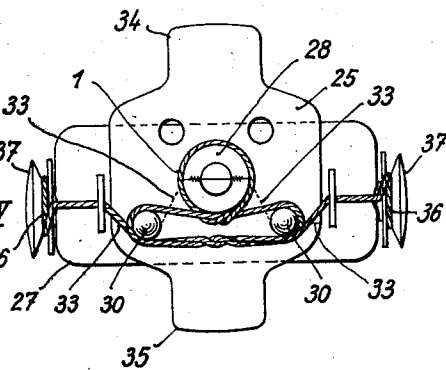


Fig. 14

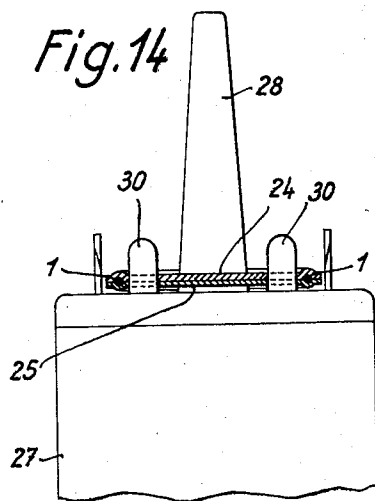
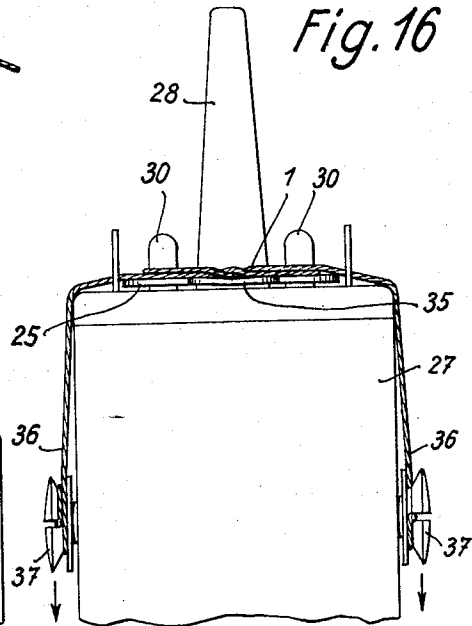


Fig. 16



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THREAD FOR THE PRODUCTION OF KNOTTED LIGATURES, MORE ESPECIALLY FOR SURGICAL PURPOSES AND PARTICULARLY FOR THE LIGATURING OF BLOOD VESSELS DURING OPERATIONS

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Application January 5, 1954, Serial No. 402,360

Claims priority, application Germany July 3, 1953

9 Claims. (Cl. 128—326)

The present invention relates to a ligature carrier, and more particularly to a ligature carrier which carries a pre-looped ligature ready for transfer to a surgical instrument.

It is one object of the present invention to provide a ligature carrier to which a pre-looped ligature is detachably attached, so that it can be immediately transferred to a suitable ligaturing instrument capable of tightening the pre-looped ligature into a double knot on a blood vessel. Another object of the present invention is a ligature carrier including a plate which may remain directly on the surgical instrument as a protection for the ligature during the tying operation.

Another object of the present invention is a ready-looped ligature arrangement including a supporting plate and a ligature, which can be prepared in non-sterilized condition, and then sterilized in large numbers while the ligature remains on the supporting plate.

With these objects in view, the present invention mainly consists in a ligature carrier which comprises, in combination, support plate means for supporting a ligature to be tied into a knot and having at least one first boss portion surrounded by a first loop portion of a ligature, and at least one second boss portion surrounded by another loop portion of the ligature, the respective loop portions constituting the inner and outer loops of a ligature knot tied on a blood vessel so that when the ligature is transferred to a surgical instrument, a double knot is easily tied by the surgical instrument on the blood vessel.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Figure 1 is a plan view illustrating a ligature carrier according to the present invention;

Figure 2 is a sectional view of the ligature carrier shown in Figure 1 taken on line II—II;

Figure 3 is a bottom view of the ligature carrier shown in Figure 1;

Figure 4 is a fragmentary plan view of a part of the ligature carrier;

Figure 5 is a plan view of another part of the ligature carrier;

Figure 6 is an exploded side view showing the parts of Figures 4 and 5;

Figure 7 is a longitudinal section of a magazine for the ligature carriers;

Figure 8 is a horizontal sectional view taken on line VIII—VIII of Figure 7;

Figure 9 is a longitudinal sectional view of a modified embodiment of a magazine;

Figure 10 is a cross sectional view taken on line X—X of Figure 9;

Figure 11 is a longitudinal sectional view illustrating

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a modified magazine for ligature carriers including an ejector member;

Figure 12 is a cross sectional view taken on line XII—XII of Figure 11;

Figure 13 is a plan view of a ligature carrier according to the modified embodiment of the present invention;

Figure 14 is a view partly in section on line XIV—XIV in Figure 13 and showing a surgical instrument for tying blood vessels;

Figure 15 is a plan view of the arrangement shown in Figure 14 with a part of the ligature carrier removed; and

Figure 16 is a side elevation showing the ligature carrier in the condition of Figure 15, and including the surgical instrument.

Referring now to the drawings, and more particularly to Figures 1 to 6, a ligature 1 consisting of catgut, for example, is attached in pre-looped condition to a supporting plate means and wound in two loops 2 and 3 so that a double knot is produced when the loops 2 and 3 are later on tightened by a surgical instrument. The crossing points 5 and 6 of the two loops are disposed above each other. The supporting plate means may consist of metal, or artificial transparent material, and has such a size and shape as to correspond to the shape of corresponding portions of a ligaturing instrument, as is, for example, described in the co-pending applications Serial No. 347,336, now abandoned and Serial No. 402,359.

Boss portions 7, 8 and 9 project above the surface of support plate 4 and are part of another plate 10. The center boss portion 7 has an opening passing therethrough and is consequently tubular, whereas the other boss portions 8 and 9 are short solid pins. Boss portions 7, 8 and 9 project through openings 7', 8' and 9' in plate 4.

The ligature 1 is wound about the boss portions 7, 8 and 9 in front of plate 4. The ends 11 and 12 of the ligature are guided around the edge 13 of plate 4 and placed under the surface 14 of plate 10 so that they are attached to the ligature carrier 4, 10 by the clamping pressure between the plates 4 and 10. After a ligature has been wound on the ligature carrier as above described, it can be sterilized together with the carrier, and the supporting plate 10 and 7 can be discarded as waste after the ligature has been transferred to a surgical instrument.

Ready-looped ligature carriers are stored in a magazine of the type shown in Figures 7 to 12. The magazine has a base 15 with a tubular guide wall 16. A container 17 containing a stack of ligature carriers is inserted into the tubular guide wall 16 so that its open end is closed. Slots 18 and 19 are provided in the container 17 and in the guide wall 16 through which the ligature carrier plates can be removed by pincers, while successive ligature carriers move down to the base plate 15. A guide rib 20 is provided in container 17 for holding the carrier plates 4 in proper position, and engages a notch in the carrier plate 4. The free ends of the ligature are located on both sides of the guide rib 20.

In the modified magazine shown in Figures 9 and 10, instead of the guide rib 20, a guide rod 21 is provided which passes through the center opening 7 and 7' of the ligature carriers. The end of the guide rod 21 is spaced from the base plate to permit removal of ligature carriers through slots 18 and 19, which can be aligned by turning container 17 through 180° out of the position shown in Figure 9 in which the magazine is closed. In the modified embodiment of Figure 11, the foremost carrier plate is ejected through slots 18 by operation of a pusher member 22 which is normally retracted by a spring 23.

Figures 13 to 16 show a modified embodiment of the ligature carrier. A flat carrier plate 24 has wound thereon a ligature which forms two loops which are held in position by a cover plate 25. Aligned holes 26 are provided in the carrier plate 24 and in the cover plate 25, and

additional aligned holes 29 are provided in plates 24 and 25. Carrier plate 24 has a flap 31 provided with notches and tongues 32 into which the free ends of the ligature 1 are clamped, and which constitute securing means for holding the ligature. The cover plate 25 is perforated along lines 33 and can be broken along these lines when force is applied to the two flaps 34 and 35 thereon.

The ligature carrier shown in Figure 13 is placed on a surgical ligaturing instrument 27 which includes a pair of pins 30, forceps 28 for clamping a blood vessel, and buttons 37 for tightening a ligature. The ligature carrier is placed on the instrument with the forceps 28 passing through holes 26, and the pins 30 located in the holes 29, cover plate 25 facing the instrument, and plate 24 facing outward. The free ends 36 of the ligature 1 are connected with buttons 37 which were previously tightened, and after loosening of buttons 37 the free ends 36 of the ligature are tightened in the direction of the arrows in Figure 16 whereby the prepared loops of the ligature are detached from the plates 24 and 25 and lie around the forceps 28 and pins 30. Carrier plate 24 can now be removed, while cover plate 25 is broken by bending the same with the aid of flaps 34 and 35. In this manner the carrier is discarded, while the pre-looped ligature is now transferred to the surgical instrument.

In the embodiment of Figures 1 to 6, the ligature is transferred to the surgical instrument by placing the forceps in the opening 7, whereupon three ejector members of the instrument are actuated to act on boss portions 7, 8 and 9 to push plate 10 with bosses 7, 8 and 9 out of plate 4 so that the ready-looped ligature is located on the instrument. In this embodiment the plate 4 remains temporarily on the appliance during the tying of the blood vessel, and may be retained by resilient means acting on the cutout portions *a* and *b*.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of ligature carriers differing from the types described above.

The invention is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

What is claimed as new and desired to be secured by Letters Patent is:

What I claim is:

1. A ligature carrier comprising, in combination, support plate means for supporting a ligature or the like to be tied into a knot, said support plate means having at least one first boss portion adapted to be surrounded by a portion of a ligature carried by said support means which constitutes the inner loop of a prospective ligature knot and at least one second boss portion adapted to be surrounded by another portion of the ligature which constitutes the outer loop of the prospective ligature knot so that said ligature is adapted to be transferred to a surgical instrument; and securing means for securing the free end portions of the ligature to said support plate means.

2. A ligature carrier comprising, in combination, support plate means for supporting a ligature or the like to be tied in a knot, said support plate means being formed with opening means therethrough and a first annular boss portion surrounding said opening means and adapted to be surrounded by a portion of a ligature carried by said support plate means which constitutes the inner loop of a prospective ligature knot, said support plate means being also formed with at least one second boss portion adapted to be surrounded by another portion of the ligature which constitutes the outer loop of the prospective ligature knot; and securing means for securing the free end portions of the ligature to said support plate means.

3. A ready-looped ligature arrangement comprising, in combination, discardable ligature carrier means having a first portion and at least one second portion; a ligature carried by said ligature carrier means and adapted to be

sterilized together with the same, said ligature having a first portion constituting the inner loop of a prospective ligature knot surrounding said first portion and a second portion constituting the outer loop of the prospective ligature knot surrounding said second portion so that said ligature is adapted to be transferred to a surgical instrument; and securing means for securing the free ends of said ligature to said ligature carrier means.

4. A ligature carrier for supporting a ligature or the like to be tied into a knot comprising, in combination, first plate means formed with first opening means and with at least one second opening means therethrough; second plate means having a first boss portion and at least one second boss portion and located adjacent said first plate means and said first boss portion projecting through said first opening means and said second boss portion projecting through said second opening means, said first boss portion being adapted to be surrounded by a portion of a ligature carried by the ligature carrier which constitutes the inner loop of a prospective ligature knot and said second boss portion being adapted to be surrounded by another portion of the ligature which constitutes the outer loop of the prospective ligature knot whereby the ligature carrier is adapted to carry a ready-looped ligature; and securing means for securing the free end portions of the ligature to said plate means.

5. A ligature carrier for supporting a ligature or the like to be tied into a knot comprising, in combination, first plate means formed with first opening means and with at least one second opening means therethrough; second plate means formed with third opening means therethrough and a first annular boss portion surrounding said third opening means, said second plate means being also formed with at least one second boss portion, said second plate means being located adjacent said first plate means so that said first and third opening means are in registration with each other, said first annular boss portion projecting through said first opening means and said second boss portion projecting through said second opening means, said first annular boss portion being adapted to be surrounded by a portion of a ligature carried by the ligature carrier which constitutes the inner loop of a prospective ligature knot and said second boss portion being adapted to be surrounded by another portion of the ligature which constitutes the outer loop of the prospective ligature knot whereby the ligature carrier is adapted to carry a ready-looped ligature; and securing means for securing the free end portions of the ligature to said plate means.

6. A ligature carrier comprising, in combination, support plate means for supporting a ligature or the like to be tied into a knot, said support plate means being formed with opening means therethrough and a first annular boss portion surrounding said opening means and adapted to be surrounded by a portion of a ligature carried by said support plate means which constitutes the inner loop of a prospective ligature knot, said support plate means being also formed with two second boss portions adapted to be surrounded by another portion of the ligature which constitutes the outer loop of the prospective ligature knot; and securing means for securing the free end portions of the ligature to said support plate means.

7. A ready-looped ligature arrangement comprising, in combination, ligature carrier plate means having a first boss portion and at least one second boss portion; and a ligature carried by said ligature carrier plate means and having a first portion constituting the inner loop of a prospective ligature knot surrounding said first boss portion and a second portion constituting the outer loop of the prospective ligature knot surrounding said second boss portion, said ligature carrier plate means being adapted to be placed adjacent a receiving apparatus having first and second receiving means for engaging said first and second boss portions, respectively, so that the ligature may be transferred thereto in such a manner that

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the inner loop of the prospective ligature knot surrounds the first receiving means and the outer loop of the prospective ligature knot surrounds the second receiving means.

8. A ligature carrier for supporting a ligature or the like to be tied into a knot comprising, in combination, first plate means formed with first opening means and with at least one second opening means therethrough; and second plate means having a first boss portion and at least one second boss portion and located adjacent said first plate means and said first boss portion projecting through said first opening means and said second boss portion projecting through said second opening means, said first boss portion being adapted to be surrounded by a portion of a ligature carried by the ligature carrier which constitutes the inner loop of a prospective ligature knot and said second boss portion being adapted to be surrounded by another portion of the ligature which constitutes the outer loop of the prospective ligature knot whereby the ligature carrier is adapted to carry a ready-looped ligature, that first and second plate means in said assembled position being adapted to be placed adjacent a receiving apparatus having first and second receiving means for engaging said first and second boss portions, respectively, while the same project through said first and second opening means, respectively, the first and second receiving means also projecting through said first and second opening means, respectively, so that the ready-looped ligature may be transferred thereto in such a manner that the inner loop of the prospective ligature knot surrounds the first receiving means and the outer loop of the prospective ligature knot surrounds the second receiving means by movement of said second plate means relative to said first plate means and to the receiving apparatus in a direction away from said first plate means and toward the first and second receiving means.

9. A ligature carrier for supporting a ligature or the like to be tied into a knot comprising, in combination, first plate means formed with first opening means and with at least one second opening means therethrough; and second plate means formed with third opening means therethrough and a first annular boss portion surrounding said third opening means, said second plate means being also formed with at least one second boss portion, said second plate means being located adjacent said first plate

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means so that said first and third opening means are in registration with each other, said first annular boss portion projecting through said first opening means and said second boss portion projecting through said second opening means, said first annular boss portion being adapted to be surrounded by a portion of a ligature carried by the ligature carrier which constitutes the inner loop of a prospective ligature knot and said second boss portion being adapted to be surrounded by another portion of the ligature which constitutes the outer loop of the prospective ligature knot whereby the ligature carrier is adapted to carry a ready-looped ligature, said first and second plate means in said assembled position being adapted to be placed adjacent a receiving apparatus having first receiving means for projecting through said first annular boss portion and consequently through said first and third opening means, the receiving apparatus also having second receiving means for engaging said second boss portion while the same projects through said second opening means, the second receiving means also projecting through said second opening means so that the ready-looped ligature may be transferred thereto in such a manner that the inner loop of the prospective ligature knot surrounds the first receiving means and the outer loop of the prospective ligature knot surrounds the second receiving means by movement of said second plate means relative to said first plate means and to the receiving apparatus in a direction away from said first plate means and toward the first and second receiving means.

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