

[72] Inventor **Flora L. Thompson**
North Brunswick, New Jersey
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[73] Assignee **Ethicon, Inc.**
a corporation of New Jersey

[56] References Cited			
UNITED STATES PATENTS			
877,476	1/1908	Bach	128/339
2,910,983	11/1959	Everett	128/339
3,394,704	7/1968	Dery	128/339
FOREIGN PATENTS			
647,813	9/1962	Canada	128/339

Primary Examiner—Dalton L. Truluck
Attorneys—Alexander T. Kardos, Arnold S. Worfolk and
Robert W. Kell

[54] **SPANDEX SUTURE NEEDLE COMBINATION**
4 Claims, 8 Drawing Figs.
[52] U.S. Cl. **128/339,**
163/5, 223/102
[51] Int. Cl. **A61b 17/06**
[50] Field of Search **128/335.5,**
339; 223/102—104; 163/5

ABSTRACT: A spandex suture is secured to a metal needle by inserting the end of the suture together with a deformable textile material into a recessed portion of the needle and swaging the needle to compress together the spandex suture and textile material.

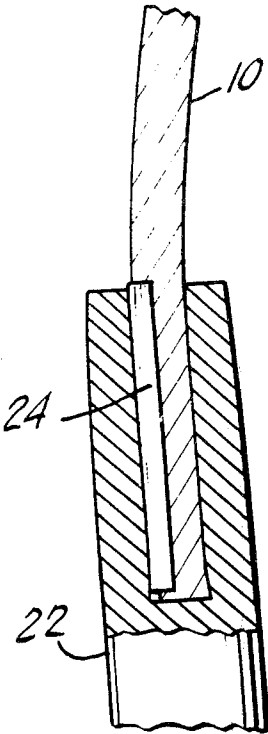


Fig. 1.

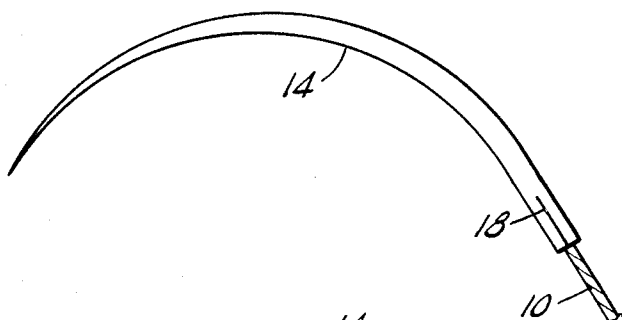


Fig. 2.

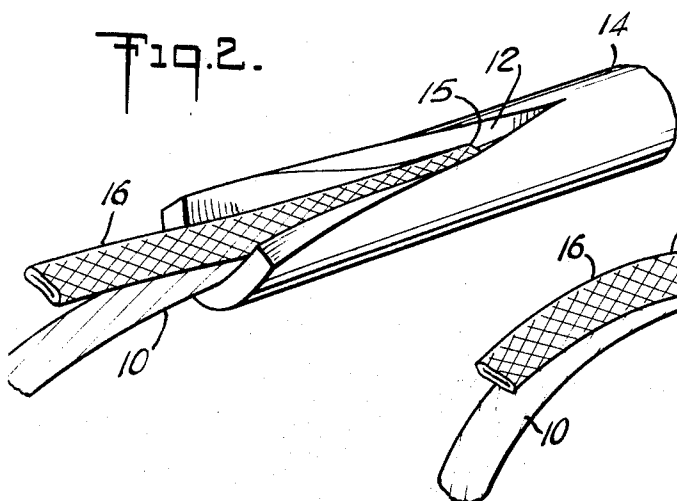


Fig. 3.

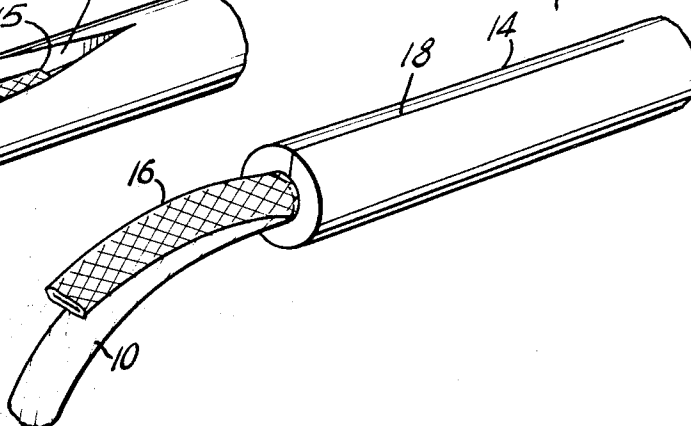


Fig. 4.



Fig. 5.

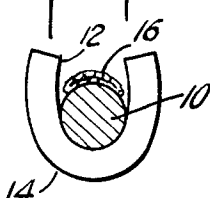


Fig. 6.

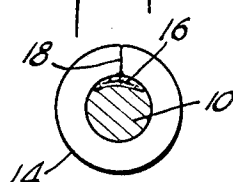


Fig. 7.

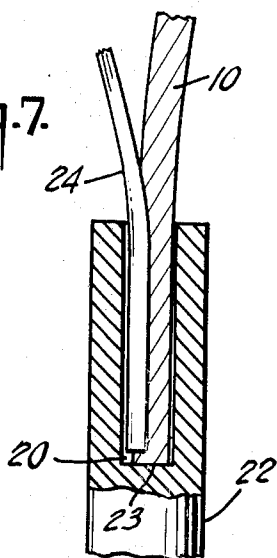
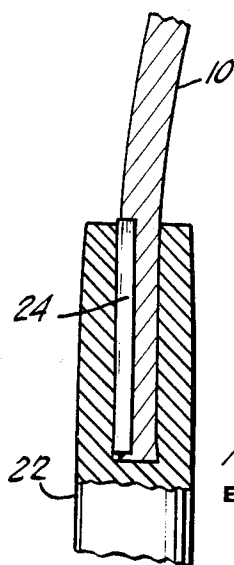


Fig. 8.



INVENTOR
FLORA L. THOMPSON
BY *Robert W. Bell*
ATTORNEY

SPANDEX SUTURE NEEDLE COMBINATION

This invention relates to a spandex suture and needle construction. For many years eyeless needles have been attached to surgical sutures by mechanical swaging to compress the metal of the needle against the suture thereby firmly attaching the same. The shank of the needle may be provided with a U-shaped recess or channel, the end of the suture laid in the groove so formed, and the shank of the needle swaged, bending the sides of the recess down over the end of the suture to clinch the same. This method of securing the suture to the needle is described in Canadian Pat. No. 647,813.

It is also known to form a longitudinal, cylindrical recess in the shank of a needle by drilling as illustrated in U.S. Pat. No. 1,558,037. Again, the shank of the needle can be swaged to clinch the suture within the needle.

Spandex is a manufactured fiber in which the fiber-forming substance is a long-chain synthetic polymer comprising at least 85 percent of a segmented polyurethane. Spandex sutures which are preferred by some surgeons for special applications because of their inherent elasticity present a special problem in that swaging such a suture into the channel or drilled hole of a needle does not satisfactorily secure the suture to the needle. The spandex suture material, when stress or tension is applied, will stretch and the end of the suture will pull away from the needle. If the swaging procedure is modified to close the recess within the needle more tightly around the spandex suture, there is a tendency for the metal to clip through the suture material.

The principal object of this invention is to provide an improved attachment of spandex sutures to needles.

Another object of this invention is to provide a satisfactory attachment of spandex sutures to needles by swaging.

Yet another object of the invention is to provide spandex suture-needle attachment means that will accommodate some variation between the relative dimensions of the spandex suture and the needle.

A particular object of the invention is to provide a means of swaging a needle to a spandex suture that is equally applicable to drilled and channeled needles.

Further advantages of the invention will be apparent from the following description, the accompanying drawing, and the appended claims.

In the drawings:

FIG. 1 is a perspective view of a channel needle and spandex suture combination;

FIG. 2 is a perspective view of a channel needle prior to swaging to secure the suture;

FIG. 3 is a perspective view of a channel needle that has been swaged to secure the suture;

FIG. 4 is an end view of a channel needle with the suture in place prior to swaging;

FIG. 5 illustrates an intermediate step in the process of the present invention;

FIG. 6 is an end view of a channel needle after swaging;

FIG. 7 is a sectional view of a drilled needle prior to swaging; and

FIG. 8 is a cross-sectional view of a drilled needle following swaging.

In accordance with this invention, a spandex suture is secured to a metal needle by inserting an end of a spandex suture and a deformable textile material into a recessed portion of the needle and swaging the needle to compress together the spandex suture and textile material.

Generally, a suture needle is formed with a narrow channel or longitudinal groove at the blunt end thereof into which the end of the suture and a small piece of the deformable textile material is introduced. Some needles are so structured that the recess takes the form of a cylindrical hole, drilled in the direction of the longitudinal axis of the needle. Preferably, the recess is dimensioned to receive the spandex suture and a length of deformable textile material at least equal in diameter

to the diameter of the suture. Although a deformable textile yarn may be used in the practice of the present invention, a braided multifilament is preferred.

The deformable textile material may be a multifilament that is not adversely affected by sterilization procedures and one that will not adversely affect the tissue being repaired. Examples of suitable deformable textile materials are braided silk, and the synthetic manmade fibers, such as, the acrylate fibers in which the fiber-forming substance is any long-chain synthetic polymer composed of at least 85 percent by weight of acrylonitrile units; modacrylic fibers, a manufactured fiber in which the fiber-forming substance is any long-chain synthetic polymer composed of less than 85 percent but at least 35 percent by weight of acrylonitrile units; polyester fibers wherein the fiber-forming substance is any long-chain synthetic polymer composed of at least 85 percent by weight of an ester of a dihydric alcohol and terephthalic acid; rayon, a manufactured fiber composed of regenerated cellulose, as well as manufactured fibers composed of regenerated cellulose in which substituents have replaced not more than 15 percent of the hydrogens of the hydroxyl groups; acetate, a manufactured fiber in which the fiber-forming substance is cellulose acetate; saran, a manufactured fiber in which the fiber-forming substance is any long-chain synthetic polymer composed of at least 80 percent by weight of vinylidene chloride units; azlon, a manufactured fiber in which the fiber-forming substance is composed of any regenerated naturally occurring proteins; nytril, a manufactured fiber containing at least 85 percent of a long-chain polymer of vinylidene dinitrile; where the vinylidene dinitrile content is not less than every other unit in the polymer chain; nylon, a manufactured fiber in which the fiber-forming substance is any long-chain synthetic polyamide having recurring amide groups as an integral part of the polymer chain; vinal, a manufactured fiber in which the fiber-forming substance is any long-chain synthetic polymer composed of at least 50 percent by weight of vinyl alcohol units and in which the total of the vinyl alcohol units and any one or more of the various acetal units is at least 85 percent by weight of the fiber; olefin, a manufactured fiber in which the fiber-forming substance is any long-chain synthetic polymer composed of at least 85 percent by weight of ethylene, propylene, or other olefin units; vinyon, a manufactured fiber in which the fiber-forming substance is any long-chain synthetic polymer composed of at least 85 percent by weight of vinyl chloride units and filaments of collagen, a protein derived from natural sources.

Referring now to the drawings and most particularly to FIGS. 2 through 6, a spandex suture 10 is placed in the open U-shaped recess 12 of a channel needle 14, said suture being aligned with the longitudinal axis of the groove, with its end 15 abutting the closed end of the channel. A piece of braided multifilament 16 about twice the length of the groove in the needle is then placed over the suture. The needle is then swaged compressing the needle against the suture 10 and the multifilament 16 and closing the recess.

FIG. 4 shows the suture in place within the needle channel prior to placing the braided multifilament in position. FIG. 5 shows the suture and braided multifilament within the needle channel at the beginning of closure, and FIG. 6 shows the suture and braided multifilament in position within the U-shaped channel which has been swaged to form a closure at the seam 18. After the swage is completed, the excess multifilament is trimmed as close to the end of the needle as possible.

The application of the present invention in securing a spandex suture within the cylindrical recess of a drilled needle is best shown in FIG. 7 and FIG. 8. A spandex suture 10 is placed within the cylindrical recess 20 of a drilled needle 22 with its end 23 abutting the end of the channel. A piece of a collagen strand about twice the length of the recess is inserted with the suture and the needle is swaged compressing the needle against the suture and collagen strand and closing the recess.

In order to test the pullout strength of a spandex suture needle combination, a Scott tester is used. The pullout strength is

defined as the pounds of stress applied to the suture at the time it is separated from the needle.

This invention is illustrated by the following examples:

EXAMPLE I

One end of a size 5/0 spandex suture was placed in the open U-shaped recess of a channel needle, said suture being aligned with the longitudinal axis of the needle and the groove, with its end abutting the closed end of the channel. A piece of size 5/0 braided polyester multifilament about twice the length of the groove in the needle is placed over the suture, and the needle is swaged compressing the needle against the suture and multifilament and closing the recess. After the swage is completed, the excess multifilament is trimmed as close to the needle as possible. The pullout strength as determined on the Scott tester (eight samples) varied between 0.26 pounds and 0.55 pounds (average 0.35 pounds). Eleven spandex needle samples swaged without the presence of Mersilene when similarly tested had a pullout strength that varied between 0.14 and 0.32 pounds (average 0.23 pounds).

EXAMPLE II

One end of a size 5/0 spandex suture was placed within the cylindrical recess of a drilled needle with its end abutting the end of the channel. A piece of braided silk size 5/0 about twice the length of the recess is inserted with the suture, and the needle is swaged compressing the needle against the suture and silk and closing the recess. The excess silk is then trimmed close to the needle. The pullout strength of sutures with the reinforcement provided by the silk is tested on the Scott tester. The pullout strength of seven samples varied from 0.21 to 0.42 pounds (average 0.32 pounds).

EXAMPLE III

One end of a size 5/0 spandex suture was placed within the cylindrical recess of a drilled needle with its end abutting the end of the channel. A piece of a size 2/0 collagen strand about twice the length of the recess is inserted with the suture; and the needle is swaged compressing the needle against the suture and collagen strand and closing the recess. The excess collagen strands are then trimmed close to the needle. The pullout strength of sutures with the reinforcement provided by the collagen strands is tested on the Scott tester. All five samples tested broke without pulling out of the needle. The variation was from 0.36 pounds to 0.55 pounds (average 0.44 pounds).

Obviously, either a drilled needle or a channel needle may be employed when the method according to the invention is used for attachment of a spandex suture to the needle.

I claim:

1. A needle-suture combination comprising: a surgical needle having a pointed end and a blunt end; a recess in the blunt end thereof; a spandex suture positioned within said recess; a deformable textile material positioned within said recess in contiguous relationship to said suture; and said suture and deformable textile material being swaged together and compressed within said recess whereby the pullout strength of said suture is increased.

2. The product of claim 1, wherein the deformable textile material is braided polyester multifilament.

3. The product of claim 1, wherein the deformable textile material is braided silk multifilament.

4. The product of claim 1, wherein the deformable textile material is collagen.