

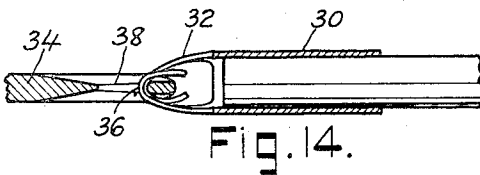
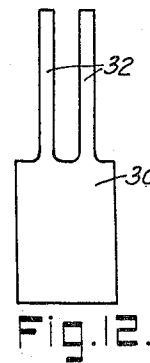
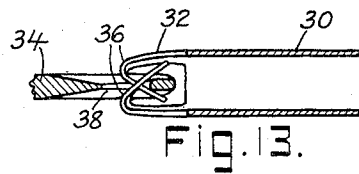
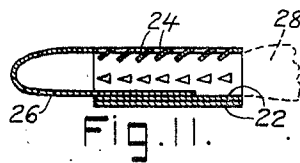
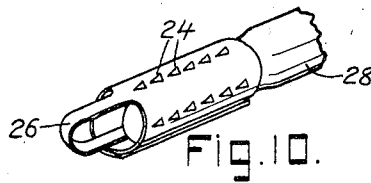
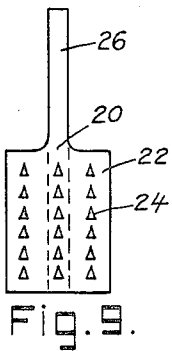
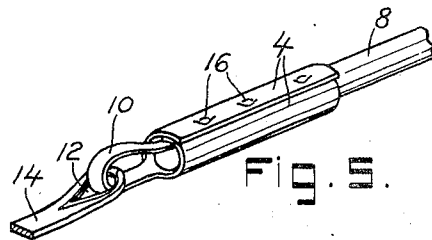
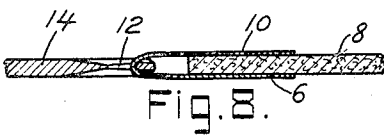
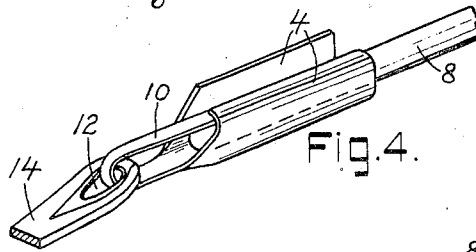
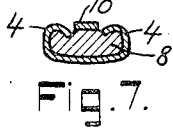
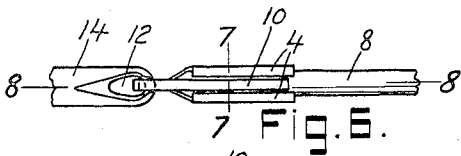
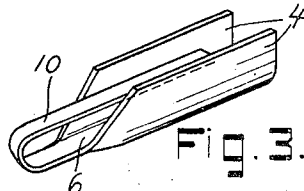
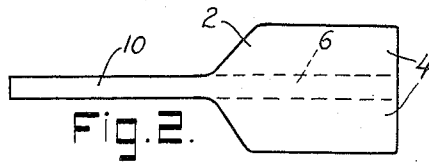
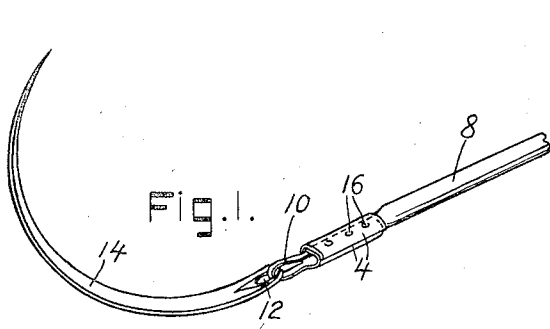
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H. B. VOLLRATH

2,302,986

ATRAUMATIC SUTURE LINK

Filed Dec. 27, 1940



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BY

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# UNITED STATES PATENT OFFICE

2,302,986

## ATRAUMATIC SUTURE LINK

Harold B. Vollrath, Philadelphia, Pa.

Application December 27, 1940, Serial No. 371,875

1 Claim. (Cl. 128—339)

My invention pertains to devices for use in surgical operations and specifically to links designed to afford an end to end connection between the standard surgical needles commonly used and the suture or ligature, such as catgut, silkworm gut, kangaroo tendon, ribbons, silk, Nylon, linen, and autogenous or other fascial sutures.

The principal object of the invention is to eliminate the necessity of tying knots in such sutures, or subsidiary connecting ligatures, or of using a double thickness of the suture around the eye of the needle, or any other method of fastening the suture to the needle which would cause a thickness greater than that of the shank of the needle or of the single strand of the suture itself. Such knots and excessively thick portions cause an amount of injury or traumatism to the muscles, organs, and tissues of the patient which is the object of this invention to avoid, or to reduce to the minimum, with the subsequent reduction of pain to the patient during postoperative recovery.

It is a further object of the invention to spare the surgical needle for repeated re-use. There are a number of atraumatic needles known to the art, where the suture is directly fastened into a hollow rear end of the needle, or in a notched section of the needle, or otherwise. But such needles are mostly, by their nature, suitable for only one use, or not adapted for the speedy and easy threading required in operating room practice.

Surgical needles are comparatively costly and another object of my invention is to provide a connecting link which may be connected to and removed from a conventional surgical needle so that the needle may be re-used as often as required while the connecting link will be inexpensive to manufacture and not uneconomical to discard after each use.

A still further object of the invention is to provide, on the one hand, a sure, positive grip on the suture by one end of the connecting link, and on the other hand, a means of joining the leading end of the link to the needle or probe so that it will be entirely flexible, like a universal joint, permitting the sharply angled turns necessary in surgical stitching without danger of the needle and link binding against each other, or of the link working loose from the eye of the needle before the suturing has been completed.

Another object of the invention is to provide a link which is smooth and free from all projecting points, edges, or burrs which might cause lac-

erations or other injury, and which will avoid as far as possible a decrease in diameter between the shank of the needle and the link, but continue a uniform diameter from one to the other, so that the needle, link, and suture can be drawn smoothly, easily, and gently and without jerks through those portions of the human body requiring surgical suturing.

It is a specific object, in one form of my invention, to provide all of the afore named features especially for use with the Gallie needle used in the repair of large inguinal, incisional, and umbilical herniae. This needle is frequently used to suture a strip of living fascia or other fascia which is flat and ribbon-like, as opposed to the common, round suture materials such as catgut. The connection of the suture to the eye of the Gallie needle has hitherto presented a difficult problem and by the prior methods used has resulted in a painful traumatism to the patient and a weakening of muscles which might lead to a recurrence of hernia. Considerable pressure must be exerted to force the Gallie needle through the parts involved in the suturing and it is most undesirable to have any knotted ligature or excessive thickness in the train of the needle and suture. My invention overcomes these objections and provides a smooth, atraumatic connection for performing this well-known type of herniorrhaphy.

Other modifications of my invention may be designed specifically for orthopedic surgery, in such service as tendon transplantations or for use in other types of operations.

In order to attain the advantages of my invention an atraumatic surgical link is provided which has a body formed of metal with a portion adapted to be secured to a suture and a part adapted to enter the eye of a conventional surgical needle for attachment thereto. The body originally is larger in diameter than a round suture or wider than a flat suture to be used so that the suture may be readily inserted into the body of the link. However, the link is capable of being deformed and reduced to a diameter or width not substantially greater than the diameter or width of the needle to be used. The link when in use, therefore, presents no projecting portions which might obstruct its entry into the tissue or injure the tissue through which it is drawn. The body is also provided with deformable means adapted to enter the eye of the needle through which the suture is usually threaded. Such means are positioned to be clamped onto the needle so that it presents no projecting por-

tions and yet insures a strong end to end connection of the suture to the needle.

These and other objects and features of the present invention will appear from the following description thereof in which reference is made to typical embodiments thereof illustrated in the figures of the drawing.

Fig. 1 is a perspective of a typical suture link embodying my invention as attached to a conventional surgical needle.

Fig. 2 is a plan view of a metal stamping used to form the suture link of Fig. 1.

Fig. 3 is a perspective of the link shown in Fig. 1 as shaped ready for use.

Figs. 4 and 5 illustrate the link of Fig. 1 in successive stages of application to a suture and a needle.

Fig. 6 is an enlarged plan view of the link of Fig. 1 as attached to a flat ribbon-like suture.

Figs. 7 and 8 are sectional views of the construction shown in Fig. 6 taken on the lines 7-7 and 8-8 thereof respectively.

Fig. 9 is a plan view of an alternative form of stamping adapted for use in forming a link embodying the present invention.

Fig. 10 is a perspective of a finished link produced from the stamping of Fig. 9.

Fig. 11 is a sectional view of the type of link illustrated in Fig. 10.

Fig. 12 is a plan view of a further alternative type of stamping embodying my invention, and

Figs. 13 and 14 are sectional views of the link formed from the stamping of Fig. 12.

Those forms of my invention which have been chosen for purposes of illustration in the drawing have been selected because they are typical of the many and various types of construction which links embodying my invention may assume.

In that form of the invention illustrated in Figs. 1 to 5 inclusive the link is formed from a metal stamping 2 having sides or wings 4 adapted to be folded upward on either side of a base 6 to the position shown in Fig. 3 to receive the end of the suture 8. A tongue 10 extends from the opposite end of the body 2 and is adapted to be passed through the eye 12 of a conventional surgical needle 14, such as a Gallie needle. The tongue 10 may be formed into a hook before or after it is passed through the needle's eye and preferably is sufficiently long to extend rearwardly between the wings 4 of the body so as to be covered by the wings when they are folded inward to be crimped onto the end of the suture.

The preferred form of the link preparatory to use is that shown in Fig. 3 wherein the wings 4 are turned upward and the tongue 10 bent rearward so as to lie between the wings of the link and yet be spaced from the base 6 thereof to permit application of the link to a needle and insertion of the suture into place beneath the tongue 10 and over the base 6 of the link. Thereafter one of the wings may be folded inward as shown in Fig. 4 so as to overlie the end of the tongue 10 and the opposite wing may be folded into overlapping relation with the first as shown in Fig. 5. If desired, the link may be further secured to the suture by forming indentations 16 therein or otherwise crimping or deforming the wings 4.

This manner of applying the link to the suture is particularly adapted for use with cat-gut, or other sutures of small diameter, whereas, when using the link on larger sutures, such as living fascial sutures, the tongue 8 when bent rearwardly, after passing through the eye of the needle,

may lie between the upturned wings as illustrated in Figs. 6, 7, and 8. In either case the suture is secured to the body and the wings compressed or crimped onto the suture so as to possess a diameter or cross section which is little if any greater than that of the suture itself and is no greater than that of the needle. Moreover, the body is so shaped that when applied to a suture there are no projections or portions which will restrict passage thereof through the tissue or injure the flesh through which it is drawn. It will be noted that the tongue serves to maintain the connection between the needle and suture approximately uniform in diameter so that the needle, link and suture present smooth, nearly continuous surfaces which reduce the jerking of the needle and link in passing through the muscles or tissue.

The connection of the link to the needle is effected by the tongue 10 which is bent rearwardly about the portion of the needle at the rear of the eye and can be compressed inward so that it does not extend appreciably beyond the sides of the needle suture. This construction not only produces end to end attachment of the suture to the needle so that they are in axial alignment and free from all rough or projecting parts but also provides a universal joint between the suture and needle which facilitates use thereof and avoids rupture or tearing of the muscles or tissue through which the needle, link and suture are passed.

In order to secure permanent attachment of the link to the suture, it is preferable to form the link of metal which is deformable. It is also generally desirable for the metal to be substantially inelastic so that it will have little or no tendency to spring away from the suture after crimping but will remain securely attached thereof throughout the operation. After the operation has been completed, the end of the suture carrying the link may be cut off and the tongue 10 may be cut or straightened out to disengage the link from the needle. The needle can then be used again while the inexpensive link is discarded.

The stamping and link illustrated in Figs. 9, 10, and 11 differ from that shown in Figs. 1 to 8 in that the body 20 and the wings 22 carry inwardly projecting elements 24 which extend toward the tongue 26 and serve to embed themselves in the suture 28 when the needle is pulled through the tissue, thus affording a more positive grip of the link on the suture. This link, like that of Figs. 1 to 8, may be manipulated in various ways and as shown in Fig. 10 may be formed into a tubular shape before the suture is inserted into the end of the body.

The form of my invention illustrated in Figs. 12, 13, and 14 comprises a body 30 having two tongues 32 extending therefrom. Such tongues may be bent rearward as shown in Fig. 13 so that the needle 34 may be pressed between the loops 36 on the tongues spreading the tongues until the eye 38 reaches the inturned ends, when the tongues will snap inward or may be pressed inward to the position shown in Fig. 14. When the needle is thereafter pulled forward against the inturned portions of the tongues, the tongues are drawn together as illustrated presenting a tapered end for the link which further insures easy passage of the link through the tissue.

The size and type of the link used in any particular case will vary with the size and nature of the suture and needle employed. However, in

view of the various ways in which the body and tongue may be folded, crimped, bent, or otherwise attached to the suture and needle it will be evident that only a limited number of link sizes and types will be necessary for use with all sizes and types of sutures and needles. It will also be apparent that the material of which the link is formed and the shape and style thereof may be varied greatly to adapt the invention to any particular use or operative procedure or for efficient manufacturing operations. For this reason it should be understood that the forms of my invention shown in the drawing and herein described in detail are intended to be illustrative of my invention and are not intended to limit the scope thereof.

What I claim is:

A link for connecting a suture to a conventional

5 surgical needle in end to end relation, said link having a body formed of substantially inelastic deformable metal and having an open sided portion on one end thereof for receiving a suture, said portion having elements on opposite sides thereof adapted to be folded inward into engagement with a suture and into overlapping relation with each other, the other end of the body having a tongue thereon adapted to be passed through the eye of a conventional surgical needle, and deformable to connect the link to a needle, said tongue being of such length that it may be turned rearwardly after being passed through the eye of a needle, and the end thereof may be located beneath the inwardly folded sides of the body of the link.

HAROLD B. VOLLRATH.