The present invention relates to surgical sutures and holders, more particularly to such holders for sutures which are attached to curved needles for use therewith, by the manufacturer.

Therefore, sutures attached to curved needles have been packaged by manufacturers in very much the same way as sutures without needles. The suture itself either is wrapped around a core, i.e., a flat normally-folded piece of cardboard, or coiled and placed inside a sleeve of paper or some other material; and the needle either is placed in a fold in the core or inserted in the sleeve or positioned some other way in the package in the most convenient manner for wrapping.

Prior art flexible packages of this type have suffered from several disadvantages. First of all, since the needle is not held firmly in a protected position, the needle may puncture the sterile package in handling prior to use with the result that the contents of the package become contaminated. If this is discovered, the package is discarded. However, the greater hazard occurs when such contamination is not discovered and the needle is used in surgery without realizing the danger presented to the patient.

Furthermore, in folding the suture around a core or in a coil, kinks are formed at the folds which must be pulled out by stretching the suture. This is true whether or not the suture is packaged with a conditioning fluid to maintain it relatively pliable or is of the type which may be packaged dry. In addition to the difficulty in removing these sharp kinks formed by folding, the nurse or surgeon performing this operation is subjected to the hazard of being impaled on the exceptionally sharp curved needle which must be held in one hand. After the kinks have been removed by stretching, the shank of the needle must be gripped properly by a needle holder for use. This also may result in injury due to handling the needle for this purpose, not to mention the loss of sterility which occurs when such an injury results.

In accordance with this invention, a holder is provided for a surgical suture attached to a curved needle which substantially eliminates all of the above disadvantages of prior art devices and packages of the type described above.

The needle is positioned in the holder in such a way that its point is protected and cannot pierce the package in which the holder carrying the needle and suture is wrapped. Furthermore, the suture is held in a substantially circular coil which minimizes the formation of kinks in the suture whether or not the suture and the holder are packaged "dry" or "wet," i.e., in a conditioning fluid. The holder is adapted to be held easily in one hand so that the suture may be unwound merely by pulling on its free end to rotate the holder. When the suture is unwound it may be stretched slightly to straighten out the strand (to the extent that this is desired) while holding the free end of the suture in one hand and the holder in the other. During stretching, the point of the needle remains secured in a protected position in the holder so that there is no chance of injuring the fingers. When it is desired to position the needle in the needle holder, the holder is grasped in one hand, with the needle point still in a protected position with respect to the fingers, and the shank of the needle is gripped by the holder and removed therefrom for use.

The holder preferably is cylindrical in shape and com-

prises an annular rim and peripheral flanges spaced axially from one another and extending outwardly from the rim to form with said rim an annular channel on which the suture is wound. A shallow recess for receiving the needle is formed in the preferably circular area enclosed by the annular channel by a side wall connected to the channel and extending across the enclosed area. A raised needle securing portion for holding the needle is connected to the side wall and located in the recess in such a way that it extends across at least a portion of the recess. The needle securing portion is formed of a relatively soft and resilient material, such as a plastic selected from the group consisting of polyethylene and polypropylene, and the needle is inserted therein by forcing the point of the needle through the soft material which, due to its resiliency, holds the needle in position. The needle lies more or less flat in the recess in a protected position below the edge of the rim and the shank of the needle is not in contact with the surface of the needle securing portion, itself, so that it is difficult to touch the point by accident.

A central hub portion is provided for rotatably gripping the holder for unreeling the suture. The hub preferably is in the form of a hollow cylinder protruding from the side wall and exposed to both sides of the holder so that it may be rotatably gripped for unreeling the suture by light finger pressure on opposite sides of the hub, as will be explained more fully hereinafter.

All of the parts of the holder may be formed of the same plastic material in an integral molding operation. Apertures or slots in at least one of the flanges around the rim of the holder may be formed during molding or cut in the flanges for leading the suture from the needle to the channel on which it is wound and for holding the free end of the suture.

Other and further advantages of this invention will be apparent from the following description and claims taken together with the drawings wherein,

FIG. 1 is a schematic view showing the suture and holder of the preferred embodiment of this invention in the hands of a nurse or surgeon as the suture is being unwound.

FIG. 2 is a side view partly in elevation and partly in section of a suture and holder according to the same embodiment of this invention.

FIG. 3 is an end view partly in elevation and partly in section taken along the line 3--3 of FIG. 2.

FIG. 4 is a rotated bottom view in section taken along the line 4--4 of FIG. 2.

FIG. 5 is a top view of the suture and holder of the previous figures rotatably held between the fingers for unreeling the suture.

Referring to the drawings, there is shown a suture 11 and holder 12 according to the preferred embodiment of this invention wherein the holder 12 is in the form of a cylindrical reel molded from a relatively soft and resilient plastic material, such as polyethylene or polypropylene.

The reel, or holder, 12 comprises an annular rim 13 of peripheral flanges 14 and 15 spaced axially from one another and extending radially outwardly from the edges of the rim 13 to form with said rim an annular channel surrounding a central circular area defined by the rim 13. A side wall 16 is connected to one side of the channel in the same plane as the flange 15 at that side of the rim 13. The side wall 16 extends across the central area to define with said rim a shallow recess 17. A hollow cylindrical hub 18 concentric with the annular channel is secured to the side wall 16 in the center of the recess. The depth of the hub 18 is the same as the width of the rim 13 so that the depth of the recess 17 is determined by the width of the rim. The shape of the recess 17 is defined by the hub 18 on the inside, the rim 13 on the outside,
and the side wall 16 on the bottom; and is generally annular.

A pair of raised needle securing portions 19 in the form of spokes connecting the hub with the rim are located in the recess 180° away from one another along the hub 16. The spokes 19 are the same height as the hub 18 so that they effectively divide the annular recess 17 into two semi-cylindrical, or more properly, semi-annular halves. The spokes 19 are formed continuous with the side wall 16 so that they are C shaped in cross section, with the closed portion of the C facing the front, or open, side of the reel and the open portion of the C facing the back of the reel. This results in the formation of depressions 21 in the back of the reel corresponding to the inside shape of the spokes 19.

The front flange 14 of the reel defines a series of slits 22 and 23 spaced from one another approximately 60° apart around the periphery of the channel. The two slits 23 are spaced 180° apart from one another, located near to one of the spokes 19, and are shaped on one side to allow the suture to pass easily from the recess 17 over one of the spokes 19 and then through one of the slits 23 to the channel in which it is wound. A pair of openings in the form of slits 24 in the side wall 16 extending from the hub 18 to the rim 13 are located about the hub 180° from one another and 90° from both of the spokes for the purpose of facilitating gripping the shank of a needle with a needle holder as will be described below.

A curved needle 25 attached to a length of the surgical suture 11 is positioned in the reel for packaging by forcing the point of the needle sideways through the soft material of the needle securing portion, or spoke 19, until it is fixed in position in the spoke with the remainder of the needle lying flat in the recess 17, i.e., lying on or just above the side wall 16 and definitely not protruding above the rim 13. The suture 11 attached to the needle 25 then is drawn over the opposite spoke 19 and led through one of the winding slits 23 into the channel and wound thereon. The free end 26 of the suture then is secured in place by snubbing it in one of the other slits 24.

Preferably the needle 25 is located in the recess 17 so that the shank 27 of the needle passes directly over one of the openings, or slots 24, in the side wall 16, as shown in FIG. 2. The slots 24 are wide enough so that the jaws of a needle holder, not shown, can be inserted therethrough from the front of the reel for easy gripping of the needle shank 27. Although the needle can be gripped by the needle holder without the necessity for inserting its jaws through the slot 24, it is more difficult to do so since it then is necessary to grip the needle 25 quite close to the tips of the jaws of the needle holder.

It is apparent that the holder of this invention with the needle 25 and attached suture 11 in position therein, as described above, can be packaged in a plastic or paper envelope, for instance, without danger of the package being penetrated by the needle since the needle is held in a protected position in the recess 17 with its point impaled in the needle holding spoke 19.

In preparation for use, the package containing the suture 11 and holder 12 is opened and the holder is placed upon a sterile table ready for use. During this and any other handling of the holder prior to use, there is no danger of injury by the needle since it is held in a protected position, and the holder 12 is grasped, as shown in FIGS. 1 and 5, by placing the tip of one finger on one side of the hub 18 and the tip of another finger on the other side and pressing them only lightly together so that the holder will rotate about its axis when the free end 26 of the suture is inserted from the slot in which it is initially held and drawn away from the holder as illustrated in FIGS. 1 and 2. Again, as the holder is rotated during this process, the needle 25 remains completely protected in the recess 17 with its point held in one of the needle securing spokes 19. When the suture 11 is completely unreeled, it may be stretched to minimize its tendency to coil merely by pulling the free end 26 with one hand and the holder 12 with the other hand. During this operation, the needle 25 remains secured in a protected position in the holder. After the suture is stretched, the shank 27 of the needle is grasped by a needle holder, not shown, in the above-described manner without danger of injury to the hand holding the reel.

Having now described the invention in specific detail and exemplified the manner in which it is embodied into practice, it will be readily apparent to those skilled in the art that innumerable variations, modifications, applications, and extensions of the basic principles involved may be made without departing from its spirit and scope. For instance, even though the needle securing spokes 19 are shown as having continuous sides which are pierced by the point of the needle in order to secure the end of the needle in one of the slots, it will be noted, not shown, may be provided in the sides of the suture for receiving the point initially. Preferably, the width of such slots would be somewhat less than the outside diameter of the needle where the needle is to be gripped by the spokes for holding. Such slots would facilitate positioning the needle and pressing it into position in one of the spokes.

The invention claimed is:

1. A suture and holder which comprises a narrow annular rim, peripheral flanges spaced axially from one another and extending outwardly from the rim to form with said rim an annular channel surrounding a central area, a side wall connected to said channel and extending across said central area to the rim and a raised annular securing portion connected to said side wall and extending across a portion of said recess, and a suture having one end secured to a curved needle lying flat in said recess in a plane substantially perpendicular to the axis of said rim and the other end free, said suture being inserted through said needle securing portion in such a way that the needle is located in said recess with the point of the needle protected by said side wall, said suture being wound in said channel.

2. A suture and holder according to claim 1, wherein an opening is provided in said side wall spaced from said needle securing portion to facilitate gripping the shank of the needle with a needle holder when the needle is inserted into and held by the needle holding portion.

3. A suture and holder according to claim 1, which comprises two of said needle securing portions and said needle securing portions are in the form of spokes located approximately 180° from one another about said hub and extending radially between the hub and said rim in said recess, and wherein a pair of radially extending openings in the form of slots are defined in said side wall to facilitate gripping the shank of the needle with a needle holder when the needle is inserted into and held by one of the needle holding spokes, said slots being located approximately 180° from one another and 90° from the spokes about said hub and extending radially between the hub and said rim in said recess.

4. A suture and holder according to claim 1, which comprises a hub portion located centrally of the holder in said recess and accessible from both sides of the inner wall of said holder, whereby the holder may be rotatably gripped by pressure on opposite sides of the hub to allow the holder to turn for unreeling the suture.

5. A suture and holder according to claim 4, wherein said hub portion protrudes from said side wall into said recess so that the suture extends between the hub and the annular rim and is itself annular in shape, and said hub portion is in the form of a hollow cylinder.

6. A suture and holder according to claim 1, wherein the needle securing portion is formed of a relatively soft and resilient material and the needle is inserted therein by
forcing the point of the needle through the soft material of the needle securing portion and the needle is held in position in the needle securing portion by the resiliency of said material.

7. A suture and holder according to claim 6, wherein all parts of the holder are formed of the same relatively soft and resilient material and said material is selected from the group consisting of polyethylene and polypropylene.

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