

Feb. 17, 1970

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3,495,703

SUTURE PACKAGE

Filed April 25, 1968

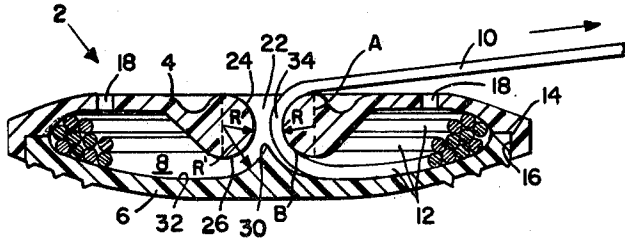


FIG. 2.

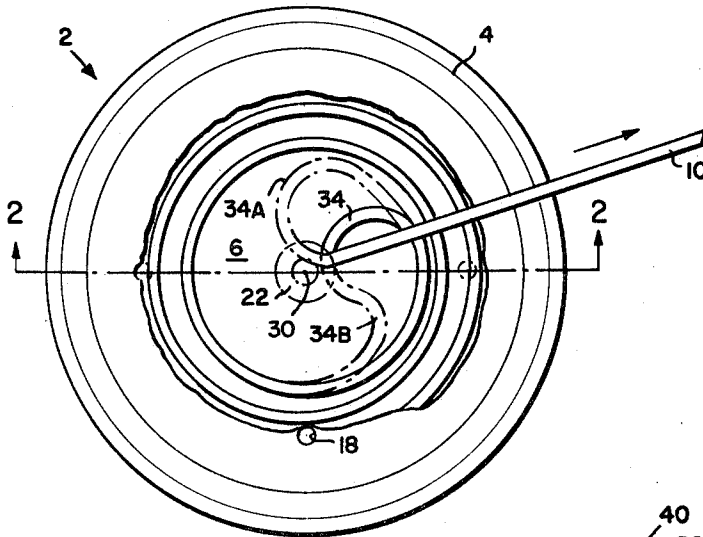


FIG. 1.

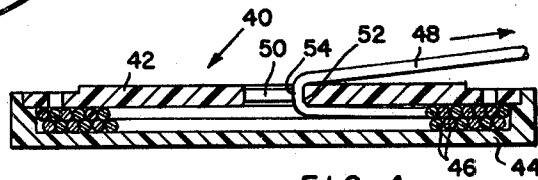


FIG. 4.

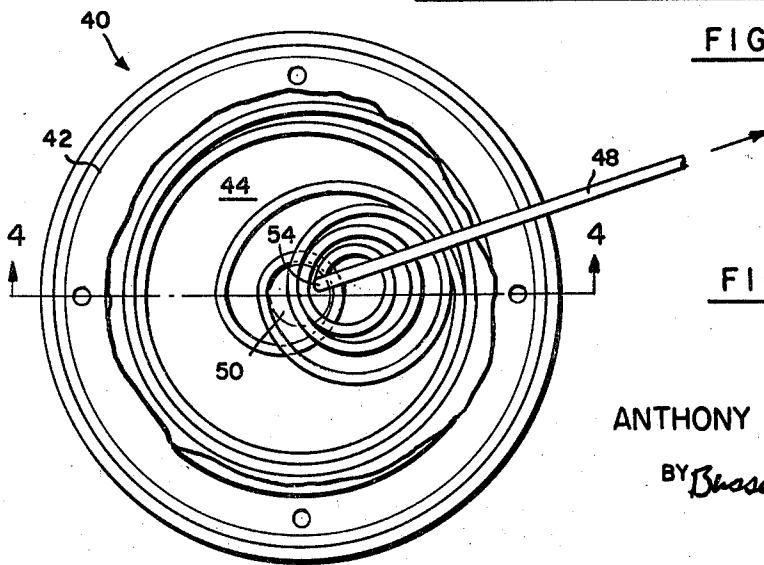


FIG. 3.

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1

3,495,703

SUTURE PACKAGE

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Filed Apr. 25, 1968, Ser. No. 724,067

Int. Cl. A61I 17/02

U.S. Cl. 206—63.3

4 Claims

ABSTRACT OF THE DISCLOSURE

A suture package has a substantially rigid case which is circular in cross-section. The case has an upper and lower portion forming a chamber for holding a coiled suture. The upper portion is provided with a substantially enlarged central portion which is circular in cross-section and which has a central opening for the passage of a suture. The central portion adjacent the opening, forms a relatively large arcuate path of travel for the suture when pulled thereover.

BACKGROUND OF THE INVENTION

The invention relates to a suture package of the type hand held by a surgeon. Generally speaking, a surgeon holds such a package in the palm of his left hand (assuming him to be right-handed) and pulls out the desired amount of suture at a sharp angle with respect to the top of the package. The packages are limited in size since they must be held in the surgeon's palm so as to leave the fingers of the holding hand free for use. Thus, such packages normally have a thickness of about 1/4" or less with a thickness of 1/2" being about the maximum satisfactory thickness and a diameter of about 1 1/2" with a diameter of 2" being about the maximum practical diameter.

Heretofore, surgeons have found such packages present a number of problems. First, there is a large variation in the drag on the suture within the package as the suture is being pulled out. Further, the suture tends to kink and snag. These problems are particularly acute when the suture is surgical gut, which typically is sheep or beef gut. The structure of this invention eliminates snags and kinds and produces greatly improved consistency in the flow of the suture.

The structure of the invention also provides for an improvement in the loading of the package providing for better formation of coils and greater rapidly in loading.

SUMMARY OF THE INVENTION

The suture package of the invention comprises a substantially rigid case which is circular in cross-section. The case has an upper portion and a lower portion forming a chamber for holding a coiled suture. The upper portion of the case has a substantially enlarged central portion which, preferably, depends downwardly into the interior of the case and is provided with a central opening for the passage of a suture, the said openings advantageously being of a small diameter sufficiently great to permit free movement of a suture therethrough, with the minimum diameter of the opening advantageously being from 3/64" to 1/4", preferably from about 3/64" to 3/32". The central portion adjacent the opening forms a path of travel on a relatively large arc for the suture when pulled thereover. Advantageously, this portion adjacent the opening is substantially a portion of a toroid. It is advantageous to have said adjacent portion on a radius in cross-section of at least 1/16". The radius may be as great as the maximum which permits free passage of the suture into and out of the package.

2

Superior loading and unloading of the suture is achieved when the inner surface of the lower portion is dished downwardly from a peak lying on the axis of the opening in the upper portion.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a plan view, partially broken away, of a suture package in accordance with the invention;

FIGURE 2 is a vertical section taken on the plane indicated by the line 2—2 in FIGURE 1;

FIGURE 3 is a plan view, partially broken away, of a suture package of the prior art; and

FIGURE 4 is a vertical section taken on the plane indicated by the line 4—4 of FIGURE 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGURE 2, a case 2 has an upper portion 4 and a lower portion 6 forming a chamber 8 for holding suture 10 in coils indicated at 12. The suture may be, for example, surgical gut, such as, sheep or beef gut, silk, Dacron, nylon, or the like. The upper portion 4 of case 2 has a peripheral cut out portion 14 into which the complimentary periphery 16 of lower portion 6 fits by a pressed fit. Chamber 8 permits the free swelling of the gut without jamming of the gut in the presence of a suture fluid.

Upper portion 4 is provided with openings 18 for the passage of a suture fluid and is also provided with a central opening 22 for loading suture 10 into the case and for withdrawing it. Opening 22 is formed in a substantially enlarged central portion 24 which is circular in cross-section and depends into chamber 8. The wall 26 of the central portion adjacent the central opening 22 is a portion of a toroid. While the wall 26 may have a varying radius, the minimum radius R of a cross-section is advantageously at least 1/16". As will be seen best in FIGURE 2, wall 26 forms a path of travel on an extensive arc of substantial radius for the suture 10 when the suture is pulled over the wall as it will be in the normal case when the suture is withdraw from case 2 at a relatively sharp angle with respect to the top of the case. Advantageously, the arc of wall 24 will extend through about 180°, that is to say from one end of a vertical line indicated at A and passing through the center of radius R to the other end of line A, but a somewhat lesser arc is satisfactory so long as the arc extends through the area of contact by the suture 10. An arc as small as 130° is satisfactory, for example. It is desirable to have the arc extend to the upper end of line A. As seen in FIGURE 2, the suture 10 does not contact the wall adjacent opening wall 2 until it arrives at the point indicated at B, when using the particular gut illustrated.

As best seen in FIGURE 2, bottom portion 6 is provided with a relatively sharp peak 30 lying on the axis of opening 22 and the inner surface 32 of lower portion 6 is dished downwardly between peak 30 and periphery 16. In the vicinity of opening 22, it is desirable to have the surface 32 on a radius R' having the same center as radius R and being sufficiently greater to permit the free passage of the suture. As previously indicated, it is advantageous to minimize the difference between the radii R and R' so long as sufficient room is provided for the free passage of the suture 10.

Case 2 can be made from a wide variety of materials such as a metal or a plastic being advantageously molded from a plastic such as, for example, polystyrene.

OPERATION

The case 2 is loaded with suture 10 by forcing the suture downwardly through opening 22 with the suture being forced to go to one side or the other of peak 30

and being urged toward the periphery of case 2 by the contour of surface 32 which is advantageous since it directs the inner end of the suture at a large angle with respect to the periphery of chamber 8 which insures a rapid commencement of coiling when the inner end of suture 10 abruptly contacts the said inner periphery and a negligible component of force to cause sliding of the coils about the periphery. The rapid initiation of coiling causes a rapid increase in friction which prevents the coiled portion of suture 10 from sliding around within chamber 8 and hence provides for rapid loading. Such loading is normally carried out by automatic machines well known to the art. The outer end of suture 10 remains outside the case 2 to permit withdrawal.

When suture 10 is being pulled from case 2 at a sharp angle as indicated in FIGURE 2, the drag on the suture closely approaches being uniform providing for an even pull by the surgeon. As seen in FIGURES 1 and 2, as the uncoiling loop 34 approaches the point where it passes under the portion of suture 10 exterior the case, it retains a relatively large radius. This permits a smooth transition of the loop from the position indicated at 34a to the position indicated at 34b which involves a transposition or flipping over of loop 34. By the same token, it will be noted that the next adjacent coil 12 remains substantially in or relatively close to its original coiled position and is not drawn close to loop 34 where it could be snagged by loop 34. Further, the large radius of loop 34 prevents kinking.

The operation of case 2 will be better understood from a comparison of its operation with that of prior art case 40 shown in FIGURES 3 and 4 which will be described briefly. Case 40 has a flat upper portion 42 and a cup shaped lower portion 44. Coils 46 of suture 48 are contained within case 40. Suture 48 passes through a central opening 50 in upper portion 42. Case 40 is typical of the prior art.

It will be seen that in the case 40 when the suture 48 is being loaded, there is no structure to direct the inner end of suture 48 at a substantial angle to the inner periphery of the case. If the inner end of suture 48 engages this periphery at a relative acute angle, considerably sliding of the coil portion of the suture occurs which necessarily requires a longer loading time for a given speed of travel of the suture.

As best seen in FIGURE 4, suture 48 as it is withdrawn from case 40 is bent rather sharply around wall 52, adjacent opening 50. This sharp bending action causes the formation of a small radius loop 54 as seen in FIGURES 3 and 4. Such a small radius loop makes a very abrupt and jerky transition as it approaches and passes under the portion of suture 48 exterior to the case, and performs its flipping operation. This is in marked contrast to the smooth transition by the larger radius loop 34 in the case of the invention. Further, the short radius of loop 54 and the increased force necessary to cause its transition causes several of the adjacent coils to be

tightened up and closely approach loop 54. This of course increases the force necessary to pull suture 48 out of the case. More importantly, it frequently results in a snarling of the suture since loop 54 in making its transition can twist onto one of the adjacent tight coils and snag it. Further, the short radius of 54 frequently results in kinking. It will also be noted that wall 52 is largely cylindrical rather than a smooth arc and enforces the suture to be drawn over relatively sharp corners greatly increasing the force necessary to pull out the suture and frequently causing shredding of the suture.

It will be understood that as used herein the term "suture" includes materials employed in ligaturing as well as materials employed in suturing.

The preferred embodiment of the invention described above is illustrative and is not intended to be limiting.

I claim:

1. A suture package for a surgeon's hand comprising: a substantially rigid case circular in cross-section and comprising an upper portion and a lower portion forming a chamber for holding a coiled suture, the upper portion having a substantially enlarged central portion circular in cross-section, a central opening in said central portion for the passage of a suture, the central portion adjacent said opening forming a path of travel on an extensive arc of from about 130° to about 180° for the suture when pulled thereover, the smallest diameter of the central opening being in the range of from about $\frac{3}{64}$ " to $\frac{1}{4}$ ", and the inner surface of the lower portion being dished downwardly from a peak on the axis of the central opening.
2. A suture package in accordance with claim 1 in which the central portion adjacent the central opening is substantially a portion of a toroid.
3. A suture package in accordance with claim 1 in which the central portion adjacent the central opening is substantially a portion of a toroid with a radius in cross-section of at least $\frac{1}{16}$ of an inch.
4. A suture package in accordance with claim 1 in which the smallest diameter of the central opening is from about $\frac{3}{64}$ " to about $\frac{5}{64}$ ".

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U.S. Cl. X.R.

206-52; 242-129