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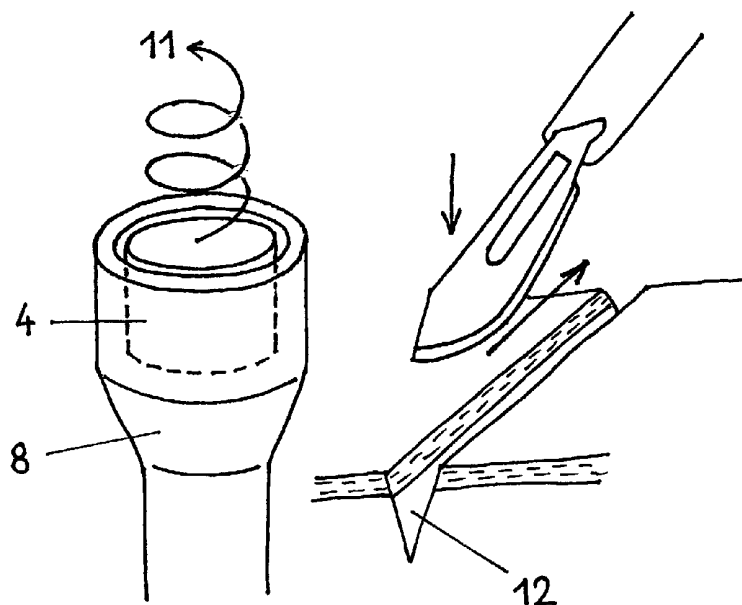
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(54) Title: SURGICAL SUTURING INSTRUMENT WITH MODIFIED CIRCULAR KNIFE



(57) Abstract: This invention relates to a circular knife (4) performing arbitrary helical (simultaneous axial and rotary) movement (11), located in sutural head (8) allowing a tissue protective surgical section when making mechanical circular enterorrhaphy. According to this invention the suturing instrument provided with a circular knife (4) performing arbitrary helical movement (11) will have according to an advantageous implementation spirals (2) and/or spiral threads (5) for directing arbitrary helical movement of the circular knife, rollers (7) embedded in the spiral threads (5), and circular knife (4) fixed to the base (6).



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SURGICAL SUTURING INSTRUMENT WITH MODIFIED CIRCULAR KNIFE

The subject of this invention shall be a circular knife of a suturing instrument, performing arbitrary helical (simultaneous axial and rotary) movement to provide a tissue protective surgical section of the intestine ends when making mechanical circular enterorrhaphy to allow thereby the reduction in the risk of injury of the suture and occurrence of sutural insufficiency, that according to an advantageous implementation has a rod provided with spiral and pin-hole located in the suturing head, a circular knife provided with a base fitted with spiral thread precisely adopted to said spiral, and rollers facilitating the movement of the spiral and the spiral thread along each other in a bearing-like way.

Circular enterorrhaphy is highly preferred, first of all, in anatomically difficult areas. When used properly, they are suitable for providing reliable enterorrhaphy within a short time. When used for enterorrhaphy purposes, the exclusive axial movement of the currently used circular knives built in the suturing head may be problematic, because such circular knives are destructive when cutting the tissue and thereby they jeopardize the reliability of enterorrhaphy, contributing thereby to the development of sutural insufficiency. Any insufficiency of a suture may result in a complication perilous to life. One of the most important purposes of suturing instruments subject to an ongoing upgrading will be to make an enterorrhaphy under a trauma as low as possible. A number of versions of suturing instruments are known, while one of the basic versions is described in USA Patent No. 5.275.322. Similarly to the present invention the modified suturing instrument described in USA Patent No. 4.907.591 also has a circular knife performing rotary movement. As an important difference, however, the rotary movement begins only at the end of the axial movement, after the circular knife has reached the tissues, thereby the tissue dissection becomes more traumatic. In contrast to this, the circular knife of the present invention performs helical (simultaneous axial and rotary) movement before reaching the tissues, and according to an advantageous implementation it dissects the tissues with at least 60° rotation, providing thereby -in contrast to the cited invention- a more protective surgical section of the tissues.

As a consequence of the foregoing, it is required that such a modified circular knife should be developed which allows to reduce the risk of sutural insufficiency.

The object of the invention is to develop a circular knife to reduce the risk of sutural insufficiency, which allows a cautious surgical section of the involved parts of the intestines instead of destructive section when making intestinal sutures, to reduce thereby the risk of sutural insufficiency.

This invention is based on the recognition that the application of a circular knife, that already performs helical (axial and rotary) movement continuously before reaching the involved tissues and according to an advantageous implementation makes at least 60° rotation, will make possible to cut the tissues in a cautious and gentle way.

Based upon the above recognition, the set objective will be solved by application of a circular knife making arbitrary helical (simultaneous axial and rotary) movement, located in the head of the circular suturing instrument, that according to an advantageous implementation has a rod fitted with spiral and pin-hole, a circular knife provided with a base fitted with spiral thread fitted precisely to said spiral, and rollers facilitating the movement of the spiral and spiral thread along each other.

According to an advantageous implementation hereof, the rod located in the suturing head is fixed to the suturing instrument. According to an advantageous implementation the pin-hole of the rod will locate the up and down moving pin or sleeve required for connecting the suturing head and the anvil (not shown on the figures) together. The slope and direction of the spirals on

the rod are adopted and fitted to the spiral threads in the base. The side of the spiral threads in the base is provided with embedded rollers to facilitate the movement of the circular knife. The circular knife is fixed to the base.

Besides the former disclosed solution any other known solution (eg: mechanic, hydraulic, pneumatic, electromotoric, etc.) is considered to be part of the present invention, that allows the former described movement of the circular knife.

In the following part hereof, the invention will be described in detail with reference to the drawings attached hereto showing the advantageous implementation of the instrument.

In the drawings

Figure 1/A shows the rod provided with spiral and pin-hole,

Figure 1/B shows the base provided with spiral threads and the circular knife fixed to it,

Figure 1/C shows the rollers embedded in either side of the spiral threads in the base,

Figure 2/A shows the circular knife of the currently used sutural instruments suitable only for cutting function, and the incised, lacerated wound produced by such knife,

Figure 2/B shows the circular knife suitable for cautious tissue section, that performs arbitrary helical movement, and shows the incised surgical wound made thereby.

As Figure 1 shows, the slope and direction of the spiral threads 5 of base 6 are adopted and similar to those of spirals 2 of rod 1. The said components make possible the rotary movement of the circular knife 4 fixed to base 6 in addition to its axial movement. The easy movement of the spiral 2 and the spiral thread 5 along each other is made possible by rollers 7 embedded in the sides of the spiral thread 5.

The sutural head provided with a circular knife performing arbitrary helical movement as set out herein will function in a manner as follows:

When making intestinal sutures, once the trigger on the grip of the unit is operated (not shown on figures), the base 6 and the circular knife 4 fixed to the base will be caused through a transmission to move upwards inside the suturing head 8 along the axis of the rod 1 fixed to the suturing head 8. By means of spirals 2, spiral threads 5 and rollers 7, the axial movement 9 will be accompanied with rotary movement 11. The helical movement 11 of the circular knife will account for tissue protective surgical section 12.

The most important advantage of the solution according to this invention shall be that it ensures a tissue protective surgical section of the concerned parts of the intestines when suturing the intestines, including a reduction in laceration of the intestinal sutures making possible thereby a reduction in risk of sutural insufficiency.

LIST OF REFERENCE NUMBERS

1. Rod
2. Spiral
3. Pin-hole
4. Circular knife
5. Spiral thread
6. Base
7. Roller
8. Suturing head
9. Axial movement of the circular knife
10. Incised-lacerated wound
11. Helical movement of the circular knife
12. Tissue-protected surgical incision wound

CLAIMS

1. Surgical circular suturing instrument provided with a modified circular knife characterized in that it has a circular knife (4) making arbitrary helical (simultaneous axial and rotary) movement (11); means for directing the helical movement; that according to an advantageous implementation has spirals (2) and/or spiral threads (5) for directing arbitrary helical movement (11), and rollers (7) advantageously embedded in spiral threads (5).
2. Device according to above claim 1 characterized in that it has a circular knife (4) making arbitrary helical (simultaneous axial and rotary) movement (11) continuously beginning from an arbitrary point given before reaching the tissue layers.
3. Device according to above claim 1 or 2 characterized in that it has means for directing arbitrary helical (simultaneous axial and rotary) movement (11) of the circular knife (4) beginning before reaching the tissue layers.
4. Device according to above claims 1-3 characterized in that it has a circular knife (4) making arbitrary only helical (along the whole axial movement simultaneous continuous rotary) movement (11).
5. Device according to above claims 1-4 characterized in that it has means for directing arbitrary only helical (rotary movement along the whole axial movement) movement (11) of the circular knife (4).
6. Device according to above claims 1-5 characterized in that it has a circular knife (4) making during the whole axial movement at least 60° simultaneous rotary movement.
7. Means according to above claims 3 or 5 characterized in that according to an advantageous implementation it has spirals (2) for directing arbitrary helical movement (11) of the circular knife (4).
8. Means according to above claims 3, 5 or 7 characterized in that according to an advantageous implementation it has spiral threads (5) for directing arbitrary helical movement (11) of the circular knife (4).
9. Means according to above claims 3, 5, 7 or 8 characterized in that according to an advantageous implementation it has rollers (7) advantageously embedded in spiral threads (5) making easier the movement of spirals (2) and spiral threads (5) along each other.
10. Means according to above claims 3, 5, 7, 8 or 9 characterized in that according to one advantageous implementation it has a rod (1) located in the suturing head (8) provided with spirals (2) and pin-hole (3), a base (6) fixed to the circular knife (4) provided with spiral threads (5) adopted precisely to the spirals (2) and rollers (7) embedded in the spiral threads (5).

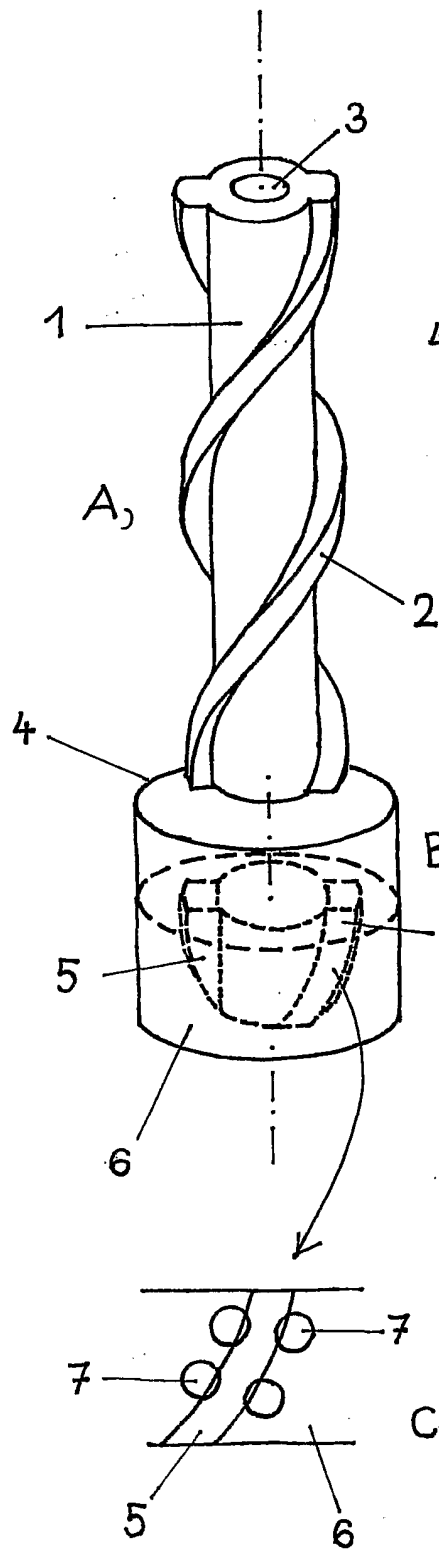
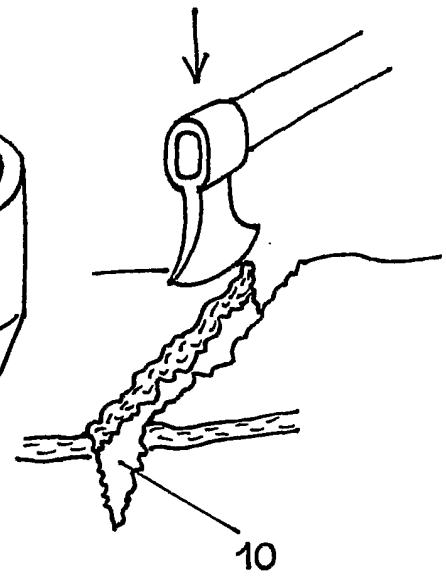
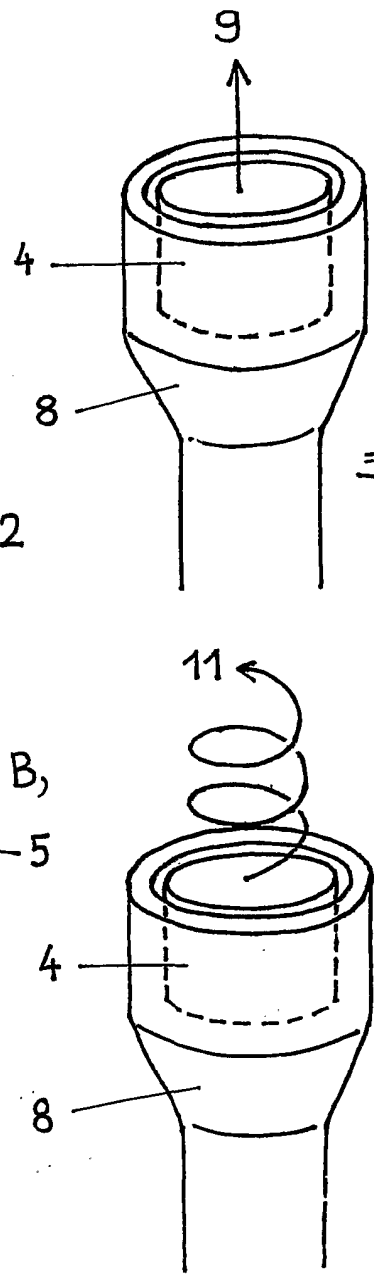
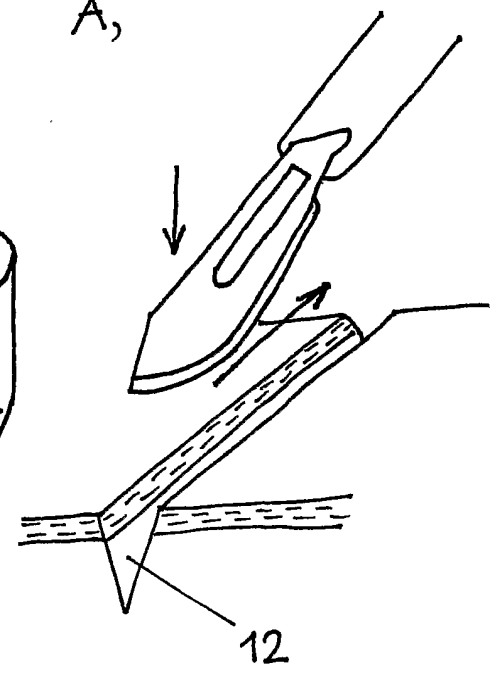


Fig. 1.



A,



B,

Fig. 2.

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61B17/11 A61B17/32 A61B17/115

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
WPI Data, EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 99 38441 A (VASCULAR SCIENCE INC.) 5 August 1999 (1999-08-05) abstract; figures page 9, line 31-34 ---	1-8
Y	US 5 827 316 A (YOUNG ET AL.) 27 October 1998 (1998-10-27) the whole document ---	1-8
A	EP 0 141 536 A (WERTHEIMER LTD.) 15 May 1985 (1985-05-15) abstract; figures page 4, line 4 -page 5, line 33 ---	1
A	US 4 907 591 A (VASCONCELLOS ET AL.) 13 March 1990 (1990-03-13) cited in the application abstract; figures ---	1
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Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 10 06 117 B (SCHREIBER) 11 April 1957 (1957-04-11) the whole document	1

INTERNATIONAL SEARCH REPORT

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