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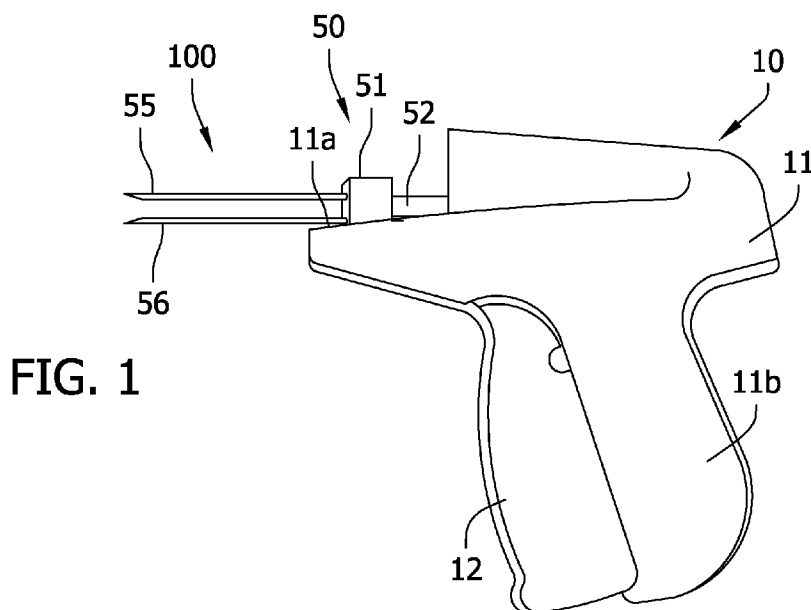
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(54) Title: MEDICAL SUTURING INSTRUMENT



(57) Abstract: A suturing instrument (100) comprises a drive mechanism part (14) which transmits the movement of an operation part (12) to both a loop forming part (53) and a suture thread (1), and a loop (53c) and the suture thread (1) are fed out from the tip end of a loop introduction (needle 55) and the tip end of a suture thread introduction needle (56) at substantially the same timing.

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MEDICAL SUTURING INSTRUMENT

Background

5 The present invention relates to a medical suturing instrument which is used when suture thread for holding the wall of an internal organ such as the stomach or bladder from outside the body on the body surface-side, such as the abdominal wall, is introduced into the
10 internal organ, and when the suture thread is withdrawn from inside the internal organ.

People with a reduced function for ingesting food orally under their own power due to advanced age or
15 illness (referred to herein as "patients") are administered with enteral feeding in which fluids and nutrients are supplied using a gastrostomy catheter. When percutaneous endoscopic gastrostomy (PEG) is used, for example, a through-hole (e.g., a fistula such as a
20 gastric fistula) which runs through the patient's abdominal wall and the wall of an internal organ (stomach wall) is established, the gastrostomy catheter is fitted into the through-hole, and the patient is supplied with fluids through the gastrostomy catheter.

25 When the through-hole is established, the wall of an internal organ which readily moves and the abdominal wall are normally sutured and fixed percutaneously using suture thread in order to simplify formation of
30 the through-hole. Various kinds of medical suturing instruments have been proposed for use in suturing and fixing the internal organ wall and the abdominal wall.

An instrument of this kind which is disclosed is a
35 medical instrument which houses, inside a case main body, a feed-out mechanism for successively feeding out towards the tip end a suture thread inserted into a suture thread insertion puncture needle 20 from the base end thereof; and a projection mechanism for

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causing an annular member of a stylet accommodated inside a suture thread gripping puncture needle 30 to project from the tip end of the suture thread gripping puncture needle 30 (see JP2009-213763A and JP2009-
5 213764A, for example). The medical instrument is designed to make it possible for only one practitioner or for a practitioner and an assistant to efficiently and safely tie a knot inside the body.

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Summary

With medical instruments such as those disclosed in the prior art, the practitioner has to insert the suture thread into the medical instrument, which increases the
15 amount of work for the practitioner. Furthermore, the operation to insert the suture thread is often complex, so it is not a simple matter to perform. The following operations are further needed with medical instruments such as those disclosed in the prior art, namely: an
20 operation in which punctures are made in the stomach from the abdominal wall using the suture thread insertion puncture needle and the suture thread gripping puncture needle, after which a stylet is pushed in in order to form the annular shape of the
25 annular member; an operation in which an operating roller is turned in order to insert the suture thread into the stomach; and an operation in which a release button is pressed in order to grip the suture thread with the annular member, all of which make the
30 operating procedure more extensive.

The present invention, in accordance with some aspects thereof, can provide a medical suturing instrument which is far easier to use and to handle.

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The medical suturing instrument according to the present invention can comprise: a suture thread introduction needle with which a suture thread is introduced; a loop introduction needle which can be
5 mounted substantially parallel to the suture thread introduction needle at a prescribed distance therefrom; a support part for supporting the suture thread introduction needle and the loop introduction needle; a housing in which the support part can be detachably
10 accommodated; a loop forming part which has a loop formed at the tip end thereof, and which can be inserted into the loop introduction needle in such a way as to be mobile therein; a suture thread feed mechanism for feeding out the suture thread from the
15 tip end of the suture thread introduction needle; an operation part, provided in the housing, for receiving practitioner operations; and a drive mechanism part for transmitting the movement of the operation part to the loop forming part and the suture thread feed mechanism,
20 and by means of the drive mechanism part: the movement of the operation part can be transmitted to both the loop forming part and the suture thread feed mechanism and the loop and the suture thread are fed out from the tip end of the loop introduction needle and the tip end
25 of the suture thread introduction needle.

In the medical suturing instrument according to the present invention, by means of the drive mechanism part and the suture thread feed mechanism: the loop can be
30 accommodated inside the loop introduction needle while the suture thread can be maintained in a state of having been fed out from the tip end of the suture thread introduction needle, and as a result the suture thread can be gripped at the tip end of the loop
35 introduction needle.

In the medical suturing instrument according to the present invention, the suture thread feed mechanism

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comprises: a hollow member which can be fixed to the base end of the support part in communication with the suture thread introduction needle, and has the suture thread inserted therein; a suture thread clamping member for clamping the hollow member or the suture thread according to the position on the tip end side to which said suture thread clamping member has been moved; and a guide, which can be fixed to the base end of the support part, for guiding the movement of the suture thread clamping member in the forwards direction, and when the operation part is operated, the drive mechanism part causes the loop forming part to move towards the tip end, while also pressing the suture thread clamping member which can be positioned at the base end side of the guide in order to cause said suture thread clamping member to move towards the tip end.

In the medical suturing instrument according to the present invention, when the hollow member penetrates the suture thread clamping member, the clamping of the suture thread by the suture thread clamping member can be released.

In the medical suturing instrument according to the present invention, when operation of the operation part is released, the suture thread feed mechanism maintains a state in which the suture thread has been fed out from the tip end of the suture thread introduction needle and the clamping of the suture thread by the suture thread clamping member is released; the loop can be accommodated inside the loop introduction needle; and the suture thread can be gripped at the tip end of the loop introduction needle.

The medical suturing instrument according to the present invention comprises a cartridge provided with the suture thread introduction needle, loop

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introduction needle, support part, loop forming part and suture thread feed mechanism; and a main body provided with the housing, operation part and drive mechanism part, and the cartridge can be detachable
5 from the main body.

In the medical suturing instrument according to the present invention the main body can be endowed with a gun-type shape in which a gripping part is provided on
10 the housing; an elastic member which can be linked to the operation part can be provided inside the gripping part, and when operation of the operation part is released, the operation part returns to its original state using the resilience of the elastic member.

15 The medical suturing instrument according to the present invention makes it possible to introduce a suture thread into an internal organ and to withdraw said suture thread from inside the internal organ in
20 essentially a single operation, so the burden on the practitioner can be considerably reduced and the ease of use is markedly improved.

Brief Description of the Figures

25 Figure 1 is a schematic external view showing one exemplary configuration of the medical suturing instrument according to a mode of embodiment of the present invention;
30 Figure 2 is a schematic exploded view showing the situation when the medical suturing instrument according to a mode of embodiment of the present invention has been dismantled into the main body and the cartridge;
35 Figure 3 is a schematic view showing an enlargement of the situation when the cartridge of the medical suturing instrument according to a mode of embodiment of the present invention is fitted to the main body;

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Figure 4 is a schematic structural diagram showing an exemplary configuration of the cartridge of the medical suturing instrument according to a mode of embodiment of the present invention;

5 Figure 5 is a schematic partial enlarged view showing an enlargement of the main parts of the cartridge of the medical suturing instrument according to a mode of embodiment of the present invention;

Figure 6 is a schematic view showing in outline the
10 situation when the suture thread clamping member of the medical suturing instrument according to a mode of embodiment of the present invention is clamping the suture thread;

Figures 7(A), 7(B1), 7(B2), and 7(C) are schematic
15 views in cross section showing, in simplified form, the operating procedure for the medical suturing instrument according to a mode of embodiment of the present invention; and

Figures 8(a)-8(c) illustrate the action of the medical
20 suturing instrument according to a mode of embodiment of the present invention.

Detailed Description

25 A mode of embodiment of the present invention will be described below with reference to the figures.

Figure 1 is a schematic external view showing one exemplary configuration of the medical suturing
30 instrument according to a mode of embodiment of the present invention (this will be referred to below simply as the suturing instrument 100). Figure 2 is a schematic exploded view showing the situation when the medical suturing instrument 100 has been dismantled
35 into a main body 10 and a cartridge 50. Figure 3 is a schematic view showing an enlargement of the situation when the cartridge 50 is fitted to the main body 10. A

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summary of the suturing instrument 100 will be described with reference to Figures 1 - 3.

It should be noted that the size relationships of the structural components may differ from the actual size relationships in the figures below, including Figure 1. In Figure 1, in order to schematically show the state of the suturing instrument 100 when seen from the side, the loop introduction needle 55 and the suture thread introduction needle 56 are shown divided into top and bottom, although the loop introduction needle 55 and the suture thread introduction needle 56 lie one over the other. Furthermore, in the situation shown in Figure 2, the cartridge 50 has been exemplarily shown as being rotated through 90° in the axial direction. The cartridge 50 is exemplarily illustrated in further detail in Figures 3 - 6.

Overall structure of the suturing instrument 100

The suturing instrument 100 is typically used in order to facilitate formation of a fistula for insertion of a fistula catheter when suture thread for lifting the wall of an internal organ such as the stomach or bladder towards the abdominal wall and holding it in place is introduced into the internal organ from outside the body. The suturing instrument 100 can comprise: a main body 10, and a cartridge 50 which is detachable from the main body 10. It should be noted that Figure 2 also shows suture thread 1 which is fed out from the tip end (blade edge) of the suture thread introduction needle 56 by means of a suture thread feed mechanism 52. Furthermore, the tip end side denotes the side which is inserted into the patient (patient side), while the base end side denotes the side which is operated by the practitioner (operation side). In the description which follows, the tip end side may also be

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referred to as forwards or the front, and the base end side may also be referred to as backwards or the rear.

The suture thread 1 does not typically form part of the suturing instrument 100, but it will be described briefly as it serves as an organopexy tool. The suture thread 1 should be made of a material which is sufficiently flexible that it can bend along bodily tissues when inserted inside the body, and which also has sufficient tensile strength that it can lift internal organs (nylon yarn, for example). Furthermore, the suture thread 1 is typically cut when removed from the patient. For this reason, the suture thread 1 is preferably made of a material and has a diameter size that can be cut by an instrument found in a medical setting, such as scissors. Furthermore, the suturing instrument 100 can be made to pierce the patient with the suture thread 1 inserted up to the tip end of the suture thread introduction needle 56.

The main body 10 typically forms the unit of the suturing instrument 100 as a whole, minus the cartridge 50. The main body 10 typically comprises: a housing 11 which forms the outline of the main body 10 and in which the cartridge 50 is detachably accommodated; an operation part 12, attached to the housing 11, for receiving operations from the practitioner; and a drive mechanism part 14, (see Figure 3) provided inside the housing 11, for transmitting the movement of the operation part 12 to a loop forming part 53 and the suture thread feed mechanism 52 of the cartridge 50.

The housing 11 can be formed as a gun-type or shaped housing which the practitioner can operate by holding it like a gun. The housing 11 can comprise: a cartridge accommodation part 11a provided with a space to accommodate the cartridge 50; and a gripping part 11b which projects downwards from the lower surface of the

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cartridge accommodation part 11a and extends towards the base end away from the cartridge accommodation part 11a. Moreover, there is no particular limitation as to the material from which the housing 11 is made, and a
5 polyolefin such as polypropylene or polyethylene, or a synthetic resin such as vinyl chloride or polycarbonate may be employed.

The cartridge accommodation part 11a has a space which
10 can accommodate the cartridge 50 (referred to below as the space 16). The space 16 is formed with a volume sufficient to allow the drive mechanism part 14 to move forwards and backwards. This space 16 may function as a guide for assisting the movement of the drive mechanism
15 part 14. Furthermore, the cartridge accommodation part 11a is open at the top in order to accommodate the cartridge 50. Moreover, a detachable cover part may be provided on the space 16, and the top of the space 16 may be opened and closed by opening/closing the cover
20 part. The gripping part 11b is the part which is actually gripped by the practitioner during operation.

Furthermore, a fitting part 15 where a support part 51 of the cartridge 50 is detachably fitted is formed in
25 the cartridge housing part 11a. This fitting part 15 may be formed by partitioning part of the tip end side of the cartridge accommodation part 11a with a partition plate or the like, for example. Furthermore, the fitting part 15 should be formed with a shape that
30 corresponds to the outer shape of the support part 51 of the cartridge 50 so that the support part 51 does not readily become detached. In addition, the fitting part 15 is open at the top so that the support part 51 of the cartridge 50 can be fitted. However, the fitting
35 part 15 may be provided with a detachable cover part in the same way as the cartridge accommodation part 11a, and the top of the fitting part 15 may be opened and closed by opening/closing the cover part. Moreover,

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when a cover is attached to the cartridge accommodation part 11a, the cover of the cartridge accommodation part 11a and the cover of the fitting part 15 may be formed as a single element or as separate elements.

5

It should be noted that Figures 1 and 2 show an exemplary case in which the housing 11 is a gun-type housing, but this is merely an example and the shape thereof is not limited to the shape depicted. The housing 11 should have a shape which allows functioning of the other components which will be described below.

The operation part 12 which is mounted on the gripping part 11b of the housing 11 is operated by the practitioner when an organopexy tool (the suture thread 1) is introduced into an internal organ using the suturing instrument 100. The operation part 12 is attached to the side surfaces at the front surface of the gripping part 11b and can move forwards and backwards. The movement of the operation part 12 is transmitted to the loop forming part 53 and the suture thread feed mechanism 52 of the cartridge 50, by way of the drive mechanism part 14. The example depicted in Figures 1 and 2 shows the situation when the operation part 12 can be accommodated inside the gripping part 11b. Then, when the operation part 12 is operated so as to be accommodated in the gripping part 11b, in other words when the operation part 12 is grasped together with the gripping part 11b, the drive mechanism part 14 moves forwards; when the operation of the operation part 12 is released, in other words when the grip on the operation part 12 is relaxed, the drive mechanism part 14 moves backwards.

Furthermore, the operation part 12 automatically returns to its original state when operation thereof is released. An elastic member such as a spring or rubber which is linked to the operation part 12 is preferably

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provided inside the gripping part 11b, and the operation part 12 for which operation has been released is moved forwards using the resilience of the elastic member. When this structure is adopted, the operation
5 to return the operation part 12 to its original state is simplified, and the suture thread 1 can be placed in a state in which it is running through the internal organ wall and the abdominal wall in essentially a single operation, which considerably reduces the burden
10 on the practitioner. Moreover, there is no particular limitation as to the material from which the operation part 12 is made, and it may be made from the same synthetic resin as the housing 11, or from a different material to that of the housing 11.

15
Figures 1 and 2 show an exemplary shape for the operation part 12 which the practitioner can operate by grasping said operation part 12 with the whole of the hand together with the gripping part 11b. By adopting a
20 shape such as this, the practitioner can carry out the operation in a stable manner, so the ease of use is improved. Moreover, the operation part 12 may be formed by a trigger provided on the cartridge accommodation part 11a or the gripping part 11b so that the
25 practitioner can operate the operation part 12 with a finger. Furthermore, a button or a rod etc. projecting from the cartridge accommodation part 11a or the gripping part 11b may be provided in order to function as the operation part 12.

30
The drive mechanism part 14 is typically placed between the operation part 12 and the loop forming part 53 and suture thread feed mechanism 52 of the cartridge 50, the drive mechanism part 14 transmitting the movement
35 of the operation part 12 to the loop forming part 53 and suture thread feed mechanism 52 of the cartridge 50. The drive mechanism part 14 slides forwards when the operation part 12 is grasped by the practitioner

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together with the gripping part 11b, and slides backwards when the force applied to the operation part 12 is released.

5 The drive mechanism part 14 typically comprises: a linking part 14a which is linked to the operation part 12 and transmits the transmitted movement of the operation part 12 to the loop forming part 53 and suture thread feed mechanism 52 of the cartridge 50; a
10 loop drive part 14b, to which is detachably linked a latching part 54 which is attached to a base end part 53a of the loop forming part 53, for moving the loop forming part 53 along with the movement of the drive mechanism part 14; and a pushing part 14c for pushing
15 the suture thread clamping member 52a of the suture thread feed mechanism 52 along with the forward movement of the drive mechanism part 14. The linking part 14a may be provided at the base end side, the loop drive part 14b may be provided at the tip end side, and
20 the pushing part 14c may be provided at the tip end side. Furthermore, the loop drive part 14b and the pushing part 14c may be arranged horizontally.

Moreover, there is no particular limitation as to the
25 shape of the drive mechanism part 14, but it should have a shape that allows it to slide backwards and forwards in the space 16 and it should have a shape which enables the movement of the operation part 12 to be transmitted to the loop forming part 53 and suture
30 thread feed mechanism 52. For example, the drive mechanism part 14 may have a structure in which one side (the side which is not the operation part 12 side) is forked (for example, a substantially L-shaped, substantially Y-shaped, substantially T-shaped or
35 substantially U-shaped planar shape, among others), and one of the prongs of the fork can be linked to the loop forming part 53, while the other prong can make contact with the suture thread feed mechanism 52, and the other

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side (the operation part 12 side) can be linked to the drive mechanism part 14. By doing so, it is possible to transmit the movement of the operation part 12 to the loop forming part 53 and suture thread feed mechanism
5 52, without adopting a complex shape for the drive mechanism part 14 as a whole.

Furthermore, a guide for moving the drive mechanism part 14 in a straight line forwards or backwards (e.g.,
10 a groove into which the drive mechanism part 14 fits) may be formed within the space 16. The space 16 may serve as the guide. If the space 16 serves as the guide, or if a guide is formed separately from the space 16, the size of the drive mechanism part 14 should
15 correspond to the inner diameter of the guide. Moreover, there is no particular limitation as to the material from which the drive mechanism part 14 is made, and a polyolefin such as polypropylene or polyethylene, or a synthetic resin such as vinyl chloride or polycarbonate
20 may be employed.

In addition, the loop drive part 14b may comprise, for example, a through-hole or a bore which is not formed as far as a penetration to/from which the latching part
25 54 can be attached/detached, or a ring part or a hook part etc. through which the latching part 54 can pass as a separate member. Furthermore, the loop drive part 14b should have a structure such that the attached latching part 54 is not readily removed, for example an
30 interlocking structure, a threaded structure and a locking structure may be combined. In this case, the latching part 54 should also have a structure corresponding to the loop drive part 14b.

35 The pushing part 14c is provided in such a way as to project from part of the tip end side of the drive mechanism part 14, and is preferably designed to transmit only the forward movement of the operation

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part 12 which is transmitted by way of the linking part 14a to the suture thread clamping member 52a. Furthermore, the pushing part 14c typically has an internal space 17, and a hollow member 52b which can be
5 linked to the base end side of the suture thread introduction needle 56 (to be described later) which can be accommodated inside the internal space 17, according to the forward movement of the drive mechanism part 14. The hollow member 52b which has
10 passed through the suture thread clamping member 52a can be accommodated within the internal space 17. The internal space 17 can be formed so as to have a larger inner diameter than the outer diameter of the hollow member 52b of the suture thread introduction needle 56.

15 Moreover, the members which make up the drive mechanism part 14 (linking part 14a, loop drive part 14b, pushing part 14c) may be formed as a single piece, or they may be assembled as separate elements. Furthermore, the
20 linking part 14a may be split into a section which links to the operation part 12 and a sliding section, and these sections then assembled. The drive mechanism part 14 is preferably constructed to be able to transmit the movement of the operation part 12 to the
25 loop forming part 53 and suture thread feed mechanism 52 of the cartridge 50. For example, the drive mechanism part 14 on the operation part 12 side may comprise a suitable combination of members such as gears and pulleys, springs or shafts etc.

30 The cartridge 50 will be described in detail next. Figure 4 is a schematic structural diagram showing an exemplary configuration of the cartridge 50. Figure 5 is a schematic partial enlarged view showing an
35 enlargement of the main parts of the cartridge 50. Figure 6 is a schematic view showing in outline the situation when the suture thread clamping member 52a is clamping the suture thread 1. It should be noted that

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in Figures 4 and 5, the cartridge 50 has been rotated through 90° in the axial direction from the mounted state on the main body 10; the cartridge 50 in the mounted state on the main body 10 is depicted for convenience in a view from above.

As described above, the cartridge 50 can be detachable from the main body 10. The cartridge 50 is preferably configured in such a way that the state in which the minimum length of suture thread 1 required for a single suture (a state in which the suture thread clamping member 52a in a state of clamping the suture thread 1 is set at the base end side of the guide 52c, and the suture thread 1 extending towards the tip end from the suture thread clamping member 52a is accommodated in the lumen of the suture thread introduction needle 56) is preset as the initial state.

The cartridge 50 can comprise: the support part 51 which can be detachably fitted to the fitting part 15 of the cartridge accommodation part 11a; the suture thread feed mechanism 52 with which the suture thread 1 can be fed out by means of the drive mechanism part 14; the loop forming part 53 which can be fed towards the tip end of the loop introduction needle 55 and returned inside the housing 11 by means of the drive mechanism part 14; the latching part 54 which can be attached to the base end part 53a of the loop forming part 53; the loop introduction needle 55 which typically has a lumen for accommodating the loop forming part 53 in such a way that said loop forming part 53 can move forwards and backwards; and the suture thread introduction needle 56 which typically has a lumen for accommodating the suture thread 1 in such a way that said suture thread 1 can move forwards.

A material such as a synthetic resin, for example, is preferably used for the support part 51, which is

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typically shaped to enable fitting to the fitting part 15; a cuboid shape is used, for example. Two through-holes running from front to back are formed in the support part 51. The loop introduction needle 55 and the suture thread introduction needle 56 are preferably fitted in these through-holes in such a way as to lie substantially parallel to each other a prescribed distance apart. As shown in Figure 4, when the base end part of the loop introduction needle 55 and the base end part of the suture thread introduction needle 56 are inserted into the support part 51, the loop introduction needle 55 and the suture thread introduction needle 56 are preferably supported as a single element by the support part 51.

The base end parts of the loop introduction needle 55 and the suture thread introduction needle 56 may or may not pass through the support part 51. The base end parts of the loop introduction needle 55 and the suture thread introduction needle 56 may be fixed to the support part 51 beforehand. The shape of the support part 51 is not limited to a cuboid shape, preferably it should just correspond to the shape of the fitting part 15.

The suture thread feed mechanism 52 is preferably a mechanism which moves in response to the movement of the operation part 12 which is transmitted by way of the drive mechanism part 14, and feeds out the suture thread 1 from the tip end (blade edge) of the suture thread introduction needle 56. The suture thread feed mechanism 52 can comprise: the suture thread clamping member 52a which can move backwards and forwards when it is pressed by the pushing part 14c of the drive mechanism part 14; the hollow member 52b which is fixed to the base end side of the support part 51 so as to communicate with the suture thread introduction needle 56, and which has the suture thread 1 inserted therein;

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and the guide 52c which is fixed to the base end side of the support part 51 and guides the forward movement of the suture thread clamping member 52a. The suture thread clamping member 52a is positioned at the base
5 end side of the guide 52c when the cartridge 50 is in its initial state.

The suture thread clamping member 52a is preferably formed with a front-to-rear cut running through the
10 centre thereof, for example, and preferably it is constructed in such a way that the hollow member 52b or the suture thread 1 can be clamped by the cut (see Figure 6). The suture thread clamping member 52a can be moved forwards by means of the pushing part 14c. The
15 suture thread clamping member 52a can be designed to clamp either the hollow member 52b or the suture thread 1 depending on the position thereof which changes according to the movement of the operation part 12. Furthermore, the suture thread clamping member 52a can
20 move forwards up to the point at which it comes into contact with the base end face of the support part 51.

The suture thread clamping member 52a may comprise or consist of an elastic element made of natural rubber or
25 synthetic rubber etc., or a ring made of a relatively soft metal such as copper, for example. If the suture thread clamping member 52a comprises, or consists of, an elastic element, the hollow member 52b or the suture thread 1 can be clamped using the resilience thereof.
30 If the suture thread clamping member 52a comprises, or consists of, an element such as a metal ring, the hollow member 52b or the suture thread 1 can be clamped using the plastic deformation thereof. The cut formed in the suture thread clamping member 52a does not have
35 to be a simple cut, and can include a slit-like hole or a hole having a smaller inner diameter than the outer diameter of the hollow member 52b and the suture thread 1, or similar.

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There is no particular limitation as to the shape of the suture thread clamping member 52a provided that it can move forwards along the guide 52c. For example, if
5 the guide 52c is cylindrical in shape, the suture thread clamping member 52a should be a circular columnar shape having an outer diameter which is smaller than the inner diameter of the guide 52c. However, if the guide 52c is prismatic in shape, the
10 suture thread clamping member 52a may be a prismatic shape having an outer diameter which is smaller than the inner diameter of the guide 52c, or it may be a columnar shape having a diameter such that there is no front-to-rear or left-to-right rotation.

15 The hollow member 52b is preferably linked to the base end side of the suture thread introduction needle 56. The hollow member 52b preferably projects towards the rear from the support part 51. The suture thread 1 is
20 preferably inserted into the hollow member 52b in the same way as in the suture thread introduction needle 56. The hollow member 52b can be over-mounted by the suture thread clamping member 52a which has moved forwards. The suture thread clamping member 52a which has moved
25 forwards can be penetrated by the hollow member 52b. When the suture thread clamping member 52a has been penetrated by the hollow member 52b, the clamping of the suture thread 1 by the suture thread clamping member 52a can be released.

30 It should be noted that an exemplary case has been described here in which the hollow member 52b is linked to the base end side of the suture thread introduction needle 56, but the base end section of the suture
35 thread introduction needle 56 may function as the hollow member 52b. The hollow member 52b and the suture thread introduction needle 56 may be linked by way of the through-hole in the support part 51 rather than

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being directly linked. The hollow member 52b may be detachable from the support part 51 or it may be fixedly attached thereto beforehand. If the hollow member 52b is provided separately from the suture thread introduction needle 56, the hollow member 52b should be hollow inside and may consist of a hollow columnar member (cylindrical member) or prismatic member (rectangular cylinder). It is possible to form a slit (or a cut) in part of the hollow member 52b so that the hollow part and the outside are in communication.

Furthermore, there is no particular limitation as to the axial length of the hollow member 52b as long as it is sufficiently long to be able to release the clamping of the suture thread 1 by the suture thread clamping member 52a which has been penetrated by the hollow member 52b. The length of the hollow member 52b should be equal to or greater than the front-to-rear length of the suture thread clamping member 52a. The hollow member 52b can be inserted into the suture thread clamping member 52a, so the outer diameter thereof needs to be such as to allow insertion into the cut in the suture thread clamping member 52a.

25

The guide 52c can be formed as a hollow element and the suture thread clamping member 52a can be accommodated in the hollow part in such a way as to be able to move forwards. The guide 52c preferably should not produce any friction resistance to the movement of the suture thread clamping member 52a. For example, it is possible to reduce friction resistance to the movement of the suture thread clamping member 52a by forming a plurality of holes (holes 57 shown in Figures 3 and 5) whereof the lengthwise direction lies in the front-to-rear direction. A slit whereof the lengthwise direction lies in the front-to-rear direction which has a width allowing the insertion of the drive mechanism part 14

- 20 -

may be formed in the guide 52c. If this is the case, the drive mechanism part 14 typically does not strike the base end of the guide 52c when it has moved forwards. However, the choice of whether or not to
5 employ a slit may be made according to the shape of the drive mechanism part 14.

The loop forming part 53 can be inserted into the loop introduction needle 55 in such a way as to be able to
10 move forwards and backwards. The loop forming part 53 can comprise: a base end part 53a to which the latching part 54 is fixed; a loop 53c which is fixed to the tip end; and a rod-like shaft 53b which connects the base end part 53a and the loop 53c. The loop 53c is formed
15 from an elastic material and it reverts to an annular shape when it has been fed out from the tip end of the loop introduction needle 55, and changes to a substantially linear shape which can be accommodated inside the loop introduction needle 55 when it has not
20 been fed out from the tip end of the loop introduction needle 55.

When the loop 53c has been fed out from the tip end of the loop introduction needle 55, it preferably extends
25 in the direction of the suture thread introduction needle 56 in such a way that the suture thread 1 which is fed out from the tip end of the suture thread introduction needle 56 passes through the inside of the loop 53c. The loop 53c may be fixed to the tip end of
30 the rod-like shaft 53b at a prescribed angle so as to form a curved shape when it has been fed out from the tip end of the loop introduction needle 55. This curved shape may be such that when the loop 53c is seen from the side the top part of the curved section projects
35 forwards, for example. If the loop 53c is formed with this kind of shape, the suture thread 1 can be positioned inside the loop 53c with greater certainty. If the centre of the loop 53c lies over the extension

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of the suture thread introduction needle 56, then when the suture thread 1 extends straight forwards, said suture thread 1 can be positioned inside the loop 53c with greater certainty.

5

Although there is no particular limitation to the tip end shape of the loop 53c, it may be substantially V-shaped or substantially U-shaped with the tip end at the centre in order to narrow the distance between the parts which grip the suture thread 1 (the substantially V-shaped or substantially U-shaped part). If this kind of shape is adopted, the suture thread 1 which has been fed out from the tip end of the suture thread introduction needle 56 can be gripped more securely.

10

15 The loop 53c may comprise, or consist of, a deformable member, for example: stainless steel wire (high tensile stainless steel for springs); piano wire (nickel-plated or chromium-plated piano wire); or superelastic alloy wire (titanium-nickel alloy, copper-zinc alloy (or an alloy containing beryllium, silicon, tin, aluminium or potassium etc. therewith), nickel-aluminium alloy etc.).

20

The rod-like shaft 53b may be constructed using, among other things, a metal (e.g. stainless steel) or a synthetic resin (e.g. a polyolefin such as polypropylene or polyethylene, or a fluoro-resin such as PTFE or ETFE). The rod-like shaft 53b may comprise or consist of a stylet or the like.

25

Furthermore, if the latching part 54 is fixed to the base end part 53a, there is no particular limitation to the method of fixing the latching part 54. For example, the base end part 53a and the latching part 54 may be fixed using adhesive or the like, or the latching part 54 may be provided with a notch, or similar structure, and the base end part 53a may be fixed thereto by fitting into said notch, or similar structure. The base end part 53a may likewise be provided with a notch, or

30

35

- 22 -

- similar structure. and the latching part 54 may be fixed thereto by fitting in the notch, or similar structure. Moreover, when the loop 53c is made of a relatively rigid material, the rod-like shaft 53b and the loop 53c may be made of the same material. In such configurations, the rod-like shaft 53b and the loop 53c may be formed as a single element or as separate elements.
- 10 The latching part 54 is preferably fixed to the base end part 53a of the loop forming part 53 and is preferably detachably fitted to the loop drive part 14b. The latching part 54 is typically made of a synthetic resin or metallic material etc. and moulded to a
- 15 predetermined shape (e.g., a round cylindrical shape or rectangular cylindrical shape, or a sheet shape etc.), for example. The latching part 54 should have a shape that can be easily fixed to the base end part 53a of the loop forming part 53 and which can be easily
- 20 attached to or detached from the loop drive part 14b. The latching part has been described with the loop drive part 14b, but there is no particular limitation to the shape of the latching part 54, preferably it has a structure corresponding to the loop drive part 14b.
- 25
- The loop introduction needle 55 preferably has a lumen in which the loop forming part 53 is accommodated in such a way as to be able to move forwards and backwards. The base end of the loop introduction needle 55 is
- 30 typically fitted to the support part 51. The loop introduction needle 55 is typically fitted to the support part 51 in such a way that the axial centre thereof is coincident with the axial centre of the loop forming part 53. If the loop introduction needle 55 is
- 35 fitted to the support part 51 in this way, the loop forming part 53 can be fed out and returned in a straight line. The loop introduction needle 55 may be

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formed from a metal such as stainless steel, for example.

Furthermore, the loop introduction needle 55 preferably
5 has a cutting surface, at the tip end, for piercing the
skin. The cutting surface may be formed by cutting the
loop introduction needle 55 on a plane which obliquely
intersects the axial centre thereof. The tip end
10 opening of the loop introduction needle 55 should be
oriented towards the suture thread introduction needle
56 so that the loop 53c of the loop forming part 53
extends in the direction of the suture thread
introduction needle 56 in a reliable manner, as will be
described herein.

15 There is no particular limitation as to the shape of
the loop introduction needle 55 provided that it can
pierce the skin and allows the loop forming part 53 to
be inserted therein. For example, a needle of outer
20 diameter around 21 - 17 G (preferably 20 - 18 G) and
length around 50 mm - 120 mm (preferably 70 - 90 mm)
may be used as the loop introduction needle 55.
Furthermore, a bevelled part may be formed at the tip
end of the loop introduction needle 55 so as not to cut
25 the suture thread 1 when it is gripped. In addition, it
should be possible to adjust the position of the tip
end of the loop introduction needle 55 (the position
relative to the suture thread 1 which has been fed out)
through the position of the support part 51.

30 The suture thread introduction needle 56 has a lumen in
which the suture thread 1 can be accommodated in such a
way as to be able to move forwards. The base end of the
suture thread introduction needle 56 is fitted to the
35 support part 51. The suture thread introduction needle
56 is fitted to the support part 51 in such a way that
the axial centre thereof is coincident with the axial
centre of the suture thread feed mechanism 52. If the

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suture thread introduction needle 56 is fitted to the support part 51 in this way, the suture thread 1 can be fed out in a straight line. The suture thread introduction needle 56 may be formed from a metal such as stainless steel, for example.

Furthermore, the suture thread introduction needle 56 typically has a cutting surface, at the tip end, for piercing the skin. The cutting surface may be formed by cutting the suture thread introduction needle 56 on a plane which obliquely intersects the axial centre thereof. There is no limitation as to the orientation of the tip end opening of the suture thread introduction needle 56, but it preferably faces the direction of the loop introduction needle 55.

Moreover, there is no limitation as to the shape of the suture thread introduction needle 56 provided that it can pierce the skin and allows the suture thread 1 to be inserted therein. For example, a needle of outer diameter around 21 - 17 G (preferably 20 - 18 G) and length around 50 mm - 120 mm (preferably 70 - 90 mm) may be used as the suture thread introduction needle 56. Furthermore, it should be possible to adjust the position of the tip end of the suture thread introduction needle 56 (the position relative to the loop 53c which has been fed out) through the position of the support part 51.

As described herein, the loop introduction needle 55 and the suture thread introduction needle 56 can be supported in parallel by the support part 51 with a prescribed distance therebetween. The distance between the loop introduction needle 55 and the suture thread introduction needle 56 should be set at the length over which the abdominal wall and the internal organ wall are to be fixed by the suture thread 1 (around 10 - 30 mm, for example). The patient's abdominal wall and

- 25 -

internal organ wall can be properly fixed by the suture thread 1 if the distance between the loop introduction needle 55 and the suture thread introduction needle 56 is within this range.

5

The cartridge 50 of the suturing instrument 100 may also be provided with a plate part through which the loop introduction needle 55 and the suture thread introduction needle 56 pass, although this is not shown
10 in the figures. When this plate part is moved towards the tip end when the loop introduction needle 55 and the suture thread introduction needle 56 can be made to pierce the patient's skin, it serves to restrict changes in distance between the loop introduction
15 needle 55 and the suture thread introduction needle 56. When this plate part is provided, it is possible to prevent any large changes in the distance between the loop introduction needle 55 and the suture thread introduction needle 56. Furthermore, the plate part
20 preferably does not obstruct the piercing operation if it can be moved forwards and backwards with respect to the loop introduction needle 55 and the suture thread introduction needle 56.

25 There is no limitation as to the planar shape of the flat plate part, but it may be rectangular, circular or polygonal. The tip end surface of the flat plate part (the surface on the patient side) should be flat so as not to irritate the patient's skin. When this kind of
30 flat plate part is provided, the tip ends of a pair of support rods extending parallel with the loop introduction needle 55 and the suture thread introduction needle 56 should be fixed to the flat plate part. Provision of the support rods typically
35 makes it possible to reduce the force transmitted from the flat plate part to the loop introduction needle 55 and the suture thread introduction needle 56.

Example

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Figure 7 is a schematic view in cross section showing, in simplified form, the operating procedure for the suturing instrument 100. An exemplary, non-limiting operating procedure for the suturing instrument 100 will be described with reference to Figure 7. Figure 7(A) shows the initial state of the suturing instrument 100 (which includes the state before the second and subsequent operations); Figure 7(B1) shows the pushing operation at the start of feeding-out of the loop 53c and the suture thread 1; Figure 7(B2) shows the pushing operation at the end of feeding-out of the suture thread 1; and Figure 7(C) shows the return operation when the drive mechanism part 14 moves backwards. It should be noted that Figure 7 shows a more simplified form of the suturing instrument 100 than the suturing instrument 100 shown in Figures 1 - 6.

The suture thread 1 is preset in the cartridge 50 before said cartridge 50 is set in the main body 10. The practitioner then sets the cartridge 50 in the main body 10 as a preliminary operation of the suturing instrument 100. In this operation, the practitioner fits the latching part 54 into the loop drive part 14b and fits the support part 51 into the fitting part 15 in order to set the cartridge 50 in the main body 10.

(A) Piercing (initial state of the suturing instrument 100)

The practitioner first of all pierces the patient's body using the suturing instrument 100 in which the cartridge 50 has been set in the main body 10. In this operation, the suture thread 1 is accommodated inside the suture thread introduction needle 56 in such a way as not to project from the tip end of the suture thread introduction needle 56. Furthermore, the suture thread clamping member 52a is positioned towards the base end

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of the guide 52c in a state in which the suture thread 1 is clamped, in other words a state in which it can move forwards.

- 5 (B1) Pushing operation 1 (start of feeding-out of the loop 53c and the suture thread 1)

Next, when the practitioner has pierced through into the internal organ using the suturing instrument 100,
10 and then grips the operation part 12 with the suturing instrument 100 still in place, the movement of the operation part 12 is transmitted to the loop forming part 53 and the suture thread clamping member 52a by way of the drive mechanism part 14. The loop forming
15 part 53 and the suture thread clamping member 52a then start to move forwards.

When the operation part 12 is gripped by the practitioner, the drive mechanism part 14 starts to
20 slide forwards. When the drive mechanism part 14 starts to move forwards, the loop forming part 53 and the suture thread clamping member 52a of the suture thread feed mechanism 52 also start to move forwards at the same time. When the loop forming part 53 moves forwards
25 the loop 53c starts to be fed out from the tip end of the loop introduction needle 55. When the suture thread clamping member 52a moves forwards, the suture thread 1 which is clamped by the suture thread clamping member 52a starts to be fed out from the tip end of the suture
30 thread introduction needle 56.

At the loop forming part 53 side, the movement of the operation part 12 is transmitted to the loop forming part 53 by way of the latching part 54 which is
35 provided at the base end part 53a of the loop forming part 53, and the loop forming part 53 starts to move. The loop forming part 53 is able to move forwards until the sliding motion of the drive mechanism part 14 stops.

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This means that when the loop 53c has been fed out from the tip end of the loop introduction needle 55 and a state is reached in which no external force is applied, said loop 53c is restored to an annular shape. The loop
5 53c is fed out from the tip end of the loop introduction needle 55 and opens out into an annular shape.

At the suture thread feed mechanism 52 side, the
10 movement of the operation part 12 is transmitted to the suture thread clamping member 52a which is provided at the base end side of the guide 52c by way of the pushing part 14c of the drive mechanism part 14, and the suture thread clamping member 52a which is pressed
15 by the pushing part 14c starts to move forwards along the guide 52c. The suture thread 1 also moves forwards along the forwards direction of the suture thread clamping member 52a. The suture thread 1 is inserted in the cut in the suture thread clamping member 52a, such
20 that it is clamped by means of the suture thread clamping member 52a and gripped in the suture thread clamping member 52a, so the suture thread 1 moves forwards as the suture thread clamping member 52a moves. As the suture thread 1 moves forwards, the suture
25 thread 1 is fed out from the tip end of the suture thread introduction needle 56.

Accordingly, the suture thread 1 is fed out from the tip end of the suture thread introduction needle 56 at
30 substantially the same timing as the loop 53c is fed out, and passes through the inside of the loop 53c which has returned to an annular shape or is in the process of returning to an annular shape. The suture thread 1 starts to be fed out at substantially the same
35 timing as the timing at which the loop 53c is fed out, and the suture thread 1 can readily reach the state of having passed through the inside of the loop 53c. It should be noted that the suture thread clamping member

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52a continues moving forwards until it runs into the support part 51.

(B2) Pushing operation 2 (end of feeding-out of the suture thread 1)

When the suture thread clamping member 52a is further pressed by means of the drive mechanism part 14 after having been penetrated by the hollow member 52b, the hollow member 52b enters the suture thread clamping member 52a. When this happens, the clamping of the suture thread 1 by the suture thread clamping member 52a is released and the suture thread 1 is freed. The suture thread 1 stops moving forwards. In this state, the suture thread clamping member 52a is moved forwards until it comes into contact with the base end surface of the support part 51. The suture thread 1 therefore remains in a state of having passed through the inside of the loop 53c.

20

(C) Return operation (backwards movement of the drive mechanism part 14)

Next, when the practitioner loosens his or her grip on the operation part 12 to interrupt operation, the movement of the operation part 12 is transmitted to the loop forming part 53 by way of the drive mechanism part 14, and the loop forming part 53 starts to move backwards. The drive mechanism part 14 starts to move backwards in response to the movement of the operation part 12, and as this happens the loop forming part 53 also starts to move backwards. When the loop forming part 53 moves backwards, the loop 53c starts to be accommodated inside the loop introduction needle 55.

35

In this operation, the suture thread 1 which has been fed out from the tip end of the suture thread introduction needle 56 is in a state of having passed

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through the loop 53c. When the loop 53c starts to move backwards, the annular shape of the loop 53c therefore gradually becomes smaller and said loop 53c is drawn towards the loop introduction needle 55 while grasping the suture thread 1. In addition, when the loop 53c moves backwards, the suture thread 1 is ultimately gripped at the tip end of the loop introduction needle 55.

Meanwhile, at the suture thread feed mechanism 52 side, the clamping force of the suture thread clamping member 52a is moved from the suture thread 1 to the hollow member 52b, and this alone prevents a return to the initial state. The suture thread clamping member 52a is simply pressed forwards by means of the pushing part 14c, so it is maintained in the pushed-forward state without following the backwards movement of the drive mechanism part 14. The drive mechanism part 14 and the suture thread clamping member 52a are not linked together, so the hollow member 52b remains inside the suture thread clamping member 52a which does not follow the backwards movement of the drive mechanism part 14. The suture thread 1 therefore remains free and the suture thread 1 does not move backwards.

The operation part 12, drive mechanism part 14 and loop forming part 53 return to the same positions as in the initial state once the above series of operations has been completed, but the suture thread clamping member 52a does not return to its initial position, and the loop 53c is in a state in which it is gripping the suture thread 1. In this state, when the loop introduction needle 55 and the suture thread introduction needle 56 of the suturing instrument 100 are withdrawn from inside the internal organ towards the abdominal wall, the suture thread 1 is smoothly guided because it is free, and the suture thread 1 assumes a state of having passed through the internal

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organ wall and the abdominal wall in substantially a U-shape. The practitioner then removes the cartridge 50 from the main body 10 and attaches another cartridge 50 to the main body 10, and by repeating the above operations, the internal organ wall can be fixed in a number of locations.

The suture thread 1 can be placed in a U-shape through the internal organ wall and the abdominal wall simply using a pushing operation and a return operation. Finally, the series of operations to introduce the suture thread 1 into the internal organ and to withdraw it therefrom is completed by tying together the two ends of the suture thread 1 which has been withdrawn to outside the body. After this, the cartridge 50 is replaced and the internal organ wall and abdominal wall can be fixed any number of times using the above procedure. In this case too, the operation to replace the cartridge 50 can be simplified and the burden on the practitioner can be reduced.

Timing for feeding out the loop 53c and the suture thread 1

This suturing instrument 100 makes it possible to transmit the movement of the operation part 12 to the loop 53c and the suture thread 1 at substantially the same time. By doing so, the suture thread 1 can be inserted inside the loop 53c with certainty, and the suture thread 1 can be securely gripped. To be specific, according to the suturing instrument 100, both the loop forming part 53 and the suture thread clamping member 52a start to operate at the same time in response to the movement of the operation part 12, and the suture thread 1 passes through the inside of the loop 53c as it is formed into an annular shape.

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The suturing instrument 100 therefore makes it possible to place the suture thread 1 so that it has passed through the internal organ wall and the abdominal wall by means of what is essentially a single operation (an operation which involves gripping the operation part 12 and releasing the grip on the operation part 12), so the working burden on the practitioner is considerably reduced. Furthermore, with the suturing instrument 100 there is no need to insert the suture thread 1 into the suturing instrument 100 and the procedure can be started simply by setting the cartridge 50, which is preset with the suture thread 1, in the main body 10, so the operating burden for the practitioner is considerably simplified.

15

Means for fixing an internal organ employing the suturing instrument 100

Figure 8 schematically illustrates the action of the suturing instrument 100. The action of the suturing instrument 100 will be described in accordance with the procedural flow employing the suturing instrument 100, with reference to Figure 8. The description given here relates to fixing a patient's abdominal wall 101 and internal organ wall 102 (the stomach wall, for example) using the suturing instrument 100.

The practitioner first inserts an endoscope orally or nasally into the patient's stomach. The practitioner then expands the internal organ by filling the internal organ with a gas (e.g., carbon dioxide). As a result, the stomach wall 101 is placed in close contact with the abdominal wall 102. Next, the skin 103 is sterilized, including the site to be pierced by the loop introduction needle 55 and the suture thread introduction needle 56. The position of the internal organ is then confirmed by the light emitted from the

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endoscope, and a local anaesthetic is applied at this site.

Next, the suturing instrument 100 is prepared: the loop
5 53c of the loop forming part 53 is accommodated inside
the loop introduction needle 55, and the suture thread
1 is accommodated inside the suture thread introduction
needle 56. The cartridge 50 is set in the main body 10.
At this point, the suture thread 1 is accommodated
10 inside the suture thread introduction needle 56 in such
a way as not to project from the tip end of the suture
thread introduction needle 56. The loop introduction
needle 55 and the suture thread introduction needle 56
of the suturing instrument 100 are then made to pierce
15 the patient's abdominal wall 101, and the loop
introduction needle 55 and the suture thread
introduction needle 56 are made to project into the
internal organ from the internal organ wall 102 (Figure
8(a)).

20
Once this state has been confirmed, the practitioner
grips the operation part 12. The practitioner then
carries out the series of operations shown in Figure 7
and the suture thread 1 is exposed outside the body
25 (Figure 8(b)). The suture thread 1 is in a situation of
passing through the internal organ wall 102 and the
abdominal wall 101 in a U-shape. Finally, the
practitioner ties the two ends of the suture thread 1
which has been withdrawn to outside the body (Figure
30 8(c)). The internal organ wall 102 and the abdominal
wall 101 are fixed by this tying. The suturing
instrument 100 is then once again made to pierce the
body substantially parallel to the position of the tie
at a prescribed distance of around 20 - 30 mm, for
35 example, and the internal organ wall 102 and the
abdominal wall 101 are fixed.

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The suture thread 1 functions as an organopexy tool in order to fix the internal organ wall 102 and the abdominal wall 101, so it is possible to easily form a fistula which is used when inserting a fistula catheter.

5 In this process, the suturing instrument 100 can be used continuously if a number of cartridges 50 are prepared in advance.

The suturing instrument 100 makes it possible to fix
10 internal organs any number of times simply by replacing the cartridge 50, without the need to insert the suture thread 1 into the suturing instrument 100 every time. Furthermore, the suturing instrument 100 makes it possible to pass the suture thread 1 in a U-shape
15 through the internal organ wall 102 and the abdominal wall 101 simply by operating the operation part 12 (by carrying out operations (A) - (C) above). Specifically, the practitioner can pass the suture thread 1 through the internal organ wall 102 and the abdominal wall 101
20 simply by carrying out an operation which involves gripping the operation part 12 and an operation which involves releasing the grip on the operation part 12, so the work required of the practitioner can be considerably simplified. In addition, the loop 53c and
25 the suture thread 1 are fed out at the same time, so the suture thread 1 can be inserted into the loop 53c with certainty.

Accordingly, the burden on the practitioner can be
30 considerably reduced and the ease of use is markedly improved. Furthermore, the procedure itself can be carried out very simply, and therefore not only is the ease of use improved, but the ease of handling is also considerably improved. In addition to the procedure
35 being simple, the suture thread 1 can also be securely gripped by the loop 53c, and therefore it is possible to minimize the number of piercings made, so this not only contributes to reducing the burden on the

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practitioner, but also to reducing the burden on the patient.

Examples of other configurations of the suture thread
5 feed mechanism

In the example, the drive mechanism part 14 is provided on the main body 10 side, but part of the drive mechanism part 14 (for example, the section which
10 slides) may be provided on the cartridge 50 side. In this case, when the cartridge 50 is fitted in the main body 10, the drive mechanism part 14 on the cartridge 50 side and the drive mechanism part 14 on the main body 10 side must be linkable. Furthermore, in the
15 example described above, the main body 10 is a gun-type member, but this is not limiting and there is no need to limit the main body 10 to a gun-type member provided that it is a shape that can be easily held by the practitioner. In addition, in the example described
20 above, the operations are carried out by gripping the operation part 12 and releasing the grip on the operation part 12, but there is no particular limitation as to the shape or structure of the operation part 12, provided that the procedure can be
25 carried out in essentially a single operation.

Key to Symbols

1 suture thread, 10 main body, 11 housing, 11a
30 cartridge accommodation part, 11b gripping part, 12 operation part, 14 drive mechanism part, 14a linking part, 14b loop drive part, 14c pushing part, 15 fitting part, 16 space, 17 internal space, 50 cartridge, 51 support part, 52 suture thread feed mechanism, 52a
35 suture thread clamping member, 52b hollow member, 52c guide, 53 loop forming part, 53a base end part, 53b rod-like shaft, 53c loop, 54 latching part, 55 loop introduction needle, 56 suture thread introduction

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needle, 57 hole, 100 suturing instrument, 101 abdominal wall, 102 internal organ wall, 103 skin.

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Claims

1. A medical suturing instrument characterized in that it comprises:
- 5 a suture thread introduction needle with which a suture thread is introduced;
- a loop introduction needle which is mounted substantially parallel to the suture thread introduction needle at a prescribed distance therefrom;
- 10 a support part for supporting the suture thread introduction needle and the loop introduction needle;
- a housing in which the support part is detachably accommodated;
- a loop forming part which has a loop formed at the tip end thereof, and which is inserted into the loop introduction needle in such a way as to be mobile therein;
- 15 a suture thread feed mechanism for feeding out the suture thread from the tip end of the suture thread introduction needle;
- 20 an operation part, provided in the housing, for receiving practitioner operations; and
- a drive mechanism part for transmitting the movement of the operation part to the loop forming part and the suture thread feed mechanism, and
- 25 by means of the drive mechanism part: the movement of the operation part is transmitted to both the loop forming part and the suture thread feed mechanism and the loop and the suture thread are fed out from the tip end of the loop introduction needle and the tip end of the suture thread introduction needle.
- 30
2. The medical suturing instrument according to Claim 1, characterized in that, by means of the drive mechanism part and the suture thread feed mechanism:
- 35 the loop is accommodated inside the loop introduction needle while the suture thread is maintained in a state of having been fed out from the

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tip end of the suture thread introduction needle, and as a result the suture thread is gripped at the tip end of the loop introduction needle.

5 3. The medical suturing instrument according to Claim 1, characterized in that the suture thread feed mechanism comprises:

10 a hollow member which is fixed to the base end of the support part in communication with the suture thread introduction needle, and has the suture thread inserted therein;

15 a suture thread clamping member for clamping the hollow member or the suture thread according to the position on the tip end side to which said suture thread clamping member has been moved; and

 a guide, which is fixed to the base end of the support part, for guiding the movement of the suture thread clamping member in the forwards direction, and

20 when the operation part is operated, the drive mechanism part causes the loop forming part to move towards the tip end, while also pressing the suture thread clamping member which is positioned at the base end side of the guide in order to cause said suture thread clamping member to move towards the tip end.

25

4. The medical suturing instrument according to Claim 3, characterized in that, when the hollow member penetrates the suture thread clamping member, the clamping of the suture thread by the suture thread clamping member is released.

30

5. The medical suturing instrument according to Claim 3, characterized in that, when operation of the operation part is released,

35 the suture thread feed mechanism maintains a state in which the suture thread has been fed out from the tip end of the suture thread introduction needle and

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the clamping of the suture thread by the suture thread clamping member is released;

the loop is accommodated inside the loop introduction needle; and

5 the suture thread is gripped at the tip end of the loop introduction needle.

6. The medical suturing instrument according to
10 Claim 1, characterized in that it comprises

a cartridge provided with the suture thread introduction needle, loop introduction needle, support part, loop forming part and suture thread feed mechanism; and

15 a main body provided with the housing, operation part and drive mechanism part, and
the cartridge is detachable from the main body.

20 7. The medical suturing instrument according to Claim 6, characterized in that the main body is endowed with a gun-type shape in which a gripping part is provided on the housing; an elastic member which is linked to the operation part is provided inside the
25 gripping part, and when operation of the operation part is released, the operation part returns to its original state using the resilience of the elastic member.

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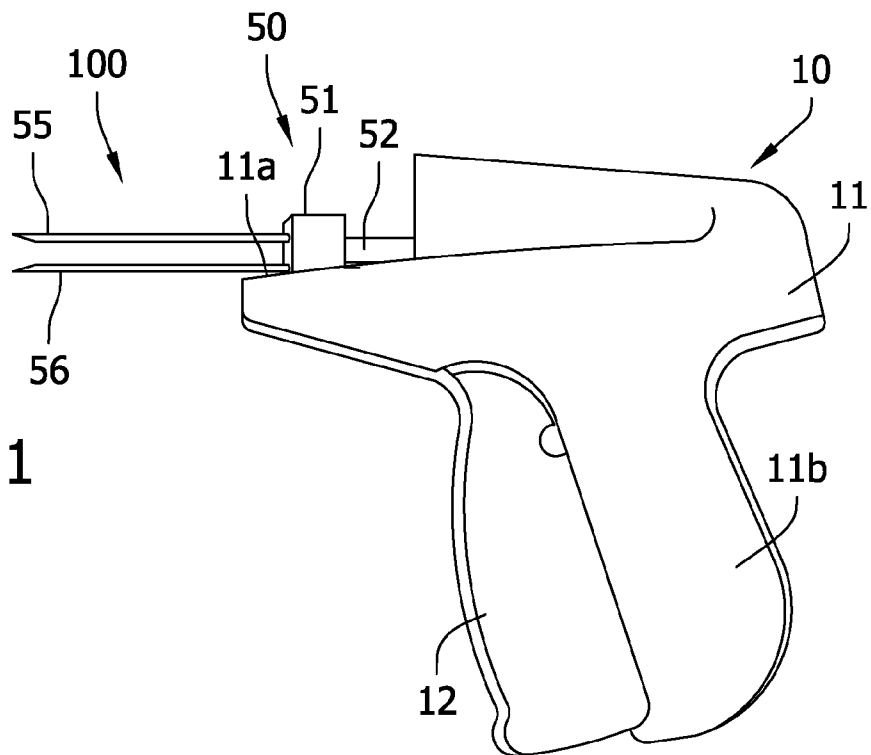


FIG. 1

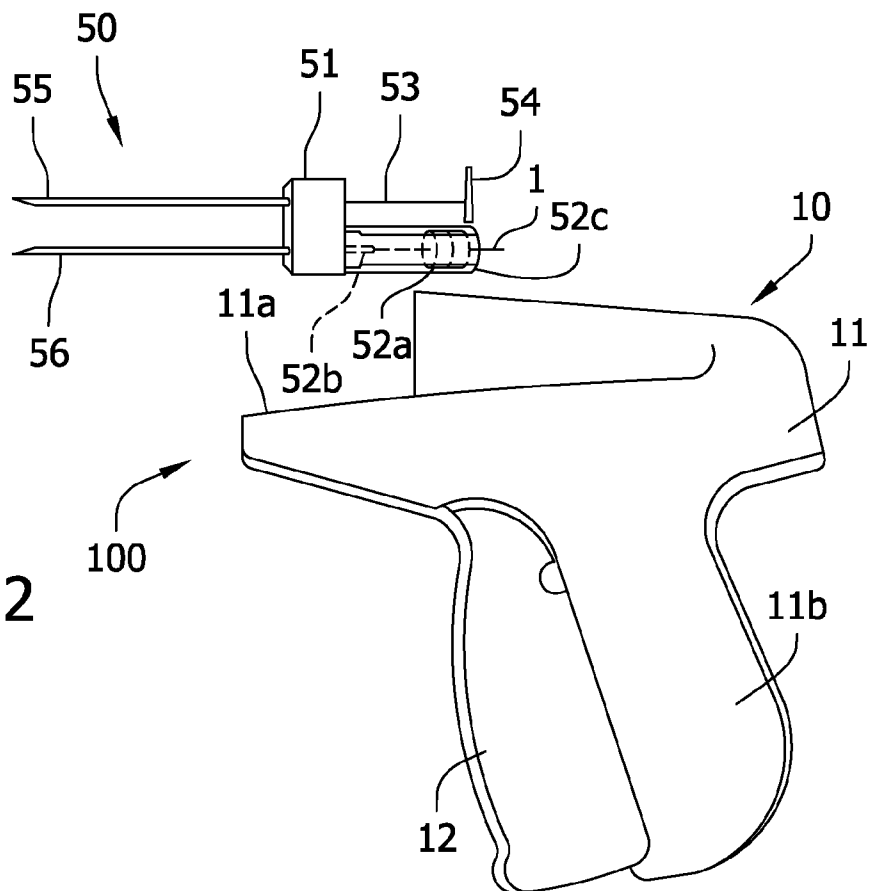


FIG. 2

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FIG. 3

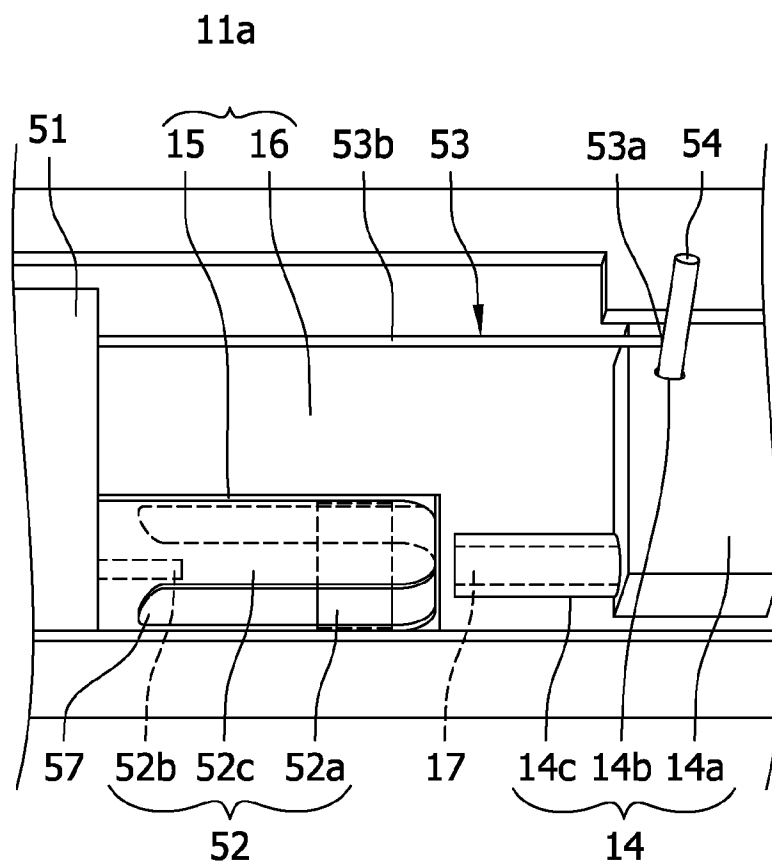
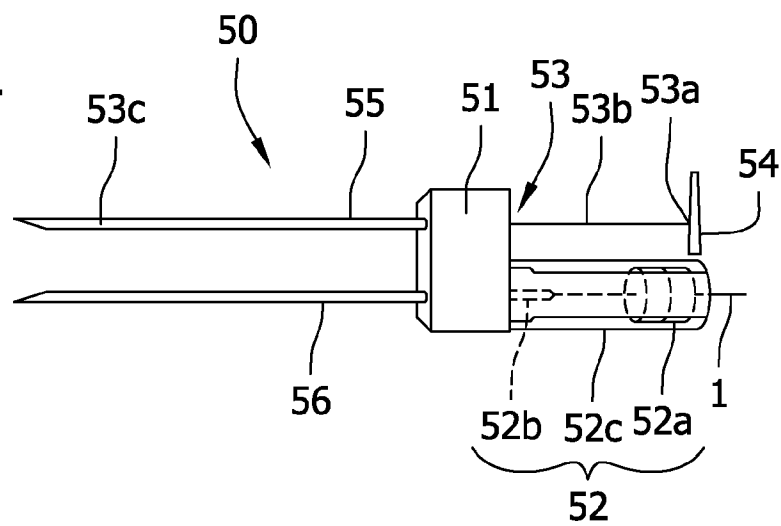


FIG. 4



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FIG. 5

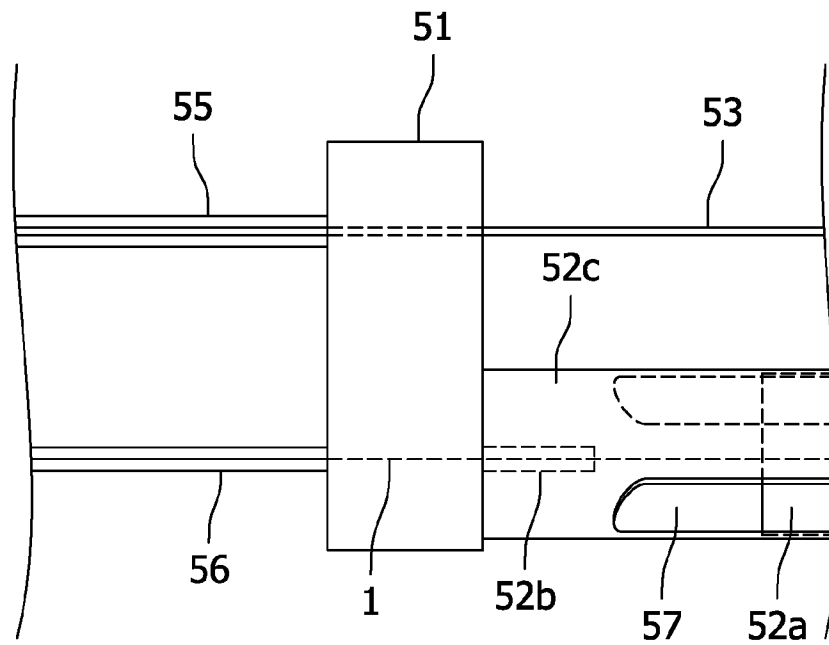
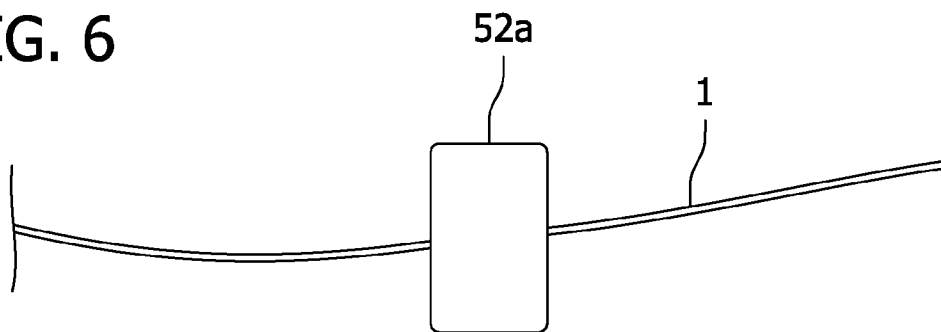


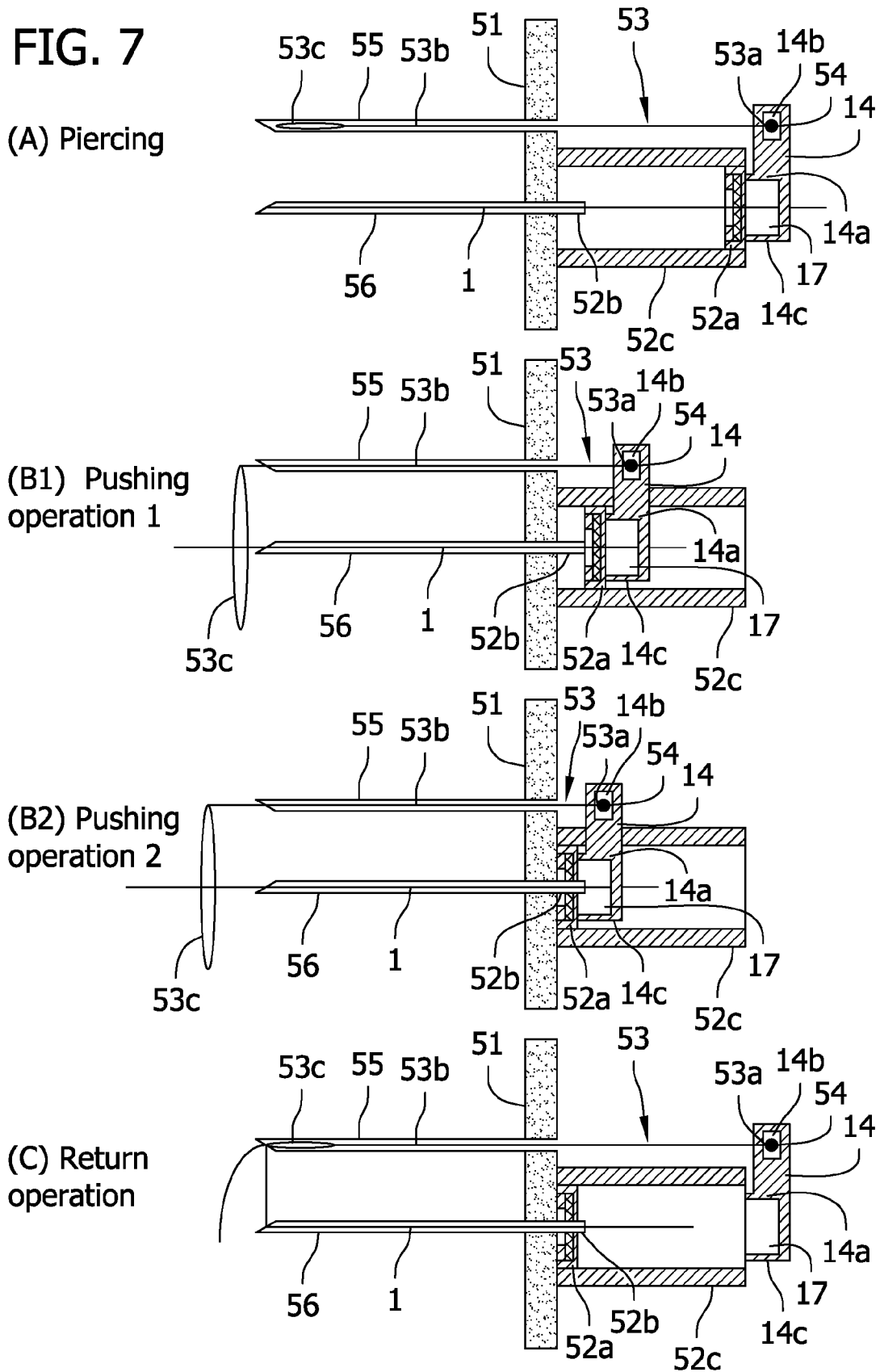
FIG. 6



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FIG. 7

(A) Piercing



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FIG. 8

