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(54) MEDICAL PROCEDURE PERFORMED INSIDE ABDOMINAL CAVITY

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(57) **ABSTRACT**

A medical procedure performed inside an abdominal cavity includes: performing a first treatment at a target position inside the abdominal cavity by a first apparatus that has been introduced percutaneously into the abdominal cavity; and performing a second treatment, using a second apparatus that has been introduced into the abdominal cavity via a natural aperture of a living body, in cooperation with the first apparatus inside the abdominal cavity, or alternatively, performing a second treatment that is necessitated as a result of the first treatment being performed after the first treatment has been performed.

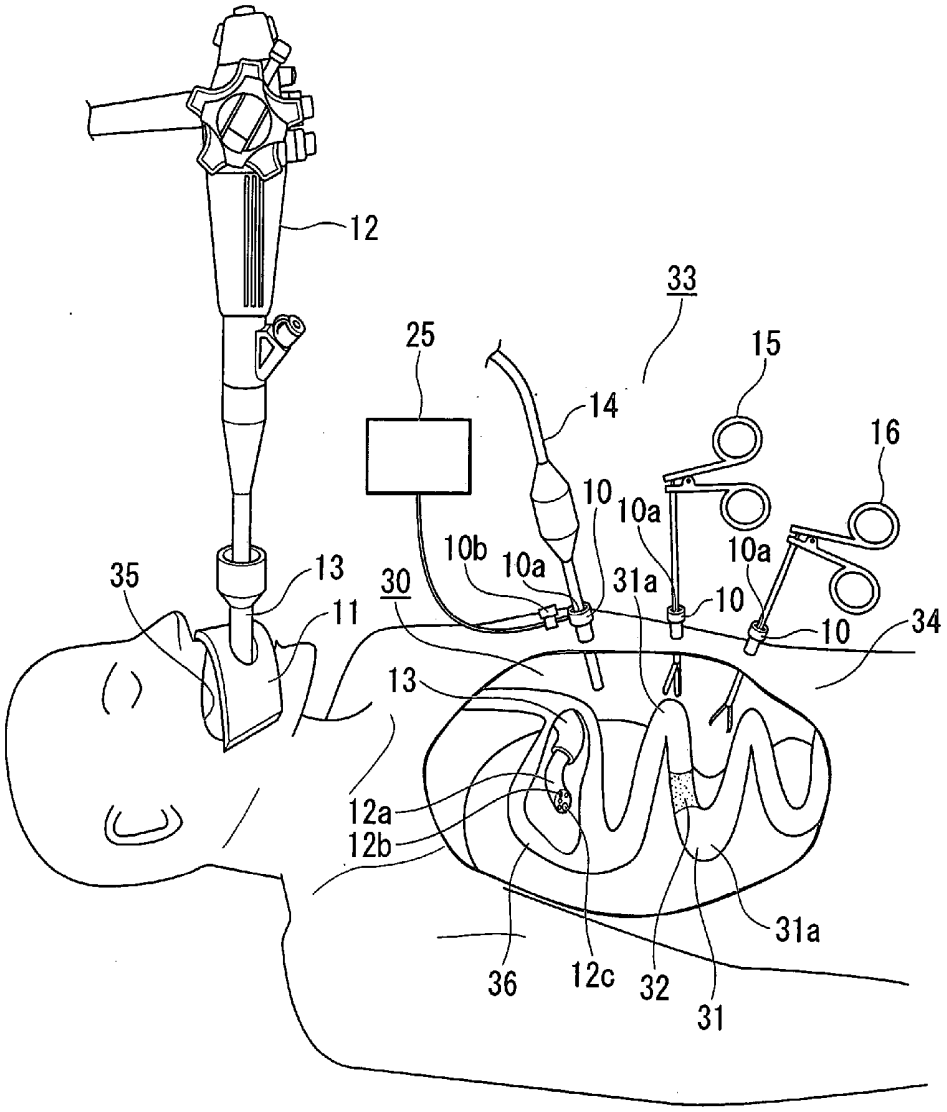
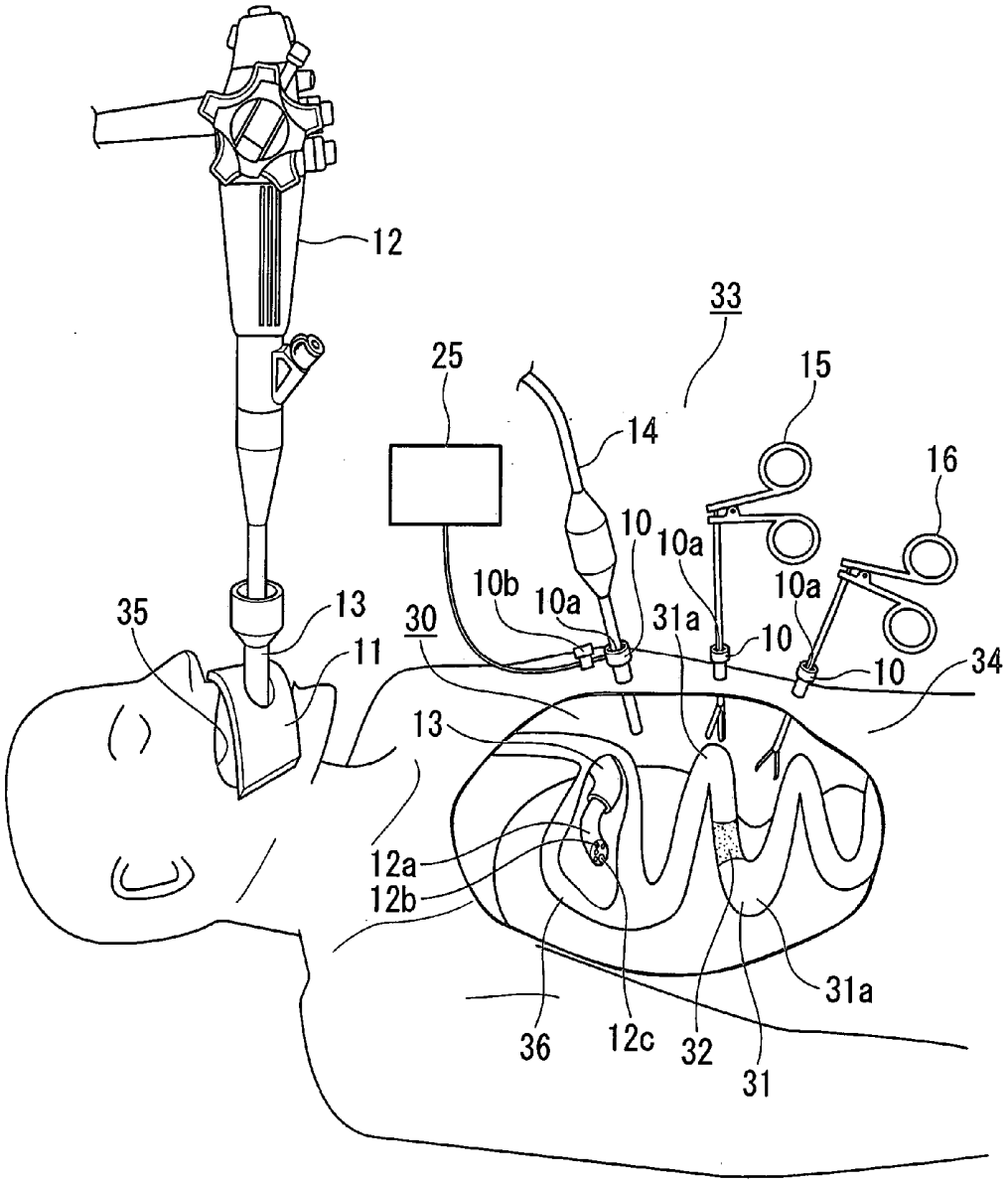


FIG. 1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12c
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FIG. 2

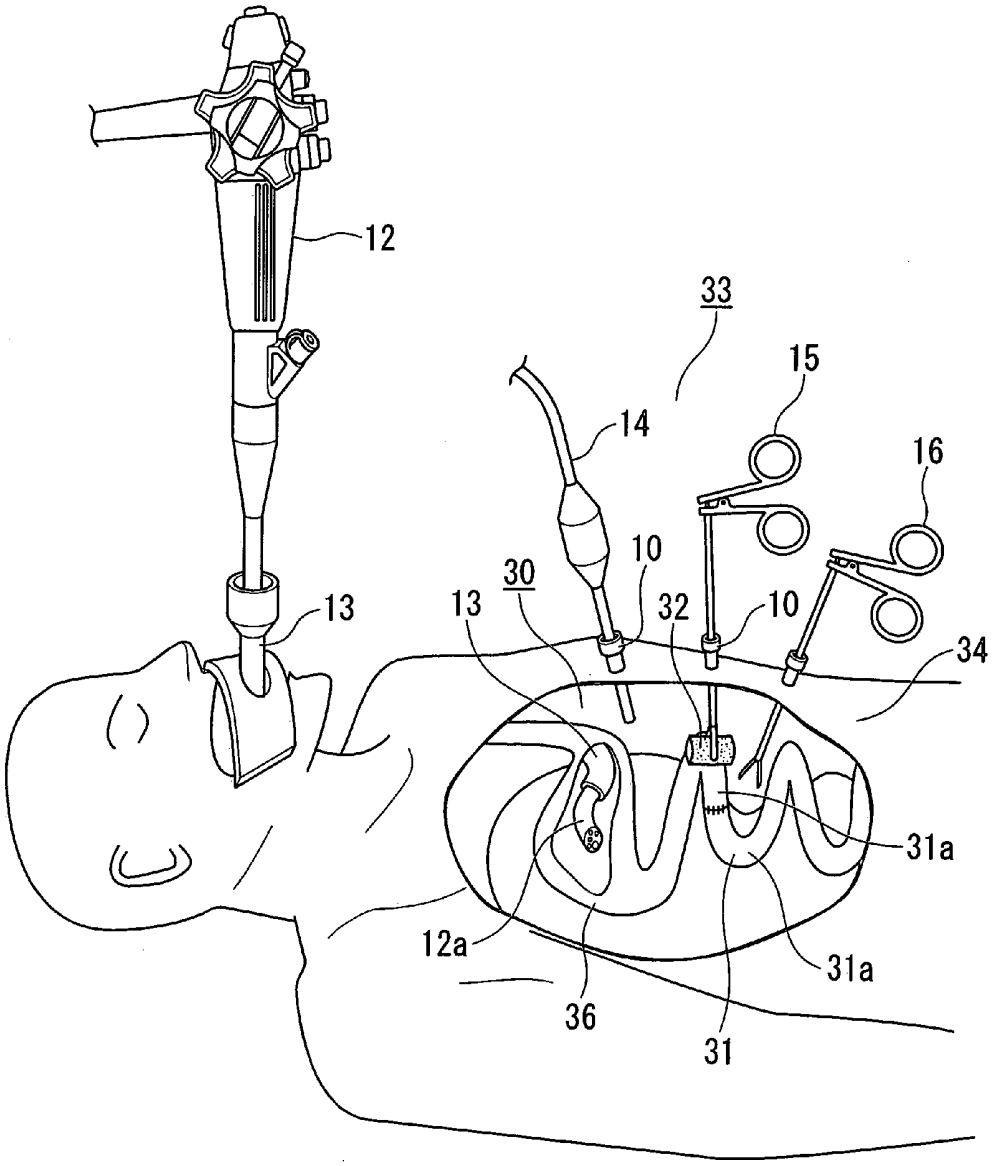
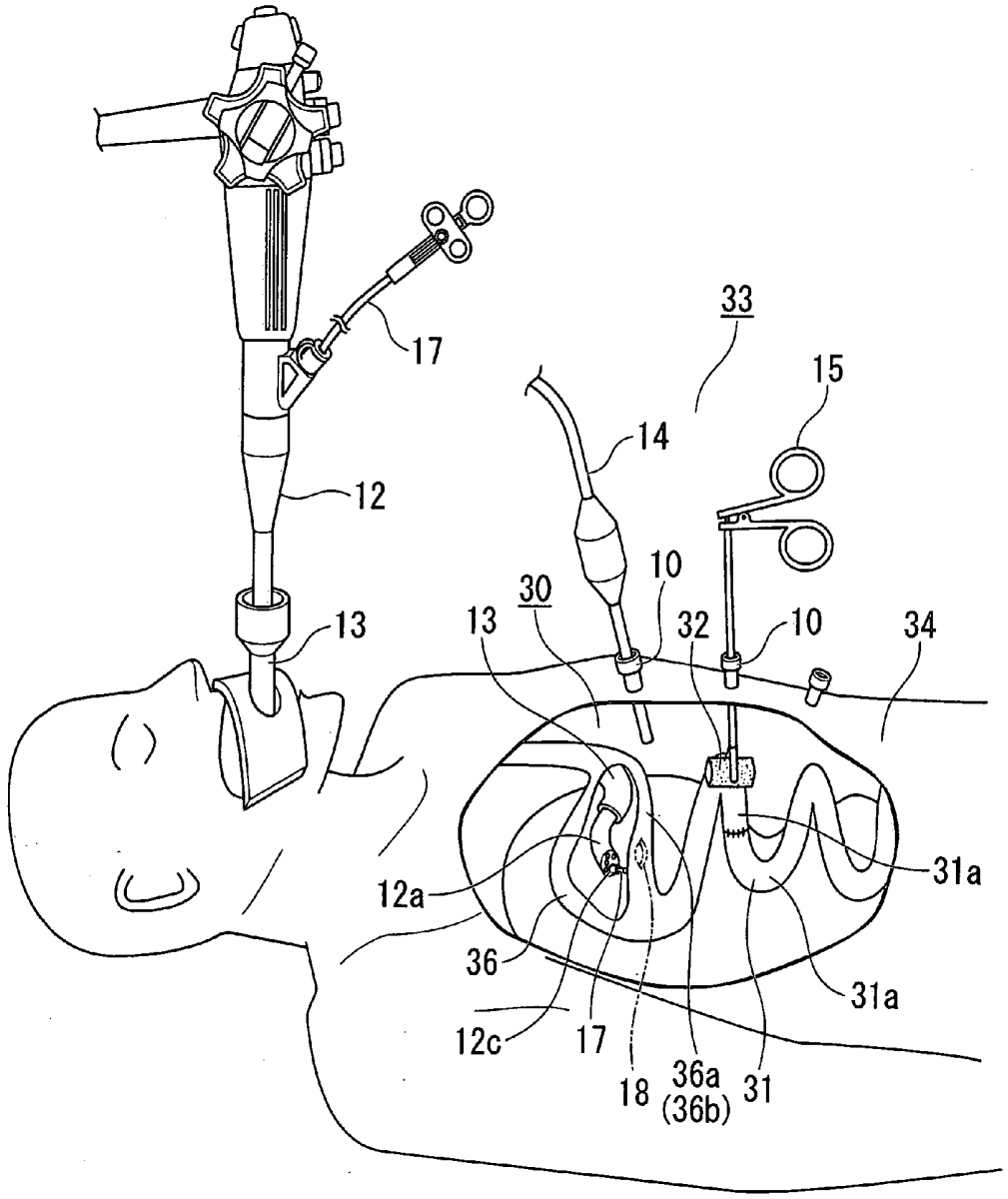


FIG. 3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17
12
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31a
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12c
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36a
(36b)
31

FIG. 4

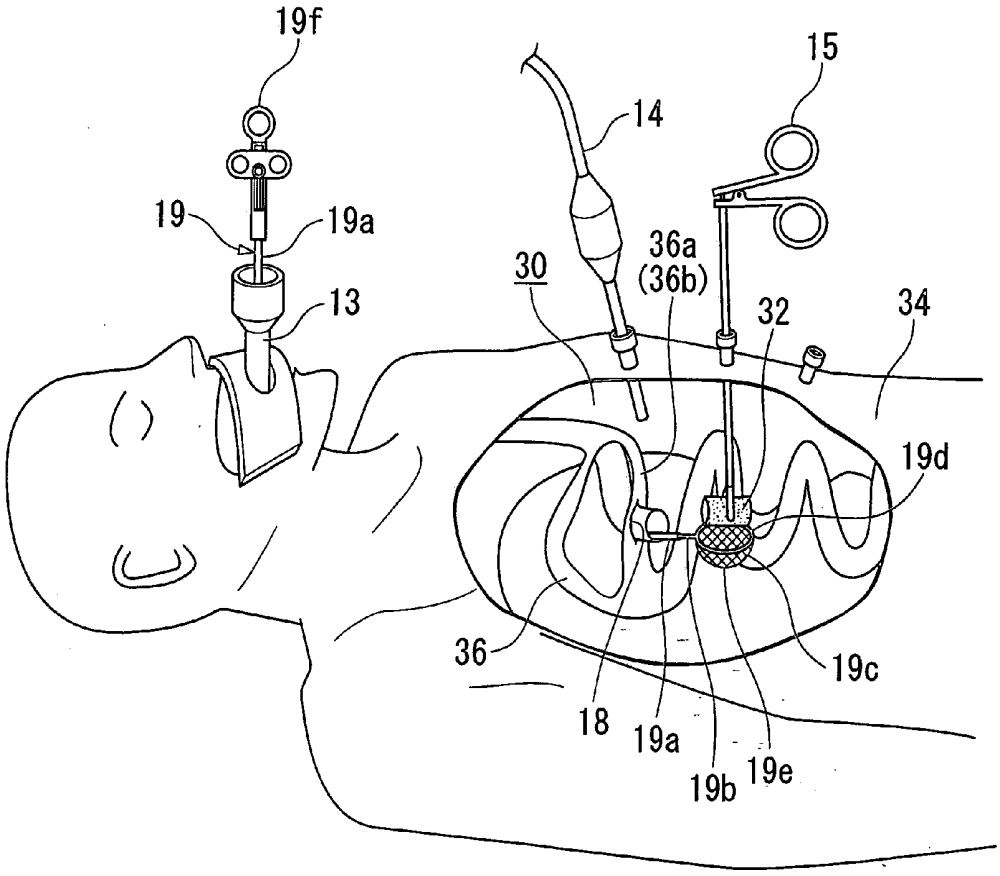


FIG. 5

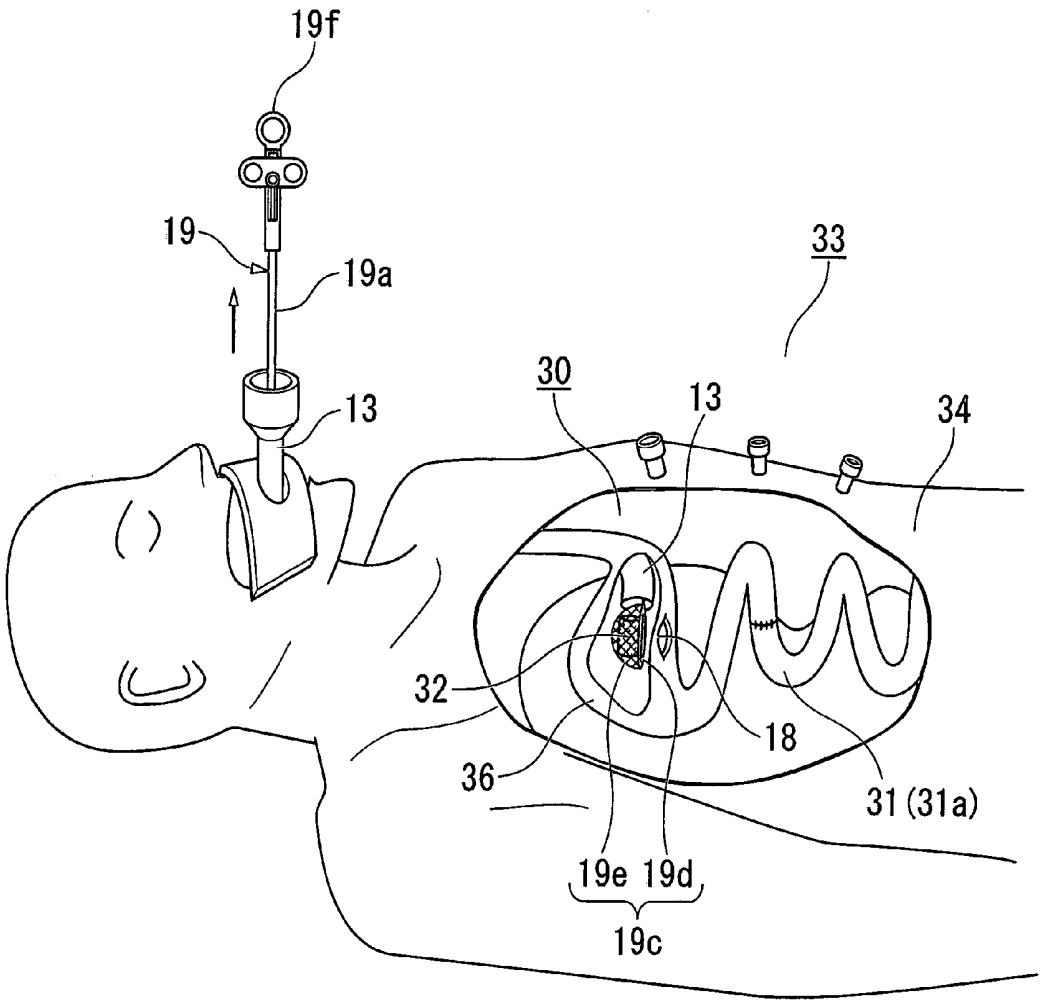


FIG. 6

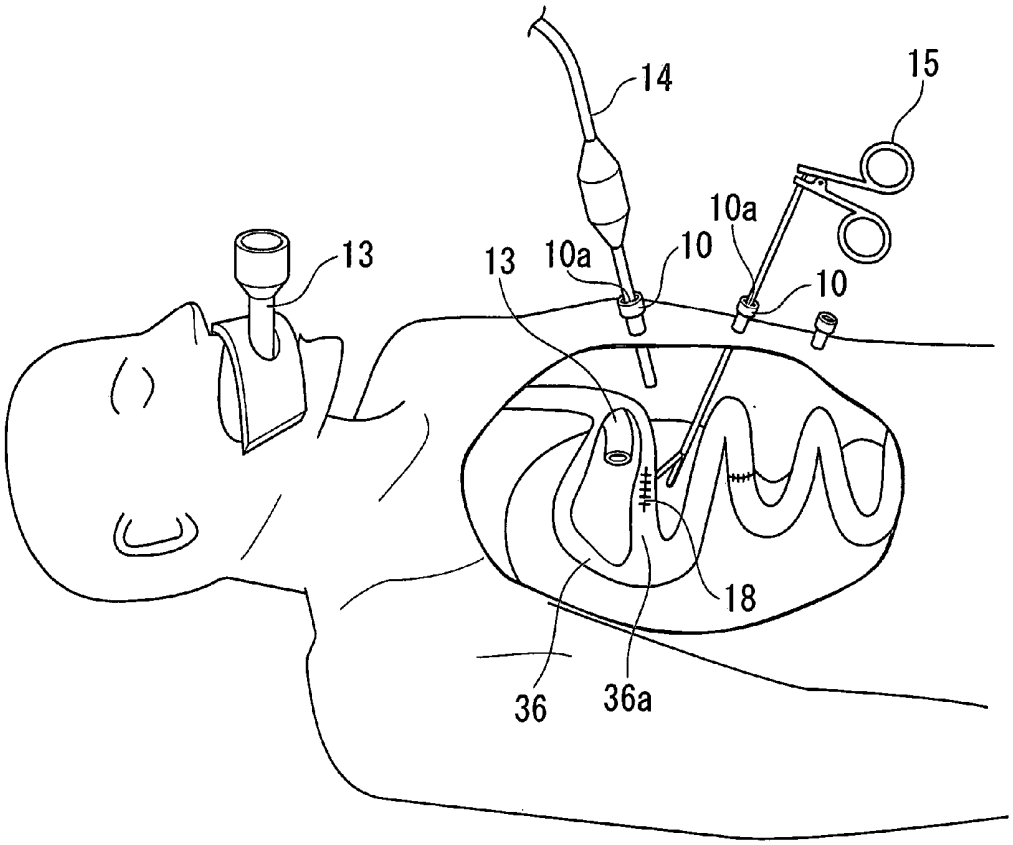


FIG. 7

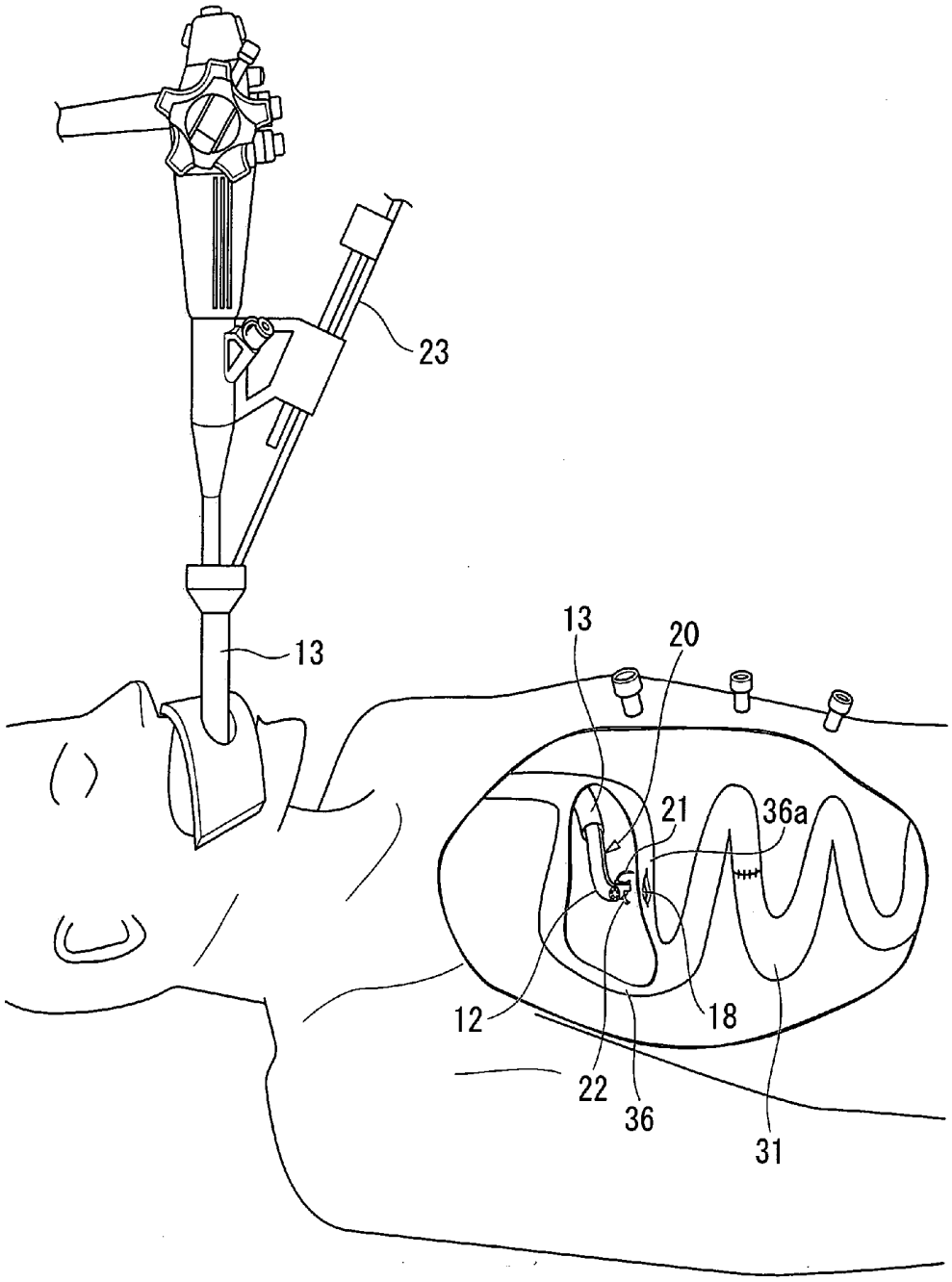


FIG. 8

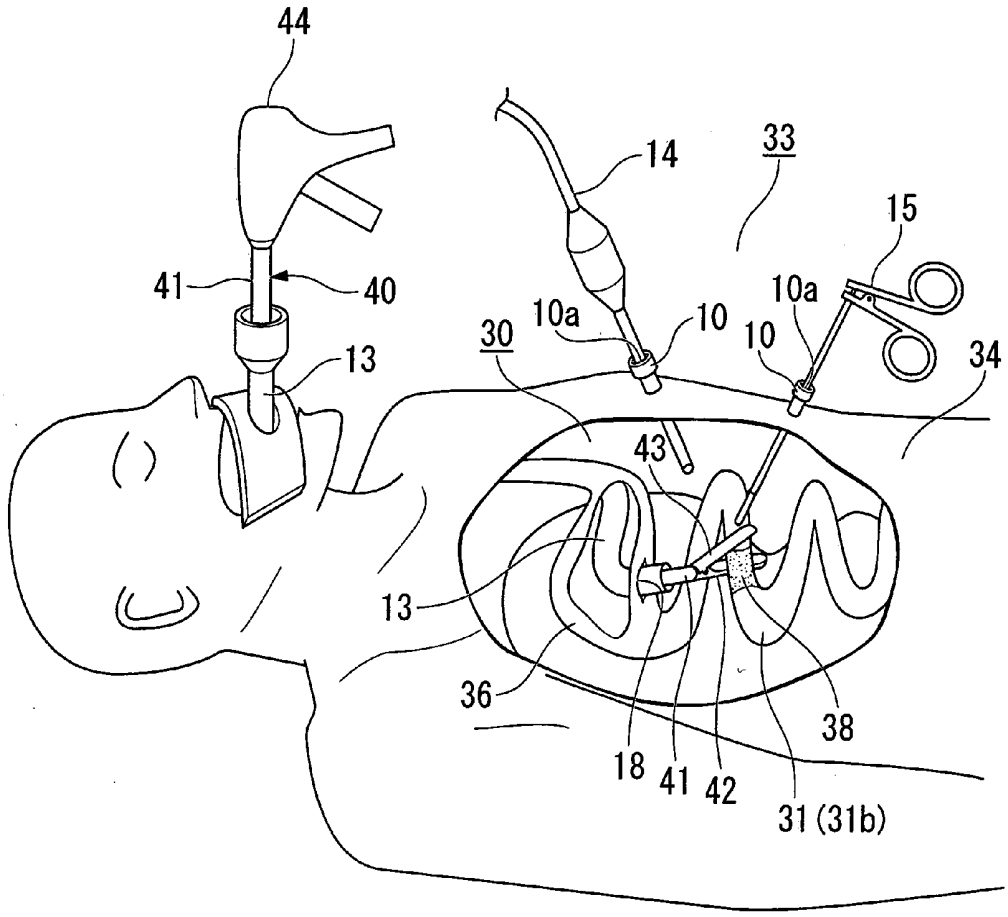


FIG. 9

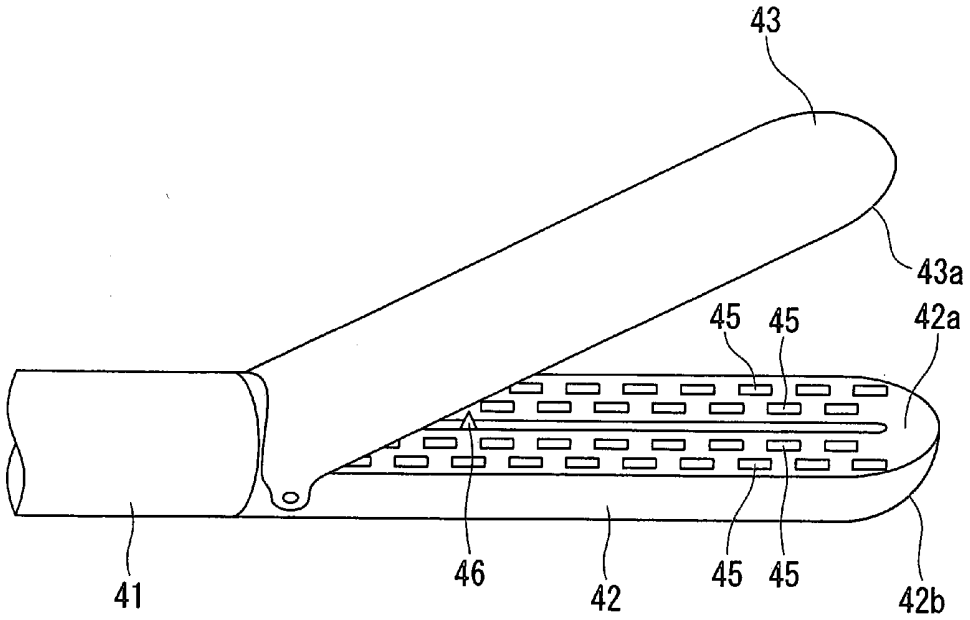


FIG. 10

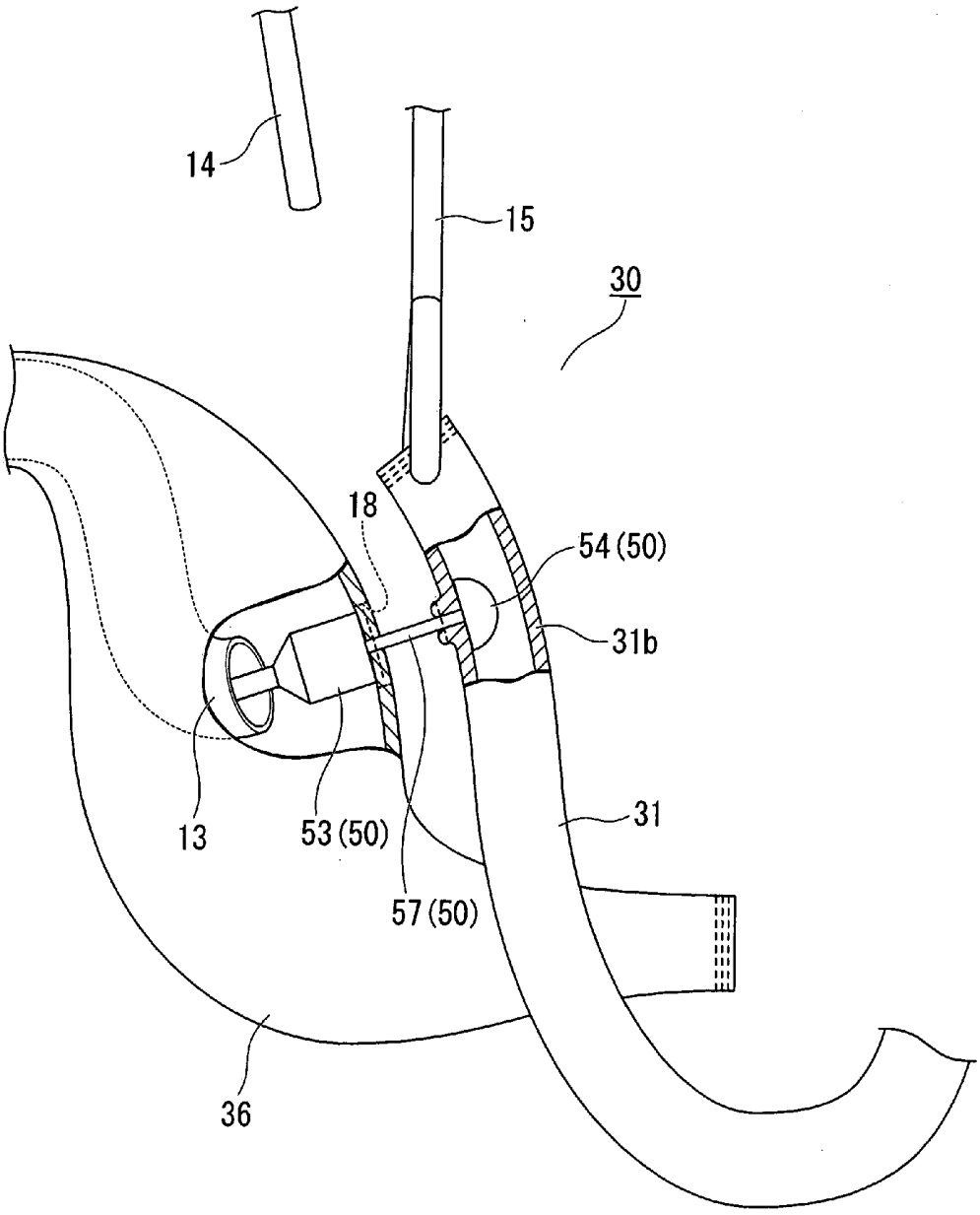


FIG. 11

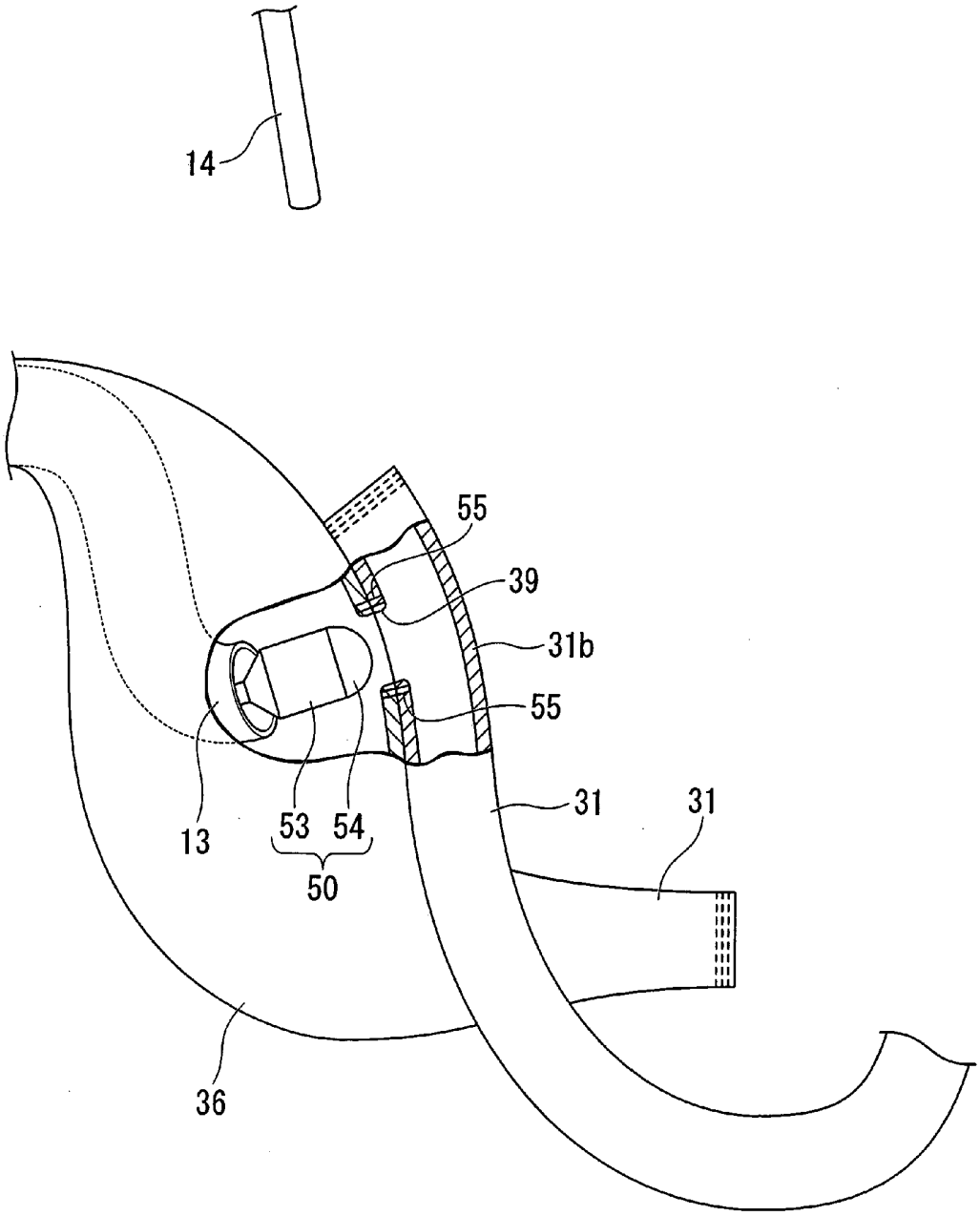


FIG. 12

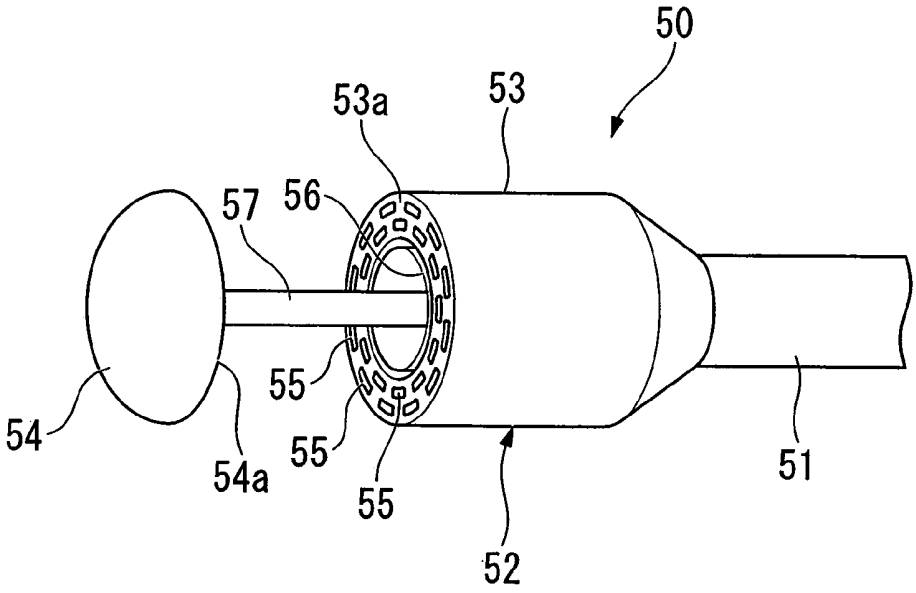


FIG. 13

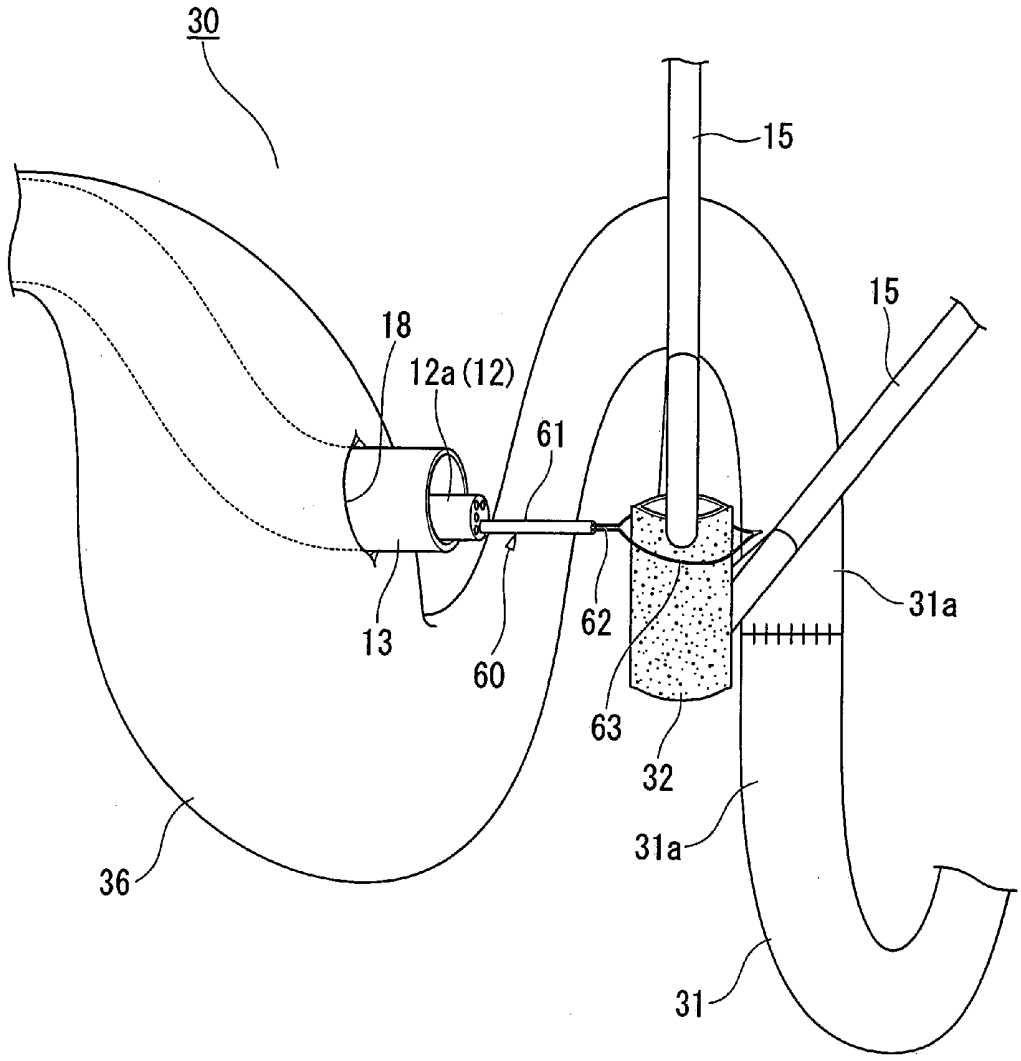


FIG. 14

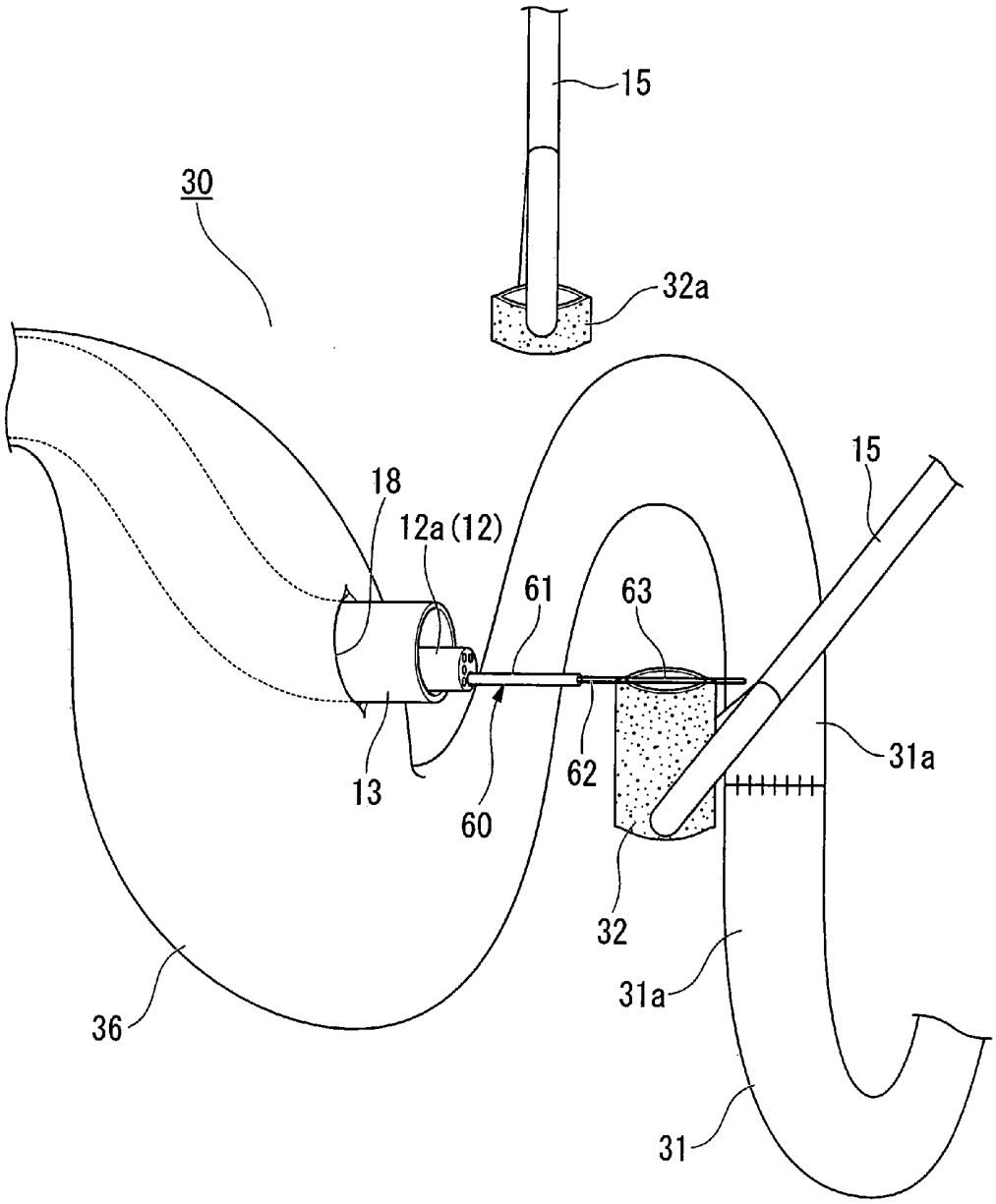


FIG. 15

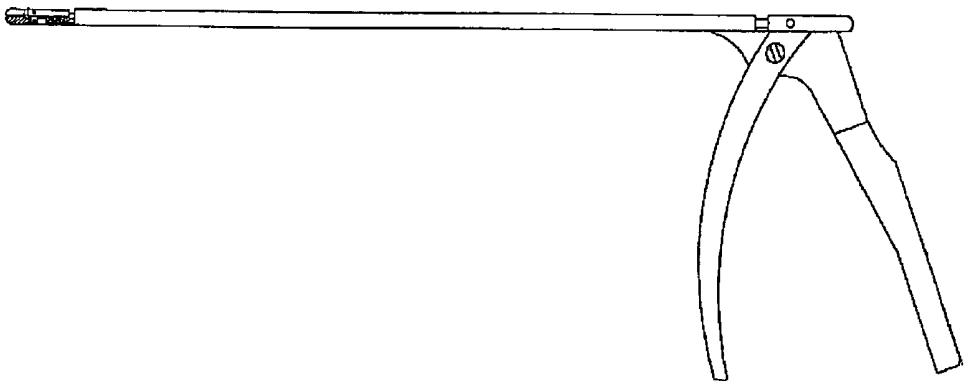
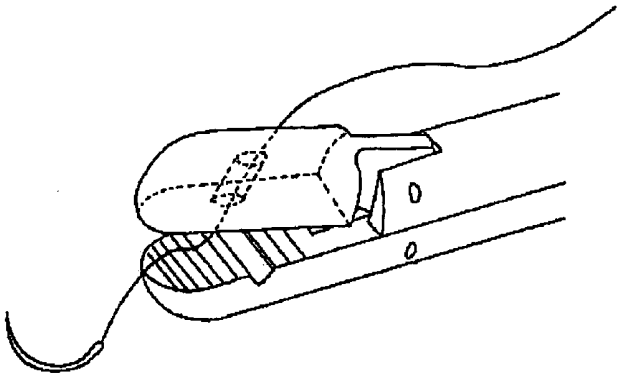


FIG. 16



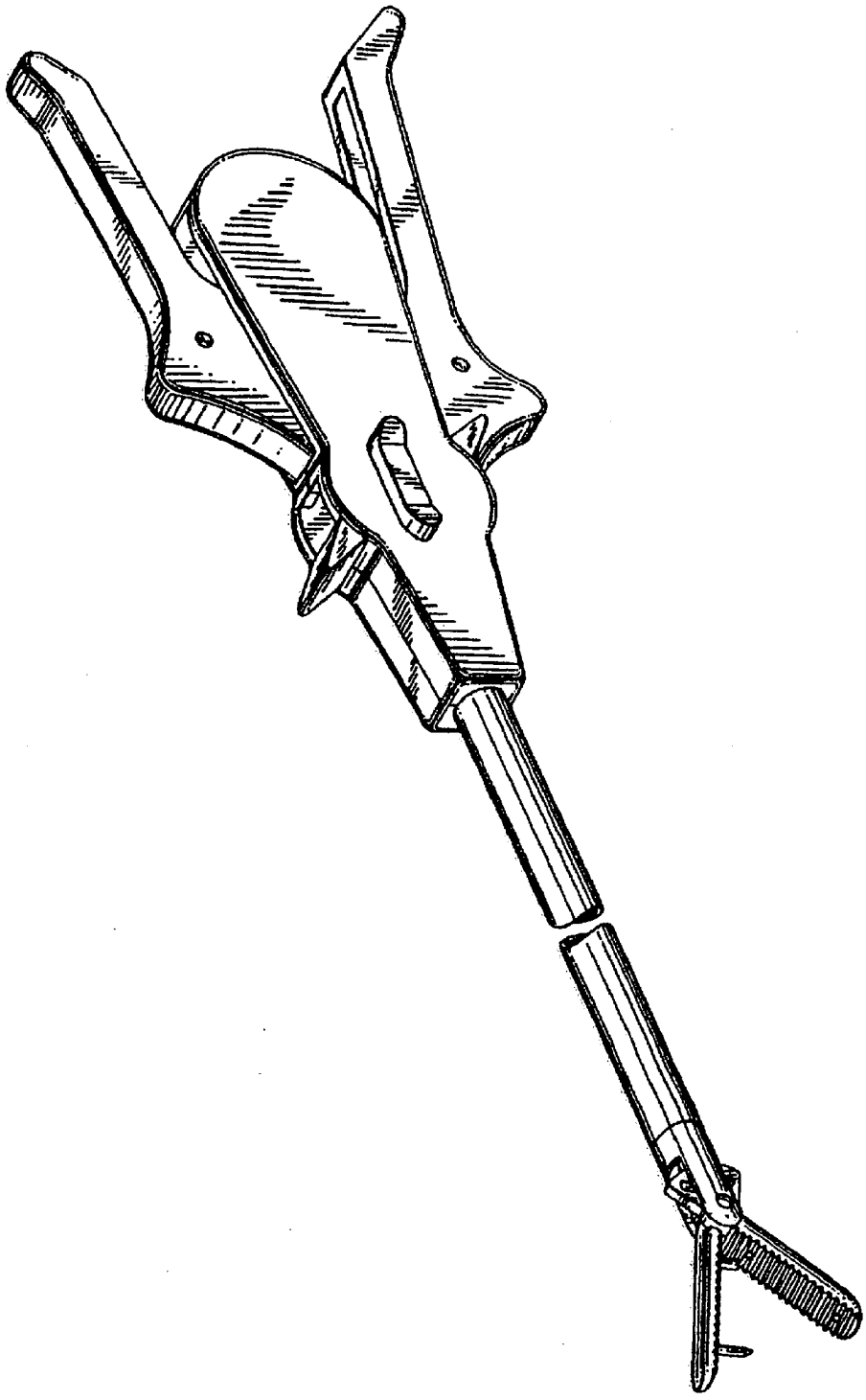


FIG. 17

MEDICAL PROCEDURE PERFORMED INSIDE ABDOMINAL CAVITY

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a medical procedure to perform a desired treatment inside an abdominal cavity.

[0003] 2. Description of Related Art

[0004] Treatment such as cutting, extirpating, and suturing a predetermined position of an organ inside an abdominal cavity is achieved by performing an abdominal operation or by performing a laparoscopic operation in which a plurality of insertion holes are formed in an abdominal wall and treatment instruments such as a laparoscope and forceps are then inserted through these holes. A laparoscopic operation (also known as a laparoscopic surgery operation) is a medical procedure in which a plurality of narrow tubes known as trocars are passed into an abdomen, and then a laparoscope or treatment instruments are inserted into the abdominal cavity via the trocars. Specifically, for example, the removal of a gall bladder, an appendectomy, a gastrectomy, total gastric resection, or subtotal gastrectomy to counter the early stages of gastric cancer, a colon excision or small bowel excision to counter colonic or rectal cancer, or splenectomy can be achieved by performing a laparoscopic surgery operation. If the organ or lesioned portion to be extirpated (i.e., removed to the body exterior) is large in size and cannot be retrieved via a trocar, then an abdominal operation to make an incision in the abdomen is performed in order to allow retrieval.

[0005] Compared with an abdominal operation, the size of the abdominal incision is smaller in a laparoscopic surgery operation. Therefore, laparoscopic surgery has advantages over an abdominal operation in that less pain is felt by the patient after the operation, recovery after the operation is quicker (i.e., the patient is able to return to work sooner), and there is less scarring resulting in less disfiguration. FIG. **1** of United States Pre-grant Patent Publication No. 2005/0222534 shows an example of this type of laparoscopic surgery operation.

SUMMARY OF THE INVENTION

[0006] It is an object of the present invention to provide a medical procedure to be performed in an abdominal cavity that, when treating a predetermined location in an abdominal cavity, restricts to a minimum the size of an insertion hole that is formed in an abdominal wall in order to allow treatment instruments and the like to be inserted, and that lessens the burden on a patient, and that causes the minimum disfiguration after an operation.

[0007] The medical procedure performed inside an abdominal cavity of the present invention includes: performing a first treatment at a target position inside the abdominal cavity by a first apparatus that has been introduced percutaneously into the abdominal cavity; and performing a second treatment, using a second apparatus that has been introduced into the abdominal cavity via a natural aperture of a living body, in cooperation with the first apparatus inside the abdominal cavity, or alternatively, performing a second treatment that is necessitated as a result of the first treatment being performed after the first treatment has been performed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. **1** is an explanatory view illustrating the cutting of a lesioned portion according to an embodiment.

[0009] FIG. **2** is an explanatory view illustrating the cutting of a lesioned portion according to the embodiment.

[0010] FIG. **3** is an explanatory view illustrating the retrieval and removal to the body exterior of a lesioned portion according to the embodiment.

[0011] FIG. **4** is an explanatory view illustrating the retrieval and removal to the body exterior of a lesioned portion according to the embodiment.

[0012] FIG. **5** is an explanatory view illustrating the retrieval and removal to the body exterior of a lesioned portion according to the embodiment.

[0013] FIG. **6** is an explanatory view illustrating the suturing of a through hole according to the embodiment.

[0014] FIG. **7** is an explanatory view illustrating another example of the suturing of a through hole according to the embodiment.

[0015] FIG. **8** is an explanatory view illustrating the illustrating the cutting of a portion to be cut out according to a first variant example of the embodiment.

[0016] FIG. **9** is an enlarged perspective view of an automatic suturing and cutting instrument according to the first variant example of the embodiment. FIG. **10** is an explanatory view illustrating an anastomosis performed on a stomach and small bowel according to the first variant example of the embodiment.

[0017] FIG. **11** is an explanatory view illustrating an anastomosis performed on a stomach and small bowel according to the first variant example of the embodiment.

[0018] FIG. **12** is an enlarged perspective view of a suturing instrument according to the first variant example of the embodiment.

[0019] FIG. **13** is an explanatory view showing the detailed cutting out of an extirpated lesioned portion according to a second variant example of the embodiment.

[0020] FIG. **14** is an explanatory view showing the removal to the body exterior of a small section that has been cut from a lesioned portion according to the second variant example of the embodiment.

[0021] FIG. **15** is an overall view showing as an example of a suturing instrument a needle grasping instrument that is used when a predetermined position is sutured.

[0022] FIG. **16** is an enlarged view of the distal end portion shown in FIG. **15**.

[0023] FIG. **17** is an overall view showing another example of a suturing instrument that is used when a predetermined position is sutured.

DETAILED DESCRIPTION OF THE INVENTION

[0024] FIGS. **1** to **6** show a medical procedure performed inside an abdominal cavity according to the present embodi-

ment In the present embodiment, a description is given of an example in which a lesioned portion **32** (i.e., an object for retrieval) that is a predetermined position (also referred to as a target position) of an organ, for example, a small bowel **31** or part thereof inside an abdominal cavity **30** is cut inside the abdominal cavity **30**, and is then removed (i.e., extirpated) to a body exterior **33**. However, the present embodiment is not limited to this and it may also be applied to the extirpation of a gall bladder or appendix, the extirpation of a lesioned portion of a liver, or the extirpation of another hollow organ such as a stomach, a colon, a duodenum or the like.

[**0025**] As shown in FIG. **1**, firstly, trocars **10** are made to pierce predetermined locations of an abdominal wall **34** and are then left in place thereby forming insertion holes **10***a* that are used to insert grasping instruments such as forceps percutaneously inside the abdominal cavity **30**. Note that the positions where the trocars **10** are inserted may be side abdomen portions or the like in the abdominal wall **34**, and are appropriately set in accordance with the locations inside the abdominal cavity **30** of the predetermined positions where treatment is to be performed. In addition, the hole diameter of the insertion holes **10***a* for the trocars **10** to be used are set at 5 mm or less, and are at least big enough for the various forceps and laparoscopes to be inserted there through. Next, an insufflator **25** is connected to an air supply port **10***b* of a trocar **10**, and the interior of the abdominal cavity **30** is inflated by being supplied with carbon dioxide gas or the like. Note that the insufflation may also be performed by inserting an insulation needle into the abdominal cavity **34**. Note that the insufflation is performed in order to secure a space when performing the treatment illustrated below, and it is not essential for it to be performed provided that the desired space can be secured. Moreover, the method used to secure a space is not limited to the aforementioned insufflation and a method based on a known lifting method may also be used.

[**0026**] Firstly, in the first step of the treatment, a normal portion **31** a of the small bowel **31** is cut from the lesioned portion **32**. More specifically, as shown in FIG. **1**, a laparoscope **14** and first apparatuses in the form of grasping forceps **15** and shearing forceps **16** that serve as an incision instrument are inserted through the three stationary trocars **10** into the abdominal cavity **30**. Here, the term "cut" refers to an action to create a state that allows a lesioned portion that has appeared on an organ or allows the organ itself to be extirpated to the outside of a living body (i.e., a state in which the relevant portion can be removed to the body exterior). Note that the incision instrument is not limited to the shearing forceps **16** and, depending on the objective, dissecting forceps or an electric scalpel can be selected as is appropriate. It is only necessary for the incision instrument to be able to be inserted percutaneously through a trocar **10** into the abdominal cavity **30** and then be able to cut a predetermined position. Next, as shown in FIG. **2**. based on observations made using the laparoscope **14**, the lesioned portion **32** is grasped by the grasping forceps **15** and the lesioned portion **32** is cut from the normal portion **31***a* of the small bowel **31** by the shearing forceps **16**. Next, the shearing forceps **16** are replaced by a suturing instrument or grasping forceps or the like (not shown), and end portions of the remaining normal portion **31***a* of the small bowel **31** are sutured and connected together.

[**0027**] Next, in the second step of the treatment, the lesioned portion **32** of the small bowel **31** that was cut in the first step is removed to the body exterior **33**. In the present embodiment, the removal of the lesioned portion **32** is performed through a natural aperture in the living body. More specifically, an aperture that communicates with the abdominal cavity is formed in a hollow organ (also referred to as a hollow internal organ) that communicates with a natural aperture of the living body. A retrieval instrument is introduced into the abdominal cavity through this formed aperture and the lesioned portion is retrieved. It is then moved to the inner side of the hollow organ and is extirpated through the natural aperture. The method used to form an aperture in these embodiments uses an endoscope **12** that has been inserted into the living body through the natural aperture of the living body. The endoscope **12** is inserted into the stomach **36** through a natural aperture in the form of the mouth **35** of a patient to which a mouthpiece **11** has been fitted, and a distal end **12***a* thereof is introduced into the abdominal cavity through a through hole **18** that is formed by making an incision in a stomach wall **36***a*. The through hole **18** is formed by inserting a high frequency knife **17** into a channel **12***c* in the endoscope **12** and observing the operation using an observation apparatus provided in the endoscope **12** (see FIG. **3**). However, the method used to form the through hole **18** is not limited to the one described above and it is also possible to form the through hole **18** by making an incision from the outside of the stomach **36** (i.e., the abdominal cavity side of the hollow organ) using, for example, the shearing forceps **16** that have been inserted through a trocar **10**. The through hole **18** is made large enough to enable the extirpated lesioned portion **32** to be retrieved. Moreover, the location where the through hole **18** is formed can be appropriately selected in accordance with the intended treatment, however, it is preferable for the location to be the front wall **36***b* of the stomach **36** (or an area on the forward side (i.e., the abdomen portion side) of the greater momentum that is hanging down lower than the greater curvature of the stomach **36**) in consideration of the ease of approach of the endoscope **12** to the abdominal cavity **30**.

[**0028**] Note that in the present embodiment an overtube **13** is also used when the endoscope **12** is being inserted into the living body. The overtube **13** is used as a guide tube to guide the insertion into and removal from the living body of a device having an insertion portion such as the endoscope **12**, however, it is also possible to insert an apparatus into a living body without using the overtube **13**. Moreover, when forming the through hole **18**, air is supplied to the stomach interior from an air supply channel (namely, an air supply conduit that has been introduced into the body interior) **12***b* that is provided in the endoscope **12** and the stomach **36** is inflated.

[**0029**] FIG. **4** shows a state in which a distal end of the overtube **13** has been introduced into the abdominal cavity **30** via the through hole **18**, a retrieval instrument in the form of a retrieval net **19** has then been inserted through the interior of the overtube **13**, and a retrieval portion **19***c* has been made to protrude from the distal end of the overtube **13**.

[**0030**] The retrieval net **19** has a sheath **19***a*, an operating wire **19***b* that is inserted inside the sheath **19***a*, and the retrieval portion **19***c* that is provided at a distal end portion of the operating wire **19***b* and retrieves a desired object. The

retrieval portion **19***c* has a toroidal wire **19***d* that has resiliency and is in a toroidal shape and is provided at a distal end portion of the operating wire **19***b*, and a net **19***e* that is suspended inside the toroidal wire **19***d*. An operating section **19***f* is provided at a proximal end portion of the sheath **19***a* and the operating wire **19***b* can be moved reciprocatingly inside the sheath **19***a*. The retrieval portion **19***c* is able to be accommodated together with the operating wire **19***b* inside the sheath **19***a* through an operation of the operating section **19***f*, and when the retrieval portion **19***c* is pushed out from the sheath **19***a*, it expands into a toroidal shape through its own resiliency. Note that the retrieval instrument is not limited to the retrieval net **19** and, instead of the net **19***e*, it is also possible to use a retrieval bag whose aperture is attached to the toroidal wire **19***d*.

[**0031**] The retrieval portion **19***c* of the retrieval net **19** is made to protrude from the distal end of the overtube **13** inside the abdominal cavity **30**. The lesioned portion **32** that was cut in the first treatment step is then placed in the recovery portion **19***c* by the grasping forceps **15**. In this state, by pulling the operating wire **19***b* to the proximal end side using the operating section **19***f*, the toroidal wire **19***d* of the retrieval portion **19***c* is also pulled into the sheath **19***a*. As a result, the extirpated lesioned portion **32** is enclosed in the net **19***e* of the retrieval portion **19***c* and is placed inside the retrieval portion **19***c* so that it cannot fall out.

[**0032**] As shown in FIG. **5**, by then drawing the retrieval net **19** to the proximal end side in this state, the lesioned portion **32** that has been retrieved to the retrieval portion **19***c* of the retrieval net **19** is removed to the body exterior **33** through the interior of the overtube **13**. Lastly, needle forceps and suture thread having a needle attached thereto, such as are shown in FIGS. **15** and **16**, or a suturing instrument such as that shown in FIG. **17** are introduced via the trocars **10** into the abdominal cavity **30**. The through hole **18** that is formed in the stomach wall **36***a* of the stomach **36** is then sutured and closed up. An example of a suturing instrument is disclosed in Japanese Unexamined Patent Application, First Publication No. H09-84799 and U.S. Pat. No. 5,728,107, the entire contents of which are incorporated herein. FIG. **6** shows a state when the suturing has been completed. Note that the suturing of the through hole **18** may also be a method in which the suturing is performed from the interior portion (namely, the interior side of the hollow organ) of the stomach **36**. FIG. **7** shows an example of this. Namely, a suturing apparatus **20** is placed alongside the outside of the endoscope **12** that has been inserted through the overtube **13**. A needle and thread are attached to forceps components **21** and **22** that can be freely opened and closed at a distal end of the suturing apparatus **20**. Namely, by opening and closing the forceps components **21** and **22** by operating an operating section **23** that is provided at a proximal end thereof, it is possible to suture the stomach wall **36***a* and close up the through hole **18**. Note that when retrieving a retrieval object such as a lesioned portion or an organ, it is also possible to insert a retrieval instrument and an endoscope that has an observation apparatus inside the overtube **13**, and then perform the retrieval task while verifying the action using the observation apparatus of the endoscope.

[**0033**] As described above, in the procedure of the present embodiment, it is not necessary to cut open the abdomen. Furthermore, it is possible to retrieve the cut lesioned portion **32** without forming an aperture in the abdominal wall **34** that matches the size of the object being recovered, but, instead, by passing it through a natural aperture via the through hole **18** that has been formed in the stomach **36**. Because of this, it is possible to keep the diameter of the insertion hole **10***a* that is formed in the abdominal wall **34** to the minimum hole diameter size of 5 mm or less that enables at least the grasping forceps **15** and shearing forceps **16** to be inserted. Moreover, in the insertion hole **10***a*, because the hole diameter is small, it can be closed by natural closure without there being any need for suture closure. As a result, treatment can be performed that keeps the burden on a patient to the minimum, and scarring after the operation can be lessened.

[**0034**] FIGS. **8** through **12** show a first variant example of this embodiment, and show an example of an anastomosis operation in which a small bowel **31** is anastomosed to a stomach **36** (i.e., a stomach—small bowel bypass) using an automatic suturing and cutting instrument **40** and an anastomosis instrument **50**. This type of medical procedure may be performed in order to treat obesity.

[**0035**] As shown in FIG. **9**, the automatic suturing and cutting instrument **40** has a flexible sheath **41** that is able to be inserted into the overtube **13**, a cartridge **42** and anvil **43** that are provided at a distal end portion of the sheath **41**, and an operating section **44** that is provided at a proximal end portion of the sheath **41**. The cartridge **42** is fixed to a distal end portion of the sheath **41** while the anvil **43** is attached by a shaft such that it can be opened and closed on the cartridge **42** by an operation of the operating section **44**. Namely, the cartridge **42** and the anvil **43** are able to nip an object using their respective nipping surfaces **42***a* and **43***a* as the result of an operation of the operating section **44**. A plurality of staples **45** are incorporated aligned in the axial direction in the nipping surface **42***a* of the cartridge **42**, and it is possible to drive the staples **45** into a nipped object. Furthermore, a movable cutter **46** that is able to cut an object that is nipped by the cartridge **42** and the anvil **43** along the axial direction is provided between the plurality of staples **43**. An observation apparatus may also be provided in a distal end portion **42***b*.

[**0036**] As shown in FIG. **8**, firstly, the grasping forceps **15** are inserted through a trocar **10** and are made to grasp an area adjacent to a portion for excision **38**. It is also possible for the portion for excision **38** itself to be grasped, or for both the portion for excision **38** and an area adjacent thereto to be grasped. Next, the automatic suturing and cutting instrument **40** is inserted orally using the overtube **13** into the stomach **36**, and is made to protrude into the abdominal cavity **30** through the through hole **18** that was formed previously. Based on observations made using the laparoscope **14**, an area adjacent to the portion for excision **38** where an excision is to be made using the automatic suturing and cutting instrument **40** is then grasped by the grasping forceps **15**. In addition, the excision of the portion for excision **38** and the suturing of end portions of that portion **31***b* that is to be bypassed to the stomach **36** (referred to below as the "object portion") are performed by the automatic suturing and cutting instrument **40**. Namely, the portion for excision **38** of the small bowel **31** is nipped by the cartridge **42** and the anvil **43** of the automatic suturing and cutting instrument **40**. Next, staples **45** are driven into the nipped portion for excision **38** of the small bowel **31** by

an operation of the operating section **44**, and the small bowel **31** is cut between the driven staples by an operation of the cutter **46**. By then performing the stapling on both sides of the cutter **46**, the portion for excision **38** is excised and end portions of the remaining object portion **31***b* are sutured. Next, the automatic suturing and cutting instrument **40** is withdrawn from the overtube **13**.

[**0037**] Here, because the automatic suturing and cutting instrument **40** is introduced into the abdominal cavity **30** via a natural aperture **30**, it is possible to keep the diameter of the insertion hole **10***a* that is formed in the abdominal wall **34** to the minimum hole diameter size of 5 mm or less that enables the grasping forceps **15** to be inserted. Moreover, the automatic suturing and cutting instrument **40** that requires a hole diameter of 10 mm or more can be introduced orally into the abdominal cavity **30**.

[**0038**] Next, as shown in FIGS. **10** through **12**, using the anastomosis instrument **50** the object portion **31***b* of the small bowel **31** is anastomosed to the stomach **36** so that a bypass is formed between the stomach **36** and the small bowel **31**.

[**0039**] As shown in FIG. **12**, the anastomosis instrument **50** has a flexible sheath **51**, and a substantially columnar anastomosis portion **52** that is provided at a distal end portion of the sheath **51**. An operating section is also provided at a proximal end portion (not shown) of the sheath **51**. The anastomosis portion **52** has a substantially cylindrical staple driving portion **53** that is provided at a distal end portion of the sheath **51** and, based on the operation of the operating section, is able to drive in a plurality of staples **55** in a circular pattern from a nipping surface **53***a* that is formed at a distal end thereof, and an anvil portion **54** that serves as a shaping device. A cutter **56** that has a substantially cylindrical shape and is able to be moved reciprocatingly in an axial direction by the operation of the operating section is provided in an interior portion of the staple driving portion **53**. The anvil portion **54** is joined to the staple driving portion **53** side by an anvil shaft **57** that penetrates the staple driving portion **53** and is inserted as far as the sheath **51**. More specifically, the anvil shaft **57** is inserted through the sheath **51** and is connected to an operating wire that is connected to the operating section. The anvil shaft **57** is thus able to be moved reciprocatingly together with the operating wire by an operation of the operating section. As a result, an object can be nipped in a toroidal shape by the nipping surfaces **53***a* and **54***a* of the staple driving portion **53** and the anvil portion **54**.

[**0040**] Next, a detailed description will be given of the anastomosis of the stomach **36** and the object portion **31***b* of the small bowel **31** using the above described anastomosis instrument **50**. Firstly, the anastomosis instrument **50** is inserted inside the overtube **13** that has been orally inserted into a living body and whose distal end has been introduced into the abdominal cavity **30** via the through hole **18**. The anvil portion **54** and the staple driving portion **53** of the anastomosis instrument **50** are then made to protrude from the distal end of the overtube **13**. The anvil portion **54** is then introduced through the through hole **18** into the interior of the abdominal cavity **30**, and the circumference of the through hole **18** that surrounds the anvil shaft **57** is sutured using a suturing instrument that has been inserted through an insertion hole **10***a*. Next, using an incision instrument (for example, shearing forceps) that has been inserted through an insertion hole **10***a*, an incision is made in the object portion **31***b* of the small bowel **31** that is to be anastomosed to the stomach **36**, and the anvil **54** is placed inside the object portion **31***b*. The position where the incision is made may be the portion cut by the automatic suturing and cutting instrument **40** or may be adjacent thereto. Once the anvil portion **54** has been placed inside the object portion **31***b*, the area surrounding the anvil shaft **57** is sutured using the suturing instrument that has been inserted through an insertion hole **10***a*.

[**0041**] Once the anvil portion **54** has been placed inside the object portion **31***b*, the operating section is operated so that the anvil portion **54** is pulled towards the staple driving portion **53** side, and the tissue being anastomosed is sandwiched between the staple driving portion **53** and the anvil portion **54**. A cutting operation to form a connecting hole **39** that connects the stomach **36** to the object portion **31***b* is then performed by further operating the operating section **54** so that the cutter **56** is moved forward and cuts the tissue between the stomach **36** and the small bowel **31**. In addition, a suturing operation to suture the stomach **36** and the object portion **31***b* while simultaneously arresting any hemorrhaging is then performed by driving staples **55** from the staple driving portion **53** into the circumference of the connecting hole **39** that has been cut As a result, anastomosis of the stomach **36** and the object portion **31***b* of the small bowel **31** is achieved. The processing sequence to perform anastomosis using the grasping forceps **15** and the like can also be assisted by making observations using the laparoscope **14**.

[**0042**] As has been described above, it is also possible when performing an anastomosis to keep the diameter of the insertion hole **10***a* that is formed in the abdominal wall **34** to the minimum hole diameter size of 5 mm or less that enables the grasping forceps **15** to be inserted. Moreover, the anastomosis instrument **50** that requires a hole diameter of 15 mm or more can be introduced orally into the abdominal cavity **30** so that the stomach **36** and the small bowel **31** can be anastomosed.

[**0043**] FIGS. **13** and **14** show a second variant example of this embodiment, and show a variant example in which, after the cut lesioned portion **32** has been cut up finely (i.e., after the target location (i.e., the retrieval object) has been divided into a plurality of pieces), the pieces are removed using a retrieval instrument that is introduced orally into the abdominal cavity **30**. Depending on the type of medical procedure that is performed inside the abdominal cavity **30**, there may be cases in which the size of the retrieval object (i.e., a lesioned portion or organ such as a gall bladder) that is to be removed to the body exterior is too large to be removed orally in its existing state. In a conventional laparoscopic operation, if the retrieval object that is to be removed to the body exterior is large in size, then because it is not possible for it to be removed to the body exterior via a trocar, an incision is made in the abdomen corresponding to the size of the retrieval object, and after the retrieval object has been removed, the incised portion is sutured. In the present variant example, when removing an object to the body exterior, the retrieval object is removed to the body exterior without making an incision in the abdomen but by cutting the object into pieces small enough to allow them to be removed perorally.

[0044] As shown in FIG. **13**, in this variant example, two grasping forceps **15** are inserted through trocars and grasp the lesioned portion **32**. In addition, a high frequency snare **60** is inserted perorally to serve as a cutting instrument.

[0045] The high frequency snare **60** has a sheath **61** that can be inserted inside the channel **12***c* of the endoscope **12**, a conductive operating wire **62** that is inserted through the sheath **61**, and a toroidal snare **63** that is provided at a distal end portion of the operating wire **62**. The snare **63** is conductive and is also resilient. An operating section (not shown) is provided at a proximal end portion of the sheath **61**, and the operating wire **62** can be moved reciprocatingly through the operation of the operating section. Because of this, by moving the operating wire **62** backward using the operating section the snare **63** can be accommodated in the sheath **61**, and by moving the operating wire **62** forward the snare **63** can be made to protrude from the sheath **61** and the diameter thereof can also be enlarged due to its own resiliency. An electrode is also provided in the operating section, and by connecting this to a power supply a high frequency current can be supplied to the snare **63** via the operating wire **62**.

[0046] Firstly, the endoscope **12** is inserted through the overtube **13** and the distal end **12***a* is made to protrude through the through hole **18** into the abdominal cavity **30**. The high frequency snare **60** is then inserted through the channel **12***c* of the endoscope **12** and is made to protrude from the distal end **12***a*. Next, by operating the operating section of the high frequency snare **60**, the snare **63** is made to protrude from the sheath **61** and the extirpated lesioned portion **32** is contained inside the ring formed by the snare **63**. If, as shown in FIG. **14**, the operating wire **62** is then moved backward by the operating section, the snare **63** is pulled inside the sheath **61** and its diameter is contracted so that it tightens around the lesioned portion **32**. If, at the same time as this, high frequency current is supplied by the operating section to the snare **63**, the lesioned portion **32** is burnt through so as to form a section **32***a* that has been cut to a small size. If the cut section **32***a* is cut to a size that allows it to be placed inside a retrieval instrument such as the retrieval net **19** or a retrieval bag and then removed perorally to the body exterior, then it is possible to remove perorally to the body exterior a retrieval object such as a lesioned portion or organ that is too large to pass through the overtube **13**. FIG. **14** shows a state in which the section **32***a* that has been formed by cutting the lesioned portion **32** is grasped by the grasping forceps **15**. The endoscope **12** is subsequently removed, and in its place a retrieval instrument such as the retrieval net **19** shown in FIG. **4** or a retrieval bag is introduced via the overtube **13** into the abdominal cavity **30**, thereby enabling the task of retrieval to be performed. By then repeating the task of cutting the lesioned portion **32** into small pieces and then removing these using a retrieval instrument through the overtube **13**, it is possible to remove the entire lesioned portion **32**. When, in view of post-surgical scarring, trocars having insertion holes **10***a* that have small hole diameters are used and the sections **32***a* are removed to the body exterior via these insertion holes **10***a*, then the sections **32***a* need to be cut even smaller, however, by retrieving them through the patient's mouth, they can be removed to the body exterior while being left at a comparatively larger size. Accordingly, a pathological diagnosis after the operation can be performed more efficiently.

[0047] As described above, in this variant example as well, it is possible to keep the diameter of the insertion hole **10***a* that is formed in the abdominal wall **34** to the minimum hole diameter size of 5 mm or less that enables the grasping forceps **15** to be inserted. Furthermore, it is possible to cut the extirpated lesioned portion **32** into small sections **32***a* using the high frequency snare **60**, and it is possible to remove a retrieval object perorally to a body exterior even when the retrieval object is large.

[0048] Note that in the present variant example, the high frequency snare **60** is used as an example of a cutting instrument for cutting the lesioned portion **32** into sections, however, the present invention is not limited to this and it is also possible to select a variety of instruments in accordance with the size and hardness of the object. For example, instead of the high frequency snare **60**, it is also possible to divide the object into a plurality of sections using a cutting instrument that is provided with a plurality of loop-shaped portions that serve as cutting portions that cut tissue, and that, when the object for cutting is placed inside the plurality of loop-shaped portions, is able to cut the object into a plurality of small sections by contracting the diameter of the respective loop-shaped portions. It is also possible to finely mince the object using an apparatus that is able to chop the object into a minced form. Moreover, the cutting of a retrieval object such as a lesioned portion or organ may also be performed using a cutting instrument that has been inserted through a trocar. In this case, by removing the cut object through a natural aperture, as shown in FIG. **4**, substantially the same effects as those of the above described variant example can be obtained. It is also possible instead of the high frequency snare **60** to use a treatment instrument that is provided with a plurality of wires formed in a basket shape, and that is able to crush an object contained therein by expanding and contracting these wires. In these cases as well, because the retrieval of the retrieval object is achieved using a retrieval instrument that is perorally introduced into the abdominal cavity **30**, it is not necessary for the diameter of the insertion holes **10***a* that are formed in the abdominal wall **34** to be enlarged.

[0049] An embodiment of the present invention is described above in detail with reference made to the drawings, however, the specific structure thereof is not limited to this embodiment and other design modifications and the like can be made thereto without departing from the spirit or scope of the present invention.

[0050] Note also that in the present embodiment and the variant examples thereof, a description is given of an example of a medical procedure in which a lesioned portion **32** of a small bowel **31** is cut and sutured, and the lesioned portion **32** is also removed to the body exterior **33**, however, the present invention is not limited to this. It is at least possible for the same effects to be anticipated in a medical procedure that is performed inside the abdominal cavity **30**. For example, the same effects can be expected when a gall bladder or appendix or the like is removed to the body exterior, or when a lesioned portion or the like that is formed on another organ within the abdominal cavity **30** such as a kidney or pancreas is removed.

[0051] Furthermore, in the second treatment step, a second apparatus was inserted through the mouth **35** of a patient and was introduced into the interior of the abdominal cavity **30**

through the through hole **18** that was formed in the stomach **36**, however, the present invention is not limited to this. It is also possible for the nose or anus to be used as the aperture through which the second apparatus is inserted in the second treatment step, and by at least inserting the second apparatus through a natural aperture, it is possible to reduce the diameter of the insertion holes **10***a* through which the first apparatus is inserted percutaneously in the first treatment step. Moreover, it is also possible to form a through hole in an organ other than the stomach **36** so that an apparatus can be introduced into the abdominal cavity **30**.

What is claimed is:

1. A medical procedure performed inside an abdominal cavity comprising:

performing a first treatment at a target position inside the abdominal cavity by a first apparatus that has been introduced percutaneously into the abdominal cavity; and

performing a second treatment, using a second apparatus that has been introduced into the abdominal cavity via a natural aperture of a living body, in cooperation with the first apparatus inside the abdominal cavity, or alternatively, performing a second treatment that is necessitated as a result of the first treatment being performed after the first treatment has been performed.

2. The medical procedure performed inside an abdominal cavity according to claim 1, further comprising: forming a through hole, which is used to introduce the second apparatus into the abdominal cavity, in a hollow organ that is connected with the natural aperture; removing the second apparatus from inside the abdominal cavity after the second treatment has been performed; and closing, after the removal, the connection between an inner side of the hollow organ in which the through hole is formed and the abdominal cavity.

3. The medical procedure performed inside an abdominal cavity according to claim 2, wherein the closing of the connection between an inner side of the hollow organ and the abdominal cavity includes suturing the through hole using a suturing instrument that is introduced percutaneously into the abdominal cavity.

4. The medical procedure performed inside an abdominal cavity according to claim **1**, comprising percutaneously inserting a laparoscope into the abdominal cavity, wherein the first treatment and the second treatment are performed while being observed using the laparoscope.

5. The medical procedure performed inside an abdominal cavity according to claim 2, wherein the introducing of the first apparatus into the abdominal cavity includes introducing the first apparatus into the abdominal cavity through an insertion hole that is formed in the abdominal wall and has a hole diameter of 5 mm or less, and the introducing the second apparatus into the abdominal cavity includes introducing apparatuses, which require a hole having a larger hole diameter than 5 mm to be formed when they are introduced into the abdominal cavity, into the abdominal cavity via the through hole.

6. The medical procedure performed inside an abdominal cavity according to claim 1, wherein in the first treatment, the first apparatus is inserted into the abdominal cavity through an insertion hole that is formed in the abdominal wall having a hole diameter of a size that can be closed not by suture closure but by natural closure, and if it is necessary to insert an apparatus into the abdominal cavity through a hole diameter that is too large to be closed by natural closure, then in the second treatment the apparatus is inserted into the abdominal cavity through a natural aperture.

7. The medical procedure performed inside an abdominal cavity according to claim 1, wherein the target position is an organ in the abdominal cavity.

8. The medical procedure performed inside an abdominal cavity according to claim **1**, wherein the performing of the first treatment includes cutting the target position using the first apparatus that has been introduced into the abdominal cavity percutaneously.

9. The medical procedure performed inside an abdominal cavity according to claim 8, further comprising forming a through hole, which is used to introduce the second apparatus into the abdominal cavity, in a hollow organ that is connected to the natural aperture, wherein the second treatment includes: using at least a retrieval instrument that is introduced into the abdominal cavity through the through hole; retrieving the target position that was cut in the first treatment as a retrieval object; and removing the target position to the body exterior through the natural aperture.

10. The medical procedure performed inside an abdominal cavity according to claim 8, further comprising dividing the target position, which was cut in the first treatment, into a plurality of sections, wherein the second treatment includes removing the plurality of sections into which the target position was divided to the body exterior using at least the retrieval instrument.

11. The medical procedure performed inside an abdominal cavity according to claim 1, wherein the second treatment includes cutting of the target position and suturing of the circumference of the cut portion using an automatic suturing and cutting instru ment that has been introduced into the abdominal cavity via a natural aperture of the living body, and the first treatment includes grasping at least one of the target position and the vicinity of the target position using a grasping instrument that has been introduced percutaneously so that the suturing of the cut at the target position and the circumference of the cut portion by the automatic suturing and cutting instrument is assisted.

12. The medical procedure performed inside an abdominal cavity according to claim 1, wherein the second treatment includes anastomosing an area between different positions of a single organ or an area between different organs using an anastomosis instrument that has been introduced into the abdominal cavity via a natural aperture in the living body, and the first treatment includes grasping at least one of the target position and the vicinity of the target position using a grasping instrument that has been introduced percutaneously so that the anastomosis by the anastomosis instrument is assisted.

* * * * *

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摘要(译)

在腹腔内进行的医疗手术包括：通过经皮引入腹腔的第一装置在腹腔内的目标位置进行第一次治疗;使用已经通过活体的自然孔引入腹腔的第二装置与腹腔内的第一装置配合进行第二次治疗，或者可选地，进行第二次治疗，所述第二次治疗是必需的。在进行第一次处理后进行第一次处理的结果。