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(54) SURGICAL HOOK INSTRUMENT FOR GASTRIC BAND CLOSING

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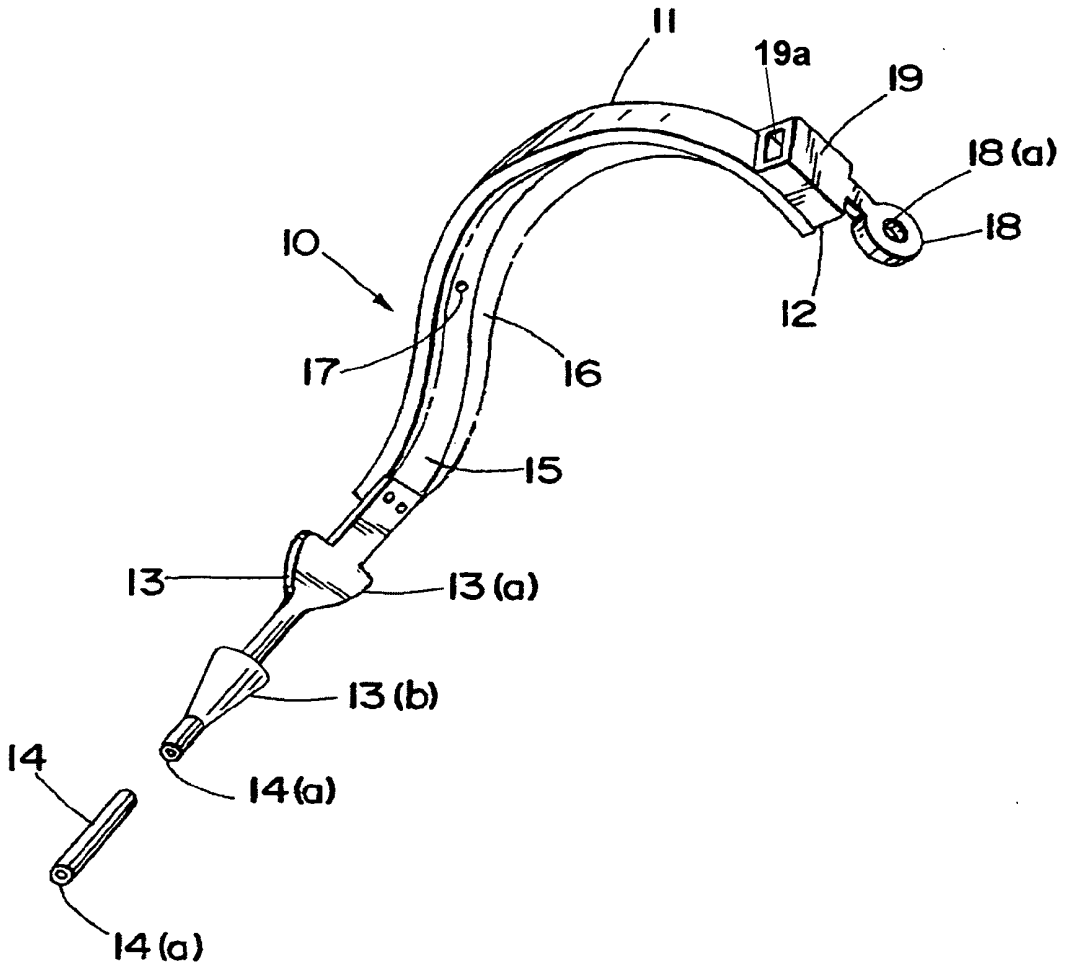
(57) **ABSTRACT**

An endoscopic surgical hook instrument is used in minimally invasive laparoscopic surgery for closing a gastric band having a buckle end a free end. The hook instrument includes a flat hook end that is placed underneath or on top of a pull tab that extends from the buckle end and through a hole of the pull tab. The hook instrument holds the buckle end securely while a pusher instrument is used to push the free end of the gastric band through the buckle.



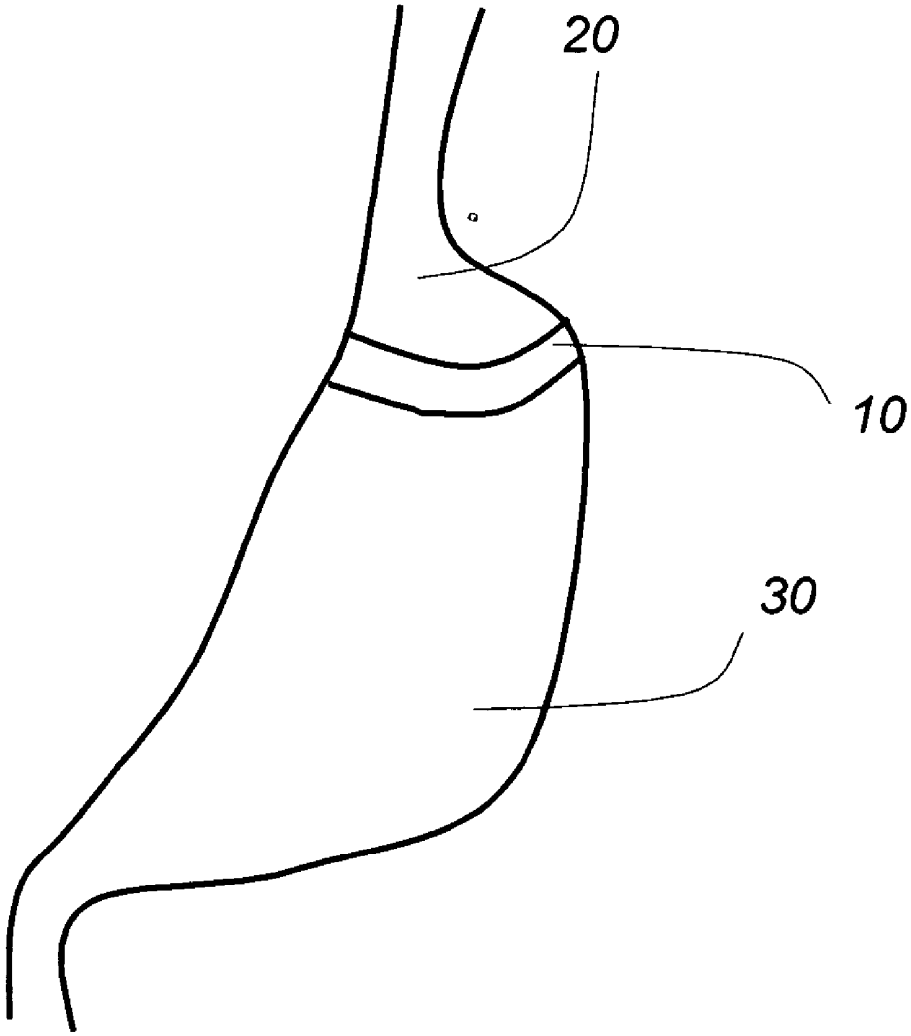


FIG. 1

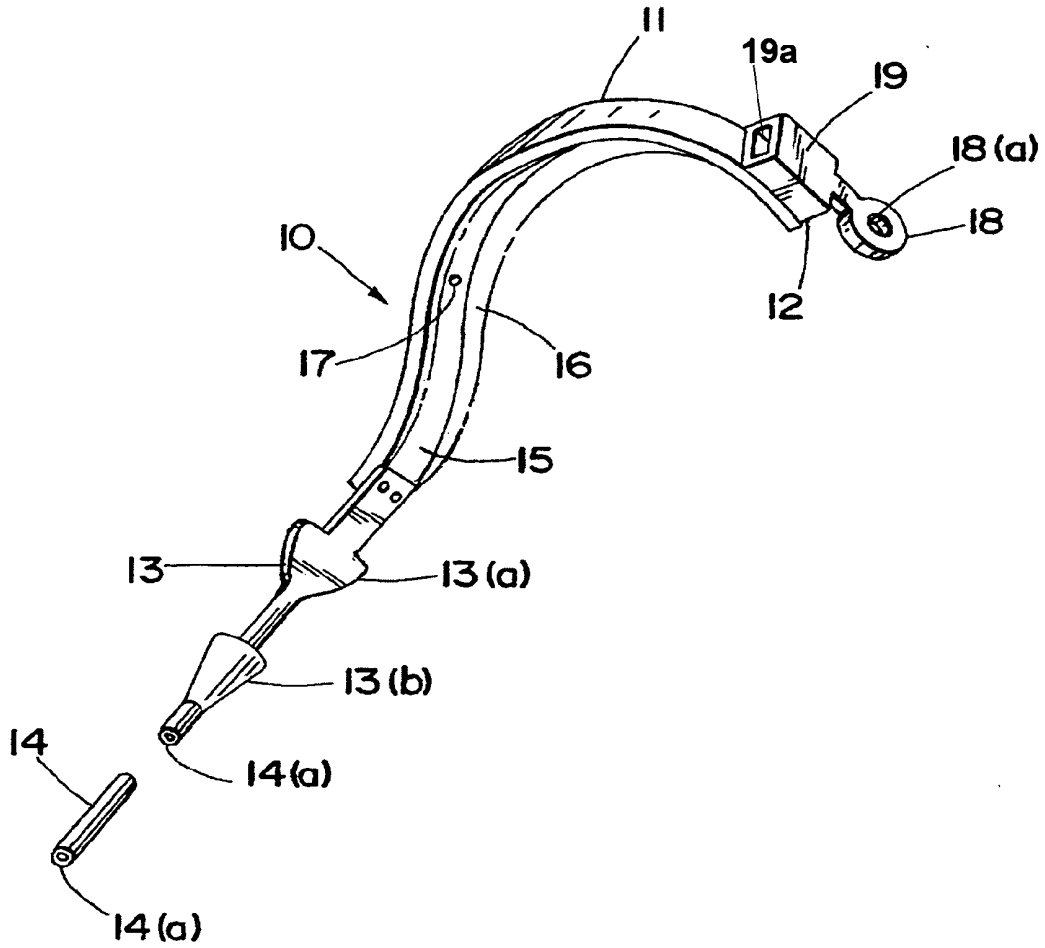


FIG. 2A

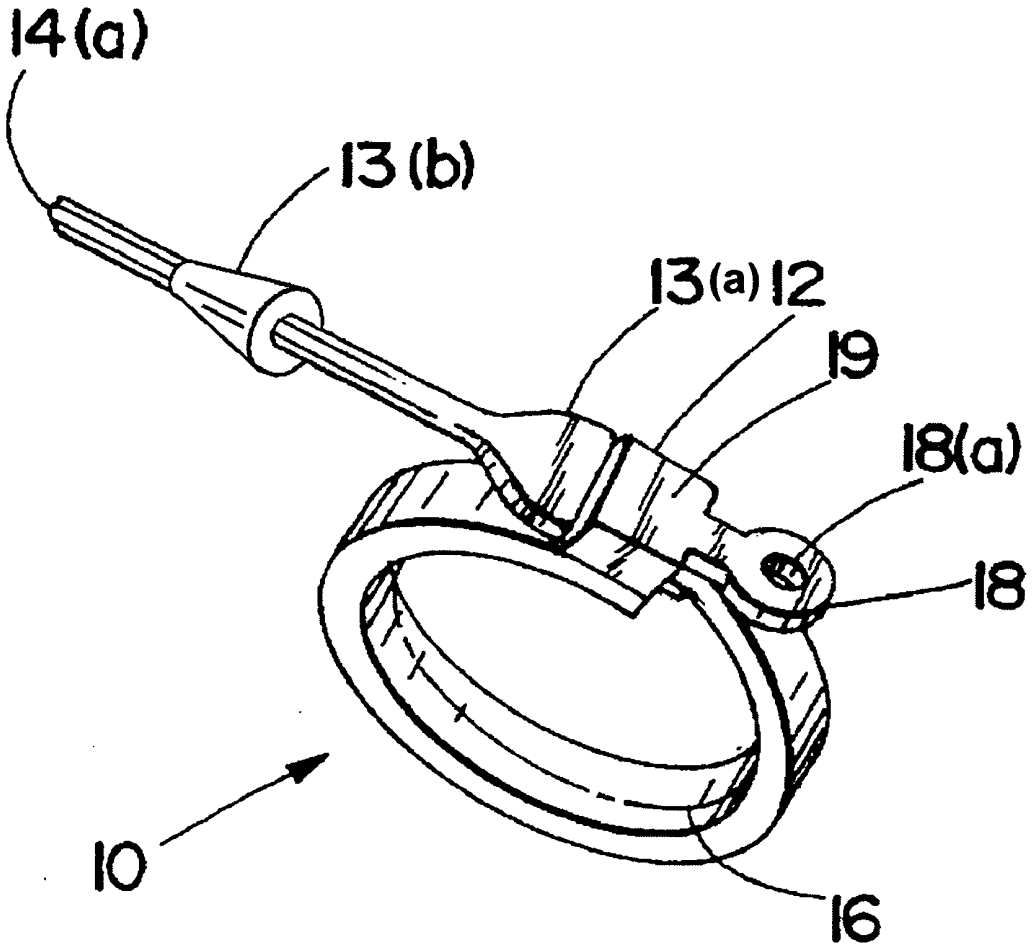


FIG. 2B

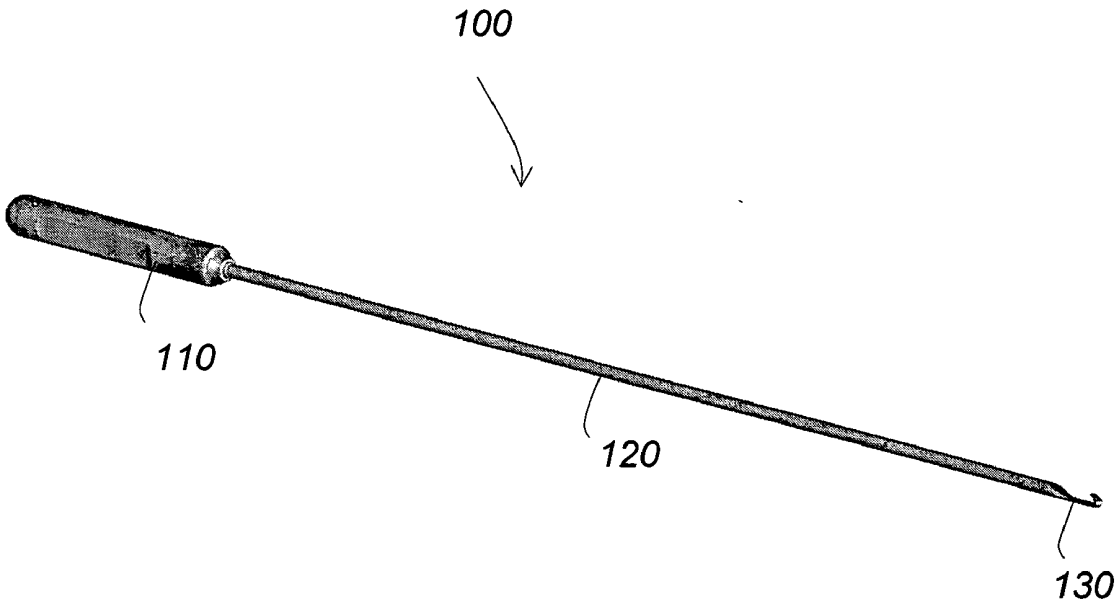


FIG. 3

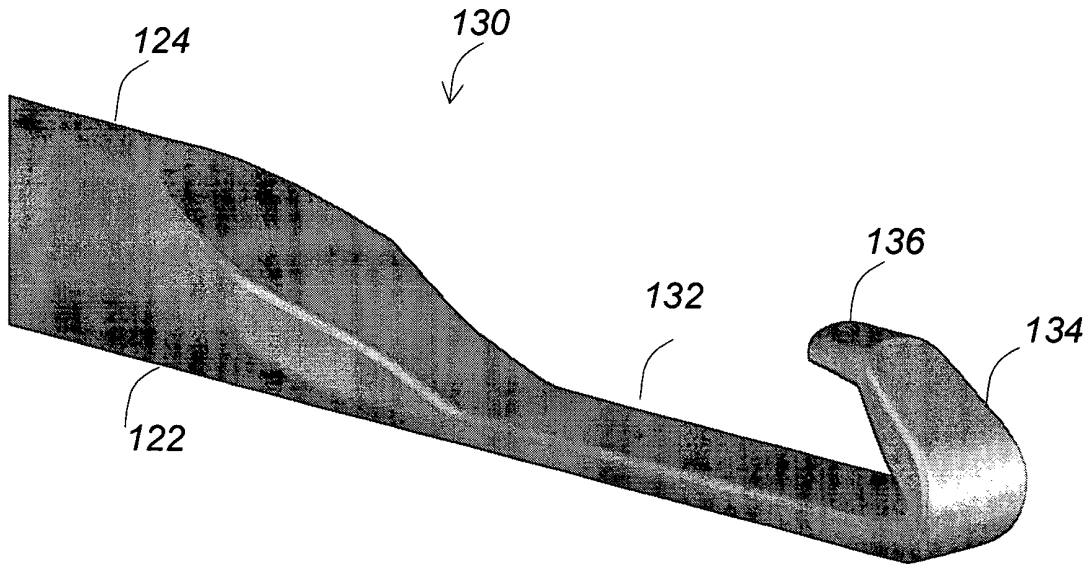


FIG. 4

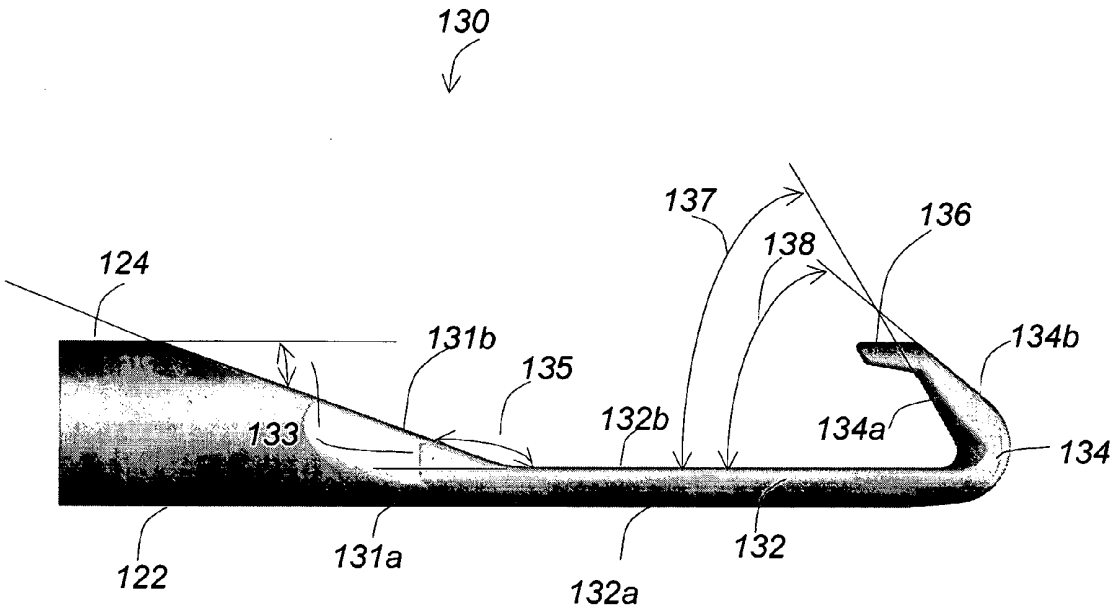

130
137
136
138
124
131b
135
134b
133
132b
134a
134
122
131a
132
132a

FIG. 5

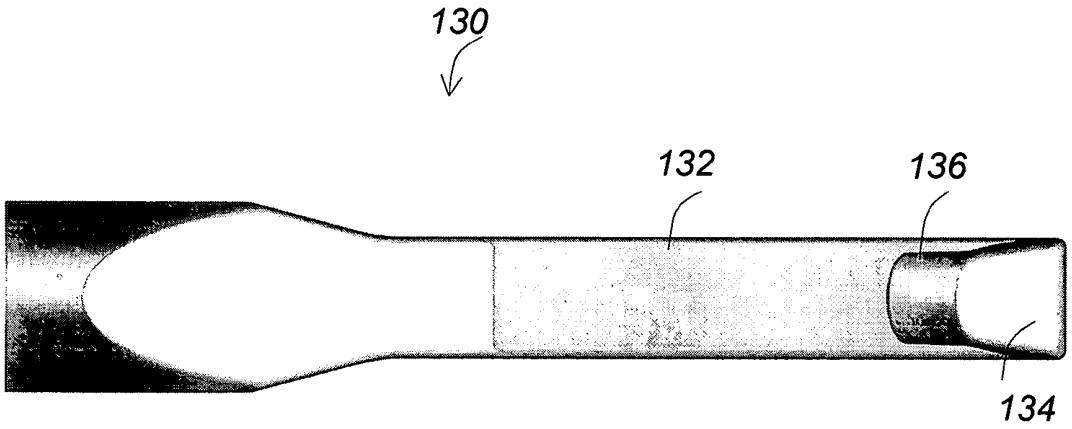


FIG. 6

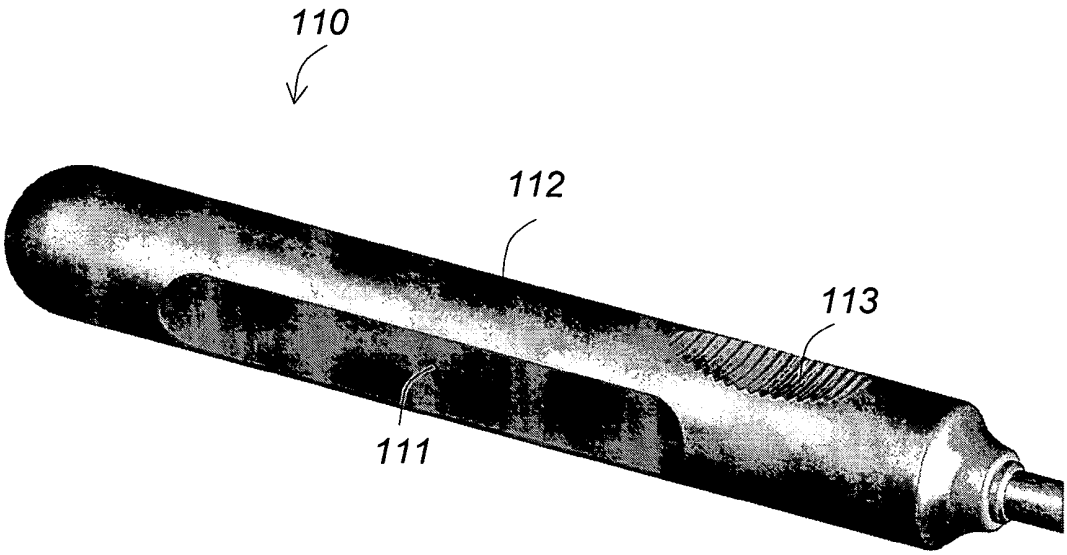


FIG. 7

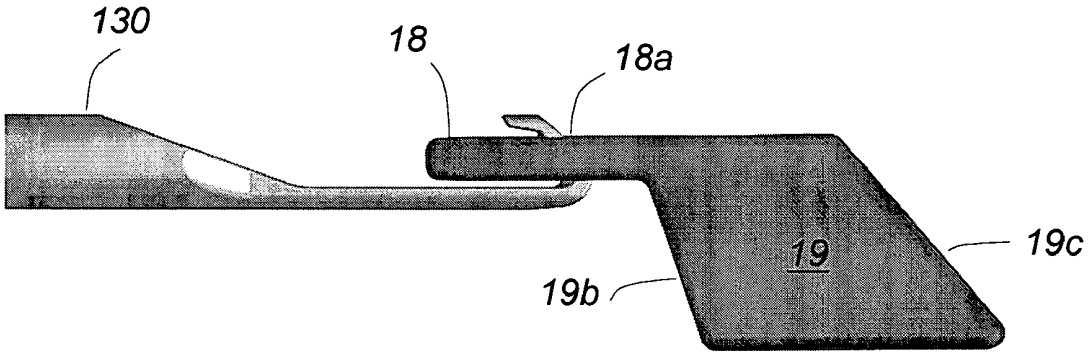


FIG. 8

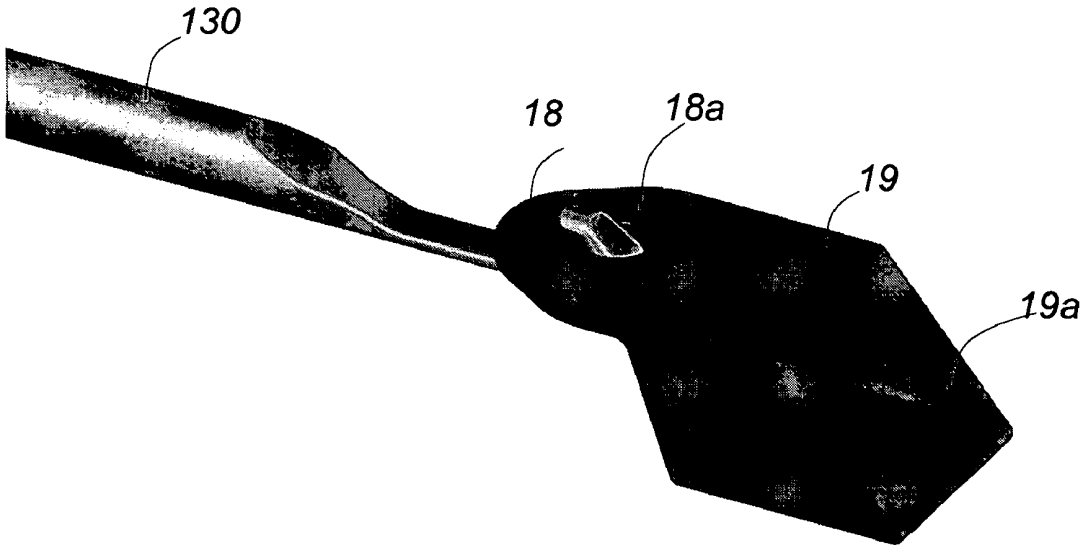


FIG. 9

SURGICAL HOOK INSTRUMENT FOR GASTRIC BAND CLOSING

CROSS REFERENCE TO RELATED CO-PENDING APPLICATIONS

[0001] This application claims the benefit of U.S. provisional application Ser. No. 60/650,284 filed on Feb. 4, 2005 and entitled SURGICAL HOOK INSTRUMENT FOR GASTRIC BAND CLOSING which is commonly assigned and the contents of which are expressly incorporated herein by reference.

[0002] This application is also related to U.S. provisional application Ser. No. 60/650,290 filed on Feb. 4, 2005 and entitled SURGICAL ROTARY CAPTURE INSTRUMENT FOR GASTRIC BAND CLOSING which is commonly assigned and the contents of which are expressly incorporated herein by reference.

[0003] This application is also related to U.S. provisional application Ser. No. 60/670,111 filed on Apr. 11, 2005 and entitled GASTRIC BAND INSERTION INSTRUMENT which is commonly assigned and the contents of which are expressly incorporated herein by reference.

FIELD OF THE INVENTION

[0004] The present invention relates to an endoscopic surgical hook instrument, and more particularly to a surgical hook instrument used in minimally invasive laparoscopic surgery for closing a gastric band.

BACKGROUND OF THE INVENTION

[0005] One method of controlling the intake of food in an obese person is to place an adjustable restriction band **10** around the upper stomach **20**, shown in **FIG. 1**. This creates a new small stomach pouch in the upper stomach **20** for holding a small amount of food and leaves the larger part of the stomach below the band so the stomach volume available for holding food is reduced. The band also controls the stoma, i.e., stomach outlet, between the upper stomach and the lower stomach **30**. The size of the stoma regulates the flow of food from the upper stomach to the lower stomach. When the stoma is small the patient feels full sooner and has a feeling of satiety that lasts longer.

[0006] One specific type of an adjustable restriction band **10** is the LAP-BAND system manufactured by INAMED Corporation, shown in **FIG. 2A** and **FIG. 2B**. The LAP-BAND system is described in U.S. Pat. No. 5,601,604, the contents of which are incorporated herein by reference. Referring to **FIG. 2A**, the gastric band **10** of the LAP-BAND system includes a body portion **11** a head portion **12** and a tail portion **13**. The head portion **12** has a buckle **19** with a pull tab **18** and the pull tab **18** has a hole **18***a* for receiving a post. The tail portion **13** has a tube **14** extending from one end, a triangular shaped member **13***a* and a conical shaped barb **13***b*. Tube **14** is in communication with an inflatable member **16** of the inner surface **15** of the body portion **11**. The inflatable member **16** is gradually inflated by injecting a saline solution through the tube **14**. The inflated member **16** presses against and constricts the stomach wall underlying the band **10**. This results in decreasing the diameter of the stoma. The amount of the injected solution controls the size of the inflated member **16** and accordingly the diameter of the stoma.

[0007] During a minimally invasive laparoscopic surgical procedure, the tube **14** of the gastric band **10** is pushed through a laparoscopic cannula and is inserted in the patient's abdomen. The gastric band **10** is then placed around the patient's upper stomach and the tail portion **13** is inserted into the buckle **19** thereby forming a ring structure around the upper stomach. The triangular shaped member **13***a* of the tail portion **13** interlocks with the buckle **19** and prevents the tube **14** from slipping backwards. The process of inserting the tail portion **13** into the buckle **19** requires simultaneously grasping the buckle **19** and threading and pushing the tube **14** through the buckle conduit **19***a*. Minimally invasive tools are used for performing these two mechanical manipulations needed for tightening the gastric band around the upper stomach.

[0008] A prior art combination tool for grasping the pull tab **18** and pushing the tube **14** is described in U.S. Pat. No. 5,658,298. This prior art tool includes two elongated slidably mounted cylindrical members and a handpiece. At the distal end of the first cylindrical member there is a post extending downwards that is dimensioned to engage the hole **18***a* of the tab **18** from the top side, shown in FIG. 6 of U.S. Pat. No. 5,658,298. The second cylindrical member, which is slidably mounted with respect to the first cylindrical member, has mounted on its distal end a seat or a fork, shown in FIG. 3A of U.S. Pat. No. 5,658,298. This fork is dimensioned to capture protuberances such as the conical barb **13***b* at the tube end of the band **10** and push the tube **14** through the buckle conduit **19***a*, while the first cylindrical member engages and pulls on the pull tab **18**. Surgeons performing this type of laparoscopic surgery have encountered the problems of the post unintentionally slipping out of the hole **18***a* and the fork unintentionally releasing the tube end of the band **10** during the band tightening procedure. This requires regrasping the tube end of the band **10** and the tab **18** several times during the procedure, which increases both the operation time and the complexity of the operation.

[0009] Accordingly there is a need for an improved grasping and pushing tool used in tightening a band having a buckle end and a free end that does not disengage unintentionally and provides better stability and control during the tightening procedure.

SUMMARY OF THE INVENTION

[0010] In general, in one aspect, the invention features an endoscopic surgical hook tool used in minimally invasive surgery for grasping and tightening a ligature band. The ligature band comprises an elongated strap having a buckle end and a distal end. The buckle end has an aperture and a pull tab having a hole. The elongated strap is configured to encircle an internal organ and the distal end is configured to pass through and lockingly engage the aperture thereby tightening the ligature band around the internal organ. The hook tool includes an elongated shaft having a hook end and a handle. The hook end is configured to engage the hole and pull the pull tab in a first direction while the distal end is threaded and pushed through the aperture, opposite to the first direction. The hook end comprises a flat portion and a bend portion extending from the flat portion. The flat portion is configured to slide along a flat surface of the pull tab and the bend portion has an inner surface radius matching a radius of the hole.

[0011] Implementations of this aspect of the invention may include one or more of the following features. The

elongated shaft is dimensioned to enter one end, pass through and extend beyond the other end of the cannula. The handle is configured to provide tactile control of the hook end orientation. The handle comprises a cylindrical body having first and second side indentations opposite to each other and a thumb indentation on a top surface of the cylindrical body, the thumb indentation being aligned with the bend portion of the hook end. The hook end further comprises an extension portion extending from the bend portion, running parallel to the flat portion and pointing towards the handle. The internal organ may be a stomach, artery, intestines, heart, lung, pancreas, kidney, bone or liver. In general, in another aspect, the invention features an endoscopic surgical hook tool used in minimally invasive surgery through a cannula for grasping and pulling an elongated strap having a pull tab. The hook tool includes an elongated shaft having a hook end and a handle. The hook end comprises a flat portion and a bend portion extending from the flat portion and the flat portion is configured to slide along a flat surface of the pull tab and the bend portion is configured to engage and grasp a hole on the pull tab. The bend portion has an inner surface radius matching a radius of the hole.

[0012] In general, in another aspect, the invention features an endoscopic surgical instrument used in minimally invasive surgery through a cannula for grasping and tightening a ligature band around an internal organ. The ligature band comprises an elongated strap having a buckle end and a distal end. The buckle end has an aperture and a pull tab having a hole thereon. The elongated strap is configured to encircle the internal organ and the distal end is configured to pass through and lockingly engage the aperture thereby tightening the ligature band around the internal organ. The surgical instrument includes a hook tool configured to engage the hole and pull the pull tab in a first direction while the distal end is threaded and pushed through the aperture, opposite to the first direction. The surgical instrument also includes a pusher tool configured to engage a protuberance of the distal end and push the distal end through the aperture after it has been threaded through it. The hook tool comprises a hook having a flat portion and a bend portion extending from the flat portion and the flat portion is configured to slide along a flat surface of the pull tab and the bend portion has an inner surface radius matching a radius of the hole. The hook tool and the pusher tool apply opposing forces on the ligature band for tightening the ligature band around the internal organ. The hook tool may be used in other non endoscopic procedures.

[0013] In general, in another aspect, the invention features a method for tightening a ligature band around an internal organ via minimally invasive surgery. The method includes providing a ligature band comprising an elongated strap having a buckle end and a distal end. The buckle end has an aperture and a pull tab having a hole thereon. Next, inserting the ligature band into a patient's body through a minimally invasive cannula and encircling the internal organ with the elongated strap. Next, inserting a surgical hook tool through the cannula. The hook tool comprises an elongated shaft having a hook end and a handle and the hook end comprises a flat portion and a bend portion extending from the flat portion and the flat portion is configured to slide along a flat surface of the pull tab and the bend portion has an inner surface radius matching a radius of the hole. Next, engaging the hole with the hook end and then pulling the pull tab in a first direction with the hook tool while pushing the distal end through the aperture, opposite to the first direction.

[0014] Among the advantages of this invention may be one or more of the following. The bend portion of the hook end together with the extension and the flat portion form a C-shaped hook that grasps securely the pull tab. The risk of unintentional disengagement is very low. The extension helps prevent slippage of the hook out of the hole. The inner surface of the bend portion is formed with a radius that matches the inside of the hole in the pull tab. This distributes the pulling force uniformly around the hole and prevents damaging of the pull tab during pulling. The flat portion of the hook end allows the hook end to slide easily underneath or above the pull tab.

[0015] The details of one or more embodiments of the invention are set forth in the accompanying drawings and description below. Other features, objects and advantages of the invention will be apparent from the following description of the preferred embodiments, the drawings and from the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] Referring to the figures, wherein like numerals represent like parts throughout the several views:

[0017] **FIG. 1** is a side view of a stomach with an adjustable gastric band around the upper part of the stomach;

[0018] **FIG. 2A** is a perspective view of an open LAP-BAND gastric band;

[0019] **FIG. 2B** is the gastric band of **FIG. 2A** in a closed position forming a ring structure;

[0020] **FIG. 3** is a perspective view of the endoscopic hook instrument of this invention;

[0021] **FIG. 4** is a perspective view of the hook end of the instrument of **FIG. 3**;

[0022] **FIG. 5** is a side view of the hook of **FIG. 4**;

[0023] **FIG. 6** is a top view of the hook of **FIG. 4**;

[0024] **FIG. 7** is perspective view of the handle of the instrument of **FIG. 3**;

[0025] **FIG. 8** is side view of the hook end of the instrument of **FIG. 3** engaging the hole in the tab of the buckle of the gastric band of **FIG. 2A**; and

[0026] **FIG. 9** is a perspective view of the hook end of the instrument of **FIG. 3** engaging the hole in the tab of the buckle of the gastric band of **FIG. 2A**.

DETAILED DESCRIPTION OF THE INVENTION

[0027] Referring to **FIG. 3**, a surgical hook instrument **100** includes a handle **110**, an elongated shaft **120** and a hook end **130**. The handle **110** features a tactile control of the hook end. Referring to **FIG. 7** the handle **110** features a cylindrical body having a diameter of 15.9 mm and a length of 11.4 cm and it includes two side indentations **111**, **112** opposite to each other and a thumb indentation **113** on the top surface. The elongated shaft **120** has a cylindrical shape and is dimensioned to fit through a laparoscopic cannula for minimally invasive surgery. In one example, the elongated shaft

120 has a length of 45 cm and a diameter of 5 mm. Referring to **FIG. 4** and **FIG. 5**, the hook end **130** includes an angled portion, a flat portion **130** a bend portion **134** and an extension **136**. The angled portion **131** has a flat bottom surface **131***a* and a downwards slopped top surface **131***b* forming an angle **133** with the top surface **124** of the elongated shaft **120**. The flat portion **132** has a flat top surface **132***b* and a flat bottom surface **132***a* that extends continuously from the bottom surface **122** of the elongated shaft **120** and the bottom surface **131***a* of the angled portion **131**. The top surface **132***b* of the flat portion **132** forms an angle **135** with the top surface **131***b* of the angled portion **131**. Angles **133** and **135** are supplementary to each other, i.e., their sum is 180 degrees. In one example, angle **133** is 20 degrees and angle **135** is 160 degrees. In one example, the flat portion **132** has a thickness of 1.3 mm, a width of 3.3 mm and a length of 13.4 mm. The bend portion **134** extends from the flat portion **132** and is bend upwards and towards the handle **110**. The inner surface **134***a* of the bend portion **134** forms an angle **137** with the top surface **132***b* of the flat portion **132**. Inner surface **134***a* is formed with a radius that matches the inside of the hole **18***a* in the pull tab **18**. This distributes the pulling force uniformly around the hole and prevents damaging of the pull tab **18** during pulling. The outer surface **134***b* of the bend portion **134** is curved and forms an angle **138** with the top surface **132***b* of the flat portion **132**. In one example angles **137** and **138** are 40 and 60 degrees, respectively. Extension **136** extends from the bend portion **134**, points towards the handle **110** and is parallel to the flat portion **132**. In one example it has a length of 2.0 mm and a thickness of 0.8 mm. Extension **136** helps prevent slippage of the hook out of the hole **18***a*. The inner surface of **136** forms an angle with the inner surface **134***a*, which facilitates pickup of the hole **18***a* by the hook **130**.

[**0028**] Referring to **FIG. 8** and **FIG. 9**, the flat portion **132** of the hook end **130** is placed either underneath or on top of the pull tab **18** of the gastric band buckle and the bend portion is inserted into the hole **18***a* thereby engaging the pull tab. The bend portion **134** together with the extension **136** and the flat portion **132** form a C-shaped hook that grasps securely the pull tab **18**. The risk of unintentional disengagement is very low. While holding the buckle end **19** securely with the hook end **130** a pusher instrument (not shown) is used to push the tube **14** of the gastric band **10** through the buckle conduit **19***a*. The triangular shaped member **13***a* of the tail portion **13** interlocks with the buckle conduit **19***a* and prevents the tube **14** from slipping backwards. The hook instrument and the pusher instrument apply opposing forces on the gastric band **10** in order to cinch and lock the band closed.

[**0029**] Several embodiments of the present invention have been described. Nevertheless, it will be understood that various modifications may be made without departing from the spirit and scope of the invention. Accordingly, other embodiments are within the scope of the following claims.

What is claimed is:

1. An endoscopic surgical hook tool used in minimally invasive surgery for grasping and tightening a ligature band, wherein said ligature band comprises an elongated strap having a buckle end and a distal end, said buckle end having an aperture and a pull tab having a hole thereon and wherein said elongated strap is configured to encircle an internal organ and said distal end is configured to pass through and lockingly engage said aperture thereby tightening said ligature band around said internal organ, the hook tool comprising:

an elongated shaft having a hook end and a handle, wherein said hook end is configured to engage said hole and pull said pull tab in a first direction while said distal end is threaded through said aperture and pushed opposite to said first direction; and

wherein said hook end comprises a flat portion and a bend portion extending from said flat portion and wherein said flat portion is configured to slide along a flat surface of said pull tab and said bend portion has an inner surface radius matching a radius of said hole.

2. The endoscopic surgical hook tool of claim 1 wherein said elongated shaft is inserted through a cannula into a patient's body and is dimensioned to enter one end, pass through and extend beyond the other end of said cannula.

3. The endoscopic surgical hook tool of claim 1 wherein said handle is configured to provide tactile control of said hook end orientation.

4. The endoscopic surgical hook tool of claim 3 wherein said handle comprises a cylindrical body having first and second side indentations opposite to each other and a thumb indentation on a top surface of said cylindrical body, said thumb indentation being aligned with said bend portion of said hook end.

5. The endoscopic surgical hook tool of claim 1 wherein said hook end further comprises an extension portion extending from said bend portion, running parallel to said flat portion and pointing towards said handle.

6. The endoscopic surgical tool of claim 1 wherein said internal organ is selected from a group consisting of stomach, artery, intestines, heart, lung, pancreas, kidney, bone and liver.

7. An endoscopic surgical hook tool used in minimally invasive surgery for grasping and pulling an elongated strap having a pull tab, the hook tool comprising:

an elongated shaft having a hook end and a handle; and

wherein said hook end comprises a flat portion, a bend portion extending from said flat portion and an extension portion extending from said bend portion and wherein said flat portion is configured to slide along a flat surface of said pull tab and said bend portion is configured to engage and grasp a hole on said pull tab and wherein said bend portion has an inner surface radius matching a radius of said hole.

8. The endoscopic surgical hook tool of claim 7 wherein said handle is configured to provide tactile control of said hook end orientation.

9. The endoscopic surgical hook tool of claim 7 wherein said elongated shaft is inserted through a cannula into a patient's body and is dimensioned to enter one end, pass through and extend beyond the other end of said cannula.

10. The endoscopic surgical hook tool of claim 7 wherein said bend portion, runs parallel to said flat portion and points towards said handle.

11. An endoscopic surgical instrument used in minimally invasive surgery for grasping and tightening a ligature band around an internal organ, wherein said ligature band comprises an elongated strap having a buckle end and a distal end, said buckle end having an aperture and a pull tab having a hole thereon and wherein said elongated strap is config-

ured to encircle said internal organ and said distal end is configured to pass through and lockingly engage said aperture thereby tightening said ligature band around said internal organ, the instrument comprising:

a hook tool configured to engage said hole and pull said pull tab in a first direction while said distal end is threaded through said aperture and pushed opposite to said first direction;

a pusher tool configured to engage a protuberance of said distal end and push said distal end;

wherein said hook tool comprises a hook having a flat portion and a bend portion extending from said flat portion and wherein said flat portion is configured to slide along a flat surface of said pull tab and said bend portion has an inner surface radius matching a radius of said hole.

12. The endoscopic surgical instrument of claim 11 wherein said hook tool and said pusher tool apply opposing forces on said ligature band for tightening said ligature band around said internal organ.

13. A method for tightening a ligature band around an internal organ via minimally invasive surgery comprising:

providing a ligature band comprising an elongated strap having a buckle end and a distal end, wherein said buckle end has an aperture and a pull tab having a hole thereon;

inserting said ligature band into a patient's body and encircling said internal organ with said elongated strap;

inserting a surgical hook tool into the patient's body, wherein said hook tool comprises an elongated shaft having a hook end and a handle and wherein said hook end comprises a flat portion and a bend portion extending from said flat portion and wherein said flat portion is configured to slide along a flat surface of said pull tab and said bend portion has an inner surface radius matching a radius of said hole;

engaging said hole with said hook end; and

pulling said pull tab in a first direction with said hook tool while threading said distal end through said aperture and pushing said distal end opposite to said first direction.

14. The method of claim 13 wherein said elongated shaft is inserted through a cannula into a patient's body and is dimensioned to enter one end, pass through and extend beyond the other end of said cannula.

15. The method of claim 13 wherein said handle is configured to provide tactile control of said hook end orientation.

16. The method of claim 15 wherein said handle comprises a cylindrical body having first and second side indentations opposite to each other and a thumb indentation on a top surface of said cylindrical body, said thumb indentation being aligned with said bend portion of said hook end.

17. The method of claim 13 wherein said hook end further comprises an extension portion extending from said bend portion, running parallel to said flat portion and pointing towards said handle.

18. The method of claim 13 wherein said internal organ is selected from a group consisting of stomach, artery, intestines, heart, lung, pancreas, kidney, bone and liver.

* * * * *

专利名称(译)	用于胃束带闭合的手术钩器械		
公开(公告)号	US20060241653A1	公开(公告)日	2006-10-26
申请号	US11/315822	申请日	2005-12-22
[标]申请(专利权)人(译)	JONES DANIEL乙 格里菲思杰里 - [R DI FRANCESCO FRANCISĴ		
申请(专利权)人(译)	JONES DANIEL乙 格里菲思杰里 - [R DI FRANCESCO FRANCISĴ		
当前申请(专利权)人(译)	对称医疗制造，INC.		
[标]发明人	JONES DANIEL B GRIFFITHS JERRY R DI FRANCESCO FRANCIS J		
发明人	JONES, DANIEL B. GRIFFITHS, JERRY R. DI FRANCESCO, FRANCIS J.		
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CPC分类号	A61F5/005 A61F5/0089 A61F5/0066		
优先权	60/670111 2005-04-11 US 60/650284 2005-02-04 US 60/650290 2005-02-04 US		
外部链接	Espacenet USPTO		

摘要(译)

内窥镜手术钩器械用于微创腹腔镜手术，用于闭合具有带扣端部自由端的胃束带。钩子器械包括扁平钩端，该扁平钩端放置在拉片的下方或顶部上，拉片从带扣端部延伸并穿过拉片的孔。钩子器械牢固地保持带扣端部，而推动器械用于推动胃带的自由端穿过带扣。