(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 446 852 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
23.03.2016 Bulletin 2016/12

(21) Application number: **11187365.9**

(22) Date of filing: **01.11.2011**

(51) Int Cl.:
A61B 34/00 *(2016.01)* ***A61B 1/05*** *(2006.01)*
A61B 17/00 *(2006.01)*

(54) Mountable camera for laparoscopic surgery

Montierbare Kamera für laparoskopische Eingriffe

Caméra montable pour chirurgie laparoscopique

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **02.11.2010 US 409275 P**
16.08.2011 US 201113210573

(43) Date of publication of application:
02.05.2012 Bulletin 2012/18

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EP 2 446 852 B1

Printed by Jouve, 75001 PARIS (FR)

Description

BACKGROUND

Technical Field

[0001] The present disclosure relates generally to a laparoscopic surgical system and more particularly to an instrument mountable camera for laparoscopic surgery.

Background OfRelatedArt

[0002] In laparoscopic surgery, surgery is performed through access ports extending into the abdominal cavity. The advantages of laparoscopic and other minimally invasive surgical procedures arc well established and include reduced infection, reduced costs and reduced patient recovery time. In many of these procedures, several access ports are required, each dimensioned to receive a surgical instrument, providing a guide for accessing the surgical site. One of the access ports is configured to receive the endoscopic camera for viewing the abdominal cavity and enabling display of the cavity and the manipulation of the instrumentation and tissue within the body cavity on a video monitor.

[0003] It would be advantageous to reduce the number of access ports in the abdominal cavity while maintaining the same instrumentation and maneuverability of the instruments within the body cavity. It would also be advantageous to alternatively provide the same number of access ports but enable use of an additional instrument within the body cavity.

[0004] Systems in which one or more camera units are released into a body cavity and subsequently retrieved are known from WO 2007/061386, JP 2003-135388 and WO 2005/053517. A system in which a camera is manually attached to a support rod or surgical instrument within a body cavity is known from JP 2002-204773.

SUMMARY

[0005] The present disclosure provides in one aspect a laparoscopic surgical system comprising a camera, a base supporting the camera and a camera insertion tool for inserting the camera into the body cavity through an access port. The camera is mountable to a surgical instrument inside the body cavity and releasable from the insertion tool after mounting to the surgical instrument.

[0006] In a preferred embodiment, the base includes at least one magnet for magnetic attachment of the camera to the surgical instrument. The system can include a sleeve mountable to a least a portion of the surgical instrument wherein the camera is mountable to the sleeve. Preferably, the surgical instrument can rotate about a longitudinal axis within the sleeve while the camera remains stationary on the sleeve. The base can include an opening at a proximal end to receive a distal portion of the insertion tool.

[0007] The present disclosure provides in another aspect a camera mountable to a portion of a surgical instrument extending into a body cavity through a second opening, the camera having a mounting base and at least one magnet supported by the base. The camera is insertable through a first opening in the body cavity and magnetically connectable to a portion of the surgical instrument inside the body cavity which extends through the second opening in the body cavity.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] Various embodiments of the presently disclosed device are described herein with reference to the drawings, wherein:

Figure 1 is a perspective view of the mountable camera of the present disclosure;
Figure 2 is a bottom perspective view of the mountable camera of Figure 1;
Figure 3 is a perspective of the camera of Figure 1 and a camera insertion tool;
Figure 4 illustrates the camera and insertion tool of Figure 3 prior to insertion through a laparoscopic port;
Figure 5 illustrates the camera and insertion tool of Figure 1 being inserted into the abdominal cavity through a laparoscopic port;
Figure 6 illustrates the camera being mounted to a clip applier within the abdominal cavity; and
Figure 7 illustrates the camera mounted on a sleeve of the clip applier.

DETAILED DESCRIPTION OF EMBODIMENT

[0009] The presently disclosed laparoscopic surgical system and camera will now be described in detail with reference to the drawings in which like reference numerals designate identical or corresponding elements in each of the several views. Throughout this description, the term "proximal" will refer to the portion of the instrument closer to the operator and the term "distal" will refer to the portion of the instrument further from the operator. The presently disclosed system is particularly suited for laparoscopic surgery but the system can be utilized for other minimally invasive surgical procedures.

[0010] The surgical system of the present disclosure advantageously eliminates the need for a designated access port for a camera for visualization of laparoscopic procedures. By freeing such access port, it can be used for insertion of other surgical instruments, thus requiring one less access port which translates advantageously to one less opening in the abdominal cavity, reducing the attendant risks of such opening and reducing the patient recovery time. As described in detail below, this is achieved by providing a camera which is inserted into the body cavity and mounted to a laparoscopic instrument inside the body cavity.

[0011] The mounting of the camera directly to the laparoscopic instrument also has the advantage of improving visibility as the camera lens is aligned along a path of the end effectors of the instrument. The mounting of the camera to the instrument shaft also has the advantage that multiple cameras can be inserted into the body cavity, each mounted to a select laparoscopic instrument, without increasing the number of access ports.

[0012] The camera is mounted by a camera insertion tool described below which can then be withdrawn from the access port, leaving the port available for insertion of other instrumentation, e.g. a retractor, clip applier, etc. In the drawings and following description, mounting of the camera to a laparoscopic clip applier is shown by way of example, it being understood that the camera can be mounted to other laparoscopic/endoscopic instruments within the body cavity in a similar fashion.

[0013] Turning first to Figures 1 and 2, the camera of the present disclosure is designated generally by reference numeral 10. The camera has a cylindrical body 12 with LEDs 14 at the distal end 16. The camera has a mounting base 20, preferably formed integral therewith. Mounting base 20 has a concave mounting surface 21 dimensioned to conform to an outer surface of a laparoscopic instrument shaft or the laparoscopic instrument sleeve described below. In alternate embodiments, the mounting surface can be flat or other configurations. Surface 21 of mounting base 20 includes a plurality of magnets 24. A different number of magnets and a different arrangement of the magnets from Figure 1 are also contemplated. An example of another arrangement is a V-block arrangement where a V-groove would accommodate one or more magnets.

[0014] The magnets are shown positioned in the base 20. However, in alternate embodiments, the magnet(s) can be positioned inside the camera. This can avoid the need of the mounting base if desirable. Mechanical attachment methods for attaching the camera or the instrument are also contemplated.

[0015] The camera preferably has an outer diameter of about 10mm or less.

[0016] As shown in Figure 3, the proximal end 26 of the base 20 has an opening 28 dimensioned and configured to receive camera insertion tool 30. The opening can include one or more posts 29 to enhance frictional engagement with the insertion tool 30. The distal end 32 of insertion tool 30 has opposing slots 31. The distal end 32 is inserted into opening 28 to hold the camera by a frictional fit as the posts 29 compress the slotted portion of the insertion tool 30. It is also contemplated that the insertion tool 30 can be removably connected to base 20 by other ways such as a screw thread, bayonet mount, or a hook/slot arrangement. These connections enable the camera to be securely held by the insertion tool 30 during insertion through the access port and manipulation within the body cavity for magnetic attachment to a laparoscopic instrument positioned within the body cavity, while allowing subsequent release after instrument mounting, Insertion of the camera 10 through an access port P1 is shown in Figure 5.

[0017] The camera can alternatively be retained by other insertion tools, such as a grasper with movable or spring loaded jaws for example.

[0018] Referring to Figure 7, a distal portion of a clip applier 50 is shown. A sleeve 60 is composed of suitable material, such as stainless steel or other magnetic material that reacts to the magnetic field of magnets 24 so that the mounting base 20 is magnetically connected to the sleeve 60. This sleeve 60 is positioned around the endoscopic portion (elongated shaft) 52 of clip applier 50. In this way, the clip applier can be rotated (see arrow in Figure 7) independent of the sleeve 60 and independent of the camera 10 so the positioning of the clip applier jaws 54 can be changed without affecting visualization as the camera 10 and lens remain stationary.

[0019] It is also contemplated that the magnet(s) can be placed inside the sleeve (which can be composed of a magnetic material) for magnetic attraction to the camera through the sleeve.

[0020] The camera 12 is preferably movable axially along the instrument to a select position along the longitudinal axis of the instrument or sleeve. For example, the camera can be moved closer to the distal tip of the instrument to zoom in on the tissue or moved away from the instrument tip to zoom out and increase the peripheral vision.

[0021] The use of the system in an abdominal cavity for laparoscopic surgery will now be described, with reference to Figures 4-6. Note Figure 4 illustrates two access port P1 and P2, one for camera insertion and one for instrument insertion. It is also envisioned that additional ports can be provided through other abdominal incisions. In any event, the mountable camera 10 of the present disclosure frees one of the ports after mounting the camera to the laparoscopic instrument.

[0022] Port P2 is used for insertion of a laparoscopic or endoscopic instrument, which by way of example is a clip applier 50 (Figure 5). The insertion tool 30 with camera 10 attached is inserted through port P1 as shown in Figure 5. The clip applier 50 is inserted into the abdominal cavity through port P2. The camera 10 is positioned on sleeve 60 and attached thereto by the magnetic attraction of magnets 24. Once placed on the sleeve 60, the clinician can pull back on the insertion tool 30 to release it from the camera 10. If a hook engagement or a threaded engagement is utilized, the insertion tool 30 can be released by reverse rotation or movement. The insertion tool 30 is then removed from the cavity through port P1, leaving the camera 10 mounted on concentric sleeve 60. The port P1 is now available for insertion of other instrumentation for performing the procedure. The camera 10 provides visualization of the tissue adjacent the clip applier jaws 52 which can then be viewed by the clinician on a video monitor. If another port is utilized (not shown) a camera 10 can be mountable on this instrument as well if desired via insertion through port P1 in the same man-

ner as attached to the clip applier 50.

[0023] To retrieve the camera 10 at the end of the surgical procedure, the insertion tool 30 is inserted through port P1 and placed within opening 28 of mounting base 20 of camera 10 for connection thereto. The camera 10 is then released from the sleeve 60 by insertion tool 30, overcoming the magnetic force of magnets 24, and removed through port P1.

[0024] Although shown within the abdominal cavity, it can be used in other regions of the body.

[0025] It will be understood that various modifications may be made to the embodiments disclosed herein. Therefore, the above description should not be construed as limiting, but merely as exemplifications of preferred embodiments. Those skilled in the art will envision other modifications within the scope of the claims appended hereto.

Claims

1. A laparoscopic surgical system comprising;
   a camera (10), the camera having a lens,
   insertion tool (30) for a camera (10) for inserting the camera (10) into a body cavity through an access port (P1), and
   a surgical instrument (50),
   the camera (10) is mountable to the surgical instrument (50) inside the body cavity, and
   releasable from the insertion tool (30) after mounting to the surgical instrument (50),
   the camera (10) having an instrument engaging surface (21), **characterised in that** the instrumer engaging surface comprises a concave portion conforming to a portion of the surgical instrument (50), such that when the camera (10) is mounted to the surgical instrument, the lens of the camera (10) is aligned along a path of end effectors of the surgical instrument (50).

2. The system of claim 1 wherein the camera (10) includes a base (20).

3. The system of claim 2, wherein the camera (10) includes a base (20) having an opening at a proximal end to receive a distal portion of the insertion tool (30)

4. The system of any preceding claim, wherein the system includes a sleeve (60) mountable to a least a portion of the surgical instrument (50), the camera (10) being mountable to the sleeve (60).

5. The system of claim 4 preferably wherein the surgical instrument (50) rotates about a longitudinal axis within the sleeve (60), the camera (10) remaining stationary on the sleeve (60).

6. The system of claim 4 or claim 5 where dependent directly or indirectly on claim 3, wherein the base (20) has a concave portion dimensioned to conform to an outer surface portion of the sleeve (60).

7. The system of any one of claims 1 to 3, wherein the base (20) has a concave portion dimensioned to conform to an outer surface portion of an endoscopic tube of the surgical instrument (50).

8. The system of any preceding claim, wherein the camera (10) has an outer diameter of about 10 mm or less.

9. The system of any preceding claim, wherein the camera (10) includes at least one magnet (24) for magnetic attachment of the camera (10) to the surgical instrument (50).

10. The system of claim 9 where dependent directly or indirectly on claim 2 wherein the base (20) has the at least one magnet (24) for magnetic attachment of the camera (10) to the surgical instrument (50).

11. The system of any preceding claim, wherein the surgical instrument (50) is insertable into the body cavity through a second opening (P2) in the body cavity.

Patentansprüche

1. Laparoskopisches Chirurgie-System umfassend;
   eine Kamera (10), wobei die Kamera ein Objektiv aufweist,
   ein Einführungswerkzeug (30) für eine Kamera (10) zum Einführen der Kamera (10) in die Körperhöhle durch eine Zugangsöffnung (P1) und
   ein chirurgisches Instrument (50),
   wobei die Kamera (10) an das chirurgische Instrument (50) innerhalb der Körperhöhle montierbar ist, und nach der Montage an das chirurgische Instrument (50) von dem Einführungswerkzeug (30) lösbar ist,
   wobei die Kamera (10) eine Instrumenteneingriffsfläche (21) aufweist,
   dadurch gekennzeichnet, dass die Instrumenteneingriffsfläche einen konkaven Abschnitt in Übereinstimmung mit einem Teil des chirurgischen Instruments (50) aufweist,
   so dass, wenn die Kamera (10) an dem chirurgischen Instrument montiert ist, das Objektiv der Kamera (10) entlang einem Weg der Endeffektoren des chirurgischen Instrumentes (50) ausgerichtet ist.

2. System nach Anspruch 1, wobei die Kamera (10) eine Basis (20) umfasst.

3. System nach Anspruch 2, wobei die Kamera (10) eine Basis (20) umfasst, die eine Öffnung an einem

proximalen Ende aufweist, um einen distalen Abschnitt des Einführungswerkzeugs (30) zu empfangen.

4. System nach einem der vorhergehenden Ansprüche, wobei das System eine Hülse (60) umfasst, die an mindestens einem Teil des chirurgischen Instruments (50) montierbar ist, wobei die Kamera (10) an der Hülse (60) montierbar ist.

5. System nach Anspruch 4, wobei vorzugsweise das chirurgische Instrument (50) sich um eine Längsachse in der Hülse (60) dreht, wobei die Kamera (10) stationär auf der Hülse (60) bleibt.

6. System nach Anspruch 4 oder 5, wenn direkt oder indirekt abhängig von Anspruch 3, wobei die Basis (20) einen konkaven Abschnitt aufweist, der dimensioniert ist, um einem äußeren Oberflächenabschnitt der Hülse (60) zu entsprechen.

7. System nach einem der Ansprüche 1 bis 3, wobei die Basis (20) einen konkaven Abschnitt aufweist, der dimensioniert ist, um einem äußeren Oberflächenabschnitt des endoskopischen Schlauches des chirurgischen Instruments (50) zu entsprechen.

8. System nach einem der vorhergehenden Ansprüche, wobei die Kamera (10) einen Außendurchmesser von etwa 10 mm oder weniger aufweist.

9. System nach einem der vorhergehenden Ansprüche, wobei die Kamera (10) wenigstens einen Magneten (24) zum magnetischen Anbringen der Kamera (10) an dem chirurgischen Instrument (50) aufweist.

10. System nach Anspruch 9, wenn direkt oder indirekt abhängig von Anspruch 2, wobei die Basis (20) den wenigstens einen Magneten (24) zum magnetischen Anbringen der Kamera (10) an dem chirurgischen Instrument (50) aufweist.

11. System nach einem der vorhergehenden Ansprüche, wobei das chirurgische Instrument (50) in die Körperhöhle durch eine zweite Öffnung (P2) einführbar ist.

Revendications

1. Système chirurgical laparoscopique comprenant :

une caméra (10), la caméra ayant une lentille,
un outil (30) d'insertion de la caméra (10) pour insérer la caméra (10) dans une cavité corporelle à travers un orifice d'accès (P1) et
un instrument chirurgical (50),
la caméra (10) pouvant être montée sur l'instrument chirurgical (50) à l'intérieur de la cavité corporelle et pouvant être libérée de l'outil d'insertion (30) après montage sur l'instrument chirurgical (50),
la caméra (10) ayant une surface (21) s'engageant sur l'instrument, **caractérisé en ce que** la surface s'engageant sur l'instrument comprend une partie concave se conformant à une partie de l'instrument chirurgical (50) de sorte que, lorsque la caméra (10) est montée sur l'instrument chirurgical, la lentille de la caméra (10) soit alignée le long d'un trajet d'effecteurs d'extrémité de l'instrument chirurgical (50).

2. Système selon la revendication 1, dans lequel la caméra (10) comprend une base (20).

3. Système selon la revendication 2, dans lequel la caméra (10) comprend une base (20) ayant une ouverture à une extrémité proximale pour recevoir une partie distale de l'outil d'insertion (30).

4. Système selon l'une quelconque des revendications précédentes, dans lequel le système comprend un manchon (60) qui peut être monté sur au moins une partie de l'instrument chirurgical (50), la caméra (10) pouvant être montée sur le manchon (60).

5. Système selon la revendication 4, de préférence dans lequel l'instrument chirurgical (50) tourne autour d'un axe longitudinal dans le manchon (60), la caméra (10) restant immobile sur le manchon (60).

6. Système selon la revendication 4 ou la revendication 5, dans la mesure où elles dépendent directement ou indirectement de la revendication 3, dans lequel la base (20) a une partie concave dimensionnée pour se conformer à une partie de surface externe du manchon (60).

7. Système selon l'une quelconque des revendications 1 à 3, dans lequel la base (20) a une partie concave dimensionnée pour se conformer à une partie de surface externe d'un tube endoscopique de l'instrument chirurgical (50).

8. Système selon l'une quelconque des revendications précédentes, dans lequel la caméra (10) a un diamètre externe d'environ 10 mm ou moins.

9. Système selon l'une quelconque des revendications précédentes, dans lequel la caméra (10) comprend au moins un aimant (24) pour assurer la fixation magnétique de la caméra (10) sur l'instrument chirurgical (50).

10. Système selon la revendication 9, dans la mesure

où elle dépend directement ou indirectement de la revendication 2, dans lequel la base (20) a le au moins un aimant (24) pour assurer une fixation magnétique de la caméra (10) sur l'instrument chirurgical (50).

11. Système selon l'une quelconque des revendications précédentes, dans lequel l'instrument chirurgical (50) peut être inséré dans la cavité corporelle à travers une seconde ouverture (P2) dans la cavité corporelle.

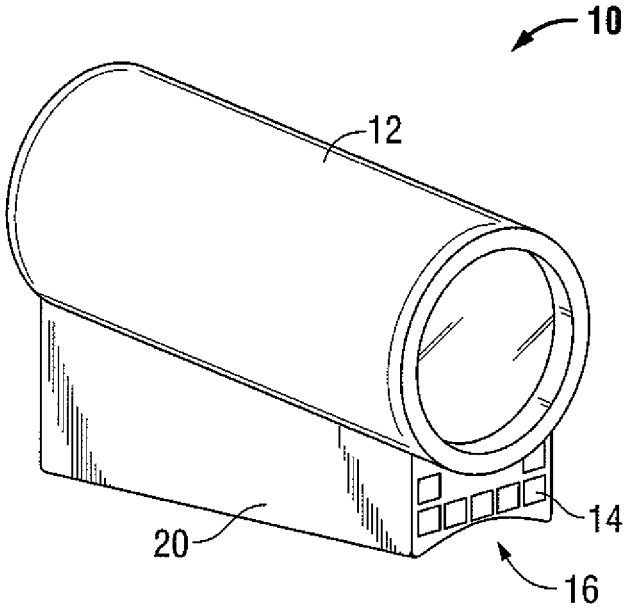

FIG. 1

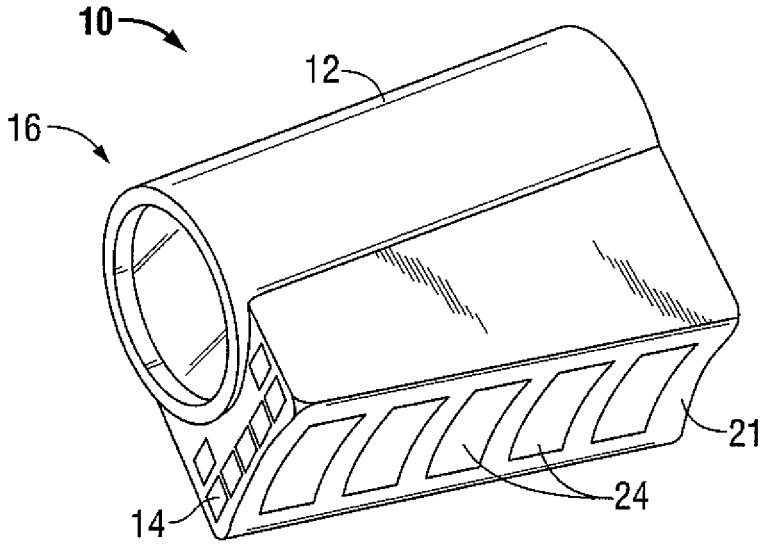

FIG. 2

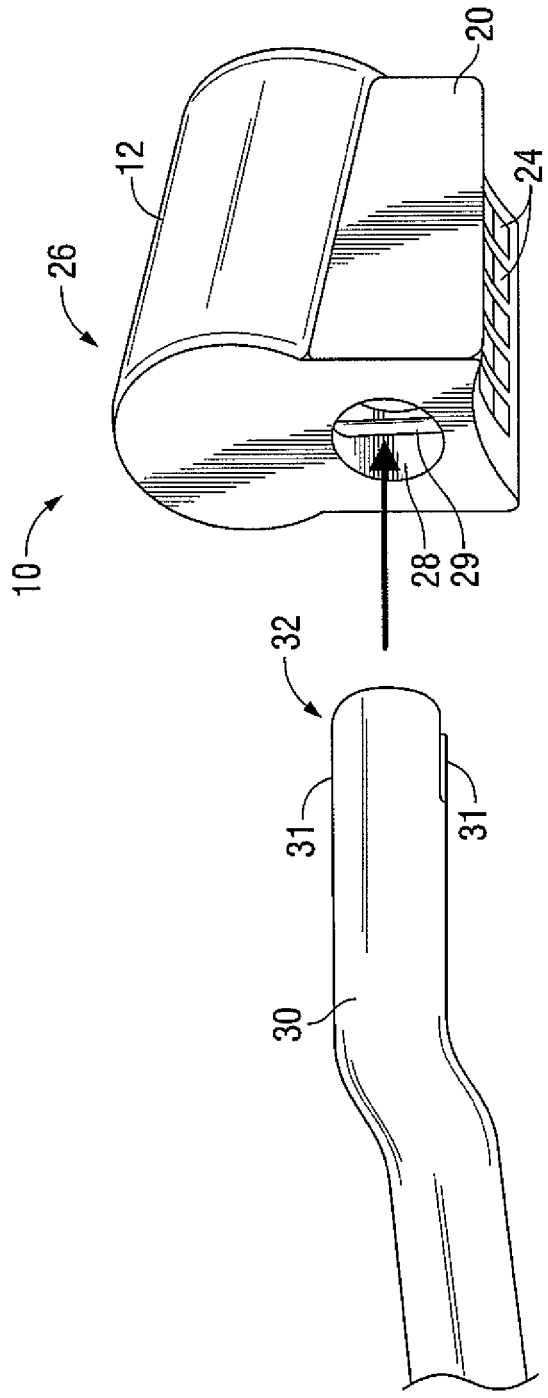

FIG. 3

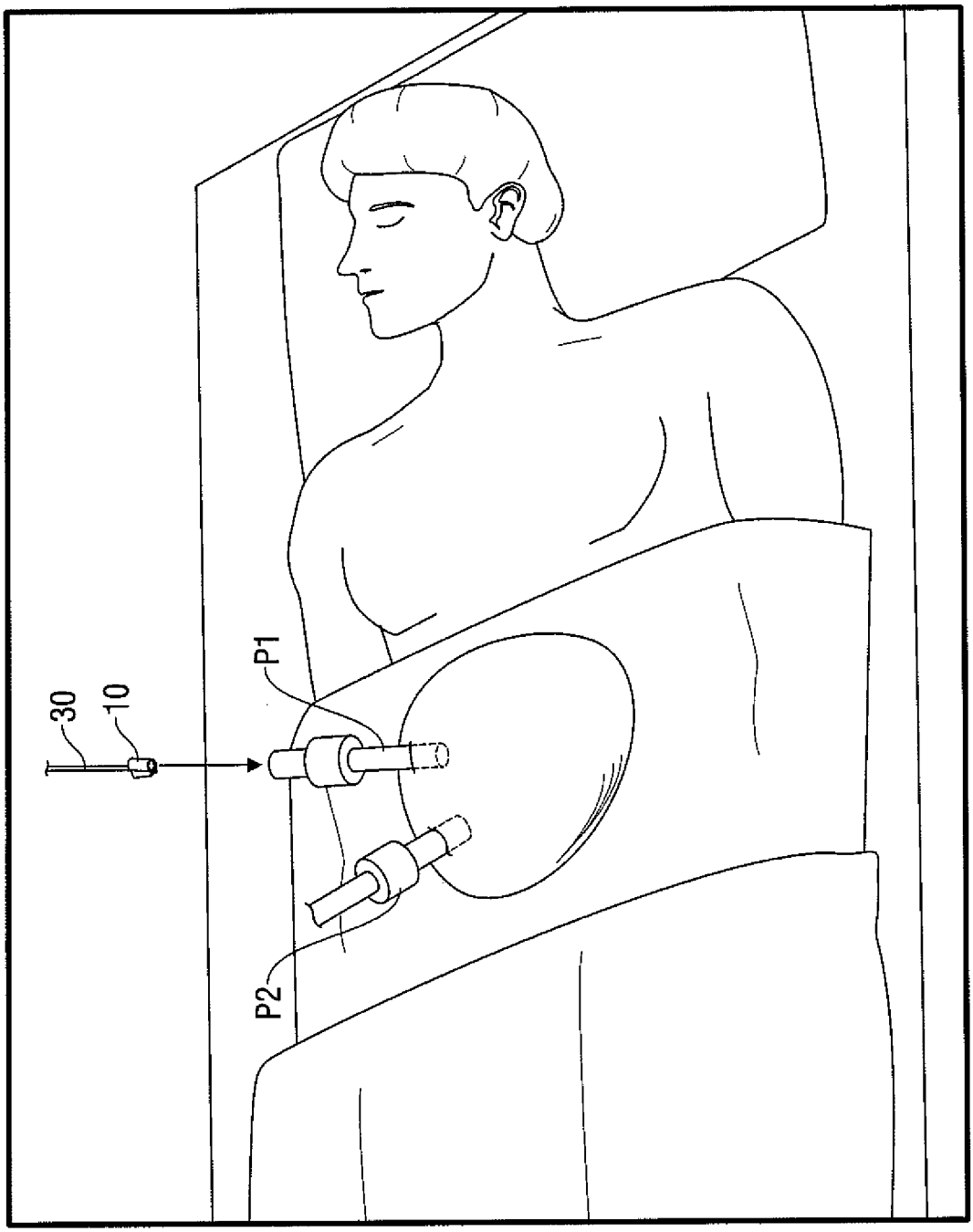

FIG. 4

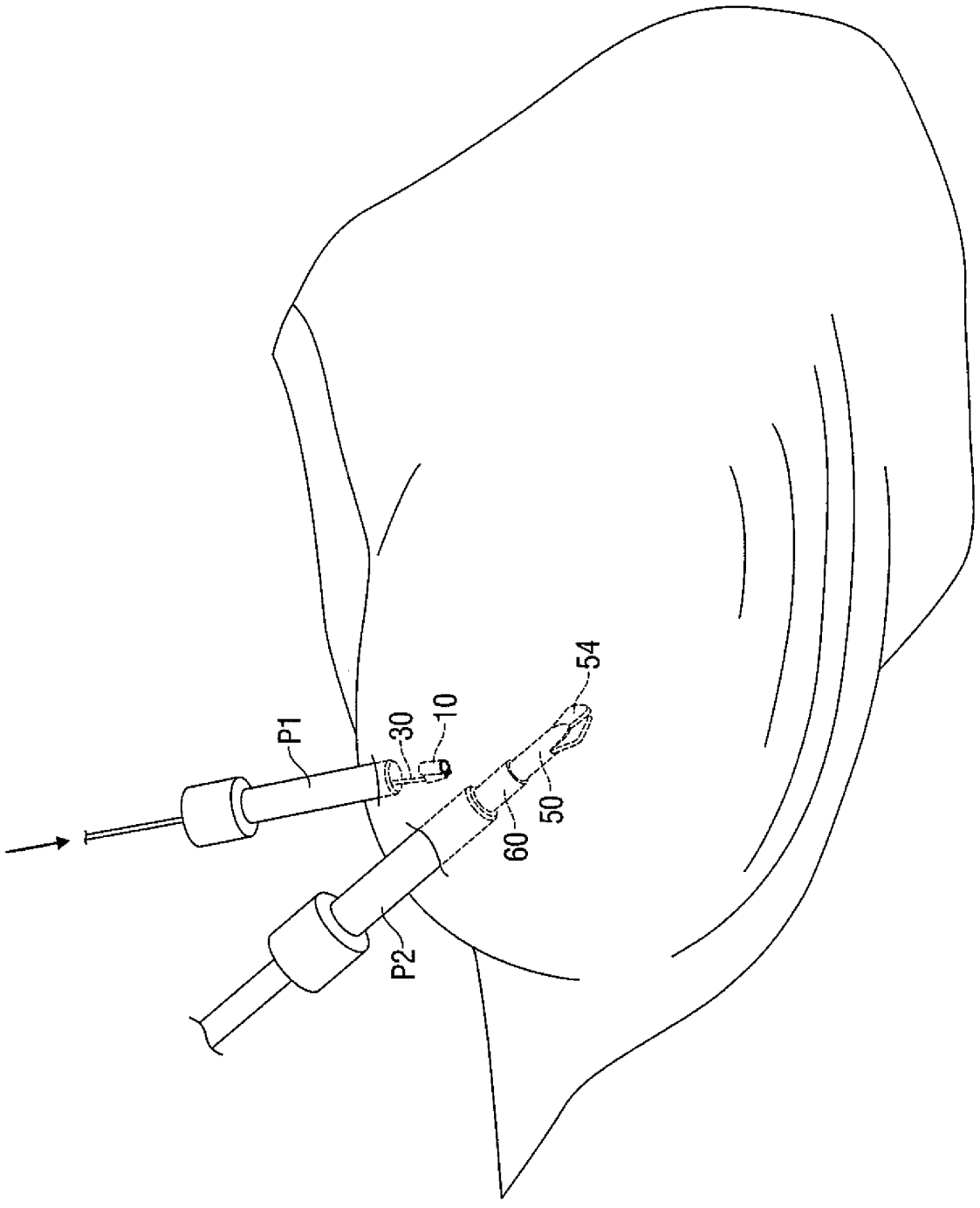

FIG. 5

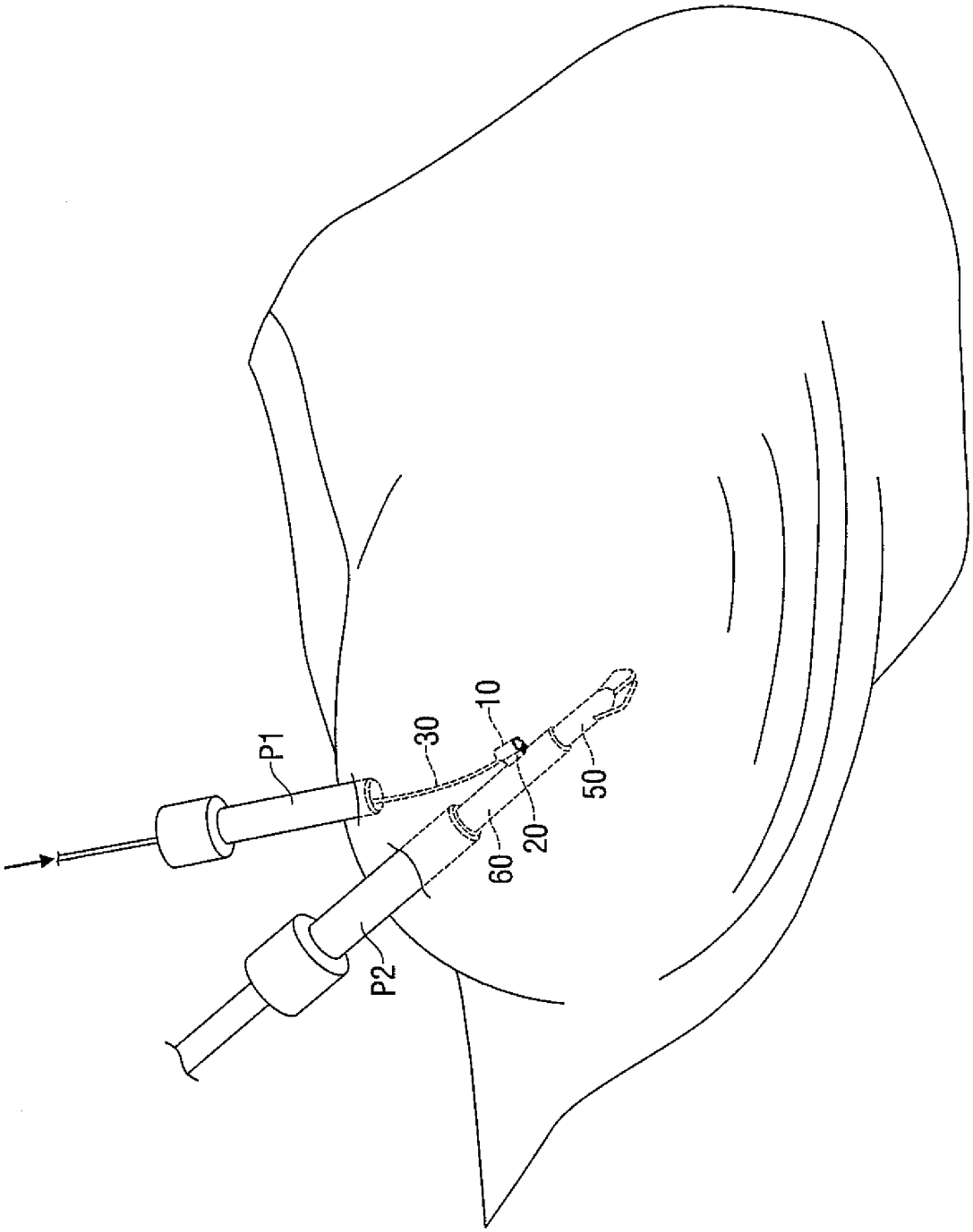

FIG. 6

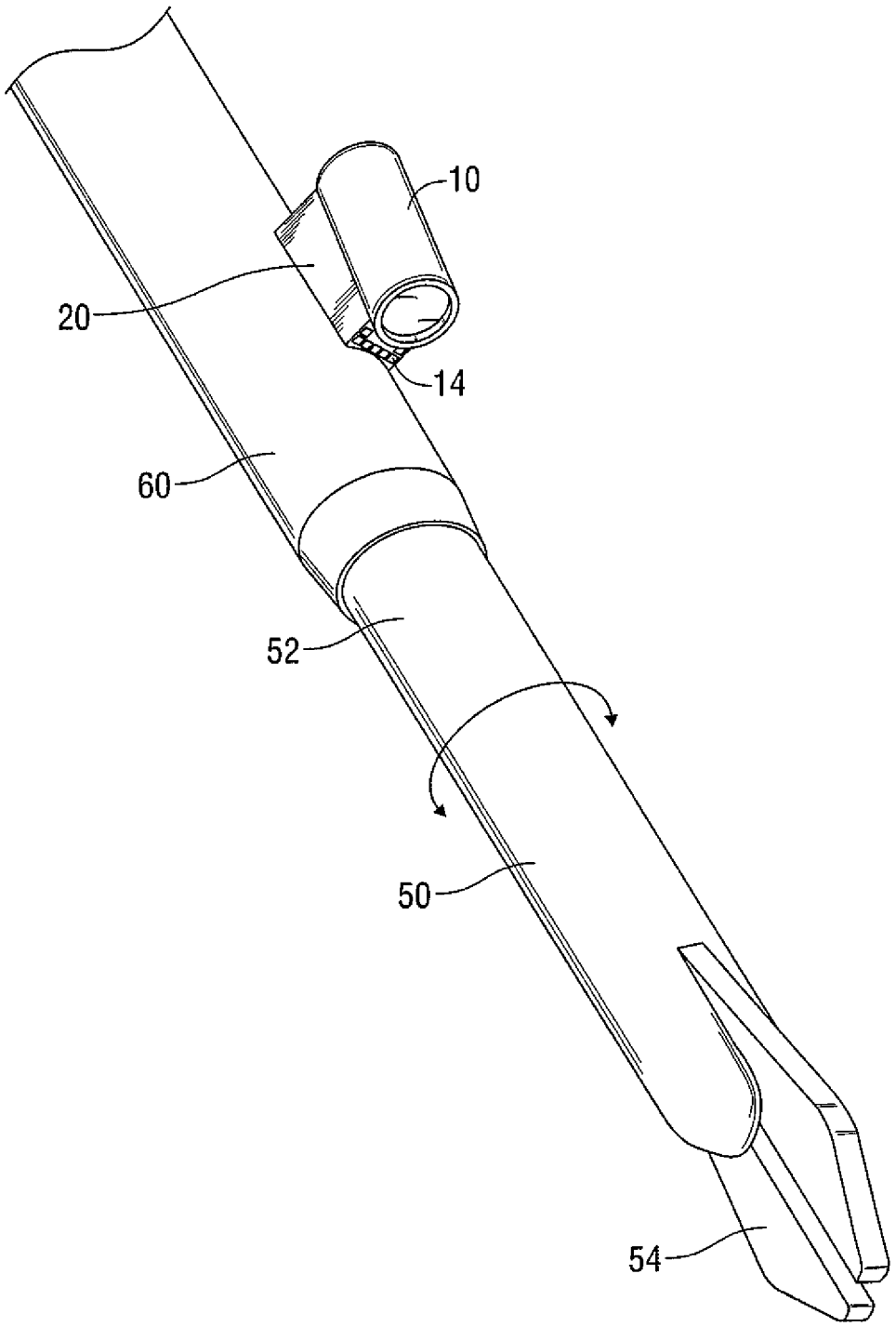

FIG. 7

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2007061386 A **[0004]**
- JP 2003135388 A **[0004]**
- WO 2005053517 A **[0004]**
- JP 2002204773 A **[0004]**

专利名称(译)	用于腹腔镜手术的可安装摄像头		
公开(公告)号	EP2446852B1	公开(公告)日	2016-03-23
申请号	EP2011187365	申请日	2011-11-01
[标]申请(专利权)人(译)	柯惠有限合伙公司		
申请(专利权)人(译)	泰科医疗集团LP		
当前申请(专利权)人(译)	COVIDIEN LP		
[标]发明人	VIOLA FRANK HORTON KENNETH		
发明人	VIOLA, FRANK HORTON, KENNETH		
IPC分类号	A61B34/00 A61B1/05 A61B17/00		
CPC分类号	A61B1/00121 A61B1/01 A61B1/018 A61B1/053 A61B1/0676 A61B1/0684 A61B1/3132 A61B17/00234 A61B90/361 A61B2017/00477 A61B2017/00876 A61B2090/309		
优先权	13/210573 2011-08-16 US 61/409275 2010-11-02 US		
其他公开文献	EP2446852A1		
外部链接	Espacenet		

摘要(译)

一种腹腔镜手术系统，包括照相机和支撑照相机的底座，以及用于将照相机插入体腔的照相机插入工具。相机可安装到体腔内的手术器械，并且在安装到手术器械之后可从插入工具释放。

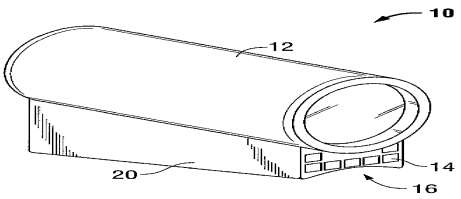

FIG. 1

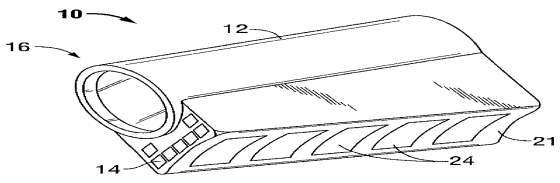

FIG. 2