US 20060058680A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2006/0058680 A1**

Solomon (43) **Pub. Date: Mar. 16, 2006**

(54) **NEEDLE GUIDE FOR LAPAROSCOPIC ULTRASONOGRAPHY**

(76) Inventor: **Stephen Solomon**, New York, NY (US)

Correspondence Address:
FRISHAUF, HOLTZ, GOODMAN & CHICK, PC
220 Fifth Avenue
16TH Floor
NEW YORK, NY 10001-7708 (US)

(21) Appl. No.: **11/213,033**

(22) Filed: **Aug. 25, 2005**

Related U.S. Application Data

(60) Provisional application No. 60/604,286, filed on Aug. 25, 2004.

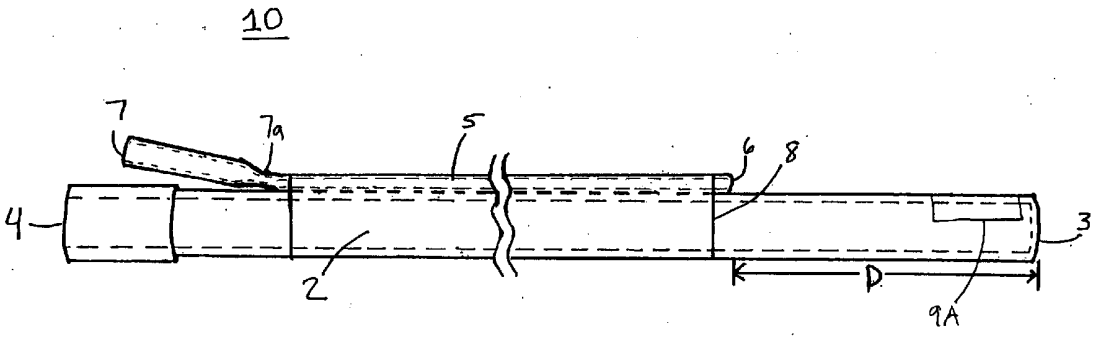
Publication Classification

(51) **Int. Cl.**
A61B 8/14 (2006.01)

(52) **U.S. Cl.** **600/466**

(57) **ABSTRACT**

A guide device is provided for a laparoscopic ultrasound probe. The guide device includes a sheath that is adapted to fit over at least a portion of the ultrasound probe, and a guide coupled to the sheath for guiding a medical tool inserted therethrough to position the medical tool in a plane of an ultrasound image obtained via the ultrasound probe.



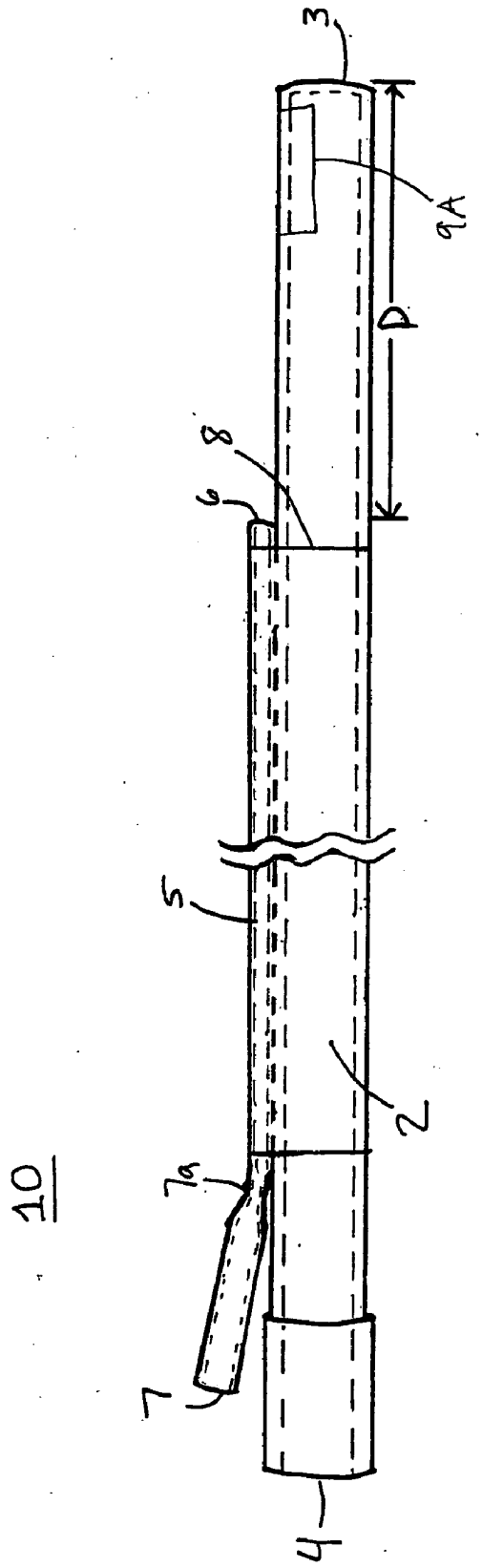


Fig. 1

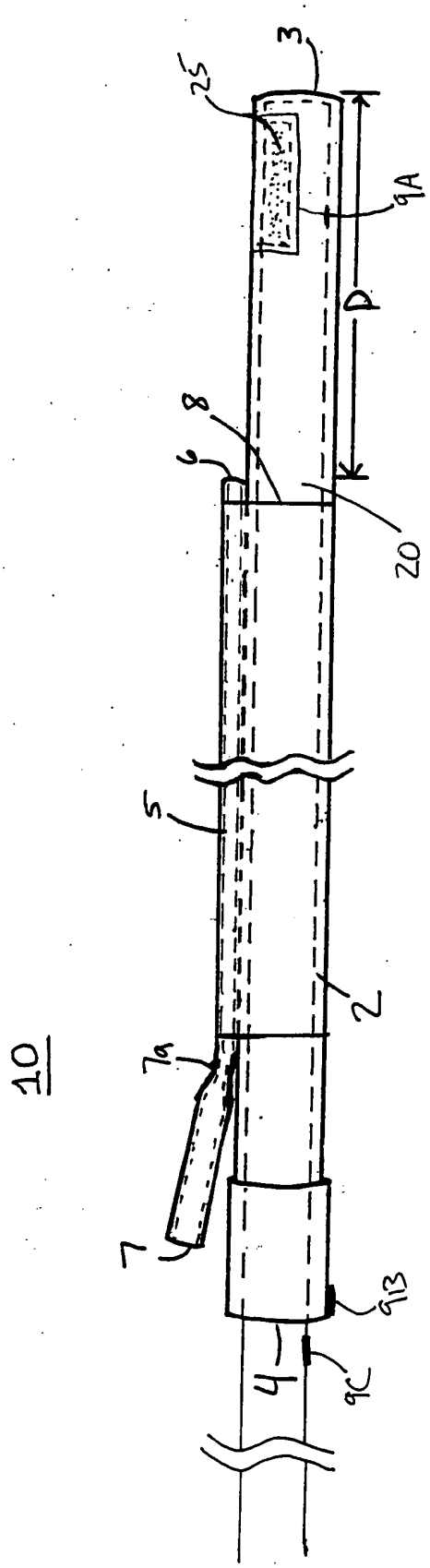


Fig. 2

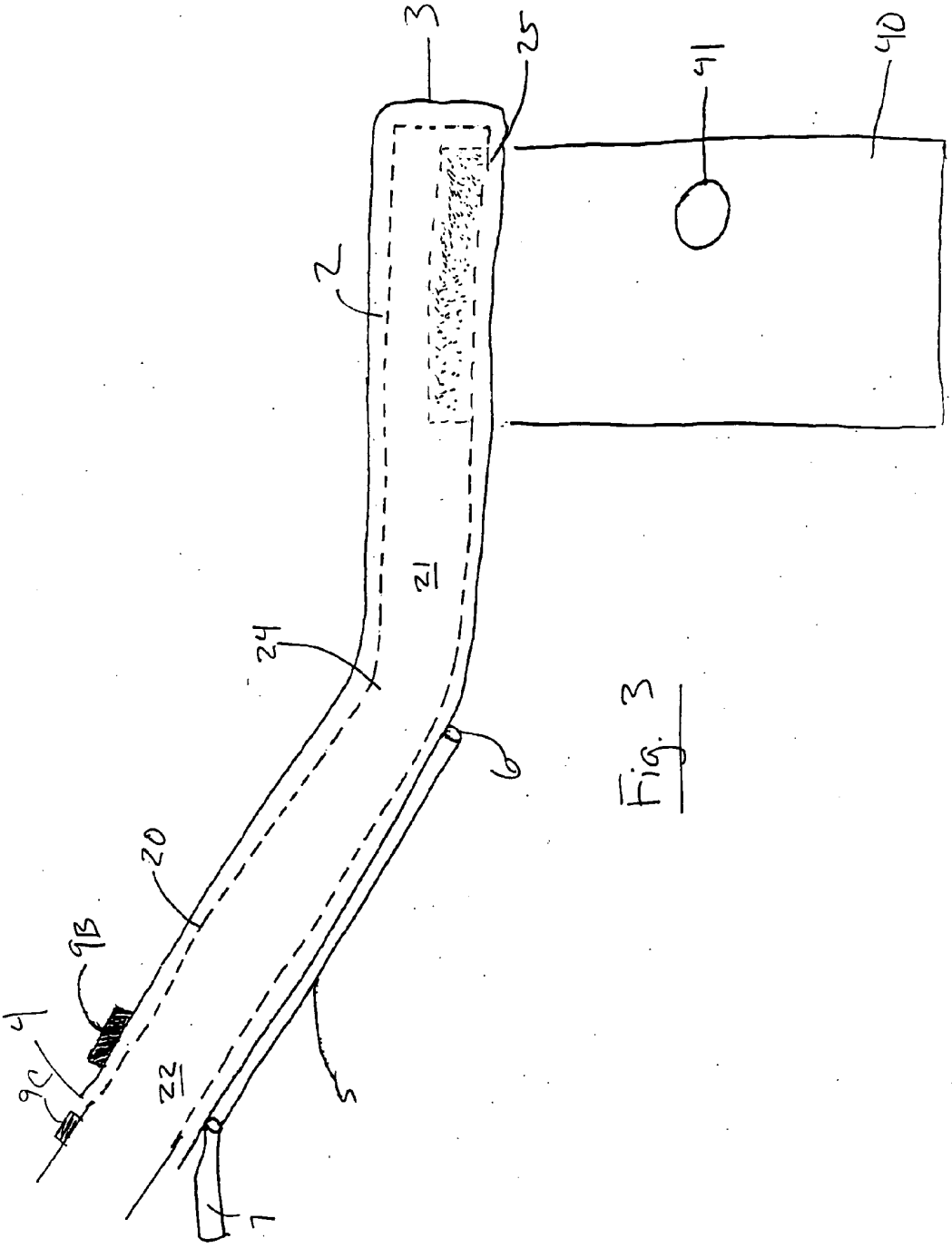


Fig. 3

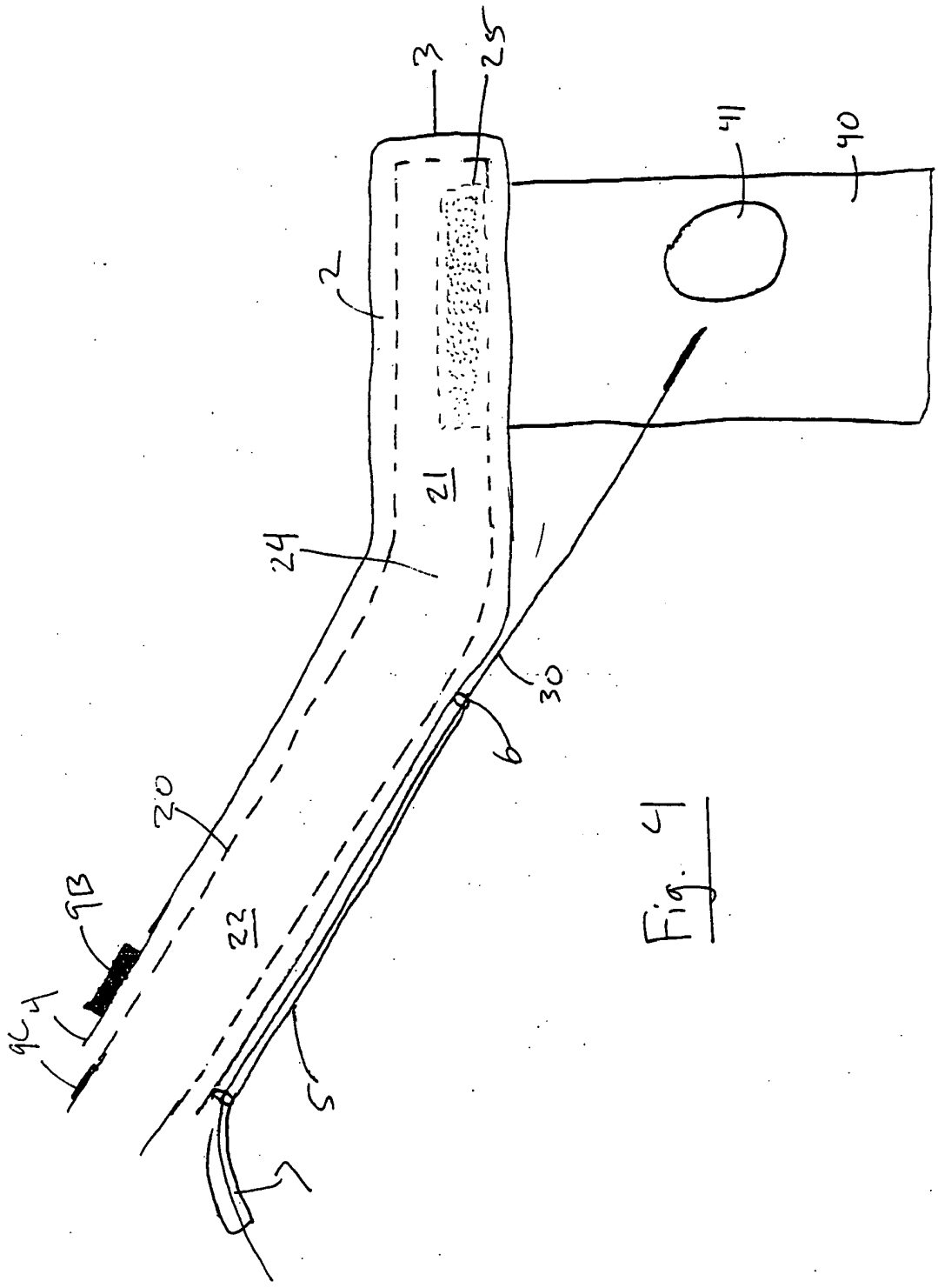


Fig. 4

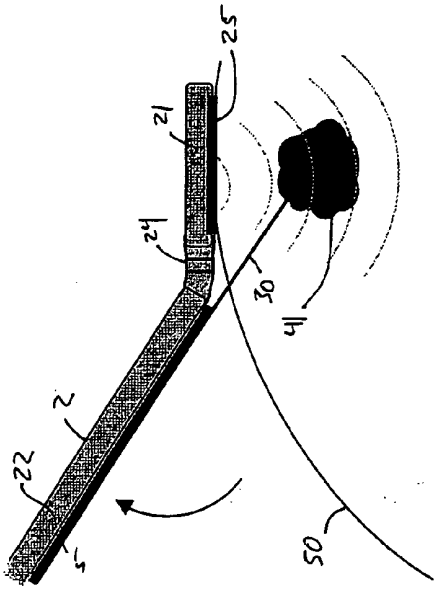


Fig. 5D

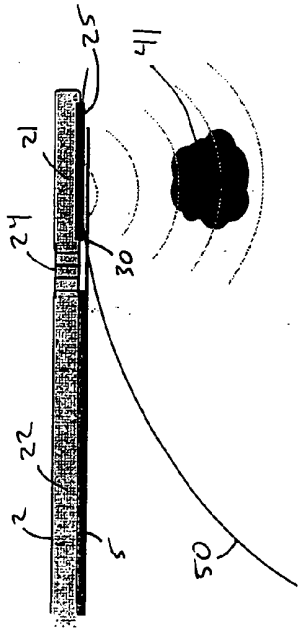


Fig. 5A

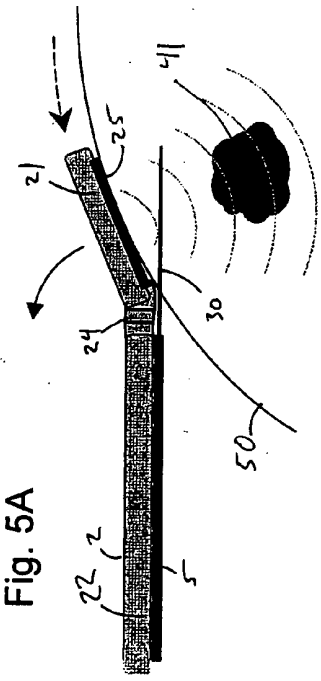


Fig. 5B

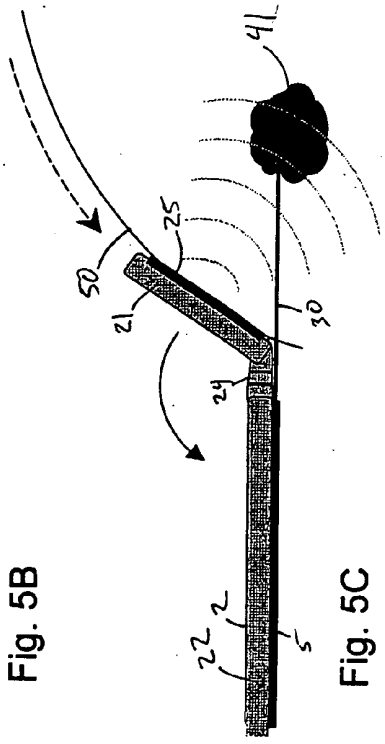


Fig. 5C

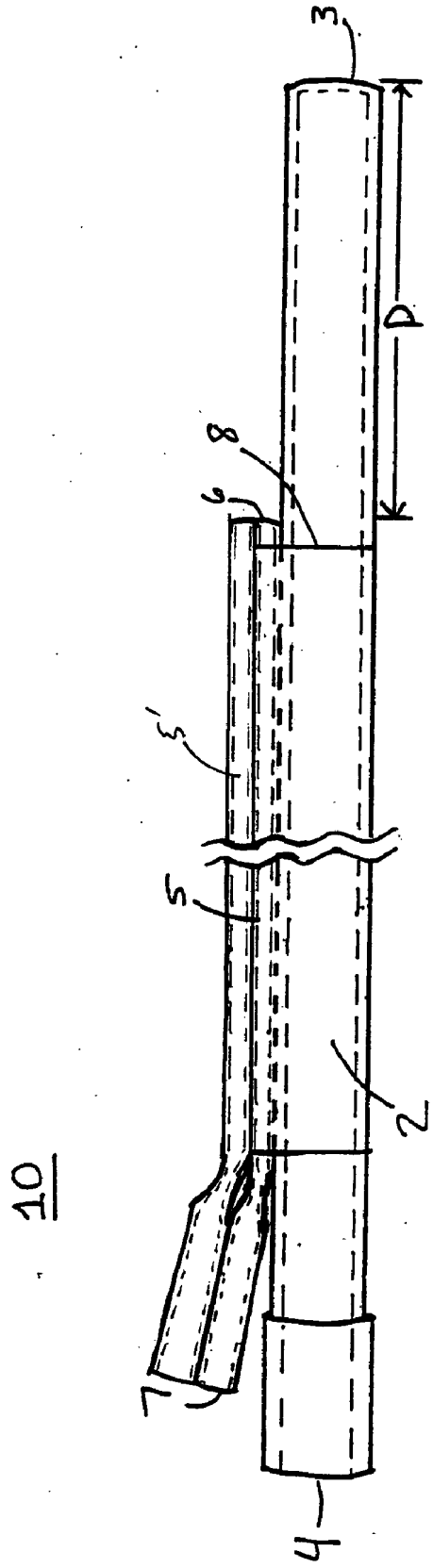


Fig. 6

NEEDLE GUIDE FOR LAPAROSCOPIC ULTRASONOGRAPHY

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of priority of provisional application Ser. No. 60/604,286, filed Aug. 25, 2004, the entire contents of which are incorporated herein by reference.

FIELD OF THE INVENTION

[0002] The present invention relates to a medical tool guide for use with a laparoscopic ultrasound probe.

BACKGROUND OF THE INVENTION

[0003] Laparoscopic ultrasonography is a known technique for visualizing regions inside of organs. The image obtained through laparoscopic ultrasonography is essentially a two-dimensional image extending from a transducer at the distal end of a laparoscopic ultrasound probe. Frequently, laparoscopic ultrasonography is used to visualize masses for needle biopsy or tumor ablation. To perform the biopsy or ablation, a needle or probe (or other instrument, referred to in this section as a "needle" for convenience) must be inserted into the mass while the mass is visualized in the ultrasound image. To accomplish this, the needle is kept in the plane of the ultrasound image while guiding the needle to the mass. The needle, however, is operated independently of the laparoscopic probe and is inserted separately from the laparoscopic probe. It is therefore challenging to insert the needle in the plane of the ultrasound image. See Berber et al, "Laparoscopic ultrasonography and biopsy of hepatic tumors in 310 patients"*The American Journal of Surgery* 187 (2004) 213-218, for a description of laparoscopic ultrasonography.

OBJECT OF THE PRESNET INVENTION

[0004] It is an object of the present invention to provide a medical tool guide device for a laparoscopic ultrasound probe that enables adjustable positioning of the medical tool in the imaging plane.

SUMMARY OF THE INVENTION

[0005] According to one aspect of the present invention a guide device is provided for a laparoscopic ultrasound probe. The guide device includes a sheath that is adapted to fit over at least a portion of the ultrasound probe, and a guide coupled to the sheath for guiding a medical tool inserted therethrough to position the medical tool in a plane of an ultrasound image obtained via the ultrasound probe.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] **FIG. 1** shows a guide device according to the present invention;

[0007] **FIG. 2** shows a laparoscopic ultrasound probe inserted in the guide device of **FIG. 1**;

[0008] **FIG. 3** shows the laparoscopic ultrasound probe inserted in the guide device in use to visualize a mass;

[0009] **FIG. 4** shows a needle being introduced through the guide device of the present invention;

[0010] **FIGS. 5A through 5D** show the adjustment of the depth of the needle with respect to the ultrasound transducer using the guide device according to the present invention; and

[0011] **FIG. 6** shows a modification of the guide device of the present invention.

DETAILED DESCRIPTION

[0012] **FIG. 1** shows a guide device **10** of the present invention, which includes a sheath **2** and a guide **5** fixed to the sheath **2**. As shown in **FIG. 2**, the sheath **2** slides over the distal end of a laparoscopic ultrasound probe **20**, such that the distal end of the probe **20** contacts the closed distal end **3** of the sheath **2** and the proximal portion of the probe **20** extends out through the open proximal end **4** of the sheath **2**. The sheath **2** should fit snugly enough on the probe **20** that air is prevented from coming between the probe **20** and the sheath **2**. When the probe **20** is laparoscopically inserted in the body of the patient, the proximal end **4** of the sheath **2** preferably remains outside the patient. According to the present invention, the guide is made from, for example, PVC or polyurethane or another plastic.

[0013] The guide **5** is attached to the sheath **2** to guide a medical tool (instrument), such as a biopsy needle or ablation probe inserted through the introduction port **7** and out through the distal end **6**. As shown in **FIG. 1**, the introduction port **7** may be angled slightly with respect to the sheath **2** (and the probe **20** therein) to facilitate entry of the needle into the guide **5**. See bent portion **7***a* in **FIGS. 1 and 2**. The angle of the introduction port **7** with respect to the sheath **2** should be small enough to allow a rigid or substantially rigid medical tool to pass therethrough. If the introduction port **7** is angled too much, a rigid or substantially rigid medical tool will not be able to pass around the bent portion **7***a* between the port **7** and the rest of the guide **5**.

[0014] The guide **5** has a wide enough passageway (channel or lumen) to accommodate either a needle or an ablation probe, or another desired instrument. Since a radiofrequency ablation probe may be 15 gauge, the lumen of the guide **5** should preferably be larger than 15 gauge.

[0015] As shown in **FIG. 1**, the guide **5** is in the form of a tube and may be attached to the sheath **2** by a belt **8** that wraps tightly around both the sheath **2** and the guide **5** and that is attached to the sheath **2** with an adhesive. The belt **8** could also be adhered to both the sheath **2** and the guide **5**. In addition, multiple smaller belts could be used instead of the large belt **8** shown in **FIG. 1**. Alternatively, the guide **5** could simply be fixed to the sheath **2** by adhesive, or the guide **5** and sheath **2** could be formed integrally.

[0016] The laparoscopic ultrasound probe **20** is flexible so that the distal end thereof can be controlled to bend. See, for example, **FIG. 3**, in which the distal end portion **21** is bent with respect to the proximal end portion **22** of the probe **20** at a bending section **24**. Such laparoscopic ultrasound probes are known in the art and, as described in Berber et al (supra), may be controlled by knobs in a similar manner as a flexible endoscope to allow about the distal 5 cm thereof, for example, to be bent with respect to the rest of the probe.

[0017] To allow substantially rigid or rigid medical tools to be inserted through the guide **5** while the probe **20** is bent, the guide **5** is set back from the distal end **3** of the sheath **2**

by a distance D (see **FIG. 1**) that is at least as long as the distance from the distal end **3** of the probe **20** to the point at which the probe **20** bends in the bending section **24**. For example, the distal end **6** of the guide **5** is provided at the distal end of the proximal end portion **22** of the probe **20** (see **FIGS. 5A-5D**, for example).

[**0018**] As shown in **FIG. 4**, a medical tool **30** is inserted through the guide **5**, which is positioned so that the medical tool **30** introduced therethrough is visible in the imaging plane **40** of the ultrasound image obtained via the ultrasound transducer **25** located at the distal end portion **21** of the probe **20**. The probe **20** is bent by a desired amount to change the exiting angle of the medical tool **30** from the guide **5** with respect to the distal end portion **21** of the probe **20**. The depth of the medical tool **30** in the imaging plane **40** may thereby be adjusted to target a mass **41** for biopsy or ablation with the medical tool **30**.

[**0019**] **FIGS. 5A-5D** show the bending of the probe **20** to target the mass **41** with the medical tool **30**. **FIG. 5A** shows the medical tool **30** exiting the guide **5** while the probe **20** is not bent. With this orientation of the probe **20**, the medical tool **30** is immediately adjacent to the transducer **25**. As shown in **FIG. 5B**, if the transducer **25** is moved along the organ **50** and the distal end portion **21** of the probe **20** is bent about the bending section **24**, it is possible to reach a deeper location in the organ **50**. **FIG. 5C** shows the transducer **25** moved further along the organ **50** with respect to **FIG. 5B** and the distal end portion **21** bent sufficiently to allow the needle to reach the mass **41** while both the medical tool **30** and the mass **41** are visualized via the ultrasound transducer **25**. **FIG. 5D** shows the transducer **25** positioned at the same location on the organ **50** as in **FIG. 5A**. In **FIG. 5D**, the proximal end portion **22** of the probe **20** has been bent while the distal end portion **21** remains in place to allow the medical tool **30** to reach the mass **41** while visualizing both the medical tool **30** and the mass **41** via the ultrasound transducer **25**.

[**0020**] As shown in **FIG. 2** one or more markers may be provided on the guide device **10** to align the guide device **10** on the probe **20** to ensure that the imaging plane of the image obtained with the transducer **25** and the medical tool **30** introduced through the guide are co-located. For example, a marker **9**A may be provided at the distal end of the sheath **2** as a box or other marker to be aligned with the ultrasound transducer **25**. In addition, a marker **9**B may be provided at the proximal end of the sheath **2** to be visible to an operator of the probe **20** while the probe **20** and guide device **10** are inserted in a patient. In this case, the marker **9**B may be aligned with a marker **9**C provided on the probe **20**. The marker **9**C may be a sticker that is removably attached to the probe **20** when the guide device **10** is fitted on the probe **20**. For example, when the marker **9**A is used to align the guide device **10** on the probe **20**, the marker **9**C may be fixed to the probe **20** in a position that is aligned with the marker **9**B at the proximal end of the sheath **2**. Thus, when the probe **20** and guide device **10** are inserted in the patient, it should be possible for the operator of the probe **20** to ensure that the guide device **10** is properly aligned even when the marker **9**A is no longer visible.

[**0021**] According to the present invention, the laparoscopic ultrasound probe **20** may slide into the sheath **2**, and the sheath is sufficiently tight to be secure on the probe **20**. However, the guide device **10** according to the present invention may also be fixed to the sheath using a vacuum chamber to expand the sheath so that the probe **20** can be inserted in the sheath.

[**0022**] In addition, according to the present invention, multiple guide tubes could be attached to the sheath **2** to allow multiple medical tools to be placed simultaneously in the imaging plane **40** of the ultrasound transducer **25**. For example, guides **5** and **5'** shown in **FIG. 6** could be used to guide both a biopsy needle and a grasper to the imaging plane. The guides **5** and **5'** may be different sizes, for example to accommodate different types of medical tools.

[**0023**] As described hereinabove, the guide device **10** according to the present invention may be slidably fitted onto a laparoscopic ultrasound probe **20** to allow the medical tool **30** to be reliably introduced into the imaging plane **40** visualized via the ultrasound transducer **25**. Since the probe **20** is flexible, and the guide **5** is set back from the distal end of the probe **20** so as not to interfere with the flexibility thereof, the exiting angle of the medical tool **30** from the guide **5** may be adjusted by bending the probe. The depth of penetration of the medical tool **30** in the imaging plane **40** in the organ **50** may thereby be easily adjusted. In addition, since the guide device **10** according to the present invention covers the portion of the laparoscopic ultrasound probe **20** inserted in the body of the patient, the guide device **10** may provide advantages in the sterility of laparoscopic ultrasonography and may facilitate clean-up after laparoscopic ultrasonography procedures.

[**0024**] The foregoing provides a detailed description of presently preferred embodiments. Various modifications and additions can be made without departing from the spirit and scope of the invention. In particular, the terms "needle" and "medical tool" as used herein should be understood to include any medical device that could be inserted through the guide **5** of the present invention, such as a biopsy needle, ablation probe, grasper or other instrument. In addition, while the guide **5** and lumen therethrough are shown in the drawings as being round, other shapes of guides and lumens may, of course, be used. Accordingly, the foregoing description is meant to be taken only by way of example and not to otherwise limit the scope of the present invention as defined in the appended claims.

What is claimed is:

1. A guide device for a laparoscopic ultrasound probe, said guide device comprising:

a sheath that is adapted to fit over at least a portion of the ultrasound probe; and

a guide coupled to the sheath for guiding a medical tool inserted therethrough to position the medical tool in a plane of an ultrasound image obtained via the ultrasound probe.

2. The guide device according to claim 1, wherein the guide comprises a tube having a lumen therethrough.

3. The guide device according to claim 2, wherein the lumen is at least 15 gauge.

4. The guide device according to claim 1, wherein the ultrasound probe is bendable, and an exiting angle of the medical tool from the guide with respect to a distal end portion of the ultrasound probe is adjustable by bending the ultrasound probe.

5. The guide device according to claim 4, wherein a distance from a distal end of the sheath to a distal end of the guide is not less than a distance from a distal end of the ultrasound probe to a bending portion about which the ultrasound probe is bendable.

6. The guide device according to claim 1, further comprising at least one marker for aligning the guide with the plane of the ultrasound image.

7. The guide device according to claim 6, wherein the marker is positioned at a distal end of the sheath to be aligned with an ultrasound transducer of the ultrasound probe.

8. The guide device according to claim 6, wherein the at least one marker comprises:

a first marker provided at a proximal end of the sheath; and

a second marker provided on the ultrasound probe to be aligned with the marker at the proximal end of the sheath.

9. The guide device according to claim 1, further comprising an additional guide for guiding an additional medical tool inserted therethrough to position the additional medical tool in the plane of the ultrasound image.

10. The guide device according to claim 9, wherein the additional guide is coupled to the guide that is fixed to the sheath.

11. The guide device according to claim 2, wherein the guide tube comprises an introduction port at a proximal end thereof, and the introduction port is angled with respect to the sheath.

12. The guide device according to claim 11, wherein an interior of the introduction port is shaped as a funnel

13. A guide device for an ultrasound probe, said device comprising:

a sheath that is adapted to fit over at least a portion of the ultrasound probe;

a guide coupled to the sheath for guiding a medical tool inserted therethrough to position the medical tool in a plane of an ultrasound image obtained via the ultrasound probe; and

at least one marker for aligning the guide with the plane of the ultrasound image;

wherein the ultrasound probe is bendable, and an exiting angle of the medical tool from the guide tube with respect to a distal end portion of the ultrasound probe is adjustable by bending the ultrasound probe.

* * * * *

专利名称(译)	用于腹腔镜超声检查的针引导		
公开(公告)号	US20060058680A1	公开(公告)日	2006-03-16
申请号	US11/213033	申请日	2005-08-25
[标]申请(专利权)人(译)	所罗门史蒂芬		
申请(专利权)人(译)	所罗门史蒂芬		
当前申请(专利权)人(译)	所罗门史蒂芬		
[标]发明人	SOLOMON STEPHEN		
发明人	SOLOMON, STEPHEN		
IPC分类号	A61B8/14		
CPC分类号	A61B8/0833 A61B8/12 A61B8/0841		
优先权	60/604286 2004-08-25 US		
外部链接	Espacenet USPTO		

摘要(译)

提供了一种用于腹腔镜超声探头的引导装置。引导装置包括适于装配在超声探头的至少一部分上的护套，以及连接到护套的引导件，用于引导插入其中的医疗工具以将医疗工具定位在通过其获得的超声图像的平面中。超声探头。