



US009510734B2

(12) **United States Patent**
Cooper et al.

(10) **Patent No.:** **US 9,510,734 B2**

(45) **Date of Patent:** **Dec. 6, 2016**

(54) **SIDE LOOKING MINIMALLY INVASIVE SURGERY INSTRUMENT ASSEMBLY**

A61B 1/00193 (2013.01); *A61B 1/018* (2013.01); *A61B 1/04* (2013.01);

(Continued)

(71) Applicant: **Intuitive Surgical Operations, Inc.**, Sunnyvale, CA (US)

(58) **Field of Classification Search**

USPC 600/104, 106, 107, 114, 139, 141, 142, 600/144, 166, 170, 171, 174; 606/205-209, 606/1, 139-150; 227/175.1-182.1

See application file for complete search history.

(72) Inventors: **Thomas G. Cooper**, Menlo Park, CA (US); **David J. Rosa**, San Jose, CA (US); **David Q. Larkin**, Menlo Park, CA (US); **Matthew R. Williams**, Walnut Creek, CA (US); **Eugene F. Duval**, Menlo Park, CA (US)

(56) **References Cited**

U.S. PATENT DOCUMENTS

(73) Assignee: **Intuitive Surgical Operations, Inc.**, Sunnyvale, CA (US)

3,557,780 A 1/1971 Sato
4,401,123 A 8/1983 Baba

(Continued)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 290 days.

FOREIGN PATENT DOCUMENTS

(21) Appl. No.: **14/173,681**

JP S57190549 A 11/1982
JP S6483238 A 3/1989
JP 2000166936 A 6/2000

(22) Filed: **Feb. 5, 2014**

OTHER PUBLICATIONS

(65) **Prior Publication Data**

US 2014/0206936 A1 Jul. 24, 2014

Advisory Action mailed Oct. 21, 2010 for U.S. Appl. No. 11/762,132, filed Jun. 13, 2007.

(Continued)

Related U.S. Application Data

Primary Examiner — Ryan Henderson

(62) Division of application No. 13/248,930, filed on Sep. 29, 2011, now Pat. No. 8,672,833, which is a division of application No. 11/762,132, filed on Jun. 13, 2007, now Pat. No. 8,083,667.

(Continued)

(57) **ABSTRACT**

Two surgical instruments are inserted through a guide tube. The surgical instruments exit at an intermediate position of the guide tube and are oriented to be substantially parallel to the guide tube's longitudinal axis as they exit. A stereoscopic image capture component is on the guide tube between the intermediate position and the guide tube's distal end. The image capture component's field of view is generally perpendicular to the guide tube's longitudinal axis. The surgical instruments and the guide tube are telemanipulatively controlled.

(51) **Int. Cl.**

A61B 1/00 (2006.01)

A61B 1/04 (2006.01)

(Continued)

10 Claims, 37 Drawing Sheets

(52) **U.S. Cl.**

CPC *A61B 1/00149* (2013.01); *A61B 1/002* (2013.01); *A61B 1/00087* (2013.01); *A61B 1/00154* (2013.01); *A61B 1/00165* (2013.01);

