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

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- (54) **PLATFORM LINK WRIST MECHANISM**
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- (\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 755 days.

(58) **Field of Classification Search** ..... 606/1, 606/39, 51, 53, 120, 151, 190, 205, 210, 606/237; 623/24  
See application file for complete search history.

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(65) **Prior Publication Data**  
US 2007/0156119 A1 Jul. 5, 2007

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**Related U.S. Application Data**

*Primary Examiner*—Henry M Johnson, III  
*Assistant Examiner*—Jeffrey B Lipitz

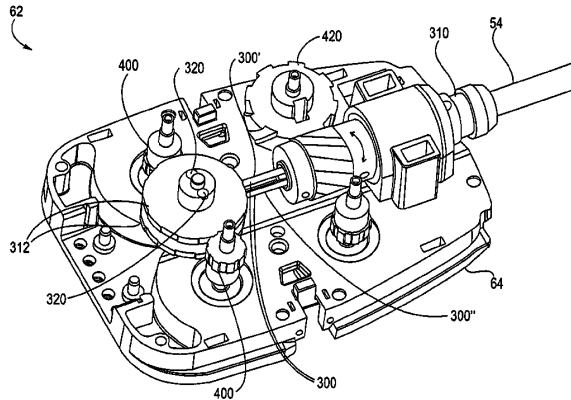
- (63) Continuation of application No. 10/758,050, filed on Jan. 14, 2004, now Pat. No. 7,066,926, which is a continuation of application No. 10/186,176, filed on Jun. 28, 2002, now Pat. No. 6,699,235.
- (60) Provisional application No. 60/301,967, filed on Jun. 29, 2001, provisional application No. 60/327,702, filed on Oct. 5, 2001.

(57) **ABSTRACT**

The present invention provides a robotic surgical tool for use in a robotic surgical system to perform a surgical operation. The robotic surgical tool includes a wrist mechanism disposed near the distal end of a shaft which connects with an end effector. The wrist mechanism includes a distal member configured to support the end effector, and a plurality of rods extending generally along an axial direction within the shaft and movable generally along this axial direction to adjust the orientation of the distal member with respect to the shaft. Advancement or retraction of a first rod generally along the axial direction tips the base through a first angle. The addition of a second angle allows the distal member to direct the end effector in essentially a compound angle. The robotic surgical tool may also include provisions for roll movement.

- (51) **Int. Cl.**  
*G05G 11/00* (2006.01)  
*G05G 9/00* (2006.01)  
*B25J 9/06* (2006.01)  
*B25J 11/00* (2006.01)  
*A61B 17/28* (2006.01)  
*A61B 19/00* (2006.01)  
*A61B 17/00* (2006.01)
- (52) **U.S. Cl.** ..... **606/1**; 74/490.06; 74/490.01; 606/914; 606/206; 606/139; 606/130; 606/142; 606/205

**14 Claims, 24 Drawing Sheets**



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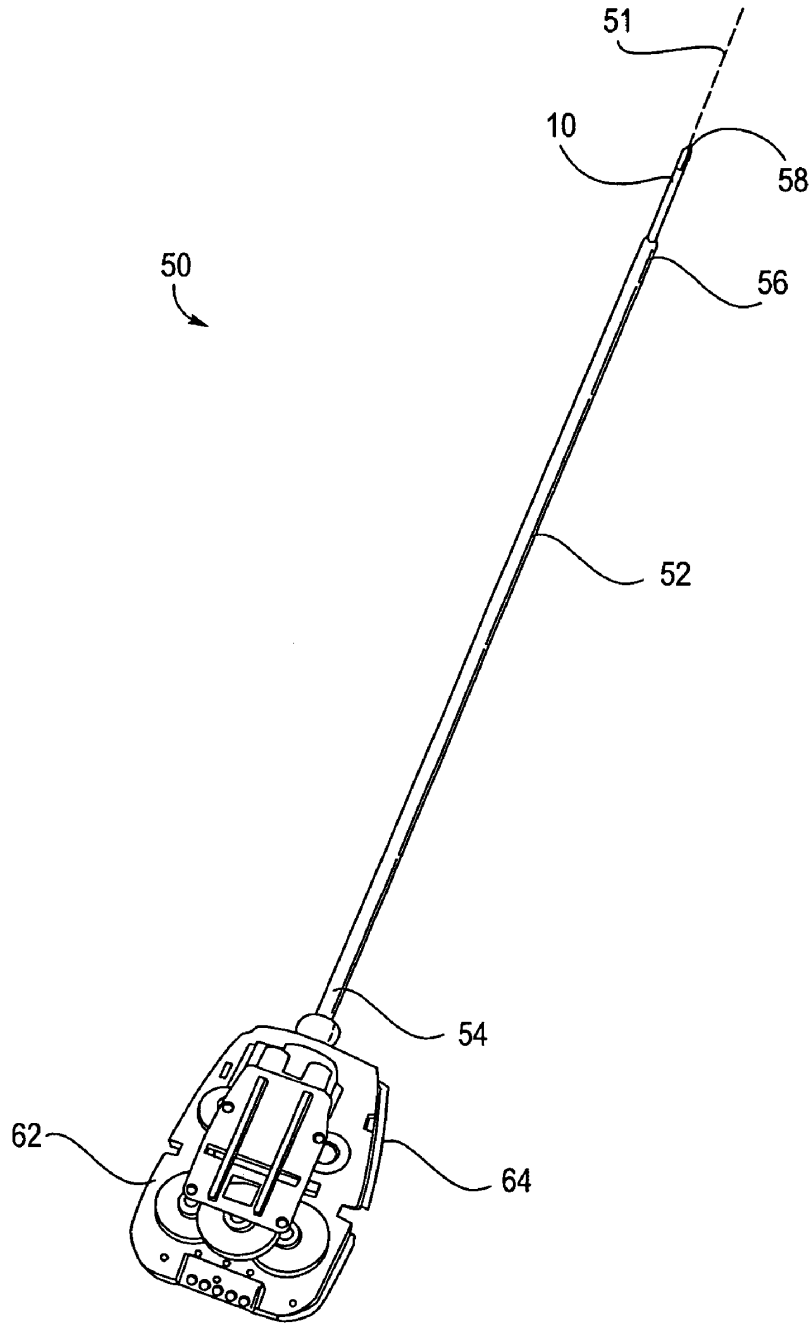


Fig. 1

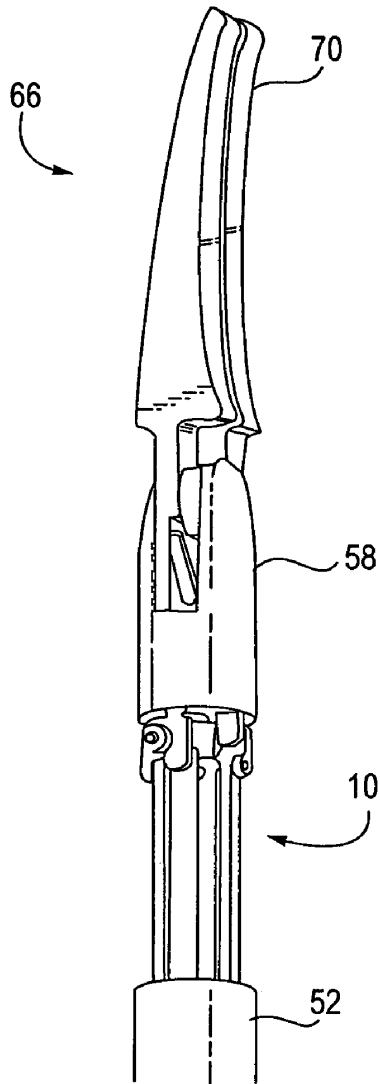


Fig. 2A

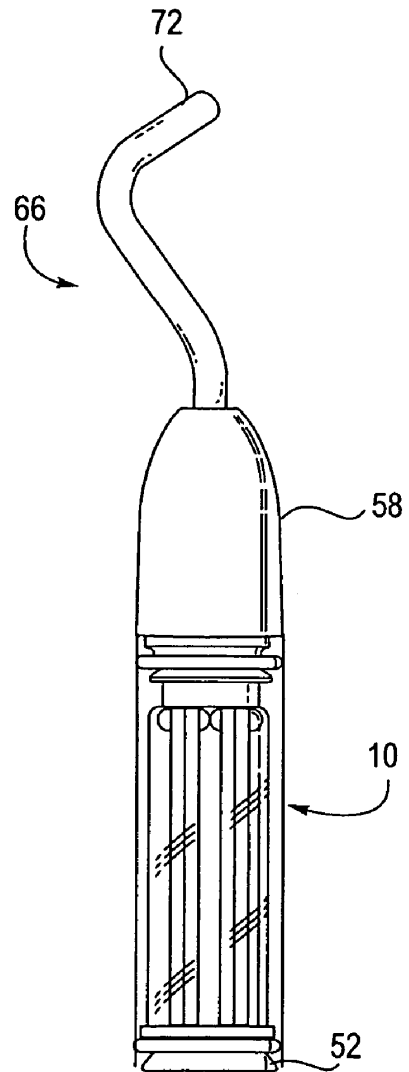


Fig. 2B

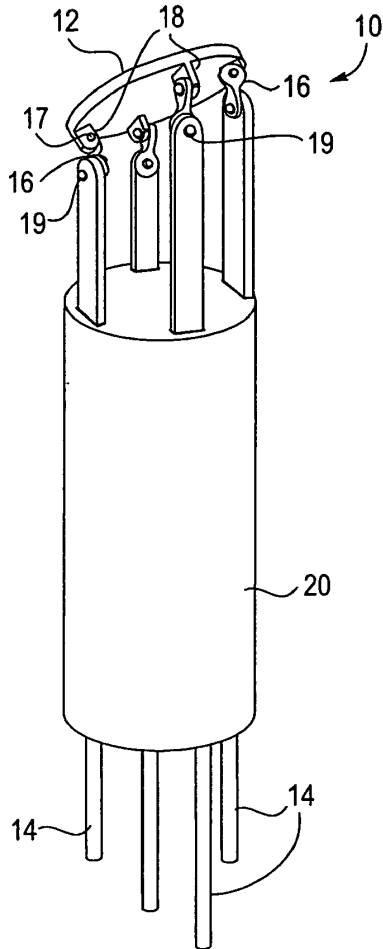


Fig. 3

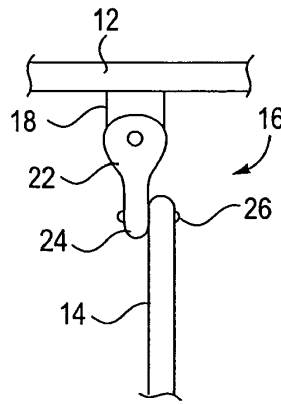


Fig. 3C

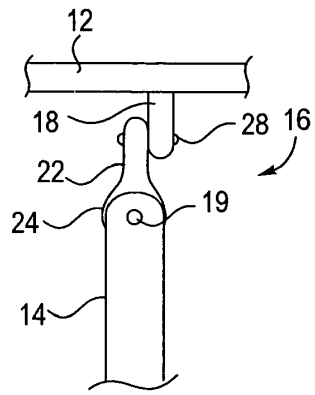


Fig. 3D

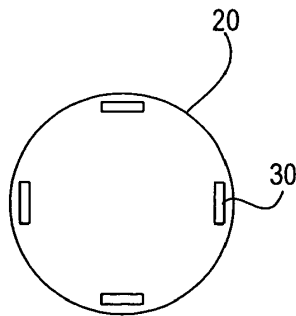


Fig. 3A

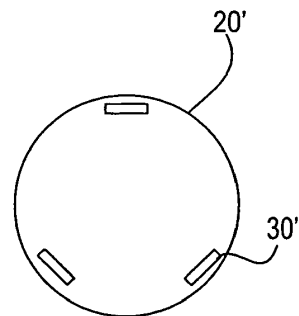


Fig. 3B

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