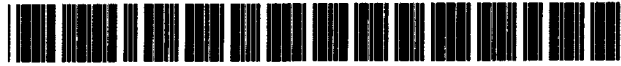


Exhibit 29



US005789878A

United States Patent [19]

Kroeker et al.

[11] Patent Number: **5,789,878**

[45] Date of Patent: **Aug. 4, 1998**

[54] **DUAL PLANE ROBOT**

[75] Inventors: **Tony Kroeker**, Georgetown; **Ben Mooring**, Austin, both of Tex.

[73] Assignee: **Applied Materials, Inc.**, Santa Clara, Calif.

[21] Appl. No.: **679,868**

[22] Filed: **Jul. 15, 1996**

[51] Int. Cl.⁶ **B25J 18/00**; B65G 49/07

[52] U.S. Cl. **318/45**; 901/14; 901/23; 464/29; 74/490.03; 318/625

[58] **Field of Search** 318/15, 45, 568.11, 318/625; 901/14, 15, 23, 24, 25; 464/29; 74/490.01, 490.03, 490.05; 414/222, 225, 744.1, 744.4, 744.5, 744.6, 749, 750, 751, 917

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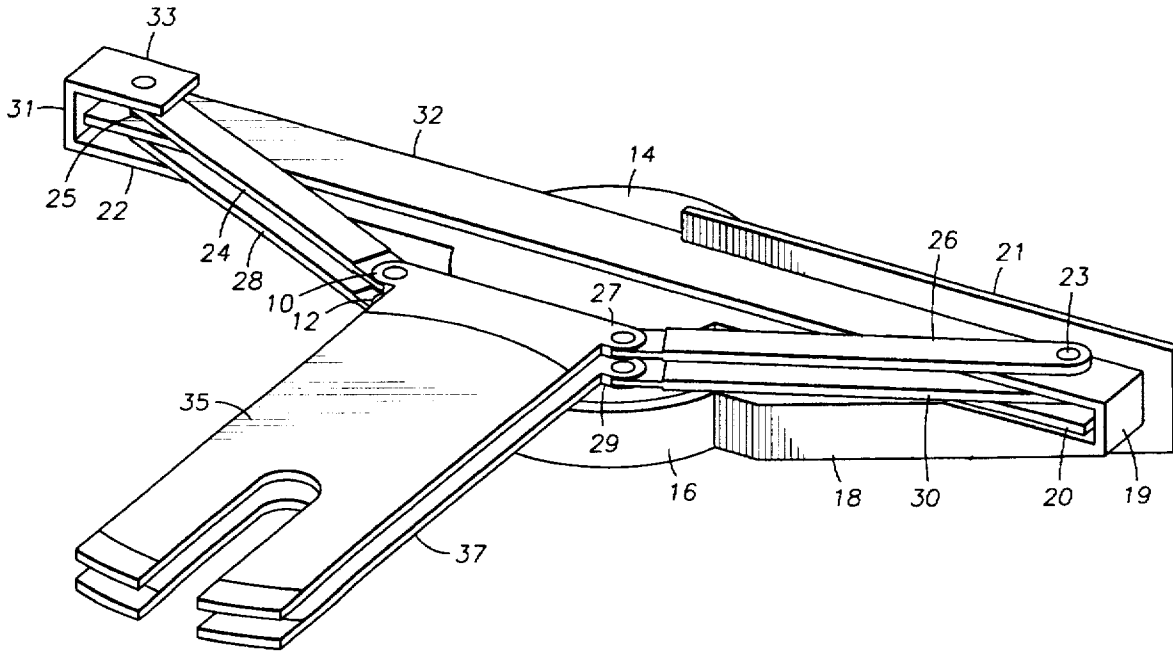
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Primary Examiner—Bentsu Ro
Attorney, Agent, or Firm—Patterson & Streets, L.L.P.

[57] **ABSTRACT**

The present invention provides a robot assembly for transferring objects, namely substrates, through a process system. A robot linkage is provided to a multi-plane, multi-arm robot assembly driven by two motors. In one embodiment, a linkage is provided which is driven by two magnetic retaining rings. In another embodiment, a linkage is provided which is driven by three magnetic retaining rings, two of which are coupled to the same motor. Both embodiments enable a substrate shuttle operation to be performed wherein a pair of substrates can be shuttled into and out of a selected chamber without having the robot assembly rotate in the transfer and by actuation of only two motors.

45 Claims, 9 Drawing Sheets



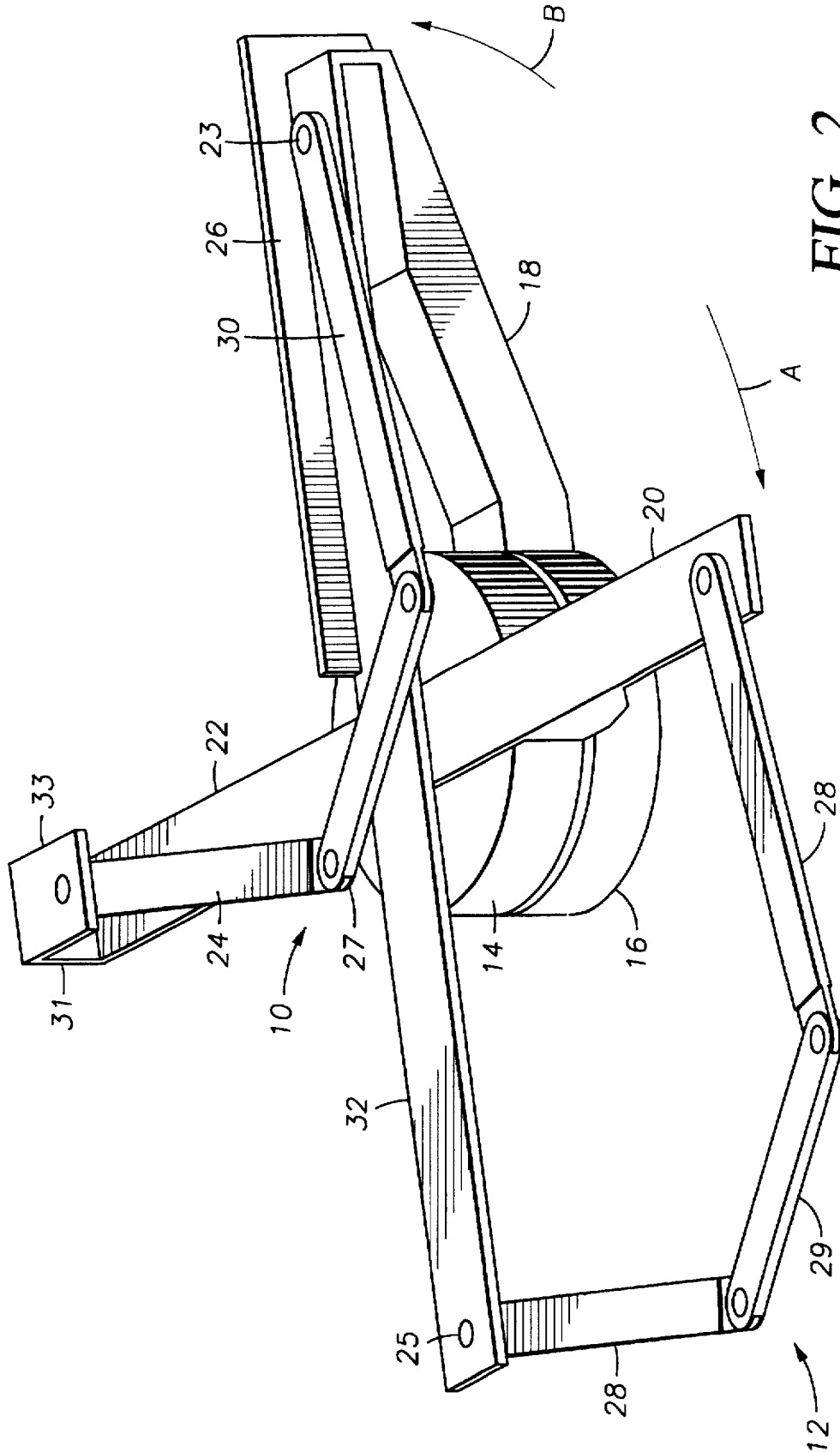


FIG. 2

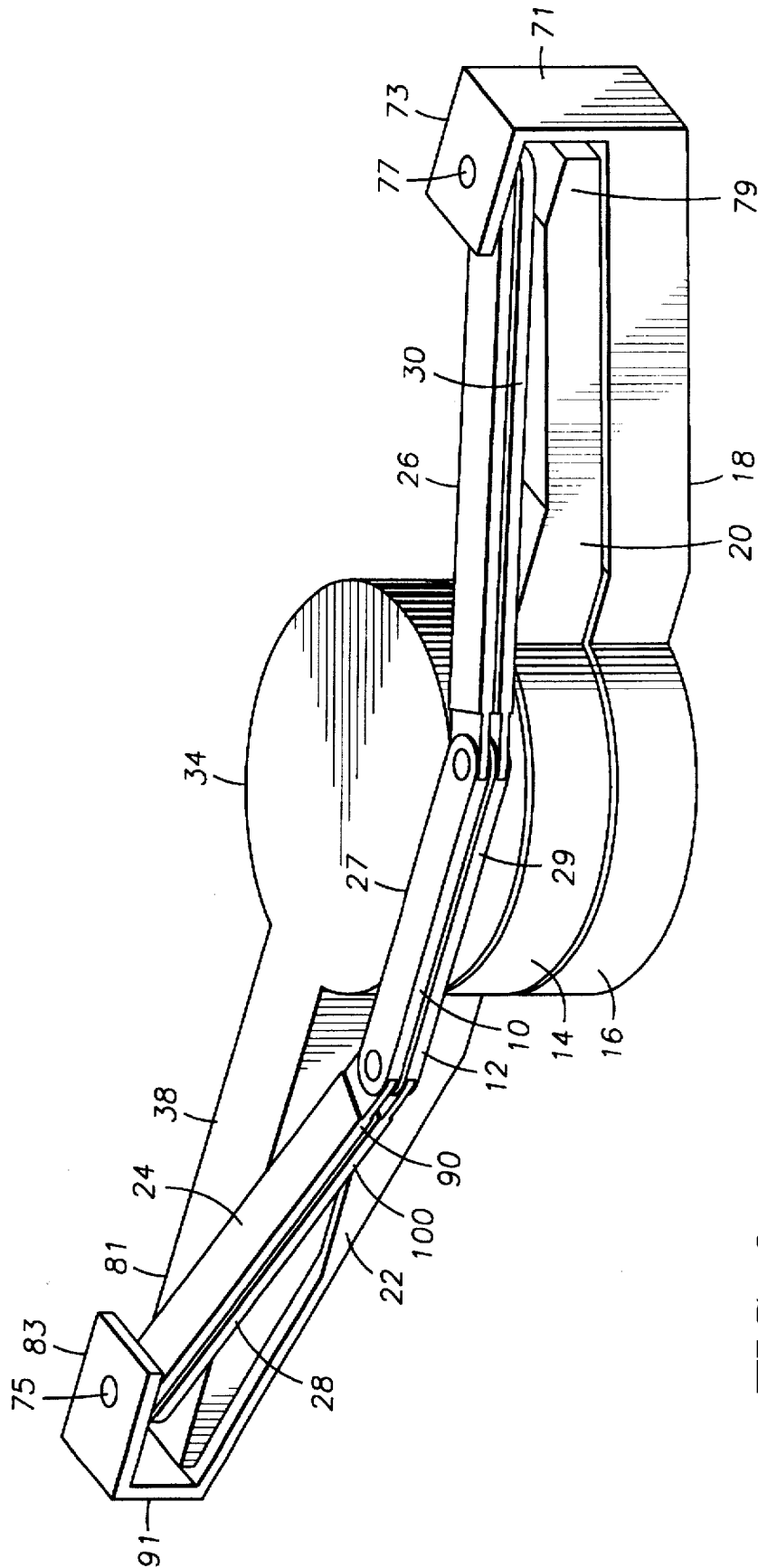


FIG. 3

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