



US006047610A

# United States Patent [19]

Stocco et al.

[11] Patent Number: **6,047,610**

[45] Date of Patent: **Apr. 11, 2000**

[54] **HYBRID SERIAL/PARALLEL MANIPULATOR**

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### [57] ABSTRACT

A six degree of freedom structure forming a robotic manipulator, consisting of two five-bar linkages (30 and 80) set on rotatable base linkages (18 and 58); the output points (44 and 94) of the five-bar linkages (30 and 80) are attached to a rigid payload platform (48) by universal joints (46 and 96), respectively. Each linkage (30 and 80) on its rotatable base can position its output point in three degrees of freedom, but since the two five-bar linkages (30 and 80) are tied together at the platform (48), five degree of freedom motion of the platform (48) results—three degrees of freedom in translation, and two of rotation. A seventh motor (100), mounted for example on one of the five bar linkages, provides power to rotate the platform about the axis defined by the two universal joints (46 and 96). The rotational torque is coupled through one of the universal joints (46 or 96).

**2 Claims, 19 Drawing Sheets**

[21] Appl. No.: **08/844,457**

[22] Filed: **Apr. 18, 1997**

[51] Int. Cl.<sup>7</sup> ..... **G05G 11/00**

[52] U.S. Cl. .... **74/479.01; 74/490.03; 901/23**

[58] Field of Search ..... 74/479.01, 490.01, 74/490.03, 490.05, 490.07; 901/16, 23

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