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(54) **THREE-DEGREE-OF-FREEDOM PARALLEL PLANAR MANIPULATOR**

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(52) **U.S. Cl.** ..... **74/490.05**; 74/490.01; 901/15

(58) **Field of Search** ..... 74/490.01, 490.03, 74/490.05; 414/728; 901/2, 14, 15, 23

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(57) **ABSTRACT**

A pair of five-bar mechanisms having their pivotal axes parallel are each mounted at one end to a base and are interconnected at their other ends by a crankshaft to obtain a manipulator generating three degrees of freedom planar motion of an end-effector. Redundant actuation may be used to generate an unlimited rotation range and an extensible link in the crankshaft may be used to provide adjustable torque capabilities during operation.

**17 Claims, 13 Drawing Sheets**

