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*J. Todd Pichini*

Acting Commissioner of Patents and Trademarks

*Margaret V. Turner*

Attest



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**United States Patent** [19]  
**Jen et al.**

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[54] **MULTI-FUNCTIONAL TEST MACHINE**

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[58] Field of Search ..... **73/856, 857, 859, 73/860, 796, 853**

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[57] **ABSTRACT**

A multi-functional test machine is provided. The machine includes a frame with a pair of upright columns parallel extended upward from a foundation, an upper crosshead system slidably engaged on the columns and actuated by a pair of hydraulic jacks butting the columns, a ball bearing suspending from a hollow sphere casing in the upper cross-head system to connect with an upper specimen grip and fastened by a plurality of hydraulic buckles, a lower cross-head system fixed to a lower part of the columns including a rotatable hydraulic cylinder and a linear hydraulic cylinder disposed in alignment in the system to rotatably or slidably actuate a actuator shaft to which a lower specimen grip is engaged so that the test machine is capable of self-alignment and carrying out both torsion and tension-compression test for a specimen, this disclosure further includes a series of detective apparatus such as stress sensors, rotatable and linear displacement detectors which send the tension and displacement information of the specimen grips to a computer and automatically make stress compensations to the upper specimen grip.

**14 Claims, 6 Drawing Sheets**

