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Avitan

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(54) **LOAD SENSING SYSTEM**

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(*) Notice: Under 35 U.S.C. 154(b), the term of this patent shall be extended for 0 days.

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Related U.S. Application Data

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(51) **Int. Cl.**[7] **G01L 1/26**
(52) **U.S. Cl.** **73/862.392**
(58) **Field of Search** 73/862.381, 862.49, 73/862.392, 818, 826

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,774,437	*	12/1956	Remde	180/282
3,824,578	*	7/1974	Harders	212/277
3,841,493	*	10/1974	Jackson et al.	212/278
3,993,166	*	11/1976	Senour	187/223
4,206,829	*	6/1980	Medocik	414/631
4,221,530	*	9/1980	Williams et al.	180/285
4,231,450	*	11/1980	Hedtke et al.	180/282
4,895,262	*	1/1990	Maso	212/277
5,105,896	*	4/1992	Kyrtsos	177/139
5,224,815	*	7/1993	Abels et al.	414/635
5,409,346	*	4/1995	Grether	180/282
5,538,364	*	7/1996	Huntsman	405/288
6,050,770	*	4/2000	Avitan	414/636

FOREIGN PATENT DOCUMENTS

1258081	*	12/1971	(GB)	414/636
2097959	*	11/1982	(GB)	414/636

* cited by examiner

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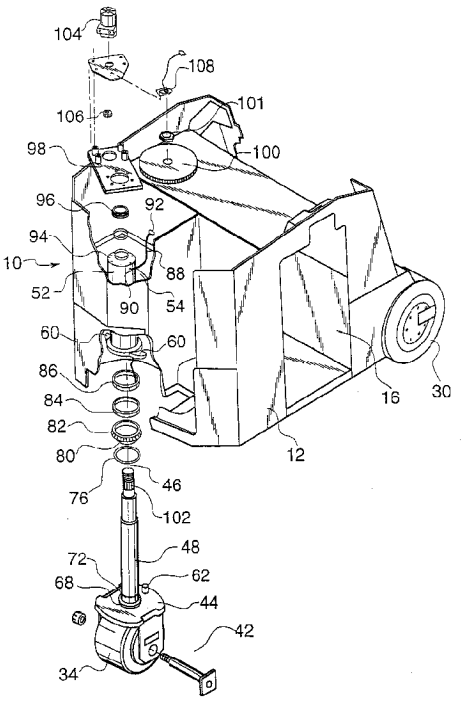
(57) **ABSTRACT**

A processor implemented stabilization system for load handling equipment monitors at least a portion of the equipment weight load at an equipment support member. Reduction below or increase above predetermined values signals an approaching tip over condition and triggers alarm condition responses for stabilization of the equipment. In a counterbalanced lift truck, the equipment weight load on a rear steer wheel is carried by an outer bearing race of a spindle and is transferred from the race to a load cell which is positioned between the race and a shoulder of a mounting tube. The load cell output is received at a processor which monitors the cell to determine if there is an approaching longitudinal tip over condition (toward or away from the load) as well as a lateral tip over condition. Upon sensing an approaching tip over condition, the processor implements one or more corrective measures such as actuation of an annunciator, preventing an increase in vehicle speed, preventing elevation of the load, preventing mast tilt, etc.

18 Claims, 7 Drawing Sheets