

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
3 March 2005 (03.03.2005)

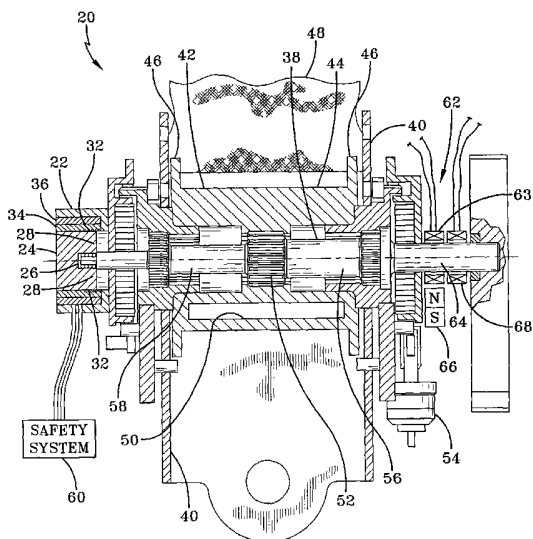
PCT

(10) International Publication Number  
WO 2005/018991 A3

- (51) International Patent Classification<sup>7</sup>: **B60R 22/28**, B65H 75/48
- (21) International Application Number: PCT/US2004/019193
- (22) International Filing Date: 14 June 2004 (14.06.2004)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
10/643,865 20 August 2003 (20.08.2003) US
- (71) Applicant (for all designated States except US): **KEY SAFETY SYSTEMS, INC** [US/US]; 7000 Nineteen Mile Road, Sterling Heights, MI 48314 (US).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **CLANCY III, Edward, W.** [US/US]; 1405 Roc Drive, Commerce Township, MI 48390 (US). **KELLER, Gerald, J.** [US/US]; 52137 Blue Bell, Shelby Township, MI 48316 (US). **BLACKBURN, Brian** [US/US]; 124 Glendale, Rochester, MI 48307 (US).
- (74) Agents: **DRAYER, Lonnie, R.** et al.; Key Safety Systems, Inc., 5300 Allen K. Breed Highway, Lakeland, FL 33811-1130 (US).
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:  
— with international search report

[Continued on next page]

(54) Title: SEAT BELT RETRACTOR TORSION ROD ACTIVITY SENSOR



(57) Abstract: A seat belt load limiter employs a magnetostrictive sensor (22) to detect the elastic loading and plastic deformation of a torsion rod (38) forming part of a seat belt retractor (20). A magnet (24, 66) and a coil (32, 63) are placed about or adjacent to the torsion rod (38). When the torsion rod (38) undergoes elastic or plastic strain, an electrical voltage is induced in the coil that is used to detect elastic or plastic strain of the torsion rod (38). A vehicle safety system (60) uses the output of the magnetostrictive sensor (22) to inform the vehicle operator when the seat belt load limiter is in need of replacement. The output of the magnetostrictive sensor (22) as processed by the vehicle safety system (60) can also be used to detect a situation where the seat occupant is not restrained by the seat belt (48) and to make an airbag deployment decision.

WO 2005/018991 A3



---

**(88) Date of publication of the international search report:**

23 June 2005

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/019193

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(7) : B60R 22/28; B65H 75/48  
 US CL : 280/803, 805, 806, 807; 242/379.1, 384.4

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
 U.S. : 280/803, 805, 806, 807; 242/379.1, 384.4

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
 None

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
 East

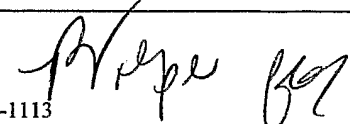
**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,739,757 (Gioutsos) 14 April 1998 (14.04.1998), see entire document.	1-7
A	US 6,343,759 B1 (Specht) 5 February 2002 (05.02.2002), see entire document.	1-7
A	US 5,779,178 (McCarty) 14 July 1998 (14.07.1998). See entire document.	1-7

Further documents are listed in the continuation of Box C.       See patent family annex.

* Special categories of cited documents:	Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier application or patent published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search: 08 March 2005 (08.03.2005)  
 Date of mailing of the international search report: 07 APR 2005

Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703) 305-3230	Authorized officer Paul Dickson Telephone No. (703) 305-1113 <div style="text-align: right; margin-top: 10px;">  </div>
---	--