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[Continued on next page]

(54) Title: SYSTEMS AND METHODS THAT USE MAGNETIC FIELD SENSORS TO IDENTIFY POSITIONS OF A GEAR
SHIFT LEVER

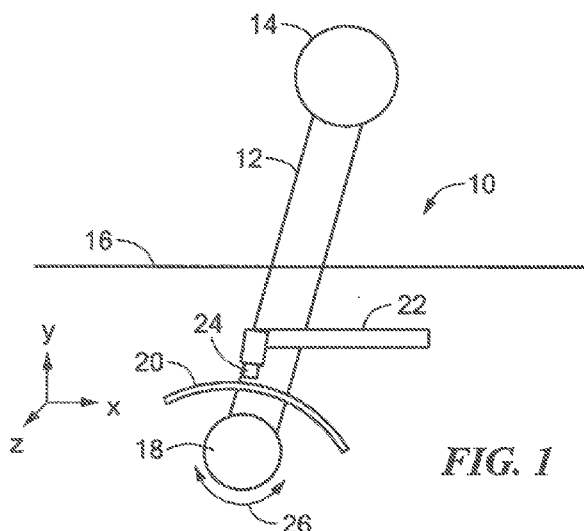


FIG. 1

(57) Abstract: A system and an associated method provide an ability to sense, with a magnetic field sensor, a position of a plurality of gears (and neutral) selected by a gear shift lever of a vehicle. In some embodiments, the system and method use a ferromagnetic target having features, positions of which can be sensed by the magnetic field sensor. In other embodiments, the system and method use a magnet having features and characteristics that can be sensed by the magnetic field sensor.



MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK,
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- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/068925

A. CLASSIFICATION OF SUBJECT MATTER
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ADD.

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)
G01D F16H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 339 325 B1 (ODA KATSUSHI [JP] ET AL) 15 January 2002 (2002-01-15)	1,33
Y	figures claims column 2, line 66 - column 3, line 50 -----	2-32, 34-50
X	US 2011/148398 A1 (YANG YUCHEN [CN] ET AL) 23 June 2011 (2011-06-23) paragraph [0041] - paragraph [0050]; figures claims -----	1,33
Y	DE 10 2007 050531 A1 (A B ELEKTRONIK GMBH [DE]) 23 April 2009 (2009-04-23) paragraphs [0044] - [0045] figure 3 ----- -/-	2-13, 34-39



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"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)

"O" document referring to an oral disclosure, use, exhibition or other means

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"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

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Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No.
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Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☒ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/068925

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2005/258820 A1 (FORSTER BERNHARD [AT]) 24 November 2005 (2005-11-24) paragraphs [0069] - [0070] -----	14-21,40
X	EP 1 450 136 A2 (DELPHI TECH INC [US]) 25 August 2004 (2004-08-25) figures claims -----	1,33
A	WO 2008/145662 A1 (ECOLE POLYTECH [CH]; POPOVIC RADIVOJE [CH]; KEJIK PAVEL [CH]; REYMOND) 4 December 2008 (2008-12-04) cited in the application the whole document -----	1-21, 33-40
Y	US 2005/126322 A1 (KOZAKI TETSUJI [JP] ET AL) 16 June 2005 (2005-06-16) paragraphs [0078] - [0087] figures claims -----	22-32, 41-50
A	FR 2 954 824 A1 (CONTINENTAL AUTOMOTIVE FRANCE [FR]; CONTINENTAL AUTOMOTIVE GMBH [DE]) 1 July 2011 (2011-07-01) page 3, line 7 - line 24 figure 3 abstract -----	22-32, 41-50

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2012/068925

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6339325	B1	15-01-2002	DE 69918935 D1 02-09-2004
			DE 69918935 T2 16-12-2004
			EP 1013972 A1 28-06-2000
			JP 2000179681 A 27-06-2000
			US 6339325 B1 15-01-2002
US 2011148398	A1	23-06-2011	CN 102102995 A 22-06-2011
			DE 102010063768 A1 30-06-2011
			JP 2011144925 A 28-07-2011
			US 2011148398 A1 23-06-2011
DE 102007050531	A1	23-04-2009	DE 102007050531 A1 23-04-2009
			EP 2210018 A1 28-07-2010
			WO 2009052976 A1 30-04-2009
US 2005258820	A1	24-11-2005	DE 102004017191 A1 27-10-2005
			US 2005258820 A1 24-11-2005
EP 1450136	A2	25-08-2004	EP 1450136 A2 25-08-2004
			US 2004164731 A1 26-08-2004
WO 2008145662	A1	04-12-2008	CN 101688902 A 31-03-2010
			EP 2000813 A1 10-12-2008
			EP 2153241 A1 17-02-2010
			JP 5187781 B2 24-04-2013
			JP 2010528305 A 19-08-2010
			US 2010164491 A1 01-07-2010
			WO 2008145662 A1 04-12-2008
US 2005126322	A1	16-06-2005	CN 1626853 A 15-06-2005
			US 2005126322 A1 16-06-2005
			US 2008276738 A1 13-11-2008
FR 2954824	A1	01-07-2011	CN 102686979 A 19-09-2012
			FR 2954823 A1 01-07-2011
			FR 2954824 A1 01-07-2011
			US 2013024156 A1 24-01-2013
			WO 2011079939 A2 07-07-2011

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-21, 33-40

A system for identifying a position of a gear shift lever
having a specific target and a magnetic field sensor

2. claims: 22-32, 41-50

A system for identifying a position of a gear shift lever
having a specific electronic circuit
