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- (81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR,

KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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**Declarations under Rule 4.17:**

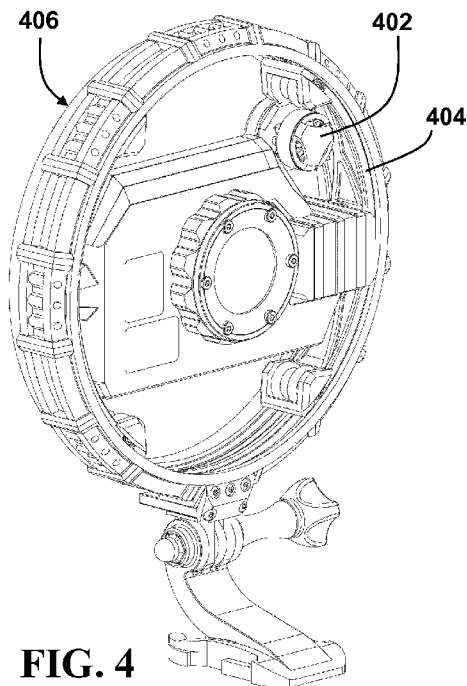
- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

**Published:**

- with international search report (Art. 21(3))

[Continued on next page]

(54) Title: TRACK AND BOGIE BASED OPTICALLY CENTERED GIMBAL



**FIG. 4**

(57) Abstract: Systems, devices, and methods for image stabilization, more particularly, a track and bogie based optically centered gimbal stabilizing assembly comprising: a ring having an inwardly disposed track (110); a first bogie (130) having an arcuate first chassis member, a first wheel assembly, and a second wheel assembly; a second bogie (120) having an arcuate second chassis member, a third wheel assembly, and a fourth wheel assembly; where the first wheel assembly, the second wheel assembly, the third wheel assembly, and the fourth wheel assembly may each ride in the track (110); and a tilt plate (170) operatively connected to the first bogie (130) and the second bogie (120) and movable therewith.



— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

**(88) Date of publication of the international search report:**  
5 February 2015

**INTERNATIONAL SEARCH REPORT**

International application No.  
PCT/US2014/042441

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC(8) - F16M 11/10 (2014.01) CPC - F16M 11/10 (2014.11) According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) IPC(8) - F16M 11/04, 11/06, 11/08, 11/10, 11/12, 11/18; G03B 17/00; G12B 9/08 (2014.01) CPC - F16M 11/04, 11/06, 11/08, 11/10, 11/12, 11/18; G03B 17/00; G12B 9/08 (2014.11)		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched USPC - 248/324; 348/373; 352/243; 396/421 (keyword delimited)		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) Orbit, Google Patents, Google Search terms used: wheel, roll, bogie, tilt, yaw, track, Brooke, ring, stab, groove, interial measurement unit, gyro, accel, stabilization		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,368,271 A (KIUNKE et al) 29 November 1994 (29.11.1994) entire document	1-14
A	US 2012/0072099 A1 (AHLSTEDT et al) 22 March 2012 (22.03.2012) entire document	1-14
A	US 2007/0127912 A1 (JONES et al) 07 June 2007 (07.06.2007) entire document	1-14
A	US 2008/0012980 A1 (YAMANE et al) 17 January 2008 (17.01.2008) entire document	1-14
A	US 2006/0071134 A1 (DENT et al) 06 April 2006 (06.04.2006) entire document	1-14
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/>		
* 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 "P" document published prior to the international filing date but later than the priority date claimed "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 "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 "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 "&" document member of the same patent family		
Date of the actual completion of the international search 28 November 2014		Date of mailing of the international search report <b>10 DEC 2014</b>
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. 571-273-3201		Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

**INTERNATIONAL SEARCH REPORT**

International application No.

PCT/US2014/042441

**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 extra 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 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.:  
1-14

**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.

CONTINUED FROM BOX NO. III:

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claims 1-14 are drawn to a stabilizing assembly.

Group II, claims 15-18 are drawn to an inertial measurement unit system.

The inventions listed as Groups I and II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical features of Group I, a first bogie having an arcuate first chassis member, a first wheel assembly, and a second wheel assembly; a second bogie having an arcuate second chassis member, a third wheel assembly, and a fourth wheel assembly, are not present in Group II; and the special technical features of Group II, an inertial measurement unit (IMU) component having a processor and memory, and wherein the processor is configured to: detect, via the IMU component, a position and a change in position of the stabilizing assembly; transmit, by the IMU component, the detected position data to a processor controller; determine, by the processor controller, a set of corrective actions in response to a received position data from the IMU component, are not present Group I.

Groups I and II share the technical features of a stabilizing assembly. However, this shared technical feature does not represent a contribution over the prior art. Specifically, US 3,818,841 A to Julien teaches of a railway car roll stabilizing bogie (Abstract) comprising a stabilizing assembly (col. 5, lines 51-63).

Since none of the special technical features of the Group I and II inventions are found in more than one of the inventions, unity of invention is lacking.