(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
23 December 2010 (23.12.2010)

PCT

(10) International Publication Number
WO 2010/148016 A3

(51) International Patent Classification:
B60K 1/04 (2006.01) *B60K 17/356* (2006.01)
B60K 17/346 (2006.01) *B60L 11/00* (2006.01)

(21) International Application Number:
PCT/US2010/038711

(22) International Filing Date:
15 June 2010 (15.06.2010)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
12/484,921 15 June 2009 (15.06.2009) US
61/187,147 15 June 2009 (15.06.2009) US

(71) Applicant *(for all designated States except US)*: **POLARIS INDUSTRIES INC.** [US/US]; 2100 Highway 55, Medina, MN 55340-9770 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **STENBERG, Kurt, E.** [US/US]; 19684 County Road 23, Greenbush, MN 56726 (US). **NOTARO, Joel, M.** [US/US]; 4903 366th Street, North Branch, MN 55056 (US). **LEONARD, Josh, J.** [US/US]; 41005 Fahrion Road, North Branch, MN 55056 (US). **CRAIN, Stephen, G.** [US/US]; 1013 Spruce Drive, Hudson, WI 54016 (US). **SABOURIN, Dennis, P.** [US/US]; 300 9th Avenue Se, Roseau, MN 56752 (US). **OLSEN, Russ, G.** [US/US]; 16655 Wild Mountain Road, Taylors Falls, MN 55084 (US). **MAKI, Richard, R.** [US/US]; 5375 Fernwood Trail, North Branch, MN 55056 (US). **MALONE, Amber, Patricia** [US/US]; 8210 Fawn Lake Drive Ne, Stacy, MN 55079 (US). **GILLINGHAM, Brian, R.** [US/US]; 2195 85th Avenue, Osceola, WI 54040 (US). **JOHNSTUN, Jeremiah, Travis** [US/US]; 909 2nd Street NE, Roseau, MN 56751 (US).

(74) Agent: **GROEN, Eric J.**; Baker & Daniels LLP, 300 North Meridian Street, Suite 2700, Indianapolis, Indiana 46204 (US).

(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, 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, IS, JP, KE, KG, KM, 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, PE, PG, PH, PL, PT, RO, RS, RU, 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.

[Continued on next page]

(54) Title: ELECTRIC VEHICLE

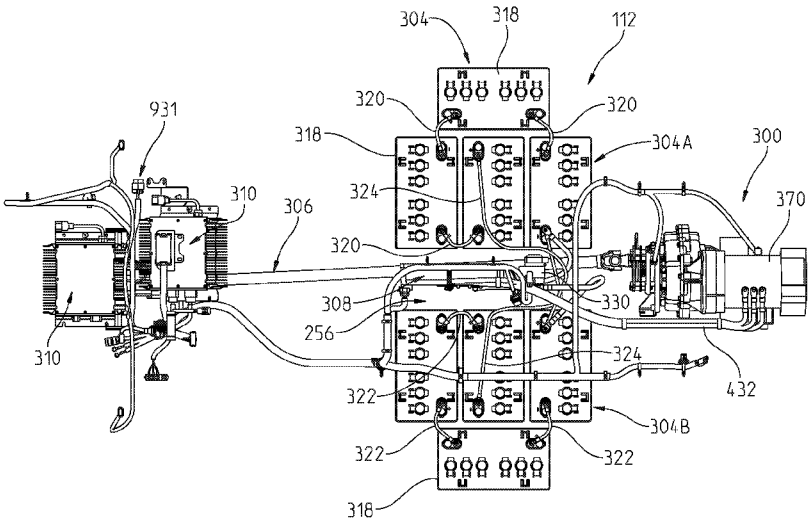

FIG. 7

(57) Abstract: A utility vehicle is disclosed having an electric drive. The drivetrain is comprised of batteries, a motor, a transaxle driven by the motor, a rear differential driven by the transaxle, and a prop shaft which is driven by the transaxle and drives a front differential The batteries are provided in two groups and are supported on the frame of the vehicle.

WO 2010/148016 A3

(84) **Designated States** *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

— *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**:
19 May 2011

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2010/038711

A. CLASSIFICATION OF SUBJECT MATTER
INV. B60K1/04 B60K17/346 B60K17/356 B60L11/00
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)
B60K B60L

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 practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 6 041 877 A (YAMADA TAKEMASA [JP] ET AL) 28 March 2000 (2000-03-28) figure 9	1-10 15-17
A	US 3 708 028 A (HAFER P) 2 January 1973 (1973-01-02) figures 2,3	1
A	US 2002/104704 A1 (CHANG HUI-LUNG [TW]) 8 August 2002 (2002-08-08) figure 4	1
X Y	US 2003/162631 A1 (WILLIAMS CAMERON P [US]) 28 August 2003 (2003-08-28) figures 1,2	11-14 15-17

-/--

[X] Further documents are listed in the continuation of Box C.

[X] 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 document 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	Date of mailing of the international search report
31 March 2011	06/04/2011

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Yildirim, Ismet

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2010/038711

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.:

11-17

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/US2010/038711

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 201 211 849 Y (JIANGLING MOTORS CO LTD [CN]) 25 March 2009 (2009-03-25) figure 1	11,12
X	US 2007/251742 A1 (ADAMS HERBERT L III [US] ET AL) 1 November 2007 (2007-11-01) figures 1,3	11,12,14
X	EP 1 205 331 A2 (NISSAN MOTOR [JP]) 15 May 2002 (2002-05-15) figure 1	11,12

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2010/038711

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6041877 A	28-03-2000	GB 2305643 A	16-04-1997
		JP 3350314 B2	25-11-2002
		JP 9095149 A	08-04-1997
US 3708028 A	02-01-1973	NONE	
US 2002104704 A1	08-08-2002	NONE	
US 2003162631 A1	28-08-2003	US 2004082433 A1	29-04-2004
CN 201211849 Y	25-03-2009	NONE	
US 2007251742 A1	01-11-2007	EP 2021200 A2	11-02-2009
		WO 2007133368 A2	22-11-2007
EP 1205331 A2	15-05-2002	DE 60113216 D1	13-10-2005
		DE 60113216 T2	23-02-2006
		US 2002087252 A1	04-07-2002

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-10

   Electric vehicle having plurality of groups of batteries, a longitudinal space therebetween, where a prop shaft is arranged.

   ---

2. claims: 11-17

   Electric vehicle having a front and a rear differential and an overrunning clutch connected with the motor.

   ---

3. claims: 18-25

   Electric vehicle having plurality of groups of batteries, groups of batteries connected in parallel and individual batteries within each group connected in series.

   ---

4. claims: 26-33

   Electric vehicle having plurality of groups of batteries, a longitudinal space therebetween, where a prop shaft is arranged and an electronic controller where all the connections to and from the controller are at one face of the controller.

   ---

5. claims: 34-38

   Electric vehicle having plurality of groups of batteries, a motor, an electronic controller and a charging unit where electrical couplings couple the batteries to controller, the controller to motor and charging unit to batteries.

   ---

6. claims: 39-49

   All wheel drive electric vehicle having frame with front and rear drive linkage, plurality of groups of batteries, an AC motor, an electronic controller and a charging unit where electrical couplings couple the batteries to controller, the controller to motor and charging unit to batteries.

   ---

7. claims: 50-65, 103-112

   (Method of powering an accessory coupled to) an electric vehicle having plurality of groups of batteries, an accessory battery, first and second DC-DC converter having different output voltages, wherein the accessory battery is

coupled to one of the first or second converter according to the movement of the vehicle.

---

8. claims: 66-74

Electric vehicle comprising a battery supply and a plurality of chargers coupled to the supply, plurality of charges being coupled in parallel.

---

9. claims: 78-85

(Method of charging a battery supply of) an electric vehicle comprising a battery supply and a plurality of chargers coupled to the supply, wherein the supply is charged by one of the chargers depending on the power source.

---

10. claims: 86-102, 113-118

Method of selecting a wheel drive mode of an electric vehicle with ground engaging members and wheel drive modes, one of the modes powers a first number of ground engaging members and upon a loss of traction a second number of ground engaging members, the second number being greater than the first number.

---

11. claims: 119, 120

Method of adjusting of a drive current of an electric vehicle to adjust the desired speed, where the drive current is increased until the desired speed is reached or the drive motor is paused.
