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(72) Inventors and


(54) Title: ALL TERRAIN VEHICLE

(57) Abstract: An all-terrain vehicle (10) including a frame having longitudinally spaced ends defining a first longitudinal axis, and an engine supported by the frame. The engine includes a crankshaft defining a second longitudinal axis substantially parallel to the first longitudinal axis.
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— with international search report
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

Date of publication of the international search report: 22 January 2009
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

INV. B62J25/00 B62K5/00 B60G3/20 B60K5/02 F16H37/08
F16H57/04 B62D7/18

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)
B62K B60K B62J B60G F16H B62D

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, 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 5 699 872 A (MIYAKAWA FUTOSHI [JP] ET AL) 23 December 1997 (1997-12-23) column 3, line 56 - column 8, line 27; figures 1-17 1-8

X JP 59 122727 A (HONDA MOTOR CO LTD) 16 July 1984 (1984-07-16) abstract; figures 1-10 1-8


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 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 as an inventive step when the document is taken alone

**Y** document of particular relevance; the claimed invention cannot be considered as an inventive step when the document is taken alone

**Z** document member of the same patent family

Date of the actual completion of the international search
12 November 2008

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25/11/2008

Name and mailing address of the ISA
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Authorized officer
Flori, Massimiliano
<table>
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<td>X</td>
<td>US 6 270 106 B1 (MAKI RICHARD R [US] ET AL) 7 August 2001 (2001-08-07) column 3, line 18 - column 5, line 3; figures 1-7</td>
<td>29-33</td>
</tr>
<tr>
<td>X</td>
<td>WO 2006/110687 A (BOMBARDIER RECREATIONAL PROD [CA]; BRP US INC [US]; MALTAIS HUGUES [CA]) 19 October 2006 (2006-10-19) paragraphs [0037] - [0055]; figure 1</td>
<td>29-33</td>
</tr>
</tbody>
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INTERNATIONAL SEARCH REPORT

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 fee, 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.:

       1–8, 29–65

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

1. claims: 1-8

An all-terrain vehicle comprising a frame including longitudinally spaced-apart ends defining a first longitudinal axis, a pair of front wheels operably coupled to the frame, a pair of rear wheels operably coupled to the frame, an engine supported by the frame, the engine including at least one cylinder and a crankshaft driven by the cylinder, the crankshaft defining a second longitudinal axis, the second longitudinal axis being substantially parallel to the first longitudinal axis wherein the engine includes a cross-sectional profile configured to be received within a trapezoidal perimeter of an approximate shape and size a rider of the ATV may straddle and be comfortably seated on seat.

2. claims: 9-23

An all-terrain vehicle including a frame including longitudinally spaced-apart ends defining a first longitudinal axis, a plurality of wheels operably coupled to the frame, an engine supported by the frame, the engine including at least one cylinder and a crankshaft driven by the at least one cylinder, and a transmission operably coupled to the engine and configured to transmit power to a transmission shaft for driving the wheels in motion, wherein the transmission includes a starting clutch operably coupled to, and positioned in spaced relation to, the engine. An all-terrain vehicle including a frame including longitudinally spaced-apart ends defining a first longitudinal axis, a plurality of wheels operably coupled to the frame, an engine supported by the frame, the engine including at least one cylinder, a crankshaft driven by the at least one cylinder, and an exhaust conduit, and a transmission operably coupled to the engine, wherein the transmission including a plurality of vanes configured to force cooling air through the housing and across the exhaust conduit.

3. claims: 24-28

An all-terrain vehicle including a frame including longitudinally spaced-apart ends defining a first longitudinal axis, a plurality of wheels operably coupled to the frame, an engine supported by the frame and operably coupled to the wheels, wherein the frame includes an upper frame member having a removable member configured to provide access to the engine.
4. claims: 29–33

An all-terrain vehicle including a frame including longitudinally spaced-apart ends defining a longitudinal axis, a straddle-type seat operably coupled to the frame, a pair of front wheels operably coupled to the frame, a pair of rear wheels operably coupled to the frame, a handlebar assembly operably coupled to at least one of the wheels for steering the vehicle, an engine supported by the frame and operably coupled to at least one of the wheels for propelling the vehicle, a pair of footwells laterally positioned on opposite sides of the seat, wherein the footwells include laterally spaced-apart inner and outer edges, where the ratio of the distance between inner edges of the footwells and the distance between the outer edges of the footwells is less than about 0.64.

5. claims: 34–65
An ATV vehicle including a frame, a pair of front wheels, a pair of rear wheels, an engine, a front suspension including right and left lower control arms, each lower control arm having an inner pivot coupling operably coupled to the frame and an outer pivot coupling operably coupled to one of the front wheels, each lower control arm having a control arm length between the inner pivot coupling and the outer pivot coupling, wherein the sum of the control arm lengths of the right and left lower control arms define a combined control arm length, wherein the ratio of the combined control arm length to the front track width is at least about 0.84.

An ATV vehicle including a frame, a plurality of laterally spaced wheels, an engine, a suspension including right and left lower control arms, each lower control arm having an inner pivot coupling operably coupled to the frame and an outer pivot coupling operably coupled to one of the wheels, each lower control arm having a control arm length between the inner pivot coupling and the outer pivot coupling wherein each lower control arm is angled from horizontal by less than about 30 degrees and has a control arm length greater than about 423 millimeters.

An ATV vehicle comprising a frame, a straddle-type seat, a pair of front wheels, a pair of rear wheels, an engine, a front suspension including a pair of upper and lower pivot couplings operably coupled to each front wheel, the upper and lower pivot couplings defining a king pin axis about which the front wheel may be rotated for steering the vehicle, wherein the king pin axis of each front wheel is offset from the front wheel axis, as measured along the rotational axis, by less than 30 millimeters.

An ATV vehicle comprising a frame, a straddle-type seat, a pair of laterally spaced front wheels, an inflatable tire, a handlebar assembly, an engine, each front wheel being operably coupled to the frame by an upper pivot coupling and a lower pivot coupling, the upper and lower pivot couplings defining a king pin axis about which the front wheel may be rotated for steering the vehicle, wherein the pivot couplings are laterally received within the wheel, in a direction from the vehicle longitudinal axis, by at least 48 millimeters.
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<th>Patent family member(s)</th>
<th>Publication date</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>JP 3366115 B2</td>
<td>14-01-2003</td>
</tr>
<tr>
<td></td>
<td></td>
<td>JP 8025979 A</td>
<td>30-01-1996</td>
</tr>
<tr>
<td></td>
<td></td>
<td>JP 63046250 B</td>
<td>14-09-1988</td>
</tr>
<tr>
<td>US 6016943 A</td>
<td>25-01-2000</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td>US 6270106 B1</td>
<td>07-08-2001</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td>WO 2006110687 A</td>
<td>19-10-2006</td>
<td>CN 101155723 A</td>
<td>02-04-2008</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 2008217081 A1</td>
<td>11-09-2008</td>
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<tr>
<td></td>
<td></td>
<td>US 2007295546 A1</td>
<td>27-12-2007</td>
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<tr>
<td>US 2006066623 A1</td>
<td>12-01-2006</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td>US 6547027 B1</td>
<td>15-04-2003</td>
<td>NONE</td>
<td></td>
</tr>
<tr>
<td>US 2006185927 A1</td>
<td>24-08-2006</td>
<td>JP 2006232059 A</td>
<td>07-09-2006</td>
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