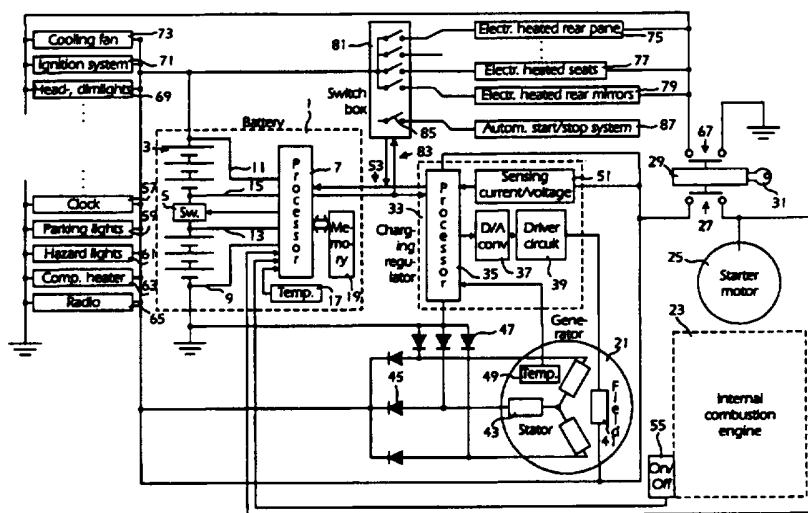




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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|---|--|---|
| <p>(51) International Patent Classification<sup>6</sup> :<br/><b>G01R 31/36, H02J 7/00</b></p>  | <p><b>A3</b></p>   | <p>(11) International Publication Number: <b>WO 96/11817</b></p> <p>(43) International Publication Date: 25 April 1996 (25.04.96)</p> |
| <p>(21) International Application Number: PCT/IB95/00835</p> <p>(22) International Filing Date: 5 October 1995 (05.10.95)</p> <p>(30) Priority Data:<br/>9403416-2 5 October 1994 (05.10.94) SE</p> <p>(71) Applicant (for all designated States except US): INTRA DEVELOPMENT A/S [DK/DK]; Kommerksvej 4, DK-2605 Brøndby (DK).</p> <p>(72) Inventor; and<br/>(75) Inventor/Applicant (for US only): THOMSEN, Jes [DK/DK]; Irlandsvej 102, DK-2300 Copenhagen (DK).</p> <p>(74) Agents: LINDÉN, Stefan et al.; Bergenstråhle &amp; Lindvall AB, P.O. Box 17704, S-118 93 Stockholm (SE).</p> | <p>(81) Designated States: AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TT, UA, UG, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, MW, SD, SZ, UG).</p> <p><b>Published</b><br/>With international search report.<br/>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</p> <p>(88) Date of publication of the international search report:<br/>25 July 1996 (25.07.96)</p> |   |

(54) Title: MOTOR VEHICLE BATTERY CIRCUIT COMPRISING MONITORING OF DISCHARGE AND RECHARGE CURRENT



## (57) Abstract

In vehicle storage battery (1) there are cells (3), a controllable switch (5) connected between inner cells and a processor (7), which controls the function of the switch (5) and communicates with a processor (35) in the charging regulator (33). The processor (7) continuously calculates the remaining capacity in the battery, based on up-to-date parameters such as current through the battery, open circuit voltage of the battery, the battery temperature and an initial value obtained during the heavy discharge of the battery when energizing the starter motor (25). If the capacity decreases, the current supply to not necessary devices (75-79) can be turned off. When the engine (23) is not running, all current supply can be stopped for ensuring that there will always be sufficient capacity for running the starter motor (25) for starting the engine (23). Further, the processor (7) monitors the charging of the battery (1) from the generator (21) and commands a processor (33) in the charging regulator to set an exciting current in a field coil (41), so that a suitable generator voltage is achieved.

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB 95/00835

| A. CLASSIFICATION OF SUBJECT MATTER   |   |  |
|---|---|--|
| <b>IPC6: G01R 31/36, H02J 7/00</b><br>According to International Patent Classification (IPC) or to both national classification and IPC   |   |  |
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| Minimum documentation searched (classification system followed by classification symbols)   |   |  |
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| Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  |   |  |
| WPR   |   |  |
| C. DOCUMENTS CONSIDERED TO BE RELEVANT  |   |  |
| Category*   | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No.  |
| Y   | EP 0502437 A2 (IVECO FIAT S.P.A.), 9 Sept 1992<br>(09.09.92), column 2, line 38 - line 56<br>--                             | 1-10   |
| Y   | GB 1136083 A (EATON YALE & TOWNE INC.),<br>11 December 1968 (11.12.68), page 2,<br>line 1 - line 124<br>--                  | 1-10   |
| Y   | GB 2144863 A (FORD MOTOR COMPANT LIMITED (UNITED<br>KINGDOM)), 13 March 1985 (13.03.85), page 1,<br>line 35 - line 47<br>-- | 1-10   |
| A   | WO 9315935 A1 (NORTHLINN LIMITED), 19 August 1993<br>(19.08.93), abstract<br>--   | 1-10   |
| <input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.  |   |  |
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| Date of the actual completion of the international search   |   | Date of mailing of the international search report                 |
| 31 May 1996   |   | 03 -06- 1996   |
| Name and mailing address of the ISA/<br>Swedish Patent Office<br>Box 5055, S-102 42 STOCKHOLM<br>Facsimile No. +46 8 666 02 86  |   | Authorized officer<br>Håkan Sandh<br>Telephone No. +46 8 782 25 00 |

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB 95/00835

Box I Observations where certain claims were found unsearchable (Continuation of Item 1 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 II Observations where unity of invention is lacking (Continuation of Item 2 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 an additional fee, this Authority did not invite payment of any additional fee.
- 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.: 1-10

Remark on Protest  The additional search fees were accompanied by the applicant's protest.  
 No protest accompanied the payment of additional search fees.

Box II cont.

- I. Claims 1-10 directed to a motor vehicle storage battery having an internal switch and a processor determining the remaining charge of said battery, and operating said internal switch to an open state if a vehicle is non-operative and if the remaining charge is lower than a predetermined value.
- II. Claim 11 directed to an electric circuit for determination of the battery capacity; determination of whether or not the capacity is decreasing; cutting off the current supply to at least one device if the vehicle is operative and if the battery capacity is decreasing.
- III. Claim 16 directed to an electric circuit for determination of the battery capacity from the battery voltage when no current is passing through it.
- IV. Claim 18 directed to a method for determining the open-circuit battery voltage.
- V. Claim 19 directed to an electric circuit for controlling the battery charging voltage.

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

01/04/96

International application No.

PCT/IB 95/00835

| Patent document cited in search report | Publication date | Patent family member(s)                             | Publication date                 |
|--|------------------|---|----------------------------------|
| EP-A2- 0502437                         | 09/09/92         | IT-B- 1245436<br>IT-D,V- T0910153                   | 20/09/94<br>28/06/91             |
| GB-A- 1136083                          | 11/12/68         | NONE  |                                  |
| GB-A- 2144863                          | 13/03/85         | DE-A,C,C 3429145<br>JP-A- 60044879<br>US-A- 4595880 | 28/02/85<br>11/03/85<br>17/06/86 |
| WO-A1- 9315935                         | 19/08/93         | AU-A- 3457893                                       | 03/09/93                         |