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Datasheet for the decision of 26 April 2013

Case Number: T 1998/09 - 3.5.02

Application Number: 01973549.7

Publication Number: 1326761

IPC: B60L 11/18

Language of the proceedings: EN

Title of invention:
Electric Scooter with On-Board Charging System

Applicants:
Vectrix International Limited
Parker-Hannifin Corporation

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step - obvious combination of known features"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 1998/09 - 3.5.02

D E C I S I O N
of the Technical Board of Appeal 3.5.02
of 26 April 2013

Appellant: (Applicant 1)
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 19 May 2009 refusing European patent application No. 01973549.7 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman: M. Ruggiu
Members: M. Léouffre
P. Mühlens

Summary of Facts and Submissions

I. The applicant appealed against the decision of the examining division, dispatched on 19 May 2009, on the refusal of the European patent application No. 01973549.7.

II. In its decision according to the state of the file, the examining division referred to its communication dated 9 February 2009.

The examining division held that the subject-matter of claim 1, then on file, did not involve an inventive step having regard to the combination of documents

D8 = US 5 713 426 A and
D1 = EP 0 808 738 A.

The examining division considered further that claim 2, then on file, was obvious in the light of documents:

D3 = US 5 631 532 or
D4 = WO 00 35032 A.

III. In the statement setting out the grounds of appeal, received on 23 September 2009, the applicant considered that D1 did not provide "an onboard power source configured for charging the battery power supply" (cf. grounds of appeal at page 3, paragraph 5), and that "D8 differs from the present invention in that it does not disclose "a second charging circuit configured to connect the battery power supply to an external power source". The appellant concluded therefrom that "while it may have been known to charge batteries using

an on board power source, and also to charge batteries using an external power source, it is clear from the prior art that the state of knowledge at the priority date of the application was that either of these charging sources would have been sufficient by itself" (cf. grounds of appeal, page 4, paragraph 6).

IV. Therefore, in a communication attached to the summons for oral proceedings, the board used their discretion and cited a new document:

D9 = US 5 894 898 A and

referred further, inter alia, to document

D7 = Bruce Lin "Conceptual Design and Modeling of a Fuel Cell Scooter for Urban Asia" ELSEVIER, Journal of Power Sources vol. 86, 2000, no. 1-2, pages 202 to 213.

V. With an electronic letter of reply received on 21 March 2013, the appellant filed a new main request accompanied by five auxiliary requests.

VI. During the oral proceedings before the board, which took place on 26 April 2013, the appellant withdrew the fifth auxiliary request.

VII. The appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the main request or of one of the first to fourth auxiliary requests, all filed with the letter of 21 March 2013.

VIII. Claim 1 of the main request reads as follows:

"A two wheeled electric scooter (130) comprising:
- a scooter frame (132) including a compartment shaped and sized to accommodate a battery power supply (104);
- an electric motor (100) connected to said battery power supply (104) via at least one switch, the electric motor configured to drive a rear wheel (134) of the scooter (130);
- a second charging circuit (106) configured to connect the battery power supply (104) to an external power source;
- an onboard power source (112) configured to charge the battery power supply (104), and
- a first charging circuit (116; 160) configured to connect the onboard power source (112) to the battery power supply (104) characterised in, that said two wheeled electric scooter (130) further comprises
- a motor controller circuit (102) connected to the motor (100) and configured to charge the battery power supply (104) upon deceleration of the scooter (130)."

Claims 2 to 8 are dependent on claim 1.

IX. Claim 1 of the first auxiliary request adds to claim 1 of the main request the two following features:
"- the onboard power supply (112) comprises a fuel cell configured to trickle charge the battery supply (104) via said first circuit (116; 160); and
- a fuel tank (114) configured to hold a fuel suitable for running the fuel cell."

Claims 2 to 5 are dependent on claim 1.

X. Claim 1 of the second auxiliary request adds to claim 1 of the first auxiliary request the following feature:
"- wherein the compartment accommodating the battery power supply is placed between the scooters front and rear wheel."

Claims 2 to 5 are dependent on claim 1.

XI. Claim 1 of the third auxiliary request adds to claim 1 of the first auxiliary request the following feature:
"- wherein the first charging circuit (116; 160) comprises a boost converter (116) which receives a first voltage output by the fuel cell and outputs a second voltage to the battery power supply (104), the second voltage being greater than the first voltage."

Claims 2 to 4 are dependent on claim 1.

XII. Claim 1 of the fourth auxiliary request is based on claim 1 of the third auxiliary request wherein the feature
"- a fuel tank (114) configured to hold a fuel suitable for running the fuel cell" is replaced by the feature
"- a fuel tank (114) configured to hold the hydrogen or menthol fuel" and wherein the following feature is added:
"- the battery power supply (104) has a voltage of at least 100 volts".

XIII. The appellant essentially argued as follows:

D1 disclosed a scooter with regenerative braking possibility and possibility to recharge the battery with an electrical cord. A problem was to recharge the

battery when the scooter was not in the vicinity of the mains. The solution was a second on-board power source. D1 mentioned the problem of weight and its consequence on the steering of the scooter (cf. column 9, last paragraph). A person skilled in the art would therefore not have added more weight to the scooter of D1. D1 taught away from the invention and taught that regenerative braking was sufficient.
D9 proposed an incomplete solution comprising solar cells which did not allow to recharge the battery at any time, e.g. at night.

A more specific solution of the invention according to the first and second auxiliary requests involved a fuel cell having two modes of operation. In a first mode of operation, the fuel cell was able to return the state of charge of the battery to 100% after a commuting day (cf. page 9, lines 17 to 25 and page 10, lines 9 to 13 of the published application). In a second mode of operation the fuel cell could be used as a trickle charger (cf. claim 14, lines 15 to 17 and page 6, lines 17 to 20).
D7 disclosed a scooter with a fuel cell, which was, however, only able to recharge the battery to 100% in certain circumstances.

Claim 1 of the third and fourth auxiliary requests were further characterised by a boost converter (116) receiving a first voltage output by the fuel cell and outputting a second voltage to the battery, the second voltage being greater than the first voltage. This feature helped to define the operation of the fuel cell with respect to the battery.

Reasons for the Decision

1. The appeal is admissible.

2. *Novelty*

None of the available prior art documents discloses a two-wheeled electric scooter comprising a battery connectable over a first, respectively a second, charging circuit to an onboard power source, respectively an external power supply, and wherein the battery may be charged upon deceleration. The subject-matter of the claims thus appears to be new.

3. *Inventive step*

The closest prior art is considered as represented by D1 which discloses a two wheeled electric scooter (cf. column 16, lines 34 to 36 and figure 1) comprising:
- a scooter frame including a compartment 142 (cf. column 25, lines 49 to 53 and figures 1 and 9) shaped and sized to accommodate a battery power supply 13 (cf. column 17, lines 27 to 35) between the scooter front and rear wheels (cf. figure 1);
- an electric motor 7 connected to said battery power supply 13 via at least one switch (cf. column 17, lines 10 to 19), the electric motor being configured to drive a rear wheel 5 of the scooter (cf. column 16, lines 46 to 48);
- a second charging circuit 17 configured to connect the battery power supply to an external power source (cf. column 27, lines 24 to 43 and figure 10).

Said two wheeled electric scooter comprises further a motor controller circuit 125 connected to the motor 7 and configured to charge the battery power supply 13 upon deceleration of the scooter (cf. column 34, lines 26 to 38 and figure 19).

3.1 *Main request*

The subject-matter of claim 1 of the main request differs from D1 in that the two wheeled electric scooter comprises further:
- an onboard power source configured to charge the battery power supply, and
- a first charging circuit configured to connect the onboard power source to the battery power supply.

Scooters with onboard power sources and a charging circuit configured to connect the onboard power source to the battery power supply are however known from D9 (cf. column 5, lines 18 to 30) and D7 (cf. D7, page 209, item 5) and it appears therefore to be obvious for a person skilled in the art to apply the solar panel 12 of D9 together with its charging circuit 15 to a scooter according to D1, or to mount a fuel cell as suggested by D7 to a scooter according to D1.

A fuel cell would indeed not lead to a substantial increase in weight of the scooter of D1 as objected by the appellant. Fuel cells may exhibit different sizes and weights and it would be obvious to a person of ordinary skill to replace the voltage drop compensating auxiliary battery 133 of the second embodiment of D1 (cf. column 21, line 48 to column 24, line 30 and figure 6) by a fuel cell without increasing the total

weight of the scooter of D1. Actually, for a comparable driving range, it appears to be known that a battery weights more than the corresponding fuel tank together with its fuel cell (cf. D7, page 208, left-hand column, last paragraph of item 3.3 and table 7: weight of total stack). Furthermore an hybrid scooter may be equipped with a scaled-down fuel cell of reduced size and weight (cf. D7, page 209, item 5). Thus, the board comes to the conclusion that claim 1 of the main request does not involve an inventive step (Article 56 EPC).

3.2 *First and second auxiliary requests*

Claims 1 of the first and second auxiliary requests differ from D1 further in that:
the onboard power supply (112) comprises a fuel cell configured to trickle charge the battery supply (104) via said first circuit (116; 160) and a fuel tank (114) configured to hold a fuel suitable for running the fuel cell.

These features do not involve an inventive step because any fuel cell needs a fuel tank, and because the charge output by the fuel cell of the invention cannot be considered to provide a trickle charge output in the usual sense of the term.
A battery charging current is usually considered as a trickle charging current when it just compensates the self-discharge losses of the battery over long periods of time.
The fuel cell output of the invention delivers current for a charging rate well above the self-discharging rate of the battery pack.

Actually in the embodiments of the invention, the fuel cell delivers continuously from 80 to 500 watts (cf. page 6, lines 10 to 12; page 9, lines 17 to 20 and 26 to 28). Such power is certainly more than what is necessary for "providing a constant trickle charge to the battery pack 104" contrary to the description at page 6, lines 7 to 20. The charging times (50% of full charge overnight) given as example in the description for an electric scooter configured for extra urban driving confirm a charge output by the fuel cell corresponding to a normal charging rate well above the self-discharging rate of the battery pack (cf. page 9, lines 17 to 25 and page 10, lines 1 to 13). Actually the "fuel cell is preferably able to fully charge the battery pack after day normal use" (page 10, lines 9 and 10).

The operation of the fuel cell as a trickle charger is mentioned in original claim 14. However the trickle charging current mentioned in the description (cf. page 6, lines 11 to 20) does not correspond to the definition of a usual trickle charging current. Therefore the description does not allow an interpretation wherein the fuel cell would comprise two different modes of operation, one mode wherein the charging current allows for recharging the battery after a commuting day and a second mode wherein the battery losses are compensated by trickle charging the battery pack during longer absences.

It follows that the fuel cell is not considered as "configured to trickle charge the battery supply" in the sense of compensating the self-discharge of the battery, but as delivering a charging current

sufficient for an overnight charging time. The subject-matter of claims 1 of the first and second auxiliary requests therefore does not involve an inventive step in the light of the combination of documents D1 and D7.

3.3 *Third auxiliary request*

The controller circuit of D1 comprises a voltage raising circuit to boost the voltage in case of regenerative braking (cf. D1, column 7, lines 50 to 56). It is therefore obvious for a person skilled in the art to use a similar circuit to raise the voltage output by a fuel cell if necessary.
Consequently the following feature of claim 1 of the third auxiliary request:
"wherein the first charging circuit (116; 160) comprises a boost converter (116) which receives a first voltage output by the fuel cell and outputs a second voltage to the battery power supply (104), the second voltage being greater than the first voltage"
does not involve an inventive step.

3.4 *Fourth auxiliary request*

The further features of claim 1 of the fourth auxiliary request, namely "the battery power supply (104) has a voltage of at least 100 volts" and "a fuel tank (114) configured to hold the hydrogen or menthol [methanol] fuel," do not involve an inventive step having regard to the combination of D1 and D7 because the voltage of the battery of D1 is 72 volts (cf. D1, column 26, lines 10 to 21), which is a voltage comparable to the battery voltage used in the present invention, and because hydrogen is the fuel chosen for the fuel cell of the

scooter of D7 (cf. page 212, item 6 and page 207, item 3.3).

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

K. Götz M. Ruggiu