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**Datasheet for the decision
of 24 January 2019**

Case Number: T 0333/18 - 3.5.03

Application Number: 08837606.6

Publication Number: 2212535

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B60W10/00, H02P9/04

Language of the proceedings: EN

Title of invention:

OPTIMAL LOAD CONTROLLER METHOD AND DEVICE

Applicant:

Verschuur, John Alexander

Headword:

Controller/VERSCHUUR

Relevant legal provisions:

EPC Art. 56

RPBA Art. 13(1)

Keyword:

Inventive step - main request (no)

Admissibility - auxiliary requests 1 to 3 (no)

Decisions cited:

Catchword:



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Case Number: T 0333/18 - 3.5.03

D E C I S I O N
of Technical Board of Appeal 3.5.03
of 24 January 2019

Appellant: Verschuur, John Alexander
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Decision under appeal: **Decision of the Examining Division of the
European Patent Office posted on 13 July 2017
refusing European patent application No.
08837606.6 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman F. van der Voort
Members: T. Snell
R. Winkelhofer

Summary of Facts and Submissions

- I. This appeal is against the decision of the examining division refusing European patent application No. 08837606.6, with publication number WO 2009/048549 A2. The refusal was based on the ground of lack of inventive step with respect to the disclosure of document D6 (see below III.).
- II. The applicant (appellant) filed an appeal against the above decision, including a new main request.
- III. In a communication accompanying a summons to oral proceedings, the board gave a preliminary view that the subject-matter of claim 1 of the main request did not involve an inventive step, essentially agreeing with the reasons given by the examining division in the impugned decision. Reference was made, *inter alia*, to the following documents:

D6: US 2007/0183885 A1; and

D7: "Optimization Theory with Applications", Donald A. Pierre, section 6-5a, 1986, Dover Publications.
- IV. With a submission dated 23 November 2018, the appellant filed claims of auxiliary requests 1 to 3.
- V. Oral proceedings were held on 24 January 2019. The appellant finally requested that the decision under appeal be set aside and that a patent be granted on the basis of the main request as filed with the statement of grounds of appeal or, in the alternative, on the basis of one of auxiliary requests 1 to 3.

VI. Claim 1 of the **main request** reads as follows:

"A controller device configured to optimize power output by a power generation system to attain maximum power and efficiency of said system, wherein said system comprises:

a source of power; and

a load that consumes power output from the power source; and wherein one or more power transfer parameters associated with said system can be increased or decreased and held constant by said controller to optimize said power output;

wherein said controller device comprises the following devices:

a memory device;

one or more load controllers;

a power sensor device adapted to measure said power output, obtain power output measurements, and power output samples, and send said measurements and power samples to the memory device, wherein the memory device is arranged to store the power output measurements and power samples sent from said power sensor device that are compared by the controller;

a device that is arranged to select one of said power transfer parameters for optimization and hold all other of said power transfer parameters constant in their last setting value by sending signals to the one or more load controllers, wherein said selected power

transfer parameter's effect on the power output is isolated, an optimization cycle that when complete begins another cycle optimizing said selected power transfer parameter until the next power transfer parameter is selected for optimization;

a device that is adapted to optimize said power output by increasing or decreasing the setting value of said selected power transfer parameter as required to maximize said power output based on said power output measurements sent from said power sensor, stored in said memory and compared by said controller, and by sending "increase" or "decrease" signals to said one or more load controllers, wherein said one or more load controllers are arranged to accept and apply the "increase" or "decrease" signals sent from said device that optimizes, and said signals sent from said device that selects to optimize said selected power transfer parameter while holding all other of said power transfer parameters constant in their last setting value."

VII. Claim 1 of **auxiliary request 1** reads as claim 1 of the main request up to and including the seventh paragraph (see point VI above), i.e. up to the wording "... power samples sent from said power sensor device that are compared by the controller;", after which it reads:

"a device that is arranged to select one of said power transfer parameters for optimization and hold all other of said power transfer parameters constant in their last setting value by sending signals to the one or more load controllers, thereby isolating said selected power transfer parameter's effect on the power output;

a device that is adapted to optimize said power output by increasing or decreasing the setting value of said selected power transfer parameter as required to maximize said power output based on said power output measurements sent from said power sensor, stored in said memory and compared by said controller, and by sending "increase" or "decrease" signals to said one or more load controllers,

wherein said one or more load controllers are arranged to accept and apply the "increase" or "decrease" signals sent from said device that optimizes and said signals sent from said device that selects to optimize said selected power transfer parameter while holding all other of said power transfer parameters constant in their last setting value,

and wherein the controller device is adapted to measure and optimize the power output after each increase or decrease in the setting value of the selected parameter for optimization until a new power transfer parameter is selected for optimization."

VIII. Claim 1 of **auxiliary request 2** is the same as claim 1 of auxiliary request 1 except that in the seventh paragraph the wording "a power sensor device adapted to measure said power output" is replaced by "a single sensor device, said single sensor device being a power sensor device adapted to measure said power output".

IX. Claim 1 of **auxiliary request 3** is the same as claim 1 of auxiliary request 1 except that in the fourth paragraph the wording "wherein said controller device comprises the following devices" is replaced by "wherein said controller device consists of the following devices".

Reasons for the Decision

1. Main request - claim 1 - inventive step

1.1 The present application relates to a controller device configured to optimise power output by a power generation system to attain maximum power and efficiency. In essence, the effect of changing a power transfer parameter on the output power is measured whilst holding all other power transfer parameters constant, thus finding the optimum value of that power transfer parameter. The process is then repeated for other power transfer parameters.

1.2 Using the wording of claim 1, the closest prior art document D6 discloses (undisclosed features being struck through):

A controller device (200) (cf. paragraphs [0017],[0018] and [0020] and Fig. 1) configured to optimize power output by a power generation system to attain maximum power and efficiency of said system, wherein said system comprises:

a source of power ("wind turbine"); and

a load that consumes power output from the power source ("generator 160"); and wherein one or more power transfer parameters ("control parameters", cf. paragraph [0022], lines 3-6) associated with said system can be increased or decreased and held constant by said controller to optimize said power output (cf. paragraph [0025]);

wherein said controller device comprises the following devices:

a memory device (implicit);

one or more load controllers (part of controller 200; the controlled parameter may be an electric generator control parameter, i.e. a load parameter (cf. paragraph [0022], line 6));

a power sensor device (300) adapted to measure said power output, obtain power output measurements, and power output samples, and send said measurements and power samples to the memory device, wherein the memory device is arranged to store the power output measurements and power samples sent from said power sensor device that are compared by the controller (cf. paragraph [0019]);

a device (part of controller 200) that is arranged to select one of said power transfer parameters for optimization ~~and hold all other of said power transfer parameters constant in their last setting value~~ by sending signals to the one or more load controllers, wherein said selected power transfer parameter's effect on the power output is isolated (cf. claim 1, "at least one control parameter"), an optimization cycle that when complete begins another cycle optimizing said selected power transfer parameter (cf. paragraph [0026], last three lines) ~~until the next power transfer parameter is selected for optimization;~~

a device (part of controller 200) that is adapted to optimize said power output by increasing or decreasing the setting value of said selected power transfer parameter as required to maximize said power output

based on said power output measurements sent from said power sensor, stored in said memory and compared by said controller, and by sending "increase" or "decrease" signals to said one or more load controllers, wherein said one or more load controllers are arranged to accept and apply the "increase" or "decrease" signals sent from said device that optimizes, and said signals sent from said device that selects to optimize said selected power transfer parameter (cf. paragraph [0008]) ~~while holding all other of said power transfer parameters constant in their last setting value.~~

1.3 The subject-matter of claim 1 thus differs from the disclosure of D6 in two respects:

(i) After the current power transfer parameter is optimised, a next power transfer parameter is selected for optimisation; and

(ii) whilst a power transfer parameter is being optimised, all others are held constant in their last setting value.

1.4 Both these features are in fact related to the same concept of "sequential optimisation", i.e. where more than one parameter is to be optimised, this is done for each one separately, one after another. By contrast, in one explicit embodiment of D6, it is proposed to optimise all parameters simultaneously (cf. paragraphs [0029] to [0033]).

1.5 The problem to be solved, in agreement with the appellant, can be regarded as how to simplify the system of D6 with regard to optimisation of a plurality of parameters.

- 1.6 It is considered that the skilled person would include features (i) and (ii) without inventive step for the following reasons.
- 1.7 Re (i):
- 1.7.1 Claim 1 of D6 discloses selecting a single control parameter and optimising this control parameter by adjusting the parameter (step (a)) and measuring a single ("at least one") response variable (step (b)). The single response variable may be the output power (cf. paragraph [0027]). Starting out from the idea of optimising one parameter only, the skilled person would appreciate that in a system with more than one control parameter (cf. D6, claim 10 ("wherein the at least one control parameter is selected from the group consisting of: blade pitch, yaw angle, rotor speed, and an electric generator control parameter")), the same process could be carried out for another parameter, and in so doing the control parameters would be optimised one at a time on a sequential basis. As an example, it may be required to optimise one parameter daily, but another only weekly. In such circumstances, separate optimisation of each parameter is considered obvious.
- 1.7.2 The appellant questions why the skilled person, even if aware of sequential optimisation, would do this when starting out from D6, which proposes only simultaneous optimisation.
- 1.7.3 While it is true that in one embodiment (the "fifth embodiment"; cf. paragraphs [0029] to [0033]), D6 discloses optimising several control parameters simultaneously, that is a more sophisticated processing as compared to the claimed method and enables mutual

influences and interdependencies between control parameters and response variables to be taken into account, which plausibly will result in a faster convergence. Nevertheless, merely because D6 discloses this embodiment, the skilled person would not ignore an obvious simpler procedure (cf. point 1.7.1 above) in appropriate circumstances, such as the daily/weekly situation referred to above or when there is little or no mutual interaction between control parameters and therefore little to be gained from the more complex procedure of D6.

1.7.4 In this respect, the appellant argues that performing a further optimisation a day later was not at all what was claimed, which was a continuous optimisation.

1.7.5 Claim 1 is however not limited to a "continuous" optimisation" as alleged by the appellant, but defines two optimisation cycles for a given parameter which when complete are followed by selecting another parameter for optimisation. No time limitations are specified. This method embraces for example the daily/weekly example referred to above.

1.7.6 It is concluded that feature (i) does not contribute to inventive step.

1.8 Re (ii): In D6, considering the embodiment in which a single control parameter is optimised (cf. D6, claim 1), it follows implicitly that only this control parameter is adjusted and that other control parameters are held constant, as also disclosed in D7, which the board regards as representing common knowledge and which describes sequential optimisation in mathematical terms. This feature therefore does not contribute to inventive step either.

1.9 The appellant argues that further features of claim 1 held by the board to be disclosed in D6 were not in fact disclosed by this document, namely:

(i) The device of claim 1 required only a single power sensor, whereas D6 disclosed a method requiring a second sensor for measuring ambient conditions, which was also a power sensor.

(ii) The device of claim 1 functioned on the basis of feedback, whereas D6 made use of a "feedforward" method which was neither continuous nor self-correcting. In the claimed method, by continuously increasing and decreasing the parameter to be optimised, a continuous and self-correcting optimisation was achieved which was not the case in D6.

(iii) D6 does not disclose one or more load controllers which compare measurements.

1.10 Re (i): Claim 1 is not limited to "only one power sensor". Consequently, this argument is not convincing.

Re (ii): As already stated, claim 1 is not limited to a "continuous" optimisation. Claim 1 is also not limited to a "feedback"-based method. In this respect, as claimed and as disclosed in D6, the value of a selected control parameter ("power transfer parameter") is varied and the effect on the power output is measured. This method is self-correcting in the same way as can be achieved by the claimed controller device. The reference to "increasing and decreasing" the setting value of the selected parameter in claim 1 applies to the optimisation process in general, which embraces the final adjustment of the setting parameter following

each optimisation process carried out in D6. Consequently, these arguments are not convincing either.

Re (iii): The term "compare" is to be interpreted broadly, since claim 1 does not define how the measurements are compared to each other. In D6, the measurements are analysed jointly to find an optimum output value, and thus, in a broad sense, compared with each other. This feature is too mathematically vague to contribute to inventive step.

1.11 The appellant argues that the optimisation of the power output by the claimed controller device had a number of advantages over the method of D6 (see in particular "feature d" on page 3 ff. of the submission of 23 November 2018):

(i) D6 claims a slower and less efficient way of determining the optimum value of the control parameter.

(ii) In the claimed device, more measurements of power output are taken close to the optimum value of the control parameter. The optimum value is therefore more accurate.

(iii) In the claimed device, the value of the power transfer parameter is continually being increased or decreased to find an optimum. Therefore, if the ambient conditions were to change, the controller device of claim 1 would be responsive to this.

(iv) In D6, someone would have to measure the ambient conditions, determine they had changed and then start a new optimisation cycle. In fact, the controller device

of claim 1 actually removes the need to measure the ambient conditions.

(v) The controller device of claim 1 is able to respond to changes in other variables, not just ambient conditions.

(vi) The method of D6 requires the measuring of N arbitrary values, many of which are far from the optimum value.

(vii) The controller device of claim 1 avoids extended periods during optimisation where the power generation system operates far from optimally.

1.12 Re (i): Even if this were true in respect of the specific embodiment in D6 which uses simultaneous optimisation, that would not render the claimed device inventive for the reasons given above.

Re (ii) and (iii): Claim 1 is not limited to a device which implicitly or explicitly takes measurements substantially close to the optimum, or takes measurements continually.

Re (iv): In D6, the optimisation process can be scheduled at regular intervals (cf. paragraph [0026], last sentence).

Re (v): In D6, changes in other variables are also taken into account (cf. paragraph [0024], last nine lines).

Re (vi) and (vii): Claim 1 does not exclude either measuring values far from the optimum or extended periods where the system operates far from optimally.

- 1.13 The appellant finally argues that it was incorrect to assess inventive step by looking at features separately. When looking at the totality of the differences with respect to D6, there was "quite a step change".
- 1.14 The board however considers that that there are only two differences, both of which are closely related to each other (cf. point 1.3 above). The skilled person effectively only has to take one conceptual step to arrive at the subject-matter of claim 1.
- 1.15 It is concluded that the subject-matter of claim 1 does not involve an inventive step when starting out from D6 (Articles 52(1) and 56 EPC).

2. *Auxiliary requests 1 to 3 - admissibility*

- 2.1 These requests were filed in response to the board's communication. In accordance with Article 13(1) RPBA, whether or not they are taken into consideration is at the discretion of the board. In accordance with case law, a well-established criterion for determining whether to consider late-filed requests is whether or not they are prima facie allowable.
- 2.2 Claim 1 of each request (see points VII to IX above) includes in the last paragraph the feature:

"wherein the controller device is adapted to measure and optimize the power output after each increase or decrease in the setting value of the selected parameter for optimization until a new power transfer parameter is selected for optimization" (board's underlining),

which replaced the following feature of claim 1 of the main request (see point VI above):

"an optimization cycle that when complete begins another cycle optimizing said selected power transfer parameter until the next power transfer parameter is selected for optimization".

2.3 This amended feature, *prima facie*, lacks clarity (Article 84 EPC). The appellant argues that this feature was intended to better define that the increasing and decreasing steps were part of a continuous process of optimising the control parameter as described on page 11, lines 24-26 and page 42, lines 18-23 of the application as filed. However, the board considers that it remains unclear in the context of claim 1 what is meant by "optimising" the power output after each increase or decrease in the setting value of the selected parameter. "Optimisation" would normally be understood by the skilled person as finding the best value of the selected parameter, which in the context of the method described in the description, is the final result (cf. e.g. graph point 206 of Fig. 2) after several iterations of increasing and/or decreasing the setting value of the selected parameter (cf. page 11, line 31 to page 12, line 8), i.e. only after the final increase or decrease of each optimisation cycle (which is actually consistent with the deleted feature referred to above). Consequently, by defining that optimisation occurs after each increase or decrease in the setting value, *prima facie* a lack of clarity has been introduced.

2.4 With respect to admissibility, the appellant argues that the requests were filed in reaction to objections

raised by the board in its communication. However, this circumstance alone does not mean that a request filed in accordance with Article 13(1) RPBA has to be admitted (indeed, Article 13(1) RPBA makes no mention of any such criterion). Furthermore, in its decision (point 6), the examining division already noted a lack of clarity in claim 1 in respect of the wording "an optimization cycle that when complete begins another cycle optimizing said selected power transfer parameter until the next power transfer parameter is selected for optimization". Hence, amendments which re-define or clarify the concept of "optimisation" could have been submitted earlier, in particular with the filing of the statement of grounds of appeal. The appellant's argument is therefore unconvincing.

2.5 As claim 1 of each of auxiliary requests 1 to 3 is prima facie not allowable, these requests are not admitted.

3. *Conclusion*

As there is no allowable request, it follows that the appeal must be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



G. Rauh

F. van der Voort

Decision electronically authenticated