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D E C I S I O N
of 22 September 2005

Case Number: T 0745/03 - 3.4.02

Application Number: 93910920.3

Publication Number: 0672248

IPC: G01N 27/416

Language of the proceedings: EN

Title of invention:

Electronic Battery Tester with automatic compensation for low state-of-charge

Patentee:

Champlin, Keith S

Opponent:

Robert Bosch GmbH

Headword:

-

Relevant legal provisions:

EPC Art. 56

Keyword:

"The subject-matter of an independent claim in each of the main and twelve auxiliary requests lacks an inventive step"

Decisions cited:

-

Catchword:

-



Case Number: T 0745/03 - 3.4.02

D E C I S I O N
of the Technical Board of Appeal 3.4.02
of 22 September 2005

Appellant: CHAMPLIN, Keith S
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Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office posted
9 May 2003 concerning maintenance of European
patent No. 0672248 in amended form.

Composition of the Board:

Chairman: A. Klein
Members: M. Rayner
C. Rennie-Smith

Summary of Facts and Submissions

- I. Both the patent proprietor and the opponent lodged appeals against the decision of the opposition division that, account being taken of amendments made by the patent proprietor during the opposition proceedings on the basis of its then third auxiliary request, European patent 672 248 (application number 93 910 920.3, published application W093/22667), meets the requirements of the Convention. The patent concerns an electronic battery tester with automatic compensation for low state of charge.
- II. In the proceedings, reference has been made, amongst others, to the following documents:
- D7 US-A- 4 912 416 (in the name of the inventor and patent proprietor of the patent in dispute)
- D9 DE-B1-2 926 716
- D11 Statement of inventor and patent proprietor
- III. In the decision under appeal, document D7 was considered to represent the closest prior art, the subject matter of claim 1 of the patent as granted differing therefrom by virtue of correction means directly coupled to means for sensing open circuit voltage, the correction means responding thereto by adjusting a measured dynamic parameter. Automation is a general wish and the problem of automation is already known from document D9 in the field of battery testers. The problem to be solved may thus be regarded as providing a concrete realisation of the embodiment

disclosed in document D7 which increases convenience of operation. It was generally known at the priority date of the contested patent that a microprocessor can read in measured parameters according to known relationships, an example is shown in document D9. It would therefore have been straightforward for the skilled person to solve the problem by connecting means for measuring dynamic conductance and means for sensing open circuit voltage to inputs of the microprocessor suggested in column 13 of document D7, thus implementing the correction function disclosed in Figure 2 of document D7 to reach the embodiment disclosed in Figure 8 of the patent in dispute. The subject matter claimed cannot therefore be considered to involve an inventive step.

As dynamic conductance was known from document D7 and in the light of the known way a microprocessor is operated, the subject matter of claim 2 of the first auxiliary request was also considered not to involve an inventive step.

However no hint at all is provided in document D7 to suppress display of the test result if open circuit voltage is less than a predetermined minimum value and provide a recharge indication, so that in view of the number of steps needed to reach the subject matter of claim 7 of the third auxiliary request from document D7, this claim was considered directed to subject matter involving an inventive step.

IV. The patent proprietor requested that the decision under appeal be set aside and that the patent be maintained as granted or in the alternative on the basis of one of a first to twelfth auxiliary request. The opponent

requested that the decision under appeal be set aside and the patent revoked. Oral proceedings were requested on an auxiliary basis by both parties, which led to appointment thereof by the board.

During the oral proceedings, the patent proprietor confirmed a conditional request for maintenance of the patent on the basis of amended fifth to eighth auxiliary requests, should the fifth to eighth auxiliary requests on file not be acceptable solely for lack of compliance with Article 123 EPC. Following a query from the board about whether features of independent claims in the first to twelfth auxiliary requests were the same or different, the patent proprietor filed a schedule indicating features included in various independent claims of the requests submitted.

- V. The patent proprietor submits that the opposition division was wrong in its assessment of claim 1 of the patent as granted. Hindsight is involved as it would not even have occurred to the skilled person to automate the system described in document D7, as there is no suggestion towards automation, i.e. connection without operator involvement. The microprocessor mentioned is for setting the device manually as can be seen from document D11, the statement of the inventor. The apparatus of document D9 is not very relevant as it operates quite differently. Therefore the subject matter of claim 1 as granted is considered to involve an inventive step.

The subject matter of independent claim 2 of the first auxiliary request can also be considered to involve an

inventive step because it is not at all clear from D7 how a microprocessor could be used to provide a correction, presumably operator control of the amplitude pulse set at line 30 in Figure 3 would be replaced by a microprocessor controlled input signal. An arrangement with the correction itself being performed in the microprocessor is therefore a long way from the disclosure of document D7.

Claim 2 of the third auxiliary request includes the feature that the firmware program of the microprocessor is effective to suppress display of results by display means if open circuit voltage is less than a predetermined minimum value and instead provide an indication that the battery must be recharged. This important feature deals with the problem of the automated circuit providing false results when state of charge is below a certain minimum. Nothing like this is disclosed in document D7 or D9, in the latter both the test result and the charge state are given to the operator who, presumably, must decide what to do next. There is no suggestion to ignore the battery condition reading, on the contrary it is said to indicate whether charging is worthwhile.

The approach of the opponent is to eat away at the subject matter claimed by obvious bites, overlooking the entire solution given.

VI. In support of its position, the opponent argued that automating is a general desideratum for the skilled person and mentioning a microprocessor in document D7 even indicates how. The patent proprietor's contention that a skilled person would not even have thought of

automating with a microprocessor and would have used the microprocessor mentioned in document D7 solely for manual correction is technically unsustainable because the skilled person knows that a microprocessor is predestined to use its logic to process information on its inputs without manual intervention. Replacing a manual system by a manually operated microprocessor would have been an unlikely remote possibility even on cost grounds. Therefore no inventive step can be considered involved in the subject matter of claim 1 of the patent as granted.

Since a microprocessor is disclosed in document D7, there is implicit disclosure of a firmware program as this is what microprocessors have. The correction equation is known in document D7. What is important is what the disclosure of document D7 taught the skilled person, not what the inventor of that patent had in mind. Document D7 also teaches correction is possible at a number of points in the signal flow chain, for example open circuit voltage and battery rating input can be interchanged. In the latter case the input is directly to the dynamic parameter. Therefore, the subject matter of claim 2 of the first auxiliary request also lacks an inventive step.

The low battery warning as claimed in claim 2 of the third auxiliary request is an add-on function, the skilled person knowing that a low battery indication was commonplace and that no sensible results can be derived from a discharged battery as it has to be recharged. The battery tester of document D9 is an example of determining battery condition employing a microprocessor and measuring a dynamic parameter and

open circuit voltage. Here, a warning is given by the right section of the display by virtue of showing the discharged battery as "3". Suppressing a display in a low battery condition is a routine option for the skilled person amounting to no more than an obvious choice amongst the options available, the advantages and disadvantages of which are well known to the skilled person. The approach to attacking the claims has not resulted in losing the global content of the claim because separate features are for separate functions implemented by the microprocessor.

VII. Amongst the independent claims presented to the board for decision were the following. It is not necessary to give the wording of the remaining independent claims for the reasons set out in section 2.3 of the reasons for the decision below.

(a) Independent claim 1 as granted, which is worded as follows.

"1. An electronic device for testing an electrochemical cell or battery (24) having a dynamic parameter being dynamic conductance or dynamic resistance, an open-circuit voltage and a state-of-charge, said electronic device including means electrically connected (16, 28, 246, 249) to said cell or battery for measuring said dynamic parameter (10, 12, 14, 16, 18, 20, 22, 26, 29, 30, 32, 34, 42, 44, 46, 48, 50, 52, 222, 224, 244, 246, 248, 250, 252, 254, 256) and means electrically connected to said cell or battery for sensing said open-circuit voltage (38), said electronic device further characterized by:

correction means (36, 220) coupled to said means for measuring said dynamic parameter (40, 62, 226, 228) and directly electrically coupled to said means for sensing said open circuit voltage (39, 226, 228), said correction means for responding to said open-circuit voltage by adjusting a measured dynamic parameter value in accordance with said open circuit voltage to obtain a state-of-charge corrected dynamic parameter value; and, means for displaying (56, 58, 60, 84, 86, 234, 236, 238, 240, 242, 244, 246) a test result in conformance with said state-of-charge corrected dynamic parameter value."

(b) Independent claim 2 of the first auxiliary request, which is worded as follows.

"2. An electronic device for testing an electrochemical cell or battery (24) having dynamic parameters being dynamic conductance and dynamic resistance, an open-circuit voltage and a state-of-charge, said electronic device including means electrically connected (16, 28, 246, 248) to said cell or battery for measuring one of said dynamic parameters (10, 12, 14, 16, 18, 20, 22, 26, 28, 30, 32, 34, 42, 44, 46, 48, 50, 52, 222, 224, 244, 246, 248, 250, 252, 254, 256) and means electrically connected to said cell or battery for sensing said open-circuit voltage (38), said electronic device further characterized by: correction means (36, 220) coupled to said means for measuring said one dynamic parameter (40, 62, 226, 228) and directly electrically coupled to said means for sensing said open circuit voltage (38, 226, 228), said correction means for responding to said open-circuit

voltage by adjusting a measured dynamic parameter value in accordance with said open circuit voltage to obtain a state-of-charge corrected dynamic parameter value; and,

means for displaying (56, 58, 60, 64, 66, 234, 236, 238, 240, 242, 244, 246) a test result in conformance with said state-of-charge corrected dynamic parameter value, wherein said electronic device includes microprocessor means (220), said one measured dynamic parameter is dynamic conductance (G - Fig.8), said correction means comprises a firmware correction program implemented by said microprocessor means, and digital representations of said open-circuit voltage (228) and said measured dynamic conductance (224) are both inputted to said microprocessor means (220) and combined algorithmically by said firmware correction program to obtain a state-of-charge corrected dynamic conductance value."

This claim is identical to claim 1 of the second auxiliary request.

(c) Independent claim 2 of the third auxiliary request, which is worded as follows.

" 2. An electronic device for testing an electrochemical cell or battery (24) having dynamic parameters being dynamic conductance and dynamic resistance, an open-circuit voltage and a state-of-charge, said electronic device including means electrically connected (16, 28, 246, 248) to said cell or battery for measuring one of said dynamic parameters (10, 12, 14, 16, 18, 20, 22, 26, 28, 30, 32, 34, 42, 44, 46, 48, 50, 52, 222, 224, 244, 246, 248, 250, 252, 254, 256) and means electrically connected to said cell or

battery for sensing said open-circuit voltage (38), said electronic device further characterized by: correction means (36, 220) coupled to said means for measuring said one dynamic parameter (40, 62, 226, 228) and directly electrically coupled to said means for sensing said open circuit voltage (38, 226, 228), said correction means for responding to said open-circuit voltage by adjusting a measured dynamic parameter value in accordance with said open circuit voltage to obtain a state-of- charge corrected dynamic parameter value: and, means for displaying (56, 58, 60, 64, 66, 234, 236, 238, 240, 242, 244, 246) a test result in conformance with said state-of-charge corrected dynamic parameter value, wherein said electronic device includes microprocessor means (220), said one measured dynamic parameter is dynamic conductance (G - Fig.8), said correction means comprises a firmware correction program implemented by said microprocessor means, and digital representations of said open-circuit voltage (228) and said measured dynamic conductance (224) are both inputted to said microprocessor means (220) and combined algorithmically by said firmware correction program to obtain a state-of-charge corrected dynamic conductance value, said firmware program suppressing said means for display from displaying said test result if the open-circuit voltage is less than a predetermined minimum value and instead providing an indication to a user that the battery must be recharged before testing."

This claim is identical to claim 1 of the fourth auxiliary request, claim 2 of the fifth auxiliary request, claim 1 of the sixth auxiliary request, claim 2 of the seventh auxiliary request, claim 1 of

the eighth auxiliary request, claim 2 of the ninth auxiliary request, claim 1 of the tenth auxiliary request, claim 2 of the eleventh auxiliary request and claim 1 of the twelfth auxiliary request.

VIII. The board gave its decision at the end of the oral proceedings.

Reasons for the Decision

1. The appeals are admissible.
2. *Auxiliary Requests - Sets of claims*
 - 2.1 The patent proprietor presented thirteen sets of claims to the board for decision. For the auxiliary requests 1 to 12, there were 51 independent claims presented in claims sets occupying 56 pages, the independent claims, in part, bridging typewritten pages. In order to give a perspective on the volume of material involved, the board observes that the entire typewritten part of the published patent application (description and claims) amounted to 30 pages. Filing of an excessive number of auxiliary requests is unwelcome because it is open to the danger of unnecessarily increased complexity and may lead to the wood not being seen for the trees. In particular, if an auxiliary request contains only some reworded claims, it is not helpful, as in the present case, to reproduce the full text of identical claims from higher order requests; instead it is sufficient to refer to the identical claims at the relevant point in the auxiliary request. A reason for this is that otherwise each and every, possibly voluminous, claim

requires separate checking by the parties and the board to confirm that it is indeed identical (as for example the ten identical claims listed in section VII(c) of the facts and submissions above). There is even then a residual possibility of an error.

- 2.2 Generally speaking, it is up to a party to decide on presentation of its case, and, a party can be assumed to know in the final instance proceedings upon what requests it requires a decision. When filing several sets of claims, a party usually lists them in order of preference (auxiliary request I, II, etc). Parties tend to file the least limited claims as a main request and more limited versions as auxiliary requests. The idea behind this approach is that if a higher order request should fail, then a lower more limited request would still have a chance of success. Although the patent proprietor in the present proceedings began with the usual approach, this changed in moving down the requests, to an approach which could more aptly be designated as "pick and mix", as independent claims present in higher order requests are also to be found in lower order requests in differing permutations of independent claims, some of which are exclusive of others. Apart from a possibility of giving an impression of fishing around for something patentable, this "pick and mix" approach can give rise to a situation where the final decision given does not refer to some independent claims because if even just one of the independent claims in a particular request repeated from a higher order request does not meet the requirements of the Convention, the particular request concerned fails for this reason without a decision being necessary on the other independent claims,

whatever the board may think of the merits of those other independent claims.

2.3 In the present case, all the sets of claims submitted in the requests up for decision contain at least one of the claims under heading (a), (b) or (c) as set out in section VII of the facts and submissions above as confirmed by the schedule of claims submitted by the patent proprietor during the oral proceedings. For the reasons given in section 7 below, it turned out that a decision on patentability of these claims led to all the requests up for decision being considered and this is the reason why the wording of only these claims is given in that section.

3. Patentability of the subject matter of independent claim 1 as granted.

3.1 Document D7 has, in the board's view, correctly been considered by the parties and the opposition division as the closest prior art to the subject matter claimed. Document D7 discloses a testing device (see Figure 3) which can determine open circuit voltage V_0 while a selector switch is set to V_0 and is arranged for manually adjusting a variable attenuator in accordance therewith. Such variable attenuator means could actually be inserted at many points in the signal-flow chain, e.g. open circuit voltage and battery rating input can be interchanged (see column 8, lines 6-10). The dynamic parameter (conductance) is measured upon switching the selector switch to a G_x position, the user then dynamically testing the battery with the adjusted attenuator to provide normalised dynamic conductance $G_x(V_0)/G_x(12.6)$ according to a solid curve shown in

Figure 2 and described by a second order polynomial equation

$$G_x(V_0)/G_x(12.6) = -\{78.1963\} + \{12.3939\}V_0 - \{0.4848\}V_0^2.$$

No argument was presented in the appeal proceedings which might refute the novelty of the subject matter of claim 1 as granted over document D7, which novelty is given by features pertaining to correction means directly electrically coupled to means for sensing said open circuit voltage and for responding to said open-circuit voltage. The board also sees no reason to diverge from the corresponding position of the opposition division on novelty. While the underlying theory is known from document D7, the user no longer has to enter manually the open circuit voltage, which means that the objective problem solved by the novel features is dispensing with operator involvement, in other words automation.

- 3.2 While not wishing to exclude particular exceptions, the board agrees with the opponent and the opposition division that automating is a general desideratum for the skilled person. A wish for automation can usually be assumed without, in general, involving hindsight or making a contribution to inventive step. In the present case this is all the more so as the problem is known from document D9 disclosing a microprocessor based battery testing device, albeit using an iterative algorithm but to which open circuit voltage and a dynamic parameter are input. Moreover, document D7 itself also mentions in column 13, lines 6 and 7 that the correction could, for example, be implemented with a microprocessor, which reinforces the obvious nature

of automation to the board. As Figure 2 of document D7 concerns empirical state of charge correction, and correction is to be implemented by a microprocessor, the board considers it obvious to provide normalised dynamic conductance according to Figure 2 and the equation given implemented in the microprocessor logic.

3.3 With due respect to the recollection of the present inventor, who was also named inventor in document D7 as expressed in document D11, the board considers that when making an objective assessment of inventive step, it is more appropriate simply to rely on what the disclosure of document D7 teaches to a "person skilled in the art" in the sense of Article 56 EPC. The board naturally accepts that the personal approach of the inventor involved replacing the attenuator 34 of document D7 by a nonlinear amplifier and chopper, replacing these items by a microprocessor so that it received open circuit voltage and provided a digital output to control the alternating signal at line 30, and moving the microprocessor forward in the circuit to permit it to sense the dynamic conductance. Nevertheless, this approach is not consistent with the teaching of document D7 to the skilled person, in view of, for example, the absence of teaching of a nonlinear amplifier and chopper, meaning the skilled person would have applied the teaching of using a microprocessor according to column 13 to the attenuator actually disclosed, which document D7 already teaches can be moved forward to 44 in the dynamic conductance line.

3.4 In his submissions, the patent proprietor considers that, starting from document D7, the correction involves no more than manually entering the measured

open circuit voltages, so the skilled person would have directly replaced the attenuator 34 with the microprocessor to provide a signal at line 30, there being no suggestion towards automation. However, since following the teaching of document D7 to use a microprocessor implies significant modification to a digital architecture such as introducing analogue to digital conversion and so on, the board does not accept this view but on the contrary that of the opponent, that it was very unlikely that such complication and expense would be taken on board just to replace a simple manually operated component at that particular point. Reading document D7 sensibly, attenuator 34 is frequently said to implement the correction, but of course correction only has any meaning when applied to the corrected battery test result which is said to comport with that of a full battery (see for example column 7, line 49) and provision of the result in the microprocessor logic is therefore what is suggested to the skilled person.

- 3.5 The subject matter of independent claim 1 as granted cannot therefore be considered to involve an inventive step within the meaning of Article 56 EPC.

- 4. Patentability of the subject matter of independent claim 2 of the first auxiliary request and identically worded claim 1 of the second auxiliary request.
 - 4.1 The dynamic parameter specified in this claim is dynamic conductance which is the same dynamic parameter measured according to document D7. The board considers that that the opposition division was correct in its view that recitation of firmware amounts to no more

than the well known operation of a microprocessor. As is apparent from section 3.2 above, the board is satisfied that it was obvious for the skilled person to implement the polynomial equation in the microprocessor which means algorithmically in its firmware. The contention of the patent proprietor, that a microprocessor receiving V and G is not disclosed, is directed to novelty and does not affect the board's negative view on inventive step.

4.2 The subject matter of independent claim 2 of the first auxiliary request and identically worded claim 1 of the second auxiliary request cannot therefore be considered to involve an inventive step within the meaning of Article 56 EPC.

5. Patentability of the subject matter of independent claim 2 of the third auxiliary request and identically worded claim 1 of the fourth auxiliary request, claim 2 of the fifth auxiliary request, claim 1 of the sixth auxiliary request, claim 2 of the seventh auxiliary request, claim 1 of the eighth auxiliary request, claim 2 of the ninth auxiliary request, claim 1 of the tenth auxiliary request, claim 2 of the eleventh auxiliary request and claim 1 of the twelfth auxiliary request.

5.1 This claim differs from the claim discussed in section 4 above by virtue of features deriving from the description of the patent and added at the end of the claim beginning "said firmware program suppressing...". The claim does not specify exactly how the predetermined minimum value in the condition for this suppression is quantified, but it must be less than a

full charge to make sense of an indication being given to recharge. In essence, what is being provided is therefore a less than full and probably low or discharged battery warning to the user. An example of a battery state and charge measurement using a microprocessor with an iterative algorithm is however known from document D9 and this example teaches measurement of state of charge, displayed at the right as "1" (fully charged), "2" (partially discharged) or "3" (discharged). As the opponent explained, it follows that in display situation "3", the teaching of document D9 is to provide an indication to a user that the battery needs to be recharged. In other words, the bottom line is that both the patent and document D9 indicate to the user to charge a discharged battery.

- 5.2 The arguments of the patent proprietor draw on further limitations in the description, for example page 8, lines 53 to 55 and go in the direction that the predetermined value is selected in such a way as to ensure a low battery occasions a false test result to be suppressed. However, as argued by the opponent, it is part of the knowledge of the skilled person that no sensible measurement results can be achieved by measuring apparatus if a battery voltage is too low or completely discharged and that it has to be recharged. Consequently, realising this does not contribute to inventive step. It is true that display of the test result to the left of the display 24 is not suppressed in the case of document D9, but the board agrees with the opponent that the subject matter claimed solves no further technical problem leading to an inventive step in this respect. As emerged during the oral proceedings, the automation step using the microprocessor to

suppress the display bears the price that the user has no possibility of making any judgement about whether recharging a bad battery would be a waste of time and effort. This marks a step back from document D9 where, as the patent proprietor says, the decision is left to the user, who the board considers, even if he charges a bad battery, to be no worse off than if the display had been suppressed. The board therefore reached the view that the step of suppression is different to document D9 but does not amount to an inventive step in relation thereto.

5.3 The board also considers the opponent correct in the view that the display is an add-on microprocessor function because the testing algorithm is independent thereof. There is therefore no barrier to considering the disclosure of an open voltage display in document D9 in the context of inventive step despite the dynamic testing algorithm being different from that used in document D7. The board thus considers not separate bites, but separate items to be concerned, so the argument of the patent proprietor in this respect failed to convince the board.

5.4 The subject matter of independent claim 2 of the third auxiliary request and identically worded claim 1 of the fourth auxiliary request, claim 2 of the fifth auxiliary request, claim 1 of the sixth auxiliary request, claim 2 of the seventh auxiliary request, claim 1 of the eighth auxiliary request, claim 2 of the ninth auxiliary request, claim 1 of the tenth auxiliary request, claim 2 of the eleventh auxiliary request and claim 1 of the twelfth auxiliary request cannot

therefore be considered to involve an inventive step within the meaning of Article 56 EPC.

6. Since claims which lacked an inventive step were contained in the fifth to eighth auxiliary requests, it was not necessary to decide on compliance with Article 123(2) in connection with these requests, so that the condition for further amendment of these requests was not met and nor, consequentially, was there any need to deal with these requests in the present decision.

7. The board therefore reached the view that at least one claim directed to subject matter not considered to involve an inventive step in the sense of Article 56 EPC was contained in each of the requests presented by the patent proprietor to the board for decision.

Order

For these reasons it is decided that:

The decision under appeal is set aside.

The patent is revoked.

The Registrar:

The Chairman:

P. Martorana

A. G. Klein