

**Internal distribution code:**

- (A)  Publication in OJ  
(B)  To Chairmen and Members  
(C)  To Chairmen  
(D)  No distribution

**Datasheet for the decision  
of 10 February 2009**

**Case Number:** T 1242/07 - 3.4.01

**Application Number:** 97118220.9

**Publication Number:** 0911639

**IPC:** G01R 27/22

**Language of the proceedings:** EN

**Title of invention:**

Method and device for compensating the signal drift in a conductivity cell used in a domestic appliance

**Applicant:**

WHIRLPOOL CORPORATION

**Opponent:**

-

**Headword:**

-

**Relevant legal provisions:**

-

**Relevant legal provisions (EPC 1973):**

EPC Art. 83, 84, 54(1)(2), 56

**Keyword:**

"Sufficiency of disclosure (yes)"

"Clarity (yes, after amendment)"

"Novelty (yes)"

"Inventive step (yes, after amendment)"

**Decisions cited:**

-

**Catchword:**

-



Case Number: T 1242/07 - 3.4.01

**D E C I S I O N**  
of the Technical Board of Appeal 3.4.01  
of 10 February 2009

**Appellant:** WHIRLPOOL CORPORATION  
2000 M-63  
Benton Harbor  
Michigan 49022 (US)

**Representative:** Guerci, Alessandro  
Whirlpool Europe S.r.l.  
Patent Department  
Viale G. Borghi 27  
I-21025 Comerio (VA) (IT)

**Decision under appeal:** Decision of the Examining Division of the  
European Patent Office posted 23 April 2007  
refusing European application No. 97118220.9  
pursuant to Article 97(1) EPC.

**Composition of the Board:**

**Chairman:** B. Schachenmann  
**Members:** H. Wolfrum  
G. Assi

## Summary of Facts and Submissions

- I. European patent application 97 118 220.9 (publication No. EP-A-0 911 639) was refused by a decision of the examining division dispatched on 23 April 2007, for the reason of lack of novelty and inventive step (Articles 52(1), 54(1) and (2) and 56 EPC 1973) of the subject-matter of a main and an auxiliary request then on file.
- II. The applicant lodged an appeal against the decision and paid the prescribed fee on 25 June 2007. On 13 July 2007 a statement of grounds of appeal was filed. The requests pursued before the examining division were maintained.
- III. On 9 October 2008 the appellant was summoned to oral proceedings.  
In an annex to the summons the board expressed concerns regarding clarity, support by the description and sufficiency of disclosure under Articles 84 and 83 EPC 1973, respectively, as well as lack of inventive step for the subject-matter of the independent claims of the requests on file.
- IV. In examination and appeal, reference was made to the following prior art documents :
- D1: US-A-5 504 430; and  
D2: EP-A-0 686 721.
- V. Oral proceedings were held on 10 February 2009.

After discussion the appellant requested that the decision under appeal be set aside and a patent be granted on the basis of the following documents: claims 1 to 4, filed in the oral proceedings, description pages 1 to 8, filed in the oral proceedings, drawings figures 1 to 6, 9 and 10, as originally filed, and figures 7 and 8, filed in the oral proceedings.

VI. Independent claims 1 and 3 read as follows:

*"1. Method for compensating the signal drift in a conductivity cell used in a washing domestic appliance, characterized in that the conductivity cell is supplied with alternate current at more than one frequency, a function based on the signal values measured at said different frequencies being indicative of the signal drift of the cell and being used to compensate it, the function being*

$$C = [\text{Log}_{10}(s1)/R] * 100$$

*where:*

*C is the compensated value, s1 is the value of the signal measured at a first frequency, R is the ratio s2/s1, s2 being the value of the signal measured at a second frequency lower than the first."*

*"3. Washing domestic appliance, of the type comprising at least a conductivity cell which is connected to a control unit for providing this latter with a signal indicative of the electrical conductivity of the liquid fed and/or contained within the appliance, characterized in that the control unit comprises means for supplying the cell with alternate current at more than one frequency, means for measuring the signals*

*corresponding to said different frequencies and means for calculating or applying a compensated value based on a function of said signals, said compensated value being substantially not affected by drift of the signal of the conductivity cell, the function being*

$$C = [\text{Log}_{10}(s1)/R] * 100$$

*where:*

*C is the compensated value, s1 is the value of the signal measured at a first frequency, R is the ratio s2/s1, s2 being the value of the signal measured at a second frequency lower than the first."*

Claims 2 and 4 are dependent claims.

## **Reasons for the Decision**

1. In the following reference is made to the provisions of the EPC 2000, which entered into force as of 13 December 2007, unless the former provisions of the EPC 1973 still apply to pending applications.
2. The appeal complies with the requirements of Articles 106 to 108 EPC 1973 and Rule 64 EPC 1973 and is, therefore, admissible.
3. *Amendments*

Claim 1 on file constitutes a combination of originally-filed claims 1 and 4, and present claim 3 is based on originally-filed claims 5 and 8. In both claims, the formula for the function has been clarified by the introduction of suitable brackets. This clarification is supported by the version of the

formula which is disclosed on page 6 as originally filed and confirmed by the compensated values listed in Table 2 of the application as filed. In this context, an obvious calculation error as regards the compensated value for the measurements at 665 cycles ("246" instead of "285") has been corrected.

Claims 2 and 4 are based on information which is disclosed on originally-filed page 2.

The board is thus satisfied that the claims on file meet the requirement of Article 123(2) EPC.

4. *Clarity and sufficiency of disclosure*

In their present form, independent claims 1 and 3 indicate the functional relationship which allows to calculate compensated signal values for a conductivity cell in prolonged use from signal values measured at two different frequencies. The claims thus contain the information which the skilled person needs to solve without undue burden the posed problem of compensating signal drifts which arise from the occurrence of deposits on the electrodes of the conductivity cell.

In view of the fact that the description (Tables 1 and 2) and the drawings (Figures 4 to 6) present two concrete examples of a successful compensation based on the claimed function, the board has no reason to suspect that this function would not work in general for conductivity cells of washing domestic appliances.

For these reasons, the board considers the requirements of Articles 83 and 84 EPC 1973 to be met.

5. *Novelty and inventive step*

5.1 The two-part form of independent claims 1 and 3 is based on the prior art given by document D2, which refers to a washing machine in which two conductivity cells measure the conductivity of water in a supply pipe for fresh water and of the water in the washing tub, respectively. A control unit evaluates the measurement for the tub water in relation to that obtained for the fresh water. No indication is given in document D2 as to base a compensation of a signal drift of a conductivity cell in a washing domestic appliance on conductivity measurements made at two different frequencies and to derive from the measured signal values a compensated value by means of the claimed functional relationship.

Therefore, the teaching of document D2 does not anticipate nor hint at the subject-matter of independent claims 1 and 3 on file.

5.2 Document D1 refers to a method and a device for measuring conductivity in liquids by applying an alternating voltage of a predetermined frequency, which may range from 50 Hz to 50 kHz, across the pair of electrodes of a conductivity cell (claims 1 and 9; column 1, lines 11 to 14). It is known from D1 that the conductivity measurements can suffer from interfering phenomena which are considered to be due to layer formation on the electrodes by ions present in the liquid/electrolyte, thereby changing the electrical properties of the AC measuring circuit (column 1, lines 14 to 19). In order to obtain a true value of the

cell conductance, a first measurement of the conductance  $1/R$  is performed at an initial frequency  $f_i$  of an AC voltage/current applied to the cell. An "expected" frequency value for that measured conductance value (ie the frequency that would have been expected to yield the measured conductance value, given a known functional relationship between conductance and frequency for specific cell parameters at hand) is calculated (equation (2) indicated in column 3) and the thus calculated frequency is compared with the initially applied frequency  $f_i$ . If there is a difference between the applied and the calculated frequency, a new conductance value is measured at the just calculated expected frequency. On the basis of the new conductance value a new expected frequency is calculated by means of the given function. Again, the two frequencies are compared and if they differ the applied frequency is again adjusted. This procedure is repeated until the difference between the calculated frequencies lies within a small predetermined absolute range. The conductance value corresponding to the last frequency is taken as the true conductance value of the sample (column 4, line 43 to column 5, line 1).

The appellant alleges that document D1 concerned conductivity measurements in liquid chromatography and thus would not be consulted by a skilled person in the field of washing domestic appliances, who was confronted with signal drifts of conductivity cells which were due to a contamination of electrodes in contact with dirt and washing solutions. Besides, D1 did not teach to compensate measured signal values by means of a function which was based on signal values measured at different frequencies.



The board does not share this view. It is evident from D1 that measured conductance values are dependent on the frequency which is applied to the conductivity cell, the functional relationship being given by equations (1) and (2) in column 3 of D1. The observation of a discrepancy between a frequency applied and the calculated expected frequency for the observed signal value reflects changes of the condition of the electrodes on the properties of the AC measurement circuit. In fact, D1 teaches to link, on the basis of the given functional relationship, measurements of the conductance at different frequencies in order to compensate observed signal shifts. Since the success of the known compensation method is independent of the exact nature of the processes which are behind the changing electrode conditions, the board concurs with the finding of the examining division that the method and device known from document D1 can be successfully used for compensating any kind of signal drift which changes the electric properties of the measurement circuit of a conductivity cell, including the occurrence of deposits in washing domestic appliances. Taking furthermore into consideration that the teaching of D1 is by no means limited to the field of liquid chromatography (column 3, lines 41 to 48; claims 1 and 9) and that a skilled person who is confronted with a problem associated with conductivity measurements in a washing domestic appliance is to be expected to consult documents in the concrete field of conductivity cells, document D1 has to be regarded as a pertinent piece of prior art for the claimed subject-matter.

However, the function devised by the present inventor for effectively compensating signal drifts has been empirically derived and is in no way related to the functional relationship which is at the basis of the iterative process of compensating signal drifts that is taught by document D1. Thus the board agrees with the appellant that the claimed subject-matter is not only novel over the teaching of document D1 but that the latter also does not provide an example which could lead the skilled person to the present invention as it is defined in independent claims 1 and 3 on file.

5.3 In conclusion, the subject-matter of claim 1 under consideration is new with respect to the teachings of the available prior art documents and, moreover, is not rendered obvious by these documents, when taken either alone or in any conceivable combination. Therefore, the claimed subject-matter meets the requirements of Article 52(1) EPC and Articles 54(1) and (2) and 56 EPC 1973.

## Order

### For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the examining division with the order grant a patent with:
  - claims 1 to 4, filed in the oral proceedings,
  - description: pages 1 to 8, filed in the oral proceedings,
  - drawings: figures 1 to 6, 9 and 10, as originally filed, and figures 7 and 8, filed in the oral proceedings.

The Registrar

The Chairman

R. Schumacher

B. Schachenmann