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D E C I S I O N
of 19 December 2000

Case Number: T 0470/96 - 3.4.1

Application Number: 87903103.7

Publication Number: 0303615

IPC: G01R 11/52

Language of the proceedings: EN

Title of invention:
Measurement circuit

Patentee:
ROSEMOUNT INC.

Opponent:
Endress + Hauser GmbH + Co.

Headword:
Measurement Circuit/ROSEMOUNT INC.

Relevant legal provisions:
EPC Art. 54(1)(2), 56, 123(2)(3), Art. 111(1)

Keyword:
"Correction of an obvious error (yes)"
"Novelty (no, main request)"
"Fresh case - remittal (yes; auxiliary requests)"

Decisions cited:
T 0607/93, T 0462/94

Catchword:
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Case Number: T 0470/96 - 3.4.1

D E C I S I O N
of the Technical Board of Appeal 3.4.1
of 19 December 2000

Appellant: (Opponent)
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Decision under appeal: **Interlocutory decision of the Opposition Division of the European Patent Office posted 18 March 1996 concerning maintenance of European patent No. 0 303 615 in amended form.**

Composition of the Board:

Chairman: G. Davies
Members: H. K. Wolfrum
M. G. L. Rognoni

Summary of Facts and Submissions

I. The appellant (opponent) lodged an appeal against the decision of the Opposition Division, dispatched on 18 March 1996 maintaining European patent No. 0 303 615 in amended form. The notice of appeal was received on 20 May 1996, the prescribed fee being paid on the same day. The statement setting out the grounds of appeal was received on 15 July 1996.

II. Opposition had been filed against the patent as a whole and based on Article 100(a) together with Articles 52(1) and 56 EPC and Article 100(c) EPC. With respect to the amendment of claim 1 during opposition, objections under Articles 123(2) and (3) EPC had been additionally raised.

The contested decision referred *inter alia* to the following document:

D4: US-A-4 187 459.

III. In response to an annex accompanying a summons to oral proceedings, the appellant filed with a letter dated 30 October 2000 the following documents:

D11: "11th European Solid State Circuits Conference, - ESSCIRC '85 - Abstracts - Invited Papers and Contributed Papers", Toulouse, 16. - 18. Sept. 1985, pages 45 - 48;

D11a: "IEEE Journal of Solid-State Circuits", April 1987, pages 162-163; and

D12: "EDN", 10 January 1985, pages 201-208.

IV. Oral proceedings were held on 19 December 2000.

V. The appellant requested that the decision under appeal be set aside and that the patent be revoked.

VI. The respondent requested that the appeal be dismissed and that the patent be maintained on the basis of:
claims 1 to 14, the description and Figures as maintained by the opposition division (main request);
claims 1 and 2, with the description and Figures to be adapted, filed in the oral proceedings (first auxiliary request);
claim 1, with the description and Figures to be adapted, filed in the oral proceedings (second auxiliary request).

VII. Independent **claim 1** of the **main request** reads as follows:

"1. A measurement circuit (10) for providing an output signal (42) as a function of an input signal (16) comprising:

generating means (18) coupled to the input signal (16) for providing a generator signal of an electrical quantity which is a function of the input signal (16), the generating means (18) including reactance means for defining said electrical quantity;

measurement means (34) coupled to the generating means (18) for receiving the generator signal and for measuring the generator signal to provide a measurement signal (28) as a function thereof;

feedback means (9) coupled to the measurement means (34) for providing a feedback signal (19) to the generating means (18) as a function of the measurement signal (28);

and output means (38) for providing the output signal;
characterised in that:

(a) said electrical quantity is charge, the generating means (18) being adapted to provide a generator signal formed by a plurality of charge packets;

(b) the measurement means (34) are adapted for receiving the charge packets from the reactance means (11);

(c) the feedback means (9) are operative to provide a feedback signal to control the generating means (18) such that the generator signal tends towards a charge-balanced state; and

(d) the output means (38) are adapted for providing the output signal as a function of a count of a number of charge packets contained in the generator signal."

Independent **claim 1** of the **first auxiliary request** adds to claim 1 of the main request the characterising features:

"(e) the charge packets formed by the reactance means (11) include a first portion of charge packets having a first polarity and a second portion of charge packets having a second polarity opposite the first polarity;

(f) the measurement means (34) accumulates the charge packets contained in the generator signal for providing the measurement signal as a function of accumulated charge;

(g) the feedback signal controls the switching means (13) for changing the polarity of the charge packets being coupled to the measurement means (34);

(h) the first portion comprises a first number N1 of charge packets and the second portion comprises a second number N2 of charge packets;

(i) the feedback signal controls the switching means (13) to determine the first and second numbers of charge packets N1 and N2;

(j) the output means (38) provides the output signal as a function of the first number N1 and the second number N2;

(k) the generating means (18) comprises at least one reference potential coupled to the switching means (13); and

(l) the reactance means (11) includes first and second capacitances C1 and C2 and wherein the output means (38) provides the output signal substantially according to the equation: N1 C1 V = N2 C2 V wherein C1 and C2 are a function of the input signal and V is the reference potential."

Independent **claim 2** of the **first auxiliary request** differs from claim 1 thereof in that feature (l) requires capacitance C2 to be a "substantially fixed capacitance".

The sole claim of the **second auxiliary request** is identical to claim 1 of the first auxiliary request.

VIII. In the contested decision, the Opposition Division considered the amendment with respect to patent claim 1 to be admissible under Articles 123(2) and 123(3) EPC and the claimed subject-matter to involve an inventive step. In the latter respect, document D4 was identified as the closest prior art against which claim 1 of the then sole request (being now the main request) was found to be properly delimited. The division held that

the characterising features of claim 1 (with the exception of the electrical quantity being charge from feature (a)) were not known from any of the prior art documents then on file.

IX. The appellant argued that the subject-matter of claim 1 of the main request lacked novelty and thereby inventive step with respect to document D4 when the claim wording was interpreted on the basis of the generally recognized meaning of the technical terms. In view of the fact that in opposition appeal proceedings the patent proprietor was still in a position to amend the claim wording, an exclusive, narrow interpretation of claim 1 based on additional technical information contained in the description was not justified. Furthermore, the claimed subject-matter lacked inventive step with respect to document D11 when combined with the skilled person's knowledge.

The claims of the first and second auxiliary requests were not properly drafted in the two part form with respect to D11, contrary to the requirement of Rule 29(1) EPC. Moreover, the subject-matter of these claims also lacked inventive step in view of the cited prior art.

X. The respondent defended the main request with respect to document D4 by relying on a specific interpretation of the claim wording, which in the respondent's opinion, was justified by the patent specification. In particular, based on column 3, lines 20-31, of the patent specification, the respondent argued that the only reasonable interpretation of the reference to a "charge-balanced state" in feature (c) of claim 1 was a dynamic balancing of charges of opposite polarity

achieved by the generator signal over time under the control of feedback means. In the light of the patent specification, there could not remain any doubt that "charge packets" referred to in feature (a) meant discrete amounts of charges delivered from one part of the circuit to another part of the circuit. The operation of the claimed circuit was thus in clear distinction to that of the prior art circuit according to D4 which could not and did not transfer well-defined charge packets through the circuit but processed voltage signals. Moreover, from Figure 3 of the patent it was obvious that even if an input signal gave rise in one measurement cycle to a large charge packet of one polarity balanced by a plurality of smaller packets of opposite polarity, the output signal was the result of a plurality of measurement cycles. Finally, it was evident from the description that the term "feedback signal" was used in a more general sense than in analog circuits where an output signal was fed back and superposed to the input signal. Actually, the feedback signal according to the invention influenced the generator signal by controlling switches to deliver charge packets of opposite polarity from the reactance means.

As far as the main request was concerned, no arguments were given with respect to the prior art according to D11. However, as regards the auxiliary requests, the claimed measurement circuits having reactance means including first and second capacitances and operating so as to generate a charge-balanced state of charge packets from the two capacitances was to be considered patentable over D11 since this document related to an analog-to-digital converter for which there was, in principle, no need for a second capacitance. If the

Board did not decide immediately in favour of one of the auxiliary requests, remittal of the case to the first instance should be contemplated.

Reasons for the Decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is therefore admissible.

A. Main request

2. *Admissibility of late-filed prior art documents*

The Board considered document D11 to be so relevant for the subject-matter of the main request that its teaching could not be ignored. D11 was thus admitted into the proceedings.

Document D11a had been referred to only as evidence for the fact that D11 constituted prior art within the meaning of Article 54(2) EPC. Since neither the respondent nor the Board had doubted this fact, the introduction of D11a into the proceedings was considered superfluous.

Document D12 was not considered relevant for the subject-matter of the main request, and thus was not admitted into the procedure.

3. *Amendments*

With respect to the claims as granted the amendments consist in the replacement of the first occurrence of the term "input" by "output" in the phrase "a

measurement circuit for providing an input signal as a function of an input signal" in claim 1 and in the introduction of an indefinite article in dependent claim 14.

The Board is of the opinion that the amendment to claim 1 merely constitutes the correction of an obvious error.

A skilled person reading in patent claim 1 the phrase "a measurement circuit for providing an input signal as a function of an input signal" would have immediately realized that something was wrong. Moreover, in view of the definitions of the output means in the preamble and the characterizing part of claim 1, it would have become immediately evident to the skilled reader that the first occurrence of "input signal" should read "output signal". Further confirmation is consistently given throughout the description so that no reasonable doubt is left as to the occurrence of an error and its proper correction.

The amendment made to claim 14 is purely editorial in nature.

Therefore, the main request does not extend the scope of protection conferred nor did claim 1 as granted introduce subject-matter extending beyond the content of the application as filed so that the appellant's objections under Articles 123(2) and 123(3) EPC are unfounded.

3. *Patentability*

3.1 Document D4 (cf. Figures 1 and 2 with the corresponding

description) relates to a circuit arrangement for measuring digitally the ratio of first and second capacitances (C1 and C2) of a capacitance displacement transducer. Either one or both capacitance values vary in response to an external variable (cf. column 4, lines 7-13) constituting an input signal. A voltage V_{C1} proportional to the first capacitance and a voltage V_{C2} proportional to the second capacitance are generated. The voltage V_{C1} is used to charge the feedback capacitor of an integrator to a certain charge level during a time interval t1 and the voltage V_{C2} is used to discharge the feedback capacitor completely during a time interval t2. The two time intervals t1 and t2 are measured digitally and their ratio corresponds to the ratio between the capacitances C1 and C2.

The Board identifies in D4 a measurement circuit comprising, in the terminology of claim 1 under consideration, "generating means" (cf. 10 to 19, 22a, 22b, 23 to 27 in D4) for providing a generator signal including as "reactance means" sensing capacitors (cf. 12, 13), the capacitance ratio (C1/C2) of which is to be measured; "measurement means" formed by an integrator (20, 21) and comparator (36) coupled to the generating means for receiving and measuring the generator signal to provide a measurement signal as a function thereof; "feedback means" including switch controls (31, 37, 53), to control a switching network within the generating means; and "output means" including a counter (35). The "generator signal" applied to the integrator of the measurement means is indicative of the input signal arising from the external variable changing the capacitances C1 and C2 and takes on opposite polarities under the action of the switching network. As is explicitly shown in

Figure 2g of D4, the signal received at the integrator causes a feedback capacitor (21) within the measurement means to charge and discharge in consecutive time intervals. The accumulation and subsequent "balancing" of charges in the feedback capacitor (21) of the measurement means of D4 is due to a flow of charges from and to the capacitor in well-defined time intervals. This flow of charges can be imagined as being composed of a continuous stream of fixed "charge packets", the size of a packet being determined by the slope of the increase or decrease of charge in the capacitor over time and the repetition period of the clock pulses defining the respective time intervals. Hence, the transfer in the circuit of D4 of the generator signal to the measurement means can be described as the reception of "charge packets" of opposite polarity by the measurement means, whereby the term "charge packet" is given the normally recognized meaning of a discrete amount of charge flowing from or to a capacitor (cf. in this respect page 3, lines 5-7 of the patent specification). Therefore the circuit functions according to features (a) and (b) of claim 1 of the main request have to be regarded as being accomplished in the circuit according to D4. Moreover, in accordance with feature (c) of claim 1, the known feedback means are operative to provide a feedback signal which controls the generating means so as provide a generator signal which tends to a charge-balanced state over time within the measurement means. Finally, the output means generate a count which is indicative of the length of the time intervals during which the generator signals of opposite polarities are applied to the input of the measurement means and thus is indicative of the capacitance ratio to be measured. Given the fact that the amount of charge flowing to and

from the measurement means during the time intervals of charging and discharging the feedback capacitor is respectively proportional to these time intervals, the generated count of time intervals (clock periods) may be considered as a count of "charge packets" within the meaning of feature (d) of claim 1.

3.2 Whilst the Opposition Division appears to have based its judgment on a narrow interpretation of the wording of claim 1, the above comparison of the teaching of D4 with the subject-matter of claim 1 relies on a broader interpretation thereof because the Board cannot accept the respondent's submission that the claimed subject-matter could be interpreted in a reasonable manner only on the basis of the content of the patent specification.

As a general observation, the Board notes that, given a vague and ambiguous claim wording, any technically meaningful interpretation of the claim is justified for the purpose of a comparison with a prior art teaching (cf. T 607/93). In the present case, the comparison made in point 3.1 above is based on a conventional understanding of the meaning of technical terms used in claim 1 under consideration, on the one hand, and of the teaching of the prior art according to D4, on the other hand. Thus, if the claim definitions were intended to be distinguished from the prior art by relying on a narrower interpretation or a specific meaning, corresponding amendments to claim 1 would have been required, based on specific information provided by the remainder of the patent specification.

More specifically, the Board notes with respect to the proper interpretation of the term "charge packets" that

claim 1 under consideration does not define in a clear and unambiguous manner a circuit in which discrete amounts of charges formed as a function of an input signal by a reactance (or, more precisely, at a capacitance) would have to be transferred as a physical entity in a one-to-one relationship from said capacitance to the input of the measurement means (or, more precisely, to the feedback capacitor of an integrator at the input of the measurement means). The claim even fails to define in an unambiguous manner a fundamental property of the generator signal, apparent from all references in the patent description to charge packets, that the signal is composed of a sequence of charge packets of opposite polarity. Given the fact that this feature, which is indispensable for the operation of all embodiments, is first specified in dependent claim 3, the Board does not accept the respondent's narrow interpretation of the definition of charge packets in claim 1.

In this context, the functional specification "*such that the generator signal tends towards a charge-balanced state*" comprised in feature (c) is misleading. Apart from the fact that this phrase is not found in the patent specification or in the originally-filed application documents, its normally understood technical meaning implies a somehow zeroed signal to occur at the input of the measurement means. It is only by reference to the description of the specific embodiments of Figures 2, 6, 7 and 10, that it becomes apparent that the generator signal is in fact a signal composed of charge packets of opposite polarity successively applied to the input of the measurement means so that the total amount of charges of one polarity is balanced over time by the total amount of

charges of the other polarity and that this process is cyclically repeated. A further reason impeding a narrow interpretation of the claim wording on the basis of specific information from the patent description is given by the fact that the definition of the generator signal according to present claim 1 is even in contradiction to the operation of some of the specific embodiments. The requirement for the generator signal to be a "*signal of an electrical quantity which is a function of the input signal* " taken in combination with the requirement that this signal *"tends towards a charge-balanced state*" is indeed in conflict with the embodiments of Figures 2, 6 and 10, according to which only charge packets of one polarity comprised in the generator signal are derived from the input signal whereas the charge packets of opposite polarity required for the charge-balancing are generated completely independently from the input signal.

Finally, as regards the definition of the "feedback signal" provided by the"feedback means", the respondent relied on an unusual interpretation thereof. In a conventional technical sense, the term "feedback signal" is used for a signal which is fed back to the input side of a circuit so as to be superposed to the input signal. Nothing of this kind is shown in the embodiments of the present patent, in which signals generated from that part of the circuit which is named "feedback means" are exclusively used to control a switching network required for generating signals of opposite polarity to be applied to the measurement means. The respondent's justification of its interpretation of the feedback signal as mere control signals operating on the generating means relied on the observation that the generating means and measurement

means according to the invention were digital circuits in contrast to analog circuits as shown by the prior art. The Board notes that this submission refers to features which are neither the subject of claim 1 under consideration nor find support in the patent specification, as none of the generating means and measurement means shown in the specific embodiments would constitute a digital circuit in the conventional use of this term for logic circuitry.

3.3 In view of the above considerations, the Board fails to identify any feature in claim 1 of the main request which would clearly and unambiguously distinguish the claimed measurement circuit from the prior art according to D4.

Claim 1 thus does not comply with the requirements of Articles 52(1) and 54(1) and (2) EPC having regard to novelty.

Although lack of novelty was not a reason of opposition and hence is a fresh ground of opposition which may not be introduced into the appeal proceedings without the consent of the patent proprietor, a finding of lack of novelty directly implies the finding of lack of inventive step within the meaning of Articles 52(1) and 56 EPC (cf. G 7/95 OJ EPO 1996, 626). Apart therefrom, the respondent had in fact accepted a discussion of novelty.

3.4 The subject-matter of claim 1 also lacks novelty within the meaning of Articles 52(1) and 54(1) and (2) EPC with respect to the prior art according to the late-filed document D11 (see Figures 1 and 2 and the corresponding description) which shows an analog-to-

digital converter corresponding in structure and function to the embodiment of Figure 10 of the present patent.

3.5 For these reasons, the main request is not allowable.

B. First and second auxiliary requests

4. The auxiliary requests were filed as a response to the introduction of late-filed prior art into the appeal proceedings. The Board admitted the auxiliary requests in the proceedings on the general principle of fairness to the respondent.

5. The claims of the auxiliary requests combine the subject-matter of claim 1 of the main request with features from patent claims 2 to 11 and 12 or 14, respectively, by concentrating on the embodiment of Figure 7. The proposed amendments to the claims are substantial and have not been the subject of the decision under appeal.

The emergence of highly relevant prior art during the appeal proceedings and the filing of the auxiliary requests have raised new questions, in particular with respect to inventive step, which have nothing to do with the matter in dispute before the first instance.

Moreover, in view of the fact that the claims of the auxiliary requests still comprise the vague and ambiguous definitions of claim 1 of the main request, the auxiliary requests require thorough examination in relation to both the formal and the substantive requirements of the EPC. Finally, since the embodiments of Figures 2 to 6, 10 and 11, are no longer covered by

the subject-matter of the auxiliary requests an extensive revision of the description appears to be mandatory.

In these circumstances, the Board finds it appropriate to exercise its power under Article 111(1) EPC and to remit the case to the first instance department for further processing (cf. T 462/94).

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance for further prosecution on the basis of the first and second auxiliary requests filed in the oral proceedings.

The Registrar: The Chairman:

R. Schumacher G. Davies