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Datasheet for the decision of 27 October 2008

Case Number: T 1595/06 - 3.5.03

Application Number: 00965606.7

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Language of the proceedings: EN

Title of invention:
Statistical determination of estimates of process control loop parameters

Applicant:
FISHER CONTROLS INTERNATIONAL LLC

Headword:
Process control diagnostics/FISHER

Relevant legal provisions:
EPC Art. 54, 84, 111(1)

Keyword:
"Novelty (main, first and second auxiliary request) - no"
"Remittal for further prosecution"

Decisions cited:
-

Catchword:
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Case Number: T 1595/06 - 3.5.03

D E C I S I O N
of the Technical Board of Appeal 3.5.03
of 27 October 2008

Appellant: FISHER CONTROLS INTERNATIONAL LLC
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 4 May 2006 refusing European application No. 00965606.7 pursuant to Article 97(1) EPC 1973.**

Composition of the Board:

Chairman: A. S. Clelland
Members: B. Noll
R. Moufang

Summary of Facts and Submissions

I. This appeal is against the decision of the examining division refusing European patent application No. 00965606. The decision was based on the sole ground that the subject-matter of claims 1 and 25 as filed during the oral proceedings before the examining division on 6 April 2006 did not meet the requirement of novelty under Article 54(2) EPC with respect to the disclosure of document

D3: Skormin V A et al: On-Line Diagnostics of a Self-Contained Flight Actuator", IEEE Transactions on Aerospace and Electronic Systems, Vol. 30, No. 1, (1994) pages 186-196.

II. With the statement of grounds of appeal the appellant requested that the impugned decision be set aside and a patent granted on the basis of claims 1 to 52 as filed on 6 March 2006. The appellant also submitted arguments with respect to clarity, novelty and inventive step. Oral proceedings were conditionally requested.

III. In a communication accompanying a summons to oral proceedings the board gave a preliminary opinion as to the interpretation of claim 1 and novelty.

IV. In response to the board's communication the appellant filed new claims 1 and 25 of both first and second auxiliary requests and submitted arguments as to novelty.

V. Oral proceedings were held on 27 October 2008. During the oral proceedings the appellant's representative

filed a set of claims 1 to 16 as a third auxiliary request. It was furthermore requested that the case be remitted to the department of first instance for further prosecution on the basis of any one of the requests on file.

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

"1. A method of determining an estimate of a parameter associated with a process control loop (10) including the steps of:
measuring a signal;
storing the measured signal as signal data;
characterized in that:
the measured signal is generated as a result of the normal operation of a process control device (13) within the process control loop (10) when the process control loop (10) is operating normally and connected on-line within a process control environment; and
performing a statistical analysis on the stored signal data to determine the parameter estimate."

Claim 1 of the first auxiliary request differs from claim 1 of the main request in that the introductory portion reads "A method of determining an estimate of a parameter of a process control loop (10) comprising one or more process control devices in a process environment or network in a process plant including the steps of:", and in that the expression "of the process control loop" is added to the last feature.

Claim 1 of the second auxiliary request differs from claim 1 of the first auxiliary request in that the expression "and without introduction of exogenous

control signals" is added to the first characterizing feature.

Claim 1 of the third auxiliary request includes the features of claims 1 to 3 of the second auxiliary request and reads as follows:

"1. A method of determining an estimate of a parameter of a process control loop (10) comprising one or more process control devices in a process environment or network in a process plant including the steps of:
measuring a signal;
storing the measured signal as signal data;
characterized in that:
the measured signal is generated as a result of the normal operation of a process control device (13) within the process control loop (10) when the process control loop (10) is operating normally and connected on-line within a process control environment and without introduction of exogenous control signals; and
performing a statistical analysis on the stored signal data to determine the parameter estimate of the process control loop,
wherein the parameter estimate is an estimate of the friction encountered by a device (13) having an actuator that moves in response to actuator pressure applied to move the actuator, wherein the step of measuring includes the steps of measuring a first signal indicative of actuator pressure and measuring a second signal indicative of the position of the actuator within the device (13), wherein the step of storing includes the step of storing a series of data points, each data point having an actuator pressure component derived from the actuator pressure signal and

an actuator position component derived from the actuator position signal, and wherein the step of performing the statistical analysis includes the steps of creating a reduced data set from the series of data points and determining the friction estimate from the reduced data set, and
wherein the step of creating the reduced data set includes the steps of analyzing each of the series of data points to determine if the data point is outside of a friction zone having friction encountered by the actuator in the device (13) and creating the reduced data set to include these data points determined to be outside of the friction zone.

Independent claim 25 of the main and first and second auxiliary request and independent claim 12 of the third auxiliary request relate to an apparatus with features corresponding to the respective method claim 1.

VII. At the end of the oral proceedings the board announced its decision.

Reasons for the Decision

1. *Clarity - claim 1 of the main request*

1.1 According to the minutes of the oral proceedings before the examining division on 6 April 2006 a number of clarity issues were for the first time raised against claim 1 as filed on 6 March 2006, even though the claim wording was substantially the same as that of claim 1 on which the summons was based. The examining division considered that following expressions were unclear:

(a) "estimate" in the context of "estimate of a parameter",
(b) "normal operation" and "the process control loop is operating normally",
(c) "performing a statistical analysis",
(d) "measuring a signal".

1.2 The board does not concur with the examining division's objections and considers that when each feature is construed to have the normal meaning in the art then claim 1 is sufficiently clear. The reasons are as follows:

Re (a): In the field of process control an estimate of a parameter is synonymous with the value the parameter is expected to have, taking into account the known state and dynamics of the process. How the estimate is obtained is of no importance.

Re (b): The expression "normal operation" is understood to mean that the process control device is used for its intended purpose. From this it follows that injecting "small" disturbing signals for diagnostic purposes does not render the operation "abnormal" as such signals are of a sufficiently low level as not to disturb the device to such an extent that the desired behaviour changes.

Re (c): "Performing a statistical analysis" is understood in a broad sense as encompassing all kinds of statistical methods and their application to the stored signal.

Re (d): Although the expression "measuring a signal" is

of unclear limitative effect when considered on its own the board notes that the first characterizing feature specifies that the measured signal is subjected to two limiting conditions, the first being that it is generated as a result of normal operation of the process control device and the second that this occurs within the control loop. In the board's view, the signal is sufficiently defined by these two conditions for the requirement of clarity and does not need the additional expression "related to said parameter" for clarification.

1.3 The board therefore concludes that claim 1 of the main request meets the requirement of Article 84 EPC as to clarity. For the same reasons claim 25 likewise meets this requirement.

2. *Novelty - main request*

2.1 The method according to claim 1 of the main request lacks novelty with regard to the disclosure of D3 (Article 54(1), (2) EPC).

2.2 The diagnostics system described in D3 is intended for monitoring the elements of a self-contained flight actuator during the operation in order to detect a progressive degradation of components and to issue a warning before a component fails. A change of one or more parameters of the component is a sign for an upcoming failure of the component (Table II). D3 gives examples of parameters which are susceptible of direct measurement such as motor velocity, and those which are not, such as torque (page 188, right hand column). The actuator is described using a mathematical model

(figure 2), common practice in control engineering. For diagnostic purposes a diagnostic model is used which is "intentionally sensitive to particular failure modes" (paragraph III starting on page 189). The task of the diagnostic model is to monitor parameters which may lead to a failure of the actuator when entering a range of unacceptable values. Numeric examples for the correspondence between possible failures and system parameters are given in Table II. In order to obtain an estimate of those parameters which cannot be measured directly the accessible parameters of the control loop are measured during operation and input to a finite-memory recursive least-squares method (RLSM) explained in paragraph IV. This method performs a statistical analysis on the measured parameters to estimate the non-measurable parameters. Consequently, all features of the method of claim 1 of the main request are known from D3.

2.3 The appellant argued the D3 was limited to a flight actuator and taught an intentionally unrealistic diagnostic model for the prediction of failure.

It is evident from tables I and II of D3 that the possible failure modes are not specific to flight actuators but may occur in all fields of process control in which electric motors, actuators and hydraulic valves are used. Thus, contrary to the appellant's assertion, the diagnostic system in D3 is understood by the board as not being applicable only to flight actuators. Furthermore, the diagnostic model discussed in D3 is based on a well-known control system model and takes into account, in addition to the normal operating parameters, parameters which are only

relevant for failure. Thus, a basic control system model is an inherent element of a diagnostic model. From this it follows that both the diagnostic model and the basic control system model must be as realistic as possible to ensure a reliable prediction of failure. For these reasons the appellant's arguments on novelty are not considered convincing.

2.4 The above considerations also apply, *mutatis mutandis*, to apparatus claim 25 which corresponds to claim 1 in terms of apparatus features. Therefore, the apparatus of claim 25 of the main request does not meet the requirements of Article 54(1), (2) EPC.

3. *Novelty - first and second auxiliary request*

The features added in the preamble of claims 1 and 25 of both the first and second auxiliary requests do not serve to establish novelty. The expressions "process control device", "process environment" and "network" are implied by the term "process control loop" so that the use of these terms does not impose any further limitation on claim 1. The further reference to the determination of the estimate being "in a process plant" is not considered limitative either. The description relating to figures 8 and 11 at page 23 of the present application makes clear that the term "plant" is considered synonymous with a controlled member in a control loop and does not limit the claim to any specific construction.

Likewise, the reference to the measured signal being generated "without introduction of exogenous control signals" in claims 1 and 25 of the second auxiliary

request does not establish novelty with regard to the disclosure of D3 as the diagnostic model described in D3 only relies on measured values of parameters of the control loop.

4. *Remittal - third auxiliary request*

The board notes that the decision under appeal only dealt with the novelty of claims 1 and 25 of appellant's then pending request. The additional features of claims 2 and 3 of this request, now included into claim 1 of the third auxiliary request, have not yet, as far as it can be seen, been adequately examined by the department of first instance as to novelty and inventive step, the impugned decision not mentioning those claims and only generalised references to "mere constructional details" having been made in the course of the examination procedure. The board considers it therefore appropriate to remit the case pursuant to Article 111(1) EPC to the department of first instance for further prosecution.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance for further prosecution on the basis of the third auxiliary request.

The Registrar: The Chairman:

D. Magliano A. S. Clelland