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Datasheet for the decision of 26 October 2017

Case Number: T 1697/14 - 3.4.02

Application Number: 01114516.6

Publication Number: 1164550

IPC: G01M13/04, G07C3/00

Language of the proceedings: EN

Title of invention:
Machine component monitoring, diagnosing and selling system

Patent Proprietor:
NTN Corporation

Opponent:
SKF Condition Monitoring Center (Lulea) Aktiebolag

Headword:

Relevant legal provisions:
EPC Art. 100(c), 123(2)

Keyword:
Amendments - added subject-matter (yes)

Decisions cited:

Catchword:

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Office européen des brevets

Beschwerdekammern

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Case Number: T 1697/14 - 3.4.02

D E C I S I O N
of Technical Board of Appeal 3.4.02
of 26 October 2017

Appellant: (Patent Proprietor)	NTN Corporation 3-17, Kyomachibori 1-chome, Nishi-ku, Osaka-shi, Osaka 550-0003 (JP)
Representative:	Behrmann, Niels Behrmann Wagner Partnerschaftsgesellschaft mbB Patentanwälte Hegau-Tower Maggistraße 5 (10. OG) 78224 Singen (DE)
Appellant: (Opponent)	SKF Condition Monitoring Center (Lulea) Aktiebolag Aurorum 30 977 75 Lulea (SE)
Representative:	Hammond, Andrew David Valea AB Box 1098 405 23 Gothenburg (SE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 12 June 2014 concerning maintenance of the European Patent No. 1164550 in amended form.**

Composition of the Board:

Chairman	R. Bekkering
Members:	A. Hornung
	G. Decker

Summary of Facts and Submissions

I. Both the opponent and the patentee appealed against the interlocutory decision of the opposition division maintaining European patent No. 1164550 in amended form.

Opposition had been filed against the patent as a whole and based on the grounds of Article 100(a) EPC, together with Article 56 EPC, Article 100(b) EPC and Article 100(c) EPC, together with Article 123(2) EPC.

The opposition division had found that the patent as amended according to a first auxiliary request then on file and the invention to which it related met the requirements of the EPC.

II. Oral proceedings before the board were held on 26 October 2017.

During oral proceedings, the matter was discussed with the parties. In particular, the patentee withdrew its auxiliary requests 4 and 5 then on file. The parties confirmed their final requests as follows:

III. The patentee requested as its main request that the decision under appeal be set aside and the patent be maintained in amended form with the following documents: claim 1 as granted and claims 2 to 39 as maintained by the opposition division.

As auxiliary request 1, the patentee requested that the opponent's appeal be dismissed and that the patent be maintained in amended form as allowed by the opposition division, including claims 1 to 39 according to the first auxiliary request filed at the oral proceedings before the opposition division on 18 March 2014.

As auxiliary requests 2, 3 and 6 to 60, the patentee requested that the decision under appeal be set aside and that the patent be maintained in amended form with the following documents: claims according to the auxiliary requests 2, 3 and 6 to 60 filed with letter dated 26 September 2017.

IV. The opponent requested that the decision under appeal be set aside and that the European patent be revoked. Moreover, the opponent requested not to admit the auxiliary requests 2 to 60 into the proceedings.

V. Claim 1 according to the patentee's main request reads as follows:

A machine component monitoring system for monitoring machine components (1) used in a machine system provided with a plurality of such machine components each having rolling elements (13), which system comprises:

control means;

a plurality of determining units (4) each connected with a plurality of sensors (3), said determining units being connected with the control means (5), each of the sensors being arranged on the respective machine component for detecting an influence signal resulting from passage of the rolling elements induced in the machine component, each of the determining units being operable to determine according to a predetermined process set-up condition status such as presence or absence of an abnormality, lifetime and others of the machine component, which is associated with such sensor, in reference to an output signal from the associated sensor; and

said control means being operable to collect results of determination performed by each of the determining units,

characterized in that

each of the determining units determines the presence or absence of an abnormality in a sensor waveform which is the output signal from the associated sensor by comparing periods of sinusoidal waveforms of the plural sensors connected therewith with each other and, in the event that a period of a waveform deviates from those of others, detects a sensor waveform abnormality resulting from the sensor waveform and then determines the presence of a rotation abnormality as the abnormality in the sensor waveform, and

each of the determining unitsfurther [sic] determines whether or not a defect signal component contained in the sensor waveform deviates from a predefined range and, in the event that the defect signal has been determined as deviating from the predefined range, determines the presence of a defect waveform abnormality as the abnormality in the sensor waveform, and removes a high frequency component which is a noise component and a main signal component which is a sinusoidal waveform from the output signal by a low pass filter and a high pass filter, respectively to extract the defect signal component resulting from an abnormality of machine components.

First auxiliary request

Claim 1 according to the first auxiliary request differs from claim 1 of the main request in that the last feature reads (differences highlighted by the board):

"and removes a high frequency component which is a noise component and a main signal component which is a sinusoidal

waveform from the output signal by a **digital** low pass filter and a **digital** high pass filter, respectively to extract **a** defect signal component resulting from an abnormality of machine components."

Second auxiliary request

Claim 1 according to the second auxiliary request differs from claim 1 of the first auxiliary request in that the word "cycle" is added twice in the two following phrases of claim 1:

"... by comparing cycle periods of sinusoidal waveforms ...",

"... in the event that a cycle period of a waveform deviates from those of others ...".

Third auxiliary request

Claim 1 according to the third auxiliary request differs from claim 1 of the first auxiliary request in that the phrase "sensor waveform main signal cycle" is added twice in the two following phrases of claim 1:

"... by comparing sensor waveform main signal cycle periods of sinusoidal waveforms ...",

"... in the event that a sensor waveform main signal cycle period of a waveform deviates from those of others ...".

Sixth to sixtieth auxiliary requests

Claim 1 according to the sixth to sixtieth auxiliary requests differs from claim 1 of the main request in that further features are added. In particular, claim 1 of each

of the sixth to sixtieth auxiliary request contains the following feature referring to *periods* or *period*:

> "each of the determining units determines the presence or absence of an abnormality in a sensor waveform which is the output signal from the associated sensor by comparing (...) periods of sinusoidal waveforms of the plural sensors connected therewith with each other and, in the event that a (...) period of a waveform deviates from those of others, detects a sensor waveform abnormality resulting from the sensor waveform and then determines the presence of a rotation abnormality as the abnormality in the sensor waveform".

Reasons for the Decision

1. Main request - Amendments

Claim 1 contains subject-matter which extends beyond the content of the application as filed, contrary to the requirement of Articles 100(c) and 123(2) EPC.

1.1 In particular, at least the following feature of claim 1 extends beyond the content of the application as filed:

> "comparing periods of sinusoidal waveforms of the plural sensors (...) with each other".

According to this feature, "periods", which are *lengths of time*, are compared with each other. The application as originally filed, however, does neither disclose explicitly nor implicitly that periods of waveforms are compared. The term "period(s)" is not even mentioned in the original

application in connection with a waveform of a sensor. There is no disclosure in the application as filed of comparison of lengths of time or of durations of periods either.

It follows that claim 1 infringes the requirement of Articles 100(c) and 123(2) EPC.

1.2 The patentee submitted that the expression "comparing periods of sinusoidal waveforms of the plural sensors (...)" found proper support in the application documents as filed. It presented the following counter-arguments in support of its statement:

1.2.1 The patentee referred inter alia to claim 4 and to page 7, lines 16 to 24 of the application as filed, disclosing a comparison of sensor waveform main signal *cycles* for determining the rotation abnormality. The substitution of the term "cycles" by the term "periods" in present claim 1 needed to be explored and interpreted with the average expert's skills. The expert in the technical field of the present patent, i.e. in the field of machine component monitoring, combining skills of a mechanical and an electrical engineer, would have understood that the phrase "comparing cycles" in the application as filed had to be understood as a comparison in the time domain. In other words, the term "cycle" had to be understood as "cycle time". Hence, the word "period" in present claim 1 was merely another word for the word "cycle" in the application as filed.

1.2.2 In order to explain why the expert would have understood "cycle" as meaning "cycle time" or "period", the patentee referred inter alia to figure 6 of the application as filed. In the right part of figure 6 a sinusoidal curve in a time-amplitude plane was shown. An arrow in figure 6 was designated by the term "cycle". This arrow marked a length

of time being equal to a period of the sinusoidal curve. Thus, it was clear that the word "cycle" meant "period", i.e. a length of time.

The patentee also referred to figure 7 showing a sensor waveform including a "predetermined time range W" (page 35, line 20). "W" was a small duration of time within the longer duration of time of a cycle. This also showed that the term "cycle" was to be understood as a length of time.

Furthermore, the patentee referred to page 32, lines 26 and 27, disclosing that "the main signal is a waveform that appears sinusoidally at a predetermined *cycle* incident to passage of the rolling elements". This sentence, in combination with figure 6, confirmed that the expert would have understood that figure 6 showed a periodical signal, wherein one period was represented by a "cycle" in the time domain.

1.2.3 Still further, the application as filed, on page 7, lines 22 to 24, disclosed that "by performing a relative comparison of the main signal *cycles* of the sensor waveforms, one of the machine components in which rotation is *retarded* can be found" (emphasis added). The word "retarded" was clearly pointing to the time domain. This sentence in the application as filed meant that the duration of main signal cycles were determined and then compared with each other to see whether one cycle was shorter or longer than another cycle. The word "cycle" in the application as filed had to be understood as a length of time or a period.

1.2.4 The patentee referred to page 40, line 7, disclosing that "[the cycle] *corresponds* to the product of the number of rotation of the bearing multiplied by the number of the rolling elements" (emphasis added). From the fact that this sentence used the term "corresponds" and not "is", the

technical expert understood that a "cycle" was not a number of rotation to be counted. Actually, the passage on page 40, lines 5 to 8 referred to a rotation frequency. Since a frequency was the inverse of a period, this passage, too, showed that the term "cycle" related to the time domain and not simply to an abstract event to be counted.

1.2.5 In conclusion, the patentee argued first of all that the passages of the application as filed, referred to above, explicitly disclosed a comparison of main signal cycles. Secondly, since the technical expert reading the application as filed would have understood that the term "cycle" in the application as filed was a length of time or a period, the claimed feature "comparing periods" had a basis in the application as filed.

1.3 The board is not persuaded by the patentee's arguments for the following reasons:

1.3.1 While the board acknowledges that the application as originally filed does indeed disclose "comparing sensor waveform main signal cycles" (see, for instance, page 7, lines 16 and 17; claim 4), it cannot unambiguously be deduced therefrom that lengths of time or durations, i.e. periods, are compared with each other.

On the contrary, as argued convincingly by the opponent, the term "cycle(s)" is used in the application as filed in connection with a *number of revolutions* of a rotating machine component (see, e.g., page 7, lines 21 to 22 and 24 to 27; page 40, lines 5 to 13). The term "cycle(s)", therefore, is to be understood in the sense of a sequence of repeating events whose number is counted, but without the individual length of time of each event being measured.

1.3.2 The fact that in figure 6 an arrow, designated by the term "cycle", marks a length of time does not imply that time of a cycle is effectively measured for being compared with other cycles. No such information is disclosed in the application as filed. The arrow "cycle" in figure 6 shows how the amplitude of the main signal varies.

As explained by the opponent, the "predetermined time range W" mentioned on page 35, lines 19 to 26 and in figure 7 relates to the non-linear filtering operation, which is neither relevant for the description of the sensor waveform of figure 6, nor for interpreting the expression of comparing main signal cycles.

1.3.3 The board agrees with the patentee that the expression "rotation is retarded" (page 7, lines 21 to 27; page 40, lines 5 to 21) points towards the time domain in general. Nevertheless, this is not a sufficient reason for the comparison of the cycles being necessarily executed in the time domain, something that the application as filed does also not teach. Indeed, in case of a rotation being retarded, the number of revolutions varies and a comparison of the number of revolutions may be executed without a length of time of a period being determined.

1.3.4 The passage on page 40, lines 5 to 8, discloses a relationship between "cycle" and the "number of rotation" from which the board is unable to deduce that a "cycle" is necessarily a length of time. In particular, a frequency (cf. page 38, table 2) is a number of events per unit of time which does not imply measuring and comparing lengths of time.

1.4 In summary, the patentee attempted to show that the amended feature of claim 1 "comparing periods" has a basis in the expression "comparing cycles" disclosed in the application

as filed. It argued that a "cycle" is necessarily to be understood as a length of time, i.e. a period, and that, therefore, "comparing periods" and "comparing cycles" are synonyms. The board, however, is of the opinion that the disclosure of the application as filed is not so narrow since it also allows interpreting the expression "comparing cycles" as meaning "comparing the number of revolutions". Therefore, replacing the term "cycle" as originally disclosed by the term "period" in claim 1 is an amendment which is not directly and unambiguously derivable from the application as originally filed.

It follows that claim 1 according to the main request contains subject-matter which extends beyond the content of the application as filed, contrary to the requirements of Article 100(c) and 123(2) EPC.

2. First auxiliary request

Since claim 1 contains the same feature "comparing periods of sinusoidal waveforms of the plural sensors (...) with each other" as claim 1 of the main request, it contains subject-matter which extends beyond the content of the application as filed, contrary to the requirements of Article 100(c) and 123(2) EPC, for the same reasons as given for the main request.

The patentee referred to its arguments presented above.

3. Second auxiliary request

3.1 Admissibility

In exercising its discretion under Article 13(1) RPBA, the board decides to admit the second auxiliary request into the proceedings.

3.1.1 The opponent, citing Article 12(2) RPBA, argued that the grounds of appeal and the reply must contain a party's complete case. The opponent recalled that it had raised in its statement of grounds of appeal an objection of added subject-matter against the feature "comparing periods of sinusoidal waveforms of the plural sensors (...) with each other" but that the patentee did not respond to this early objection by amending claim 1. The patentee filed amendments for overcoming this objection only in response to the summons of the board. Therefore, the amendments of the second auxiliary request are late-filed and should not be admitted into the proceedings. Moreover, the amendment of claim 1 was not helpful for overcoming the objection since the newly amended expression "cycle periods" had also no basis in the application as filed.

3.1.2 The patentee presented the following arguments in favour of admission of the second auxiliary request:

The amendment of claim 1 of the second auxiliary request directly addressed the "focused" objections raised by the board in its annex to the summons to oral proceedings. The patentee was of the view that, before the board's communication, so many issues were raised by the opponent that responding extensively to all of them would not have been efficient. The patentee was also of the view that no additional delay occurred due to the second auxiliary request being filed within the time limit set by the board in its annex to the summons to oral proceedings. Finally, the patentee noted that no objection of added subject-matter was raised in the appealed decision against the amendment "comparing periods ..." of claim 1.

3.1.3 According to Article 12(2) RPBA, both parties have to present their *complete* case with the statement setting out

the grounds of appeal and the reply thereto. This means that, on the one hand, if the opponent found that the patent contravened the requirements of the EPC in many aspects, it had to raise thorough objections concerning all these issues with its statement of grounds appeal. On the other hand, the patentee had to respond thoroughly to all the issues raised by the opponent and, if necessary, file amendments in its letter of response in order to overcome the objections raised. The board's communication, focusing on the issues to be discussed during the forthcoming oral proceedings, should not be considered by the patentee as a trigger to respond for the first time to objections which have already been raised by the opponent in its grounds of appeal.

Nevertheless, in the present case, in view of the fact that the amendment of claim 1 consisted in a genuine attempt to overcome the issue at stake and in view of the rather low complexity of the amendment which did not seem to oblige the parties or the board to raise new objections or to provide completely new arguments, the board decides to admit the second auxiliary request into the proceedings.

3.2 Amendments

Claim 1 contains subject-matter which extends beyond the content of the application as filed, contrary to the requirement of Article 100(c) and 123(2) EPC.

3.2.1 In particular, at least the following feature of claim 1 extends beyond the content of the application as filed:

"comparing cycle periods of sinusoidal waveforms of the plural sensors (...) with each other".

The expression "comparing cycle *periods*" has no literal basis in the application as filed. Moreover, adding the term

"cycle" to the term "period" does not modify the fact that "periods" are compared in claim 1. Therefore, claim 1 comprises added subject-matter for the same reasons as given in point 1.1 above.

3.2.2 The patentee argued that claim 1 of the second auxiliary request did not refer to a generic "period" but to a more specific "cycle period", thereby emphasizing that cycle durations, i.e. lengths of time, were compared in claim 1. Moreover, by re-introducing the term "cycle", the above argumentation referring to figure 6 (see point 1.2.2 above) and to the arrow designated by the term "cycle" became more convincing.

3.2.3 The board is not convinced by this argument. On the contrary, as noted by the opponent, combining the two terms "cycle" and "period" into the expression "cycle period" increases the ambiguity of claim 1 without influencing the board's view that the expression "comparing cycles" as originally filed may be interpreted as meaning "comparing the number of revolutions".

4. Third auxiliary request

4.1 The third auxiliary request is admitted into the proceedings for the same reasons as those given for the second auxiliary request.

4.2 Amendments

Claim 1 contains subject-matter which extends beyond the content of the application as filed, contrary to the requirement of Article 100(c) and 123(2) EPC.

4.2.1 In particular, at least the following feature of claim 1 extends beyond the content of the application as filed:

"comparing sensor waveform main signal cycle periods of sinusoidal waveforms of the plural sensors (...) with each other".

The board acknowledges that the expression "comparing sensor waveform main signal cycles" is disclosed on page 7, lines 16 and 17, and in claim 4 of the application as filed. However, the expression "comparing sensor waveform main signal cycle *periods*" has no literal basis in the application as filed. Moreover, adding the expression "sensor waveform main signal cycle" to the term "period" does not modify the fact that "periods" are compared in claim 1. Therefore, claim 1 comprises added subject-matter for the same reasons as given in point 1.1 above.

4.2.2 The patentee argued that the amendment brought the claim wording even closer to the literal basis in the application as filed, page 7, lines 16 to 24. The only difference is that the term "period" was added to the claim. In view of figure 6, showing a cycle duration of a period and in view of page 7, lines 21 to 24, disclosing a retardation found by performing a relative comparison of cycles, it would be clear to the skilled person that the term "period" in claim 1 could only mean a period of time, a duration or a length of time.

4.2.3 The board is not persuaded by these arguments for the reason that claim 1 contains the feature of "comparing periods". Therefore, the corresponding reasons given for the main request and the second auxiliary request still apply.

5. Sixth to sixtieth auxiliary requests

The board decides not to admit the sixth to sixtieth auxiliary requests into the proceedings under Article 13(1)

RPBA for the reason that the amendments, which consist in adding further features to claim 1, are not suitable to overcome the present objection of added subject-matter due to the presence in claim 1 of the feature "comparing (...) periods". The patentee did not contradict the board's finding that the feature "comparing (...) periods" was still present in claim 1 of the sixth to sixtieth auxiliary requests.

6. For the above reasons the board comes to the conclusion that the patent must be revoked.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

M. Kiehl R. Bekkering

Decision electronically authenticated