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Datasheet for the decision of 17 September 2013

Case Number: T 2405/10 - 3.5.03

Application Number: 05740524.3

Publication Number: 1766815

IPC: H04B 11/00, H04L 1/00, H04L 27/00

Language of the proceedings: EN

Title of invention:
Robust underwater communication system

Applicant:
Sonardyne International Ltd.

Headword:
Underwater communication system/SONARDYNE

Relevant legal provisions:
EPC Art. 56, 113(1)

Keyword:
"Inventive step (all requests) - no"
"Substantial procedural violation - no"

Decisions cited:
R 0015/10, T 0576/95

Catchword:
-

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Case Number: T 2405/10 - 3.5.03

D E C I S I O N
of the Technical Board of Appeal 3.5.03
of 17 September 2013

Appellant: (Applicant)
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Decision under appeal:
Decision of the Examining Division of the European Patent Office posted 23 July 2010 refusing European patent application No. 05740524.3 pursuant to Article 97(2) EPC.

Composition of the Board:

Chairman: F. van der Voort
Members: T. Snell
R. Moufang

Summary of Facts and Submissions

I. This appeal is against the decision of the examining division refusing European patent application No. 05740524.3, with international publication number WO 2005/122446 A.

The refusal was based on the ground, *inter alia*, that the subject-matter of claim 1 of the main request and first and second auxiliary requests respectively did not meet the requirement of inventive step pursuant to Article 52(1) EPC in combination with Article 56 EPC with respect to the disclosure either of document D2 or of document D14, in each case combined with common general knowledge. Only D14 is relevant to the present decision:

D14: Miller et al, "An Experiment in High Rate Underwater Telemetry", Proceedings of IEEE International Conference OCEAN '72, 13-15 September 1972, Newport, Rhode Island, pages 34-38.

A third auxiliary request was withdrawn and a fourth auxiliary request was not admitted by the examining division.

II. The appellant filed a notice of appeal against the above decision. The appellant requested in the statement of grounds of appeal that the impugned decision be set aside and a patent granted on the basis of:

"The claims currently before the Technical Board of Appeal"; or
"Such claims as appropriate to submit during this appeal".

Oral proceedings were conditionally requested.

III. In the statement of grounds of appeal, the appellant submitted arguments which can be summarised as follows:

(i) With regard to claim 1, the examining division misinterpreted the term "distinctive bit code".

(ii) With respect to inventive step, the problem-solution approach was incorrectly applied. *Inter alia*, the single closest prior art document was not determined. Instead, the examining division used two alternative lines of argumentation based on different documents, D2 and D14. With respect to D14, the wrong problem was identified and an ex post facto analysis relied on.

(iii) At the oral proceedings the examining division refused to explain the reasons for its objection to the main and first auxiliary requests and thus committed a substantial procedural violation.

IV. In a communication accompanying a summons to oral proceedings, the board gave a preliminary opinion that it could see no grounds for any substantial procedural violation and that the subject-matter of claim 1 of the second auxiliary request ("auxiliary request 2"), which was the request essentially discussed by the appellant

in the statement of grounds, did not involve an inventive step.

V. The appellant submitted a set of new requests, referred to as auxiliary requests 5, 6 and 7, with an accompanying letter dated 15 September 2013, and requested that these be admitted to the procedure.

VI. Oral proceedings were held on 17 September 2013. At the oral proceedings, the appellant maintained only the main request and "auxiliary request 2", both as filed during the examination procedure, as well as the newly-filed "auxiliary request 5".

After discussion of the issues, the chairman confirmed the appellant's requests.

The appellant requested that the impugned decision be set aside and a patent granted on the basis of the claims of the main request filed with the fax letter dated 21 May 2010, or, alternatively, of a first auxiliary request filed as "auxiliary request 2" in the course of the oral proceedings before the examining division, or a second auxiliary request filed as "auxiliary request 5" with the fax letter dated 15 September 2013.

The chairman declared the debate closed. After a break for deliberation, the chairman stated that before the break he had already confirmed the appellant's requests and closed the debate so that the board was in a position to announce its decision. Subsequently, the chairman announced the board's decision and closed the oral proceedings.

VII. Following closure of the oral proceedings, the appellant requested that the minutes include a comment to the effect that it had not completed its submissions in respect of the problem-solution approach. The board refused the request.

VIII. Claim 1 of the **main request** reads as follows:

"An underwater communication system comprising:
a remotely positioned acoustic signal receiver; an acoustic signal transmitter; and correlator means;
characterised in that:
the acoustic signal transmitter transmits, when in use, data encoded as a plurality of symbols, each symbol of the plurality of symbols having two components one of which comprises a distinctive bit code and the other of which appertains to the frequency of a carrier signal on which the symbol is transmitted; wherein
the frequency of the carrier signal of successive symbols is stepped through a predetermined continuously repeating sequence of distinctive steps each of which occurs once in the sequence; and
the signal receiver is operated synchronously with the signal transmitter; and further comprising:
correlator means (17) responsive both to the bit code and to the frequency of the carrier signal of received signals for effecting demodulation and having a plurality of outputs one for each symbol, so that as each symbol is detected a signal on the output to which it corresponds predominates; and
amplitude detector means (18) responsive to the outputs from the correlator means (17) for providing an output signal corresponding to the data transmitted."

Claim 1 of the **first auxiliary request** is the same as claim 1 of the main request except that the term "; wherein" following the wording "on which the symbol is transmitted" is replaced by ", and", and the following clause is added to the end of the claim:

"; wherein the bit code which comprises the first component of each symbol is transmitted using phase shift keying (PSK) and the frequency of the carrier signal of each symbol is changed from symbol to symbol by hopping the carrier frequency on which the symbol is transmitted through a predetermined continuously repeating sequence of orthogonal frequencies."

Claim 1 of the **second auxiliary request** is the same as claim 1 of the main request except that the words "being PSK modulated, the transmitted signal" are inserted following the wording "each symbol of the plurality of symbols".

Reasons for the Decision

1. *Alleged procedural violation committed by the examination division*

The appellant submits that during the oral proceedings the examining division "refused to provide an oral explanation as to the reasons for refusing the Main Request and the first Auxiliary Request" and that the chairman advised that the applicant would have to wait for the decision in writing to learn the reasons in detail. The appellant alleges that this was "a

procedural violation that unfairly prejudiced the Applicant by depriving the Applicant of the necessary information needed to argue in support of the second, third and fourth Auxiliary Requests submitted".

The board notes that no mention of this point is made in the minutes of the oral proceedings. Moreover, it follows from the minutes that the issue of inventive step in relation to both D2 and D14 was extensively discussed, especially the meaning of the term "distinctive bit code" in relation to these documents. Therefore the applicant was aware of the reasoning that could potentially lead to a refusal, and had the opportunity both to comment and to file auxiliary requests (cf. Article 113(1) EPC). Furthermore, there is no obligation to inform a party in advance of the detailed reasons (cf. Decision of the Enlarged Board of Appeal R 15/10, points 7-9 of the reasons).

Hence the board is unable to identify any (substantial) procedural violation committed by the examining division.

2. *Closest prior art*

The board considers that document D14 represents the closest prior art, concurring with the view of the appellant expressed in the statement of grounds. It is therefore not necessary to go into the appellant's objection that the examining division did not correctly identify the single document representing the closest prior art.

3. *Claim 1 - main request - inventive step*

3.1 Using the wording of claim 1 of the main request, document D14 discloses an underwater communication system (cf. the abstract) comprising:

a remotely positioned acoustic signal receiver (Fig. 2); an acoustic signal transmitter (Fig. 1); and correlator means (Fig. 2, "correlators"); wherein:
the acoustic signal transmitter transmits, when in use, data encoded as a plurality of symbols (eg 8-PSK symbols; cf. page 35, right-hand col., penultimate paragraph), each symbol of the plurality of symbols having two components one of which comprises a distinctive bit code (see below under *"The terms "symbol" and "distinctive bit code""*) and the other of which appertains to the frequency of a carrier signal on which the symbol is transmitted (cf. page 34, left-hand col., lines 41 to 45, "frequency-hopping signal"); wherein
the frequency of the carrier signal of successive symbols is stepped through a predetermined continuously repeating sequence of distinctive steps (namely a predetermined continuously repeating sequence consisting of four subsequences each comprising 8 frequencies which are reused in each subsequence in a different order in order to provide additional multipath protection, cf. page 35, left-hand col., 2nd and 3rd paragraphs); and
the signal receiver is operated synchronously with the signal transmitter (page 34, right-hand col., lines 19-23); and further comprising:
correlator means responsive both to the bit code and to the frequency of the carrier signal of received signals

(cf. page 37, left-hand col., lines 19-23) for effecting demodulation and having a plurality of outputs one for each symbol, so that as each symbol is detected a signal on the output to which it corresponds predominates (cf. page 37, left-hand col., lines 23-26, "the largest [correlator output magnitude for each symbol] is added to an accumulator"); and amplitude detector means responsive to the outputs from the correlator means for providing an output signal corresponding to the data transmitted (cf. page 37, left-hand col., lines 30-35).

3.1.1 The board therefore considers that the subject-matter of claim 1 differs from the disclosure of D14 in that, according to claim 1, in the predetermined continuously repeating sequence of distinctive steps, each step occurs once in the sequence.

3.2 *The terms "symbol" and "distinctive bit code"*

3.2.1 As noted above, the board finds that the feature of claim 1 "each symbol of the plurality of symbols having [a component] which comprises a distinctive bit code ..." is disclosed in D14.

3.2.2 In this respect, document D14 uses the term "symbol" to refer to PSK symbols which encode either 1, 2 or 3 bits, the latter being 8-PSK (cf. D14, page 35, right-hand col., last two paragraphs). In the following, for the sake of convenience, the board will base its analysis on the embodiment using 8-PSK.

3.2.3 The appellant argued that D14 fails to disclose symbols comprising a distinctive bit code because PSK is a

modulation and not an encoding step. However, in the board's view, mapping several bits to a particular point of a signal constellation conventionally is also referred to as encoding, cf. D14, page 35, right-hand col., last paragraph.

3.2.4 The appellant also argued that the term "symbol" in D14 was used in a "conventional data communication sense", whereas the term "symbol" in the present application had to be understood in a different sense, namely as a "waveform" detectable using correlation techniques in the receiver. The skilled person would understand that a data communication based interpretation of claim 1, such as 8-PSK, was incorrect based on the specialised technical context of the application (underwater communication) combined with the presence of correlator means in the receiver which is responsive to both the bit code and the carrier frequency. To illustrate what was meant by a waveform, the appellant referred to "M-ary orthogonal signalling" and gave, as one example, Gold codes. Thus, the "distinctive bit code" comprised in each symbol was to be seen as an encoded waveform which is itself modulated onto a frequency-hopped carrier using binary PSK. In the present context, the skilled person would understand that claim 1 required an encoding step prior to any modulation, which was in any case clear because PSK symbols do not "comprise" a bit code, at most they merely "correspond" to a bit code.

3.2.5 The board notes however that D14 is concerned with the same special field of underwater communication and uses the term symbol in a conventional sense. Furthermore, neither M-ary orthogonal signalling, Gold codes nor

binary PSK are mentioned in the description or in claim 1. There is therefore no reason to restrict the meaning of the term "symbol" to the meaning attributed to it by appellant. Although the appellant argued that the skilled person would infer the alleged meaning from the fact that the correlator means of claim 1 are responsive to both the bit code and the carrier frequency, the board notes that in D14, correlator means falling within the terms of claim 1 are used to demodulate the 8-PSK symbols and the frequency-hopped carrier at the same time (cf. page 37, left-hand col., lines 19-23). The board is therefore unconvinced by the appellant's argument that the term "symbol" should be given a different meaning than that normally used in data communication, or indeed in D14.

3.2.6 The board now turns to the appellant's argument that the 8-PSK symbols of D14 do not "comprise" a distinctive bit code. The board disagrees, because the term "comprises a bit code" in the board's view embraces an interpretation in which the symbols comprise a property which defines a bit code. In the present case, a distinctive 3-bit code is comprised within the symbol by being mapped to a distinctive phase of the 8-PSK constellation.

3.3 *Obviousness with respect to D14*

3.3.1 As ascertained above, the subject-matter of claim 1 differs from the disclosure of D14 in that in the predetermined continuously repeating sequence of distinctive steps, each step occurs once in the sequence. This was also the distinguishing feature

identified by the examining division in the impugned decision, cf. point 3.2.2.

3.3.2 The examining division held that this feature was obvious to the skilled person (cf. points 3.2.4 to 3.2.5 of the impugned decision). It argued that the problem to be solved was "how to provide an alternative frequency-hopped communication system", and stated that in circumstances where additional multi-path protection was considered unnecessary, it would be a normal design option for a skilled person to modify [the system of] D14 by suppressing the frequency reuse.

3.3.3 The appellant argued in the statement of grounds of appeal that the problem-solution approach adopted by the examining division with respect to D14 was wrongly applied. In summary the board understands the appellant's arguments to be as follows:

(a) The problem to be solved is not the one identified by the examining division but the one set out in the present application. This is because the case law of the boards of appeal indicates that an objective definition of the problem to be solved by the invention should normally start from the problem described in the patent application.

(b) The authors of D14 never completed evaluation of the system described therein and hence D14 does not clearly solve the problem set out in the present application. Therefore the skilled person would have no expectation of success when starting out from D14.

(c) The examining division did not demonstrate that the skilled person would, as opposed to merely could, modify D14, but instead relied on an ex-post facto analysis using an artificial problem formulation.

(d) The analysis of the examining division does not take account of the amendment requiring a coding step before PSK modulation.

3.3.4 The board finds the appellant's arguments unconvincing for the following reasons:

Re (a): The objective formulation of the problem starts from the closest prior art. This may require a reformulation of the problem, eg if the closest prior art is much closer to the invention than the prior art at the disposal of the inventor (cf. eg T 576/95, point 3.2 of the reasons).

Re (b): In the board's view D14 contains a detailed disclosure of an underwater communications system and enough technical information to be a plausible starting point for the skilled person at the priority date of the application. The board does not consider it relevant whether or not the system was fully evaluated in the field by the authors of D14.

Re (c): The examining division identified the problem as being to provide an alternative frequency-hopped communication system [when starting out from D14]. The board sees nothing artificial in formulating the problem in this unspecific form. The technical effect of the distinguishing feature in this present case is a decrease in the degree of multipath protection caused

by the use of a single sequence instead of the D14 solution of using four subsequences with frequency reuse in a different frequency-hopping order (cf. page 35, left-hand col., 2nd paragraph). In the board's view it would be more artificial here to formulate the problem more specifically based on this negative technical effect (eg as "to decrease the degree of multipath protection").

As to the allegation of an ex-post facto determination of obviousness, the board notes that the use of a single sequence of frequencies in which each frequency occurs only once was evidently contemplated by the authors of D14 (".. as would be the case if the original sequence were repeated ..", cf. page 35, left-hand col., lines 24-29), but not used because of the desire for a greater multipath protection interval (cf. page 35, left-hand col., lines 20-29). Hence, the conclusion of obviousness here derives from information given in D14 and is consequently not based on an ex-post facto analysis.

Re (d): The board considers that this argument is not relevant to claim 1 of the main request because this claim does not mention PSK modulation.

3.3.5 Consequently, the board concludes that the subject-matter of claim 1 of the main request does not involve an inventive step (Articles 52(1) and 56 EPC).

4. *Claim 1 - first auxiliary request - inventive step*

4.1 Claim 1 of the first auxiliary request (see point VIII above) differs from claim 1 of the main request in that

"the bit code which comprises the first component of each symbol is transmitted using phase shift keying (PSK) and the frequency of the carrier signal of each symbol is changed from symbol to symbol by hopping the carrier frequency on which the symbol is transmitted through a predetermined continuously repeating sequence of orthogonal frequencies".

4.2 This amendment introduces three aspects: (i) the bit code is transmitted using PSK; and (ii) the frequencies of the hopping sequence are changed from symbol to symbol; (iii) the frequencies of the hopping sequence are orthogonal.

4.3 Re (i): The appellant argued in the statement of grounds that the amendment "clarifies that the encoding of data as symbols comprising two components, one of which is a distinctive bit code, is clearly not PSK modulation", and states further "it is clear that the PSK is not recited as being the mechanism for providing the distinctive bit code". However, the board does not agree that the wording of the claim clarifies that PSK modulation is not the mechanism for providing the distinctive bit code. As explained above, the board takes the view that an 8-PSK symbol transmitted in the system of D14 is a symbol having a component which comprises a distinctive bit code. It follows that D14 also discloses that the bit code is transmitted using PSK.

Re (ii): It is disclosed in D14 that the frequency is changed after each symbol is sent, ie from symbol to symbol (cf. page 34, right-hand col., lines 19-23 and page 35, left-hand col., lines 17-20).

Re (iii): It is also disclosed in D14, that the frequencies are orthogonal (cf. page 34, right-hand col., last paragraph).

The board therefore finds the arguments of the appellant unconvincing.

4.4 The board concludes that the subject-matter of claim 1 of the first auxiliary request does not involve an inventive step either (Articles 52(1) and 56 EPC).

5. *Claim 1 - second auxiliary request - inventive step*

Claim 1 of this request (see point VIII above) differs from claim 1 of the main request only in that it is stated that each symbol is PSK modulated. Since, as has been explained above, the board considers that this is also the case in D14, it follows that the subject-matter of claim 1 of the second auxiliary request does not involve an inventive step either (Articles 52(1) and 56 EPC).

6. *Request for inclusion of a statement in the minutes*

The minutes of the oral proceedings reflect what has occurred during the oral proceedings. The appellant's request to include a statement to the effect that it had something to say concerning the problem-solution approach was made after the proceedings had been closed. As this statement was not part of the oral proceedings, there is no reason to include it in the minutes. The request was therefore refused.

7. *Article 113(1) EPC with respect to the appeal procedure*

At the oral proceedings, the appellant had an opportunity to present arguments concerning the issues discussed above, in particular inventive step. At the request of the appellant, the oral proceedings were interrupted to enable the appellant to consider a response to the board's objections with respect to inventive step. Following the break, the matter was discussed further. At the end of the discussion on inventive step, the chairmen asked the appellant to comment on the alleged substantial procedural violation committed by the examining division. The chairman subsequently confirmed the appellant's requests and closed the debate. The appellant made no indication at this stage that it wished to make further comments in respect of the problem-solution approach. The appellant also made no comment after a further break during which the board deliberated. After resumption, the chairman stated that before the break he had already confirmed the appellant's requests and closed the debate so that the board was in a position to announce its decision. The chairman then announced the board's decision (cf. point VI above). Under these circumstances, the board considers that the right to present comments enshrined in Article 113(1) EPC was fully respected.

8. Since there is no allowable request, it follows that the appeal must be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

G. Rauh F. van der Voort