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Bezeichnung der Erfindung:
Title of invention:
Titre de l'invention : Method and means for real time image zoom display in an ultrasonic scanning system

Klassifikation / Classification / Classement : G01S 7/62

ENTSCHEIDUNG / DECISION
vom / of / du 7 March 1990

Anmelder / Applicant / Demandeur : General Electric Company

Patentinhaber / Proprietor of the patent /
Titulaire du brevet :

Einsprechender / Opponent / Opposant :

Stichwort / Headword / Référence :

EPÜ / EPC / CBE Article 56

Schlagwort / Keyword / Mot clé : "Inventive step (no) - obvious application of common and specific knowledge in the art"

Leitsatz / Headnote / Sommaire

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Case Number : T 618/89 - 3.5.1

D E C I S I O N
of the Technical Board of Appeal 3.5.1
of 7 March 1990

Appellant : General Electric Company
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USA

Representative : Schüler, Horst, Dr.
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Decision under appeal : Decision of Examining Division 046 of the European Patent Office dated 3 May 1989 refusing European patent application No. 84 106 290.4 pursuant to Article 97(1) EPC

Composition of the Board :

Chairman : P.K.J. van den Berg
Members : W.B. Oettinger
M. Lewenton

Summary of Facts and Submissions

I. European patent application 84 106 290.4, filed on 1 June 1984 claiming a priority of 10 June 1983 and published under No. 131 139, was refused by a decision of Examining Division 2.2.06.046 dated 3 May 1989.

The reason given for the refusal was that the subject-matter of independent Claims 1 and 4 filed on 23 January 1988 lacked an inventive step having regard to the following prior art documents:

D1: EP-A-1 933
D2: J.P. Woodcock: Medical Physics Handbooks 1: Ultrasonics, Bristol 1979, page 69.

More particularly, the Examining Division considered that the only difference between the claimed method and system and the method and system known from D1 involved only a well-known principle and this technique has, according to D2, already been incorporated in systems of the claimed kind.

II. On 30 June 1989, the applicant lodged an appeal against this decision requesting its cancellation and the grant of a patent, and paid the appropriate fee.

In a Statement of Grounds, filed on 23 August 1989, the Appellant specified that the grant of a patent should be based on Claims 1-6 filed on the same date.

The independent claims read as follows:

"1. A method for zooming a displayed area in an ultrasound imaging system in which a display is controlled by electrical signals based on reflected ultrasonic waves, comprising the steps of:

transmitting ultrasonic pulses,
generating electrical signals in response to echoes of said ultrasonic pulses,
sampling said electrical signals,
generating pixel illumination data corresponding to the sampled electrical signals, and
controlling scan lines in said display image by said pixel illumination data,
characterised by delaying said step of sampling after said step of transmitting ultrasonic pulses whereby sampled signals are obtained only from a limited area based on a user selected scale factor and sampling said electrical signals at a plurality of sampling rates depending on desired size of said limited area.

4. An ultrasonic imaging apparatus in which a display is zoomed by electrical signals based on reflected ultrasonic waves, comprising means for sampling said electrical signals and means for generating pixel illumination data corresponding to the sampled electrical signals characterised by said sampling means including means (66) for sampling said electrical signals at a plurality of sampling rates depending on a user selected scale factor and user selected start and stop points indicative of desired size of a display image, and delay means for delaying the sampling of electrical signals whereby only signals from a limited area of interest are sampled, as established by the user selected start and stop points."

III. In support of this request, the Appellant submitted, in respect of the reasons given for the decision under appeal, essentially the following:

As is disclosed in the description, the claimed invention solves a resolution problem arising with a known zooming function.

None of the passages cited from D1 has to do with zooming. D2 also does not give any teaching with respect to zooming.

Therefore, the claimed combination of features, ensuring in a surprisingly simple manner a zooming function and solving said resolution problem, is not obvious from the prior art.

Reasons for the Decision

1. The appeal is admissible.

2. An examination of patentability of the subject-matter of amended claims presupposes that the amendments are admissible, i.e. do not contravene Article 123(2) EPC.

In this respect, the Board concludes in the present case as follows:

2.1 Generally, Claim 1 filed on 23 August 1989 is based on a combination of the feature recited in the original Claim 3 with those in original Claim 1.

As is immediately apparent, this combination was not originally claimed. The original Claim 3 was restricted, by its appendancy, to a combination of its feature with

the feature recited in Claim 2 and, by way of the latter's appendancy, with the features in Claim 1.

The combination now claimed is only a sub-combination of the combination subject of the original Claim 3 as the feature of Claim 2 is absent from it. Nevertheless, support for this sub-combination can be found in the overall disclosure of the application:

(a) in the description, the essentials of the claimed invention are recited "briefly" on page 3, lines 9-26. That paragraph includes - in addition to the features of Claim 1 - also the feature of Claim 3 (cf. lines 14-16 on page 3) but not the feature of Claim 2. The definition given there (page 3, lines 11-13) for the pulse repetition rate is only the absolutely normal definition for pulse repetition rates to be used in pulse echo imaging systems (radar or sonar) but not a definition of the kind recited in Claim 2 (however this definition is to be interpreted).

(b) The original Claim 4 is the apparatus counterpart to the original method Claim 1 and the original Claim 5 is the apparatus counterpart to the original method Claim 3. An apparatus claim corresponding to the original method Claim 2 is absent from the statement of claims. So unlike Claim 3, Claim 5 defined a sub-combination from which a feature like that of Claim 2 was absent. The original claiming of this sub-combination in the apparatus category renders the present claiming of a similar sub-combination in the method category admissible.

2.2 The first characterising feature in Claim 1 differs from the feature of the original Claim 3 in wording particularly by its having been supplemented with the

statement that the limited area is "based on a user selected scale factor".

This wording seems to allow different interpretations but from common sense it would seem to follow that the only sensible interpretation is the following one:

The sampling is delayed with respect to the time of pulse transmission by an amount which defines the front boundary of the displayed area, the size of the area which is imaged being defined by a user selected scale factor.

In this natural rather than literal interpretation, the respective feature is considered as supported by the original Claim 3 and the description (e.g. page 3, lines 13-16) as far as the delay is concerned and by other parts of the description (e.g. page 2, lines 27-30 and page 3, lines 9-10 and 25-26) as far as the "scale factor" is concerned.

2.3 The second characterising feature in Claim 1 corresponds, in substance, to a feature contained in the original Claim 1.

No objection based on the amendment arises, therefore, against this feature.

2.4 Summarising the above, on the understanding that Claim 1 is interpreted in the only sensible way rather than literally, the amendments made to Claim 1 are considered to be admissible.

2.5 The amendments made to Claim 4 are also considered to be admissible.

As already stated in paragraph 2.1(b), it is based on the original Claim 5.

Any interpretation problem in respect of the "scale factor" (paragraph 2.2) does not arise in this claim.

3. As to substance, the claims on file correspond to those which were the subject of the decision under appeal, the amendments concerning, apart from merely linguistic matters ("zooming" for "varying the size of"), only the partitioning of Claims 1 and 4 according to Rule 29(1)(a) and (b) EPC.

No other action appears, therefore, necessary before a decision is taken on the merits of the case.

4. In accordance with the Examining Division's view expressed in the decision under appeal, the novelty of the method and apparatus claimed in the independent claims is not at issue.

5. The only question to be decided is, therefore, whether the subject-matter of Claims 1 and 4 involves an inventive step.

In this respect, the Board concludes as follows:

5.1 Referring to the precharacterising portion of Claim 1 as recited in paragraph II above, it is noted that this portion comprises, first, a general part defining what the method is for (zooming) and in what environment it is to be applied (echo display in ultrasound imaging systems) and, second, a specific part defining a number of steps of that method.

As to the environment defined in the general part and as to the method steps defined in the specific part, the Appellant does not dispute that they are known from D1.

As to the "zooming" facility, however, the Appellant seems to submit that it is not known from D1.

This submission is unconvincing as it appears based on an incorrect assumption.

For the purpose of a correct interpretation of the term "zooming" it should be borne in mind that, in accordance with the Appellant (cf. paragraph 3 above), this term is to be equated with "varying the size" of an imaged area, for instance enlarging it (cf. page 2, lines 25-27).

In D1, the term "zooming" is not used but image enlargement ("magnification") is clearly mentioned on page 7, lines 29-30.

5.2 Referring to the characterising portion of Claim 1, the Appellant seems to assume that both the first characterising feature relating to the delaying and the second characterising feature relating to the plurality of sampling rates are new against D1.

In the opinion of the Board, this assumption is also unsupported since the second characterising feature can, in accordance with the decision under appeal, be derived from D1.

For the purpose of a correct interpretation, in this context, of the term "plurality" it should be mentioned that it follows from the description that only a selected one out of a plurality of sampling rates is used at a time (page 3, lines 19-20 and 24-25; page 7, lines 18-21 and 26; page 8, line 8).

In D1, sampling is accomplished in input latch 104 by clock pulses LCLK and - contrary to the Appellant's assumption - the pulse rate is changeable, for instance by a factor 2 (page 7, lines 27 and 28).

According to D1 (page 7, lines 29-30), the result of such doubling the sampling rate is that the displayed image provides for "greater detail", i.e. increased resolution.

5.3 At this point, it should be noted that up to here all effects mentioned by the Appellant in the Statement of Grounds on page 3, except for stored or "frozen" imaging, have already been achieved by the prior art method: it ensures in a simple manner a zooming function which provides for enlarging images. It increases the resolution of the displayed images. Real time imaging can be realised.

These effects are thus not the effects of the combination of the second characterising feature with the first characterising feature in Claim 1 but of the second alone.

As far as stored or "frozen" imaging is concerned, this effect is, both in the application and in D1, only achieved if, in addition to the features of Claim 1, a memory is used, but has nothing to do with the remaining first characterising feature of Claim 1.

5.4 This leaves - in accordance with the decision under appeal - the delaying of the sampling step as the only technical feature in Claim 1 which is not clearly known from D1.

It is agreed that the offset of the beginning of the A-trace from the initial position of the scanning beam (page 5, lines 20-22) defining the front boundary (14b) of the display window (page 5, lines 17-18) is not made in the sampler (104) of D1 but in the memory (111) read-out circuit.

Referring again to the effects mentioned in the Statement of Grounds of Appeal, particularly on page 3, it is noted that the effect of the delaying is a different one. It is the shifting of the "window" mentioned in D1 (14a-d) to a target area of greater distance from the transmitter/receiver or - in other words - the suppression of the display of echoes from the area nearer to the transmitter/receiver.

5.5 In respect of this feature, the Examining Division referred primarily (paragraph 4 of the decision under appeal) to the general knowledge of the person skilled in the art of radar and sonar to which the claimed invention pertains. It stated that range gating is well known in this art.

This is clearly true and the Appellant has not refuted this, so that it is not necessary to refer to a particular document such as a handbook.

It is further common knowledge that range gating - for the purpose of selecting or tracking targets - involves time gating the echo of interest by a pulse constituting a "window" which is delayed with respect to the transmitted pulse by a time interval defining the selected target range, thus suppressing the display of echoes from the area nearer to the transmitter/receiver.

5.6 D2 was only cited, by the Examining Division, as supporting the view that range gating is even known in a more specific context than radar and sonar in general, viz. ultrasonic echo imaging.

More particularly, D2 discloses "time gating the echo of interest" by a "signal delayed from the transmission pulse by a time corresponding to the target range", if, in the context of "range digitisation" or "digital conversion", "it is only required to evaluate an echo from a single range".

5.7 It is recognised that there appears still to be a difference between normal range gating as known in the art generally or from D2, and delayed sampling as claimed.

The difference lies in the depth of the gated range or displayed area.

Normal range gating is with a pulse which is comparable in duration with an echo pulse in order to select the echo from a single target, and nothing else follows from D2. With the delayed sampling claimed, however, a whole area possibly containing a multiplicity of individual "targets" or a larger object having a depth corresponding to a multiplicity of sampling pulses is selected.

5.8 This latter difference does not, however, lead to the conclusion that it is unobvious to apply delayed time gating to a sampling method in the way claimed.

The important consideration is that gating with a delayed pulse excludes target echoes from ranges which are not "of interest" (cf. D2) from being evaluated. For this purpose, only the leading edge of the gating pulse is relevant. The skilled person will readily see that it is not, in

principle, of importance how "deep" the gated range or area is. The depth of this range or area will be chosen by him only in dependence on his "interest".

5.9 In the Statement of Grounds of Appeal, the Appellant submitted, as a further advantage of the claimed invention, that the viewing area can be scrolled in real time.

Apparently, the Appellant refers here to the possibility of varying the distance of the "area of interest" (page 3, line 16) by varying the delay of the gating signal. It is noted that no express mention is made, in the application documents, of a variable delay but it is accepted that it is implicit in the term "scrolled" and that - as a matter of course - the "interest" mentioned on page 8, line 10 may change.

Absolutely the same is the case with range gating of the normal kind or as known from D2. It is clearly obvious that the "interest" mentioned in D2 can change and that this means that the delay of the triggering signal must be changed.

5.10 Summarising the above, the conclusion drawn in the decision under appeal for Claim 1 must, in effect, be confirmed.

5.11 The same follows then for Claim 4.

This claim does not add any feature to the subject-matter of Claim 1 apart from the fact that it concerns an apparatus for carrying out the method claimed in Claim 1.

"User selected start and stop points", referred to in Claim 4, but nowhere expressly mentioned in the original

application documents, can be regarded as implicit in the prior art just as well as in the present application.

6. Grant of a patent as requested cannot, therefore, be envisaged.

Order

For these reasons, it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

S. Fabiani P.K.J. van den Berg