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File Number: T 775/92 - 3.5.1
Application No.: 85 307 943.2
Publication No.: 0 180 482
Title of invention: Bone evaluation method

Classification: G06K 9/52

DECISION
of 7 April 1993

Applicant: TEIJIN LIMITED

Headword:

EPC Articles 52(2)(a), (c) and (d); 52(4); 56 and 84

Keyword: "Contribution to the art in a field not excluded from
patentability" - "Diagnostic method"

Summary of Facts and Submissions

- I. European patent application No. 85 307 943.2, claiming a priority of 2 November 1984, filed on 1 November 1985 and published as EP-A-0 180 482, was refused by a decision of the Examining Division dated 7 April 1992.

The reason given for the refusal was that the subject-matter of the then valid claims lacked an inventive step having regard to the prior art represented by the Japanese publication

D1: KOTSU TAISHA, Vol. 14, 1981, pages 91 to 104.

This document was interpreted by the aid of a translation into English, filed by the Appellant, then Applicant, on 2 January 1992.

- II. The Appellant lodged a notice of appeal on 10 June 1992 and paid the appeal fee on the same day. A Statement of Grounds of Appeal was filed on 11 August 1992 requesting that the proceedings be based on a new set of Claims 1 to 6.

Claims 1 to 6 read as follows:

"1. A method for providing bone densities μ'_i for the evaluation of an X-ray photograph of a bone, comprising the steps of:

(a) determining a bone pattern by measuring the photodensities along a line substantially perpendicular to the longitudinal axis of the bone of an X-ray photograph of a long shank bone of a limb;

(b) smoothing and symmetrizing the bone pattern to modify the same; and

(c) determining bone densities μ'_i , by establishing, from the modified bone pattern, a bone model having an elliptical bone cross-sectional external shape with a ratio of the major axis to the minor axis of more than 1 but not more than 1.4 and having a zonate bone cortex consisting of a plurality of cross-sectional zones of which the densities thereof are stepwise reduced toward the centre of the elliptical bone cross-section.

2. A method as claimed in claim 1, wherein said long shank bone of a limb is the mid-shaft of a second metacarpal bone.

3. A method as claimed in claim 2, wherein the ratio of the major axis to the minor axis of the elliptical bone cross-sectional external shape is about 1.25.

4. A method for providing a colour image of bone density distribution for the evaluation of an X-ray photograph of bone, comprising the steps of:

(a) determining a bone pattern in each scanning portion of a long shank bone of a limb by measuring the photodensities along a line substantially perpendicular to the longitudinal axis of the bone of an X-ray photograph of the long shank bone of a limb at a constant scanning interval thereof;

(b) smoothing and symmetrizing the bone pattern of each portion to modify the same;

(c) determining bone densities μ'_i in each scanning portion by establishing, from the modified bone pattern, a bone model having an elliptical bone cross-sectional external shape with a ratio of the major axis to the minor axis of more than 1 but not more than 1.4 and having a zonate bone cortex consisting of a plurality of cross-sectional zones of which the densities are stepwise

reduced toward the centre of the elliptical bone cross-section;

(d) classifying, by colour, the bone densities μ'_i in each scanning portion based on the values of the densities μ'_i ; and

(e) colour imaging the bone densities μ'_i based on the above-defined colour classifications, to form the colour image of the bone density distribution.

5. A method as claimed in claim 4, wherein said long shank bone of a limb is the mid-shaft of a second metacarpal bone.

6. A method as claimed in claim 4, wherein the ratio of the major axis to the minor axis of the elliptical bone cross-sectional external shape is about 1.25."

The new independent Claims 1 and 4 are distinguished from refused Claims 1 and 4 only in that the feature of original Claim 5, that the ratio of the major axis to the minor axis is more than 1 but not more than 1.4, has been introduced in step (c) of both independent claims.

III. In a communication accompanying the summons to oral proceedings, the Board noted that its preliminary view was to agree with the decision made by the Examining Division. However, the Board also stated that unlike the Examining Division it felt that the claims were still open to objection under Article 52(2)(a), (c), (d) and (4).

IV. In the course of the proceedings before the Board, the Appellant criticised the decision of the Examining Division. He stated that the decision was not sufficiently substantiated. In particular, it had not been shown in the decision that the feature in step (a) of the independent

claims, "determining a bone pattern by measuring the photodensities", was known from D1. The Appellant in fact contested that this feature was disclosed therein.

Moreover the Appellant was of the opinion that steps (b) and (c) of Claim 1 and steps (b) to (e) of Claim 4 were not disclosed in D1. Neither was it obvious to arrive at these steps from the teaching of D1.

However, in the oral proceedings, after the Board had expressed the opinion that the said steps (b) and (c) according to Claim 1 and (b) to (e) according to Claim 4 did not appear to be of a technical nature, the Appellant agreed in principle with that proposition.

In the course of proceedings, the Appellant referred to several decisions taken by the Boards of Appeal in support of his case. These decisions are all mentioned under "Reasons for the Decision" below and account has been taken thereof in relation to matters of interest for the present decision.

V. The Appellant requests that the decision under appeal be set aside and that a patent be granted on the basis of the following requests:

1. Claims 1 to 6 (as under paragraph II above) filed on 11 August 1992 according to a main request;
2. Claims 1 and 2 filed on 27 November 1992 according to a first auxiliary request. Claims 1 and 2 read as follows:

"1. A method for providing bone densities μ'_i for the evaluation of an X-ray photograph of a bone, comprising the steps of:

- (a) determining a bone pattern by measuring the photodensities along a line substantially perpendicular to the longitudinal axis of the bone of an X-ray photograph of a mid-shaft of a second metacarpal bone;
- (b) smoothing and symmetrizing the bone pattern to modify the same; and
- (c) determining bone densities μ'_i , by establishing, from the modified bone pattern, a bone model having an elliptical bone cross-sectional external shape with a ratio of the major axis to the minor axis of about 1.25 and having a zonate bone cortex consisting of a plurality of cross-sectional zones of which the densities thereof are stepwise reduced toward the centre of the elliptical bone cross-section.

2. A method for providing a colour image of bone density distribution for the evaluation of an X-ray photograph of bone, comprising the steps of:

- (a) determining a bone pattern in each scanning portion of a mid-shaft of a second metacarpal bone by measuring the photodensities along a line substantially perpendicular to the longitudinal axis of the bone of an X-ray photograph of the mid-shaft of the second metacarpal bone at a constant scanning interval thereof;
- (b) smoothing and symmetrizing the bone pattern of each portion to modify the same;
- (c) determining bone densities μ'_i in each scanning portion by establishing, from the modified bone pattern, a bone model having an elliptical bone cross-sectional external shape

with a ratio of the major axis to the minor axis of about 1.25 and having a zonate bone cortex consisting of a plurality of cross-sectional zones of which the densities are stepwise reduced toward the centre of the elliptical bone cross-section;

(d) classifying, by colour, the bone densities μ'_i in each scanning portion based on the values of the densities μ'_i ; and

(e) colour imaging the bone densities μ'_i based on the above-defined colour classifications, to form the colour image of the bone density distribution."

Claim 1 corresponds to Claim 1 of the main request with the characterising features of Claims 2 and 3 of the main request incorporated in steps (a) and (c) of the main request respectively. The characterising features of Claims 5 and 6 of the main request have been introduced in a similar way in Claim 2;

3. Claims 1 to 3 according to a second auxiliary request filed during the oral proceedings. Claims 1 to 3 are identical to Claims 4 to 6 of the main request.

Reasons for the Decision

1. The appeal is admissible

Main Request:

2. Claim 1: Article 52(2) and (3) EPC

- 2.1 The Appellant in the oral proceedings submitted that D1 did not disclose a method including step (a) according to Claim 1, as nowhere in the said document was it shown that

photodensities were measured. Instead, according to the Appellant they were calculated.

However, it appears to the Board, that the teaching of said document clearly reveals that it was known to the skilled person before the priority date of the present application to determine a bone pattern by measuring the photodensities along a line substantially perpendicular to the longitudinal axis of the bone of an X-ray photograph of a metacarpal bone. Thus, on page 2 of the translation of D1 it is said that

"the optical density was measured at the middle position of the metacarpal II on the X-ray picture, using a microdensiometer".

Moreover, Figure 3 in D1, last row, shows measured densiometric patterns (see the said translation). These patterns correspond to the calculated model patterns shown in the first and second rows of said Figure 3. On page 3 in the translation of D1 it is said that a cross-section of the metacarpal bone II is supposed to be a circle which has also been indicated in Figure 3 (first and second row) by symbolising the said cross-sections of said models as circles. To the skilled person it is therefore implicitly disclosed by Figure 3 that also the third row, presenting the said measured patterns, represents cross-sections of bones, i.e. the said patterns have been determined by measuring the photodensities along a line substantially perpendicular to the longitudinal axis of the corresponding bone of an X-ray photograph.

On page 12 in the translation it is moreover stated that

"as a method for microdensitometric analysis on X-ray picture of the hand, we calculated the distribution of bone density with computer, supposing the cross-section at the middle level of the metacarpal bone II".

Moreover, on page 13 the method according to Figures 17 and 18 is described for obtaining "bone densities of fractions".

The Board therefore understands that the general method for providing bone densities as identified in the introductory paragraph of Claim 1 was known before the priority date of the present application. Also, it is apparent from the cited passages that step (a) is used for providing data for the determination of said bone densities. The Board is therefore of the opinion that the teaching of D1 discloses the first part of Claim 1 (the introductory paragraph and the step-a paragraph).

- 2.2 Having regard to Article 52(2) and 52(3) EPC it is apparent that an invention may consist of a mix of features, which to one part consists of technical features (not excluded from patentability - non-excluded features) and to another part consists of features excluded from patentability (excluded features). It could also happen that the use of technical means for carrying out a method, which principally consists of a mental act, may render such a method an invention within the meaning of Article 52(1) EPC (cf. T 38/86, OJ EPO 1990, 384).

In the present case it is apparent that the subject-matter of Claim 1 consists of a mix of such excluded and non-excluded features. The first part of Claim 1 (the introductory paragraph and the step-a paragraph) thus discloses features which have a technical character.

The introductory paragraph of Claim 1 which makes a general statement of the invention refers to an X-ray photograph, which in itself is of a technical nature and which has been created by a technical process. The step-a paragraph more clearly relates to a technical feature, since said measuring step identified therein and performed on said X-ray photograph, apparently must be performed by technical means.

Thus, the first part of Claim 1 is of a technical nature. This part, however, discloses - as has been shown above - a method that is known and thus is part of the prior art.

It is true that a claim can relate to a technical process even if part of the process resides in a non-technical method (cf. the lines at the beginning of this paragraph). However, it does not necessarily follow that all such mixes, which consist of subject-matter excluded from patentability under Article 52(2) EPC and subject-matter not excluded from such patentability, are patentable. In the said T 38/86 the Board concluded:

"Since patentability is excluded only to the extent to which the patent application relates to excluded subject-matter or activities as such, it appears to be the intention of the EPC to permit patenting only in those cases in which the invention involves a contribution to the field not excluded from patentability".

In the present case, the features (b) and (c) of Claim 1 represent the addition to the known art identified in the two first paragraphs (the introductory paragraph and the step-a paragraph). Therefore, it is necessary to investigate whether the steps (b) and (c) involve a contribution to the field not excluded from patentability.

Step (b) clearly appears to represent a mathematical method. This is supported by the description of the present application in that it indicates and clarifies the different sub-steps of the mathematical procedure. No means or process steps have been mentioned which could be considered technical.

Also step (c) of Claim 1 appears to be related to excluded subject-matter or activities as such within the meaning of Article 52(2) and (3) EPC. Thus, the method of determining bone densities described only identifies a mathematical method or a method for performing a mental act in order to present information (Article 52(2) (a), (c) and (d) EPC). This conclusion is also supported by the description of the present application, as there are no technical means mentioned which could perform this step.

Moreover, neither the combination of the novel features of Claim 1 (features b and c), nor such combination taken together with the known technical features of the prior art (first part of Claim 1), creates a new technical effect.

The Boards in their normal practice, when assessing an objective technical problem to be solved, start by deciding the closest prior art. In reaching a decision on this issue, it is necessary to compare the technical method which is the subject-matter of the claim under consideration with those of the prior art methods. This is done objectively by comparing the results achieved by the subject-matter claimed with those achieved by that prior art.

The objective problem to be solved in the present case would be, that the data (bone pattern) produced by the known technical method according to the first part of

Claim 1 must be analysed and treated in such a way that it can be presented in a form that makes it easier to evaluate an X-ray photograph.

Such a problem, however, is not of a technical character. Neither does the method provide a result (easier to evaluate an X-ray photograph), which is of a technical nature.

- 2.3 The Board notes that the Appellant in the oral proceedings agreed to the fact that features (b) and (c) did not involve technical features. However, he pointed out that step (a) of Claim 1 involved the technical feature of measuring the said photodensities, which feature moreover according to the Appellant was not disclosed by D1 (cf. first lines of paragraph 2.1 above). The Appellant stated that the photodensities of D1 were the result of statistical calculations and not of measurements. The Board understands that the Appellant wanted to express the opinion that the invention was more realistic and made it possible to distinguish between the bones of individuals.

However, as has been shown by the Board under paragraph 2.1 above, the said feature of measuring the said photodensities is clearly disclosed by document D1. Therefore, the Board has only to consider whether the features (b) and (c) individually, in combination or together with the known features in the first part of Claim 1 make a contribution to the art in a field not excluded from patentability. As has been shown above, the Board, however, has not found anything that would indicate that the combination of the features of Claim 1 would make a contribution in some way to the art in a field not excluded from patentability. The subject-matter of Claim 1 therefore is not patentable under Article 52(1) EPC, having regard to the exclusions from patentability under Article 52(2) EPC. It thus has become meaningless to

discuss whether it would be obvious to arrive at the method claimed starting from the said teaching of D1.

3. Claim 4: Article 52(2) and (3) EPC

3.1 Claim 4 is distinguished from Claim 1 on the following points:

The introductory paragraph of Claim 4:

Instead of just providing bone densities (as according to the introductory paragraph of Claim 1), a colour image of bone density distribution is provided (cf. step (e) below).

Step (a):

The bone pattern is determined at several cross-sections (not at only one cross-section as according to Claim 1) of a long shank bone ("determining a bone pattern in each scanning portion of a long shank bone ... by measuring ... at a constant scanning interval thereof"), which cross-sections are situated at a constant interval along the bone.

Step (b):

This step is in principle identical to step (b) according to Claim 1 but according to Claim 4 is performed at each cross-section which has been determined according to step (a) of Claim 4.

Step (c):

Also this step is identical in principle to step (c) of Claim 1 but is performed several times.

Step (d):

Not present in Claim 1. This feature provides that the bone densities mentioned in Claim 1 are classified by colour.

Step (e):

Not present in Claim 1. This feature has to be interpreted in the following way (which was also confirmed by the Appellant during the oral proceedings): the bone is represented as a section along the axis of the bone by presenting its bone densities in colours.

Thus, the introductory paragraph of Claim 5 in a general form points forward to the last step (e) and thus to the result of the claimed method.

3.2 The Board is of the opinion that, of the features added to Claim 4 in comparison to Claim 1, only the said additional feature of step (a) "determining a bone pattern in each scanning portion of a long shank bone ... by measuring ... at a constant scanning interval thereof" has a technical character. As has been shown under paragraph 2.1 above, the determining of a bone pattern in a single cross-section of a bone is disclosed by D1. Thus the novel technical feature of Claim 4 is that said determining is made several times, apparently in order to acquire data required for the representation of the bone as identified in step (e).

3.3 The introductory paragraph of Claim 4, compared to the corresponding paragraph of Claim 1 does not contain any new technical features. It just refers to the said X-ray photograph like the introductory paragraph of Claim 1 and makes a general statement of the purpose of the invention ("a method for providing a colour image of bone density

distribution"). This statement, however, does not involve any technical information and its message can only be understood when reading the last paragraph (e) of the claim.

The steps (b) and (c) of Claim 4 imply that the operations according to the steps (b) and (c) of Claim 1 are repeated several times. This, however, does not change the nature of these operations and they clearly are not of a technical nature (cf. paragraph 1.2 above).

Step (d) also represents a non-technical feature, since classifying bone densities by colour means presenting information. Such presentation is excluded from patentability by Article 52(2)(d) and (3) EPC (cf. T 119/88, OJ EPO 1990, 395, 4.2C).

Step (e), which has been forecast in the introductory paragraph, apparently implies that the data acquired in step (a) and treated according to the steps (b) and (c) is properly restructured and presented in the form of a bone density distribution based on the said colour classification according to step (d). Also this step does not have a technical character and is apparently a mix of mathematical methods (changing the bone density distribution of the cross-sections into a bone density distribution of a length-section of a bone) and presentation of information (making a coloured image based on the results of the mathematical methods).

3.4 . Having regard to the analysis in paragraphs 3.1 to 3.3, it thus appears that the only technical feature distinguishing Claim 4 from Claim 1 is the technical feature referred to under 3.2 above and included in step (a) of Claim 4 (i.e. the bone pattern is determined by measuring at several cross-sections). As has been made

clear above in paragraphs 2.1 to 2.3, the features of the first part of Claim 1 (the features of the introductory paragraph and the step-a paragraph of Claim 1) belong to the prior art according to D1 in the technical sense (the additional features of Claim 1 relate, as shown, to a field excluded from patentability).

The said distinguishing technical feature of Claim 4 (distinguishing from Claim 1) is also the only feature distinguishing the subject-matter of Claim 4 from the prior art according to D1 in a technical sense, as the features (b) to (e) of Claim 4 relate to a field excluded from patentability.

Because of said novel technical feature, however, the subject-matter according to Claim 4 involves a contribution to the art in a field not excluded from patentability, i.e. it is novel.

4. Claim 4: Articles 52(1) and 56 EPC

4.1 The objective technical problem to be solved in this case, appears to be (cf. paragraph 3.2 and 3.4 above) to acquire data required for the representation of a bone as identified in step (e) of Claim 4, since no other technical aspects can be discovered in Claim 4. The novel features with regard to the prior art, steps (b) to (e), are individually all within the field excluded from patentability and also there can be seen no mutual or interactive technical effects when combining these features with each other or the known technical features of the claim.

4.2 According to the teaching of D1, it is known to acquire data in the way defined in step (a) of Claim 1. These data are used for representing a model cross-section of a bone

(cf. Figure 17 in D1). When solving the said problem, i.e. when the skilled man wants to represent the bone by a section along the length axis of the bone, it is obvious to him that he must collect data (bone densities) from the whole length extension of the bone. As the method of collecting data from a cross-section of a bone is already known to him, it would appear self-evident to him that he could use this method also to solve his problem by scanning several cross-sections along the bone as proposed by Claim 4.

The steps (b) to (e) do not provide any technical effect and only define how the acquired data are treated and relate to a field excluded from patentability. The subject-matter of Claim 4 therefore does not meet the requirements of Articles 52(1) and 56 EPC.

First Auxiliary Request

5.7 Claim 1 is distinguished from Claim 1 of the main request only in that the features of Claims 2 (said long shank bone of a limb is the mid-shaft of a second metacarpal bone) and 3 (the said ratio of the said axis is about 1.25) of the main request have been introduced into Claim 1.

These features, however, do not add any subject-matter to Claim 1 of the main request which is not excluded from patentability in accordance with Articles 52(2) and 52(3) EPC. Claim 1 therefore does not involve features which make a contribution in a field outside the range of matters excluded from patentability under Article 52(2) and (3) EPC.

6. Claim 2 is distinguished from Claim 4 of the main request, in that the features of Claims 5 and 6 of the main request, which are identical to the features of Claims 2 and 3 of the main request, have been incorporated in Claim 2. Thus, also these added features relate to a field excluded from patentability under Article 52(2) and (3) EPC (cf. paragraph 5 above). Claim 2 is thus novel as is Claim 4 of the main request (cf. paragraph 3.4 above). However, it follows that the subject-matter of Claim 2 like the one of Claim 4 of the main request does not have an inventive step (cf. paragraph 4.2 above) and thus does not meet the requirements of Article 52(1) EPC.

Second Auxiliary Request

7. Claims 1 to 3 of the second auxiliary request are identical to Claims 4 to 6 of the main request respectively. Independent Claim 1 of this request therefore is not patentable for the same reasons as Claim 4 of the main request (cf. paragraphs 3 to 4.2 above).

General Considerations

8. The Appellant has in the course of the appeal proceedings criticised the decision taken by the Examining Division. He has alleged that the decision was not appropriately substantiated. With respect to the said step (a), according to the independent claims, he said that the feature of "determining a bone pattern by measuring" had neither been shown to be known from D1, nor was it disclosed by that document. He made a reference to T 157/87 (unpublished). In that decision a Board remitted the case to the first instance because a ground of objection relied upon by the Examining Division had not been substantiated by said Division. He also referred to

T 167/84 (OJ EPO 1987, 369) to make clear that when novelty is considered it is not correct to interpret the teaching of a document (in this case D1) as embracing well-known equivalents which are not disclosed in the document; such an approach would be a matter of obviousness. Moreover, the Appellant was of the opinion that it was not at all obvious to arrive at the alleged invention from the teaching of D1 (reference to T 390/88 - non-obvious alternatives).

The Board considers that the Appellant has made a serious attempt to defend his case and has mentioned decisions of the Boards that could have supported his case. However, as has been shown above, the Board has, in fact, come to the same conclusion as the Examining Division with respect to the said feature in step (a) of Claim 1 of the main request, i.e. the said measuring step is disclosed by D1. Moreover, contrary to the Examining Division, the Board has come to the conclusion that the method steps following step (a) of the independent claims according to all requests contribute nothing to a field not excluded from patentability within the meaning of Article 52(2) and (3) EPC. For these reasons, the Board has come to the conclusions set out above.

9. In the examination proceedings the Appellant also referred to T 208/84 (OJ EPO 1987, 14), in order to prove that an invention may relate to a technical process even if part of the process resides in a mathematical method. However, as has been pointed out by the Board in a communication, the invention in case T 208/84 may be distinguished from the present claimed invention in that it made a contribution in a field not excluded from patentability, namely a more efficient restoration or enhancement of the technical quality of an image.

In T 208/84 it is said that a direct technical result is not produced by a mathematical method. However, it is said, "if a mathematical method is used in a technical process, that process is carried out on a physical entity (which may be a material object but equally an image stored as an electric signal) by some technical means implementing the method and provides as its result a certain change in that entity".

In the present case, such a change of a physical entity cannot be found. The photodensity of the X-ray photograph could, indeed, be considered as such an entity. However, this entity is not physically changed, but only used for basic data collection required for performance of the following mathematical method.

10. Having already decided that the present invention is not patentable, the Board notes in passing that the Examining Division in its decision stated that the claims were no longer open to objections under Articles 84 and 52(4) EPC. The Appellant had in the examining proceedings referred to T 385/86 (OJ EPO 1988, 308) and stated that it was clearly to be understood from the second headnote of that decision that a method involving interaction with the human or animal body is susceptible of industrial application if it can be used with a desired result by a technician without specialist medical knowledge or skills.

The Board fully concurs with the said statement. However, having regard to the wording of the introductory paragraphs of all independent claims according to all requests, it appears that the expression "evaluation of an X-ray photograph" in said paragraphs is so vague and general (Article 84 EPC), that it also could cover the case where a diagnosis is being made. Thus, it appears

that this expression could be so interpreted that the said final data distributions of the bone densities according to steps (c) or (e) were evaluated by e.g. a doctor by comparing these distributions with model distributions in order to find out the status of a client with regard to aging or bone diseases. Such an evaluation would not only provide interim results, but would localise a deviation to a particular clinical picture and thereupon allow the doctor start a medical treatment (cf. T 400/87, not published). Such an interpretation would qualify the subject-matter of all claims as diagnostic methods, thus falling within the field identified by Article 52(4) EPC.

Order

For these reasons, it is decided that:

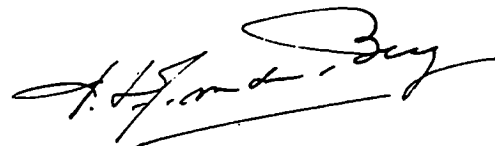
The appeal is dismissed.

The Registrar:



M. Kiehl

The Chairman:



P.K.J. van den Berg

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