Internal distribution code:
(A) [- ] Publication in OJ
(B) [- ] To Chairmen and Members
(C) [- ] To Chairmen
(D) [ X ] No distribution

Datasheet for the decision
of 7 September 2017

Case Number: T 2163/11 - 3.5.04
Application Number: 05762717.6
Publication Number: 1774465
IPC: G06T1/00
Language of the proceedings: EN

Title of invention:
ADAPTIV 3D SCANNING

Patent Proprietor:
3Shape A/S

Former Opponent:
Straumann Holding AG
smart optics Sensortechnik GmbH

Headword:

Relevant legal provisions:
EPC 1973 Art. 83, 100(b)

Keyword:
Sufficiency of disclosure - (no)
Decisions cited:
T 0435/91, T 0632/01

Catchword:
Decision of Technical Board of Appeal 3.5.04 of 7 September 2017

Appellant: 3Shape A/S
Holmens Kanal 7, 4. sal,
1060 Copenhagen (DK)

Representative: Guardian
IP Consulting I/S
Diplomvej, Building 381
2800 Kgs. Lyngby (DK)

Decision under appeal: Decision of the Opposition Division of the European Patent Office posted on 27 July 2011 revoking European patent No. 1774465 pursuant to Article 101(3)(b) EPC.

Composition of the Board:
Chairman C. Kunzelmann
Members: M. Paci
B. Müller
Summary of Facts and Submissions

I. This is an appeal by the patent proprietor against the decision of the opposition division revoking European patent No. 1 774 465.

II. Two oppositions had been filed against the patent as a whole, each based on Article 100(a) EPC (novelty and inventive step) and Article 100(b) EPC (sufficiency of disclosure).

During the proceedings before the opposition division the two opponents had relied inter alia on the following document:


III. In the decision under appeal, the opposition division held that:
- claim 1 of the main and first auxiliary requests did not meet the requirements of Articles 84 and 123(2) EPC;
- the subject-matter of claims 1 and 35 to 38 of the second auxiliary request lacked novelty (Article 54(1) and (2) EPC) over prior-art document E8;
- the subject-matter of claim 1 of the third and fourth auxiliary requests did not involve an inventive step (Article 56 EPC) in view of document E8 and the subject-matter of claims 35 to 38 of the third and fourth auxiliary requests lacked novelty over document E8;
- claim 1 of the fifth auxiliary request did not meet the requirements of Article 123(2) EPC; and
for the inventions defined in claim 1 of the fifth to seventh auxiliary requests the requirement of sufficiency of disclosure of Article 83 EPC was not met.

IV. In the notice of appeal, the appellant (patent proprietor) requested that the decision under appeal be set aside. Oral proceedings were also requested as a precaution.

With the statement of grounds of appeal the appellant filed amended claims according to a main request and first to fourth auxiliary requests (labelled "Request A" to "Request E"), which replaced the sets of claims underlying the decision under appeal.

V. Then respondents I and II (former opponents 1 and 2), in their replies to the statement of grounds of appeal, raised objections under Articles 83, 84 and 123(2) EPC as well as objections of lack of novelty and lack of inventive step. Both of the then respondents requested that the appeal be dismissed. Then respondent I also requested that any further request of the appellant comprising further amendments to the claims not be admitted.

VI. The board summoned the parties to oral proceedings and in a communication under Article 15(1) RPBA (Rules of Procedure of the Boards of Appeal of the EPO, OJ EPO 2007, 536) informed them that the discussion at the oral proceedings would focus on claim interpretation, sufficiency of disclosure and inventive step. The board also stated that it was inclined to regard prior-art document E8 as the closest prior art.
VII. With letters dated 27 July 2017 and 1 August 2017, the two then respondents withdrew their oppositions.

VIII. With a letter dated 4 August 2017, the appellant withdrew its first to third auxiliary requests (labelled "Request B" to "Request D") and renamed its fourth auxiliary request (labelled "Request E") as its new first auxiliary request. The two sets of claims according to the main and first auxiliary requests (labelled "Request A" and "Request E", respectively) were re-filed. The appellant also filed an amended page 3 of the patent specification.

IX. Oral proceedings were held on 7 September 2017. During the oral proceedings the appellant withdrew its first auxiliary request (labelled "Request E") and filed a set of amended claims according to a new first auxiliary request (labelled "Request F"). The discussion during the oral proceedings inter alia covered claim interpretation, sufficiency of disclosure and inventive step in view of E8.

The appellant's final requests at the end of the oral proceedings were that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of the claims according to the main request ("Request A") filed with the letter dated 4 August 2017, or the first auxiliary request ("Request F") filed during the oral proceedings of 7 September 2017, and the description and drawings of the patent specification with amended page 3 as filed with the letter dated 4 August 2017.

Before closing the oral proceedings the chairman announced the board's decision.
X. Claim 1 according to the appellant's main request reads as follows:

"A method for producing a 3D computer model of an impression of a dental object, said method comprising the following steps
a) providing a scanner system, said scanner system comprising
   i. a scanner, and
   ii. a computer connectable to and/or integrated in said scanner, said computer comprising a virtual model of said scanner, the virtual model comprising a camera model, a light source model, motion models and calibrated values for scanner parameters, said models specific to said scanner,
b) entering shape information of the impression of a dental object into the computer,
c) creating in said computer a visibility function based on said virtual model and the shape information, said visibility function being capable of evaluating the coverage of areas of interest of the impression of a dental object by at least one predetermined scan sequence,
d) establishing at least one scan sequence based on the evaluation of the visibility function,
e) performing a scan of the impression of a dental object using said at least one scan sequence,
f) optionally repeating steps d) and e) at least once,
g) obtaining a 3D computer model of the impression of a dental object."

XI. Claim 1 according to the appellant's first auxiliary request reads as follows:
"A method for producing a 3D computer model of a dental impression covering the surface of at least one tooth, said method comprising the following steps
a) providing a scanner system, said scanner system comprising
   i. a scanner,
   ii. at least two cameras, and
   iii. a computer connectable to and/or integrated in said scanner, said computer comprising a virtual model of said scanner, the virtual model comprising a camera model, a light source model, motion models and calibrated values for scanner parameters, said models specific to said scanner,
b) entering shape information of the dental impression obtained by an initial scanning of the dental impression into the computer,
c) creating in said computer a visibility function based on said virtual model and the shape information, said visibility function being capable of evaluating the coverage of areas of interest of the dental impression by at least one predetermined scan sequence, wherein the evaluation of coverage comprises that the area of interest is rotated for maximal visibility,
d) establishing at least one scan sequence based on the evaluation of the visibility function,
e) performing a scan of the dental impression using said at least one scan sequence, wherein the area of interest is scanned with a linear motion derived from rotation angle and the size of the area of interest
f) optionally repeating steps d) and e) at least once,
g) obtaining a 3D computer model of the dental impression by combining information from the shape information of the physical object and at least one of the results of the scan performed in step e), wherein the motion models comprises models for the rotation and linear motion."
XII. The reasoning in the decision under appeal on the issues relevant to the present decision may be summarised as follows:

Interpretation of certain terms in claim 1

The expression "scan sequence" used in the claims should be construed as a sequence of views, i.e. as more than a single view (see section 12.2 of the Reasons).

The expression "an impression of a dental object" was not limited to impressions with deep cavities but also covered shallow impressions (see section 13.4.1 of the Reasons).

Sufficiency of disclosure

Claim 1 according to each of the fifth to seventh auxiliary requests underlying the decision under appeal defined a method for producing a 3D computer model. According to the patent proprietor, that method made it possible to automatically establish a scan sequence comprising several next views in order to obtain full geometrical coverage of a physical object, said object being specified in the sixth and seventh requests as being a dental object.

Claim 1 according to these requests defined that a visibility function was created based on a virtual scanner model comprising a camera model, a light source model, motion models, and calibrated values for scanner parameters. However, the patent did not describe any concrete camera model, light source model, motion model or calibrated parameters of the scanner, or the
creation of a virtual scanner model based on such models and parameters. The opposition division was prepared to accept that the person skilled in the art might have had sufficient knowledge to create a visibility function by ray tracing for a simple virtual model of a scanner and, in case the visibility function was a function of only one motion parameter (such as one rotation angle), the skilled person would have been able to calculate a scan sequence achieving reasonable coverage of a physical object by finding values of the motion parameter which maximised the visibility function. However, the opposition division was also of the opinion that the skilled person did not have sufficient information, from the teaching of the patent in combination with common general knowledge, on how to automatically calculate a scan sequence for obtaining full coverage of a physical object in case of a complex visibility function. Conceiving a visibility function based on a complex virtual model of the scanner, automatically evaluating such a visibility function and finding a suitable scan sequence defining a sequence of motion settings, active cameras and light source and light pattern settings, would have been a difficult task which would have required further research and inventive skills (see section 13.6.2 of the Reasons).

Therefore, the requirement of sufficiency of disclosure (Article 83 EPC) was not met for claims 1 of the fifth to seventh auxiliary requests underlying the decision under appeal.

XIII. Before withdrawing their oppositions, the two then respondents had submitted the following arguments in writing on the issues of relevance to the present decision:
Interpretation of certain terms in claim 1

According to the definition of a "scan sequence" given in paragraph [0017] of the patent specification, the scan sequence could be "a single scan without motion", i.e. a single view (see section 2.3.3, first paragraph, of then respondent I's reply to the statement of grounds of appeal).

The expression "an impression of a dental object" also covered shallow impressions such as a "bite registration" (also called "check bite") used for determining the relative positions of the upper and lower teeth in the bite position (see section 2.3.4, second paragraph, of then respondent I's reply to the statement of grounds of appeal).

Sufficiency of disclosure

On page 2 of the statement of grounds of appeal the appellant had argued that the prior-art methods surveyed in document E8 were not suitable for the automatic scanning of a dental impression because "special consideration" would have to be given in order to scan a dental impression. However, neither the claims nor the patent disclosed what this special consideration might be (see section 2.3.6 of then respondent I's reply to the statement of grounds of appeal).

The appellant had stressed that a dental object was particularly challenging to scan in comparison to arbitrary objects. However, the patent specification was completely silent about the technical details making it possible to scan a dental object (see
section II.3 of then respondent II's reply to the statement of grounds of appeal).

Hence, claim 1 of each of the requests filed with the statement of grounds of appeal did not meet the requirement of sufficiency of disclosure of Article 83 EPC.

XIV.
The appellant (patent proprietor) essentially argued as follows on the issues of relevance to the present decision:

Interpretation of certain terms in claim 1

The term "scan sequence" should be understood as a "sequence of views". This was clear in the context of claim 1 because the virtual model of the scanner comprised motion models. Moreover, paragraph [0017] of the patent specification had been amended to specify that "a single scan without motion" was not covered by the invention (see page 2 of the letter dated 4 August 2017).

The definitions of "dental impression" given in various dictionaries of dentistry made it clear that a "dental impression" was not the same as a "check bite". The skilled person would thus have construed a dental impression as referring to a specific type of impression mould used in dentistry to produce a final model representing the dental section of which the impression was taken. These impressions covered the complete surface of the tooth/teeth all the way to the gums. Thus a "dental impression" generally comprised deep and narrow cavities which were particularly difficult to scan, as acknowledged in paragraph [0053]
of the patent specification (see pages 1 and 2 of the statement of grounds of appeal).

Sufficiency of disclosure

The appellant put forward several specific arguments as to sufficiency of disclosure during the oral proceedings before the board. These arguments will be presented and discussed in context in the "Reasons for the decision" below.

Reasons for the Decision

1. The appeal is admissible.

The invention

2. The present invention relates to the production of a 3D computer model of a physical object. In order to produce the 3D model, the object is scanned by a scanner comprising a light source, typically a laser, and a camera (see figure 1 of the patent specification). The scanning procedure generally comprises the following steps:
   (1) the light source projects light, such as laser dots or laser lines, onto the object;
   (2) the camera captures an image of the illuminated object;
   (3) since the relative positions of the light source and camera are known, the 3D co-ordinates of the illuminated areas of the surface of the object seen by the camera can be calculated by known triangulation techniques;
   (4) the calculated 3D co-ordinates are used to generate a 3D computer model of the surface of the object;
(5) the object is moved to a new position relative to the scanner in order to scan a yet unscanned area of the surface of the object, and steps (1) to (5) are then repeated until maximum coverage of the surface of the object is achieved.

It is a well-known problem that physical objects need to be scanned from different viewpoints in order to obtain full coverage of their surface. The more complex a form the object has, the more difficult it is to find an optimal scan sequence achieving full coverage. Negative shapes, such as holes and cavities, are known to be particularly difficult to scan. (Parts of the surface covered by a required support or attachment of the object may need further measures which are not considered in this decision).

The present invention addresses this problem by providing a method for automatically generating a scan sequence achieving full coverage of the surface of an impression of a dental object (see paragraph [0010] of the patent specification).

Main and first auxiliary requests – interpretation of claim 1

3. Regarding the interpretation of the term "scan sequence" in claim 1, the board concurs with the opposition division and the appellant that this term should be construed in the context of claim 1 as meaning a sequence of a plurality of scans.

Indeed, the normal meaning of the term "sequence" implies that a "scan sequence" comprises two or more scans arranged in a particular order. According to the board, this interpretation was only cast into doubt by the definition of "scan sequence" given in
paragraph [0017] of the patent specification which stated that a scan sequence could be "anything from a single scan without motion to a scanning with long and complex motion sequences". The former respondents used this definition to argue that the "scan sequence" could be "a single scan without motion" (see point XIII supra). However, the appellant has amended paragraph [0017] to specify that a single scan without motion is not covered by the invention. There is thus no longer any doubt that the "scan sequence" of claim 1 comprises more than one scan.

As to the term "scan" in "scan sequence", the board considers that it means a scan of the object at a given position of the object relative to the light source and camera, i.e. a scan at what is called a "view" (in expressions such as "next best view" or "view planning") in document E8.

4. As to the interpretation of the terms "impression of a dental object" and "dental impression" used in claims 1 of the main and first auxiliary requests, respectively, the board concurs with the appellant (see section XIV supra) that these terms in the context of the opposed patent imply deep and narrow cavities which are difficult to scan. This is made clear not only from the definitions of "dental impression" given in dictionaries of dentistry quoted by the appellant, but also from the following text in paragraph [0053] of the patent specification:

"Optical scanning of arbitrary anatomical or dental impressions is an application which is impossible to perform without adaptive scanning. Dental impressions are negative impression of the teeth and are usually made by some kind of silicone
material. Due to the shape of teeth and their biological variation achievement of full coverage is very challenging, since scanning down into an impression of an arbitrary tooth requires very accurate viewing positions and motion."

5. As to the method of claim 1 as a whole, the appellant submitted that it automatically created the scan sequence(s) (see steps (c) and (d) of claim 1) until full coverage was obtained for an impression of a dental object (see steps (f) and (g) of claim 1).

The board agrees with this interpretation of claim 1 because it is in line with paragraph [0010] of the patent specification, which is the first paragraph of the section entitled "Summary of the invention", explaining that the invention relates to "adaptive 3D scanning wherein a scan sequence to obtain full geometrical coverage are created automatically and specifically for the physical object" (emphasis added by the board).

6. Regarding the meaning of "full coverage" in the patent specification, the board notes that while paragraph [0026] of the patent specification explains that "full coverage" of a physical object may not necessarily mean "absolute coverage of all holes", paragraph [0053] of the patent specification also makes it clear that when the physical object is a dental impression, "very high accuracy is required to obtain a proper fit, which rules out artificial hole closing".

For these reasons, in the context of the patent, "full coverage" for an impression of a dental object means a very high level of coverage.
The board notes that this understanding is in line with that of the appellant. In particular, the achievement of full coverage at a very high accuracy for a dental impression is, according to the appellant, the main reason why the method of claim 1 involves an inventive step over the prior-art methods described in document E8 (see page 5 of the statement of grounds of appeal).

Main request - sufficiency of disclosure (Articles 83 and 100(b) EPC 1973)

7. On the basis of the above interpretation of claim 1 of the main request, the board concurs with the opposition division and the former respondents that, for the invention defined in claim 1, the requirement of sufficiency of disclosure of Articles 100(b) and 83 EPC 1973 is not met for the reasons set out below.

8. Document E8 is a survey of the state of the art in the field of automatic and semi-automatic scanning of physical objects for producing a 3D computer model (see abstract of E8). It focuses in particular on the core challenge of automatically finding a scan sequence (called automatic "view planning" in E8) achieving full coverage of the physical object.

Since document E8 was published in March 2003, i.e. approximately 16 months before the priority date of the patent, and was a comprehensive survey of the state of the art at the time, the board considers it to be a reliable indication of what was feasible and what was not before the date of filing of the patent application. The appellant has not disputed this view.

9. Document E8 makes it unambiguously clear throughout its disclosure that there was no known method that could
simultaneously achieve automatic view planning, full coverage and high-quality reconstruction for a physical object having a complex shape, despite there being a real need for such a method. Moreover, according to E8, it was not expected that such a method would be found in the near future. This message is best illustrated by the following quotes taken from E8:

- "there is a need for a view planning scheme capable of developing reliable view plans in a timely manner for comprehensive object coverage in accordance with all technical criteria of the reconstruction task" (paragraph bridging pages 67 and 68);

- "there is presently no general purpose commercial system for automated object reconstruction" (page 65, left column, second paragraph);

- "As presently developed, no traditional view planning method is directly suitable for performance-oriented automated object reconstruction" (point 8.5.5 on page 88);

- "Fully automated object reconstruction/inspection is some distance off and will involve not just research but complex system engineering and integration challenges." (page 93, last paragraph).

10. According to the appellant, the method of claim 1 of the main request can simultaneously achieve automatic view planning, full coverage and high-quality reconstruction for an impression of a dental object,
i.e. for an object having a complex shape which is particularly difficult to scan.

11. In view of the evidence from document E8 that no such method existed before the date of filing of the patent, the requirement of sufficiency of disclosure can only be met if the patent specification provides sufficient technical information to enable the person skilled in the art, taking into account common general knowledge, to carry out the invention.

12. However, the patent specification provides few details as to how the "at least one scan sequence" (step (d) of claim 1) is automatically (i.e. without human intervention) established. Claim 1 only states that this is done "based on the evaluation of the visibility function" and the description and drawings only mention a few steps (see figures 3 and 4) but without giving much detail as to how they could be implemented.

In the board's view, the most detailed method disclosed in the patent specification for automatically establishing the scan sequence(s), as understood by the person skilled in the art of the technical field of the invention and equipped with the corresponding common general knowledge, is essentially as follows:

As a first step, shape information about the impression of a dental object is entered into the computer. This shape information may be, for instance, an initial 3D computer model of the object to be scanned; it may be obtained from an initial scan or be a very simplified shape such as a box or a cylinder (see paragraphs [0021] and [0022] of the patent specification).
As a second step, the computer creates a visibility function (see, for instance, paragraphs [0028] to [0034]). The visibility function is essentially a calculation of how much of the surface of the 3D computer model could be scanned from a given viewpoint, i.e. from a given position of light source and camera relative to the object. The patent does not explain how the visibility function would be calculated, but the board concurs with the appellant that it could be done by the known method of "ray tracing" i.e. by simulating each ray of light to determine whether it would reach the surface of the 3D computer model and, from there, also reach the camera. The "ray tracing" method is known to be computer intensive.

As a third step, the computer simulates a slight change (such as the one-degree angle change mentioned in paragraph [0042] of the patent specification) of the position of the dental impression relative to the scanner by a linear motion and/or a rotational motion, and calculates the visibility function at the new position. The computer repeats this process for many new positions obtained by varying one or more parameters corresponding to the degrees of freedom of the dental impression in space, i.e. up to six parameters (three orthogonal directions of space for linear motion and three orthogonal axes of rotation). The computer then uses a known optimisation algorithm, such as "steepest descent", to try to find the optimal position or sequence of positions to maximise the visibility function (see paragraphs [0031] and [0044]).

As a fourth step, the dental impression is scanned at the optimal position or sequence of positions thus found and the results of the scan(s) are used to update the 3D computer model.
Finally, the third and fourth steps are repeated until the computer considers that full coverage of the dental impression has been achieved (see, for instance, paragraph [0036]).

13. The appellant did not dispute that document E8 disclosed similar steps: for instance, trying to find a next best view (NBV) to maximise a visibility function (see, for instance, the "visibility matrices" in section 5.1 and the maximisation of the visibility as the NBV on page 76, right column, first paragraph) and using an optimisation algorithm (see page 88, last three lines).

However, the appellant argued that the sequence of steps under point 12 supra facilitated the achievement of the stated goal of **simultaneously achieving automatic view planning, full coverage and high-quality reconstruction** for an impression of a dental object, even though document E8 emphasised that this goal could not be reached.

14. The board is not convinced that the patent specification discloses sufficient information to reach this goal for the following reasons:

As a preliminary observation, the board should point out that the method of claim 1, implemented as described under point 12 supra, would have been extremely computer intensive and it thus would have taken an extremely long time to scan an object of a complex shape. Indeed, the calculation of the visibility function by ray tracing, which is already computer intensive, would have had to be repeated for a large number of simulated new positions by varying up
to six parameters (three for linear motion and three for rotation). In document E8, such an approach was deemed to have a computational complexity which was prohibitive and to be a fundamental limitation regarding its applicability to object reconstruction (see last two paragraphs of section 5.1).

However, it can be left unanswered whether the computational complexity would have been such that the skilled person would not have been able to carry out the invention because there is another reason why the requirement of sufficiency of disclosure of Articles 100(b) and 83 EPC 1973 is not met.

Indeed, the board is not persuaded that, even given enough time, the method of claim 1 implemented as described under point 12 supra would have managed to automatically scan an impression of a dental object with full coverage. The scanning of such a difficult shape, typically having deep and narrow recesses aligned in several directions, would have required a long and complicated sequence of scans. The method of the patent, which is based on the use of a known optimisation algorithm such as "steepest descent" would have only found a local maximum of the visibility function when searching for the NBV. As a result, it is easy to imagine situations in which the method of the patent would have got stuck in a loop by repeatedly trying to scan an area which could not be successfully scanned. For instance, it is very likely that most impressions of a dental object would have had at least one cavity which, because of the shape of the corresponding tooth, could not be properly scanned under any viewpoint. The optimisation algorithm would then have repeatedly determined that the NBV maximising the visibility function was to try again to scan this
still uncovered area. The method would thus have become stuck on an area impossible to fully scan instead of moving on to other parts of the dental impression.

The board discussed this issue with the appellant during the oral proceedings. The appellant admitted that such a problem could occur and that in such a case a human operator would have had to intervene. However, the appellant submitted that such problems would have happened in isolated cases but not for the vast majority of dental impressions.

The board did not find this argument persuasive because, in view of the typical shape of a dental impression comprising several deep and narrow recesses, i.e. a shape particularly difficult to scan even for an experienced human operator, this type of problem would be the rule rather than the exception to the rule.

For the above reasons, the board considers that the skilled person, in view of the disclosure of the patent and taking into account common general knowledge, would not have been able to carry out a method as defined in claim 1 of the main request.

15. Additional arguments submitted by the appellant

15.1 The appellant argued that the method of claim 1 would work, if not for all dental impressions, at least for those which were easier to scan.

This argument did not convince the board because it is established jurisprudence of the boards that the invention is only sufficiently disclosed if it can be performed in the whole range claimed rather than only for some members of the claimed class, and that only
exceptional failures can be tolerated: see, for instance, decision T 435/91 (OJ EPO 1995, 188), point 2.2.3 of the Reasons, decision T 632/01, point 2.4 of the Reasons, and section II.C.4.4 of the "Case Law of the Boards of Appeal of the European Patent Office", 8th edition, July 2016.

Hence, in the present appeal, in order to be sufficiently disclosed, the method of claim 1 would have to be able to successfully scan all "impressions of dental objects", except in exceptional cases, which is not the case for the reasons given above.

15.2 The appellant also argued that in the method of claim 1 only two motion parameters would have to be adjusted, instead of up to six parameters, thereby speeding up the execution of the method.

The board agrees with the appellant that optimising the visibility function in a two-dimensional space instead of a six-dimensional space would reduce the computing time. However, allowing "an impression of a dental object" to be moved relative to the scanner along only two degrees of freedom, such as linear motion along one direction and rotation about one axis, instead of six, would further reduce the ability of the method to achieve full coverage of the dental impression. Hence, reducing the degrees of freedom from six to two does not overcome the above reasons for the finding of insufficiency of disclosure.

16. Conclusion on the main request

Since the invention defined in claim 1 according to the main request is not sufficiently disclosed within the
meaning of Articles 100(b) and 83 EPC 1973, this request is not allowable.

First auxiliary request - sufficiency of disclosure (Article 83 and 100(b) EPC 1973)

17. Claim 1 according to the first auxiliary request differs from claim 1 according to the main request essentially by the following amendments:
   - "impression of dental object" was replaced by "a dental impression covering the surface of at least one tooth";
   - the scanner comprises "at least two cameras";
   - the shape information is "obtained by an initial scanning of the dental impression";
   - in step (c), the visibility function is capable of evaluating the coverage of areas of interest of the dental impression by at least one predetermined scan sequence, "wherein the evaluation of coverage comprises that the area of interest is rotated for maximal visibility";
   - in step (e), performing a scan of the dental impression using said at least one scan sequence, "wherein the area of interest is scanned with a linear motion derived from rotation angle and the size of the area of interest"; and
   - in step (g), the 3D computer model is obtained "by combining information from the shape information of the physical object and at least one of the results of the scan performed in step e), wherein the motion models comprises models for the rotation and linear motion".

18. The board cannot see any reason why the above amendments would allow the method of claim 1 to achieve full coverage of a dental impression. The reasons for the insufficiency of disclosure against claim 1 of the
main request raised by the board supra thus also apply to claim 1 of the first auxiliary request.

19. Conclusion on the first auxiliary request

Since the invention defined in claim 1 according to the first auxiliary request is not sufficiently disclosed within the meaning of Articles 100(b) and 83 EPC 1973, this request is not allowable.

Overall conclusion

20. Since the appellant's main and first auxiliary requests are not allowable, the decision under appeal revoking the patent cannot be set aside and the appellant's appeal must be dismissed.
Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

K. Boelicke C. Kunzelmann

Decision electronically authenticated