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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:

Case Number: **T 2163/11 - 3.5.04**

D E C I S I O N
of Technical Board of Appeal 3.5.04
of 7 September 2017

Appellant:	3Shape A/S
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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:

        E8:   W.R. Scott et al., "View Planning for Automated
               Three-Dimensional Object Reconstruction and
               Inspection", ACM Computing Surveys, Vol. 35,
               No. 1, March 2003, pages 64 to 96.

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