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Datasheet for the decision of 12 September 2023

Case Number: T 0810/19 - 3.2.02

Application Number: 10727345.0

Publication Number: 2442720

IPC: A61B5/00, G01B11/25, H04N13/02

Language of the proceedings: EN

Title of invention:
FOCUS SCANNING APPARATUS

Patent Proprietor:
3Shape A/S

Opponents:
Wunderlich, Rainer
Horn Kleimann Waitzhofer Patentanwälte PartG mbB

Relevant legal provisions:
EPC Art. 54, 56, 83, 84, 123(2)
RPBA Art. 12(4)
RPBA 2020 Art. 12(2), 13(2)

Keyword:

Primary object of appeal proceedings to review decision - appeal case directed to request on which decision was based - main request (yes)
Novelty - main request (yes) - auxiliary request (yes)
Inventive step - main request (no) - auxiliary request (yes)
Amendment after summons - exceptional circumstances (yes)
Claims - clarity - auxiliary request (yes)
Amendments - added subject-matter - auxiliary request (no)
Sufficiency of disclosure - auxiliary request (yes)

Decisions cited:

G 0003/14

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Case Number: T 0810/19 - 3.2.02

D E C I S I O N
of Technical Board of Appeal 3.2.02
of 12 September 2023

Appellant 1: (Opponent 1)	Wunderlich, Rainer Weber & Heim Patentanwälte Partnerschaftsgesellschaft mbB Irmgardstrasse 3 81479 München (DE)
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Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 16 January 2019 concerning maintenance of the European Patent No. 2442720 in amended form.**

Composition of the Board:

Chairman	M. Alvazzi Delfrate
Members:	S. Dennler
	N. Obrovski

Summary of Facts and Submissions

I. Opponent 1 and opponent 2 each filed an appeal against the Opposition Division's interlocutory decision to maintain the contested patent as amended on the basis of the main request, "request L", filed by the patent proprietor during the oral proceedings before the Opposition Division.

II. In its decision, the Opposition Division held that the invention as claimed in that request was sufficiently disclosed, that the requirement of Article 123(2) EPC was met and that the subject-matter of independent claims 1 and 19 was novel and inventive, in particular in view of the following documents:

D4 US 2009/0103103 A1
D6 US 4,629,324
E15 US 5,381,236

III. **Appellants 1 and 2 (opponents 1 and 2)** requested that the decision under appeal be set aside and that the patent be revoked.

IV. With its reply to the appellants' statements of grounds of appeal, the **respondent (patent proprietor)** requested that the appeals be dismissed, i.e. that the patent be maintained on the basis of request L (main request).

As an auxiliary measure, the respondent requested that the patent be maintained on the basis of the claims of one of auxiliary requests 1 and 2, "request M" and "request N", respectively, submitted for the first time with the respondent's reply, or one of auxiliary

requests 3 to 9, which are identical to requests F to J, E and K, respectively, filed in the opposition proceedings.

V. The Board issued a summons to oral proceedings dated 5 April 2023 and gave its preliminary opinion on the main request in its communication under Article 15(1) RPBA 2020 dated 30 June 2023. In particular, the Board expressed the view that, given its interpretation of the claims, the novelty objections raised in respect of E15 against claims 1 and 19 were not convincing.

VI. In its letter of 4 September 2023 in response to the Board's communication, appellant 1 submitted, *inter alia*, that in any event the subject-matter of claims 1 and 19 did not involve an inventive step starting from E15.

VII. Oral proceedings before the Board were held on 12 September 2023 by videoconference.

VIII. During the oral proceedings before the Board, the respondent submitted a new auxiliary request 1, which it requested to be considered immediately after the main request and before the other auxiliary requests.

IX. The independent claims of the **main request** (request L), claims 1 and 19, read as follows (feature numbering introduced and amendments to claims 1 and 138 as originally filed, respectively, highlighted by the Board):

Claim 1:

a1 "*A scanner for obtaining and/or measuring the 3D geometry of at least a part of the surface of an object, said scanner comprising:*

a2 *- at least one camera (180) accommodating an array of sensor elements,*

a3 *- means for generating (110, 120, 130) a probe light incorporating a spatial pattern,*

a4 *- means for transmitting (140, 150, 170) the probe light towards the object thereby illuminating at least a part of the object with said pattern in one or more configurations,*

a5 *- means for transmitting (140, 150, 170) at least a part of the light returned from the object to the camera (180),*

a6 *- means for varying (151) the position of the focus plane of the pattern on the object while maintaining a fixed spatial relation of the scanner and the object,*

a7 *- means for obtaining at least one image from said array of sensor elements,*

a8 *- means for evaluating a correlation measure at each focus plane position between at least one group of image pixels and a weight function, where the weight function is determined based on information of the configuration of the spatial pattern; and*

a9 *- data processing means for:*
a) determining by analysis of the correlation measure the in-focus position(s) of:
~~- each of a plurality of image pixels for a range of focus plane positions, or~~
- each of a plurality of groups of image pixels for a range of focus plane positions, and

a10 *b) transforming in-focus data into 3D real world coordinates.*"

Claim 19:

b1 "*A method for obtaining and/or measuring the 3D geometry of at least a part of the surface of an object, said method comprising the steps of:*

b3 *- generating a probe light incorporating a spatial pattern,*

b4 *- transmitting the probe light towards the object along the optical axis of an optical system (150), thereby illuminating at least a part of the object with said pattern,*

b5 *- transmitting at least a part of the light returned from the object to the camera (180),*

b6 *- varying the position of the focus plane of the pattern on the object while maintaining a fixed spatial relation of the scanner and the object,*

b7 *- obtaining at least one image from said array of sensor elements,*

b8 *- evaluating a correlation measure at each focus plane position between at least one group of image pixels and a weight function, where the weight function is determined based on information of the configuration of the spatial pattern;*

b9 *- determining by analysis of the correlation measure the in-focus position(s) of:*

~~- each of a plurality of image pixels in the camera for said range of focus plane positions, or~~

- each of a plurality of groups of image pixels in the camera for said range of focus planes, and

b10 *- transforming in-focus data into real world coordinates.*"

X. The independent claims of the **new auxiliary request 1** filed during the oral proceedings before the Board, claims 1 and 18, differ from claims 1 and 19 of the main request, respectively, in that features a4 and b4 are amended as follows (amendments highlighted by the Board):

Claim 1:

a4 "- *means for transmitting (140, 150, 170) the probe light towards the object thereby illuminating at least a part of the object with said pattern in one ~~or more~~ configuration~~s~~, wherein the pattern is a static pattern that does not vary in time,*"

Claim 18:

b4 "- *transmitting the probe light towards the object along the optical axis of an optical system (150), thereby illuminating at least a part of the object with said pattern, wherein the pattern is a static pattern that does not vary in time,*"

XI. The **appellants' arguments** relevant for the present decision can be summarised as follows.

Main request

Admittance of the request

The main request had been filed very late, during the oral proceedings before the Opposition Division. However, there was no reason for the respondent not to have submitted it at an earlier stage of the proceedings. The Opposition Division therefore erred in

admitting this request, so it should not be taken into account on appeal.

Novelty in view of the embodiment of E15 described in column 11, line 43 to column 13, line 46

As could be seen from the wording "at least one group of image pixels" in feature a8, the subject-matter of claim 1 also covered a scanner in which a correlation measure was evaluated for only one group of image pixels. In that case, feature a9 was to be understood as determining the in-focus position(s) of that one group of image pixels for a range of focus plane positions. Furthermore, claim 1 did not exclude the possibility that the spatial pattern could vary in time.

It followed that the subject-matter of claims 1 and 19 was not novel over the embodiment of E15 described in column 11, line 43 to column 13, line 46. In that embodiment, the four spatially adjacent pixels *A*, *B*, *C*, *D* of the 2x2 detector shown in Figure 9A formed a group of image pixels. Furthermore, the signal based on $M'=(A+C)-(B+D)$ could be regarded as a correlation measure between the signals obtained from these four pixels at a given time and a weight function corresponding to a 2x2 checkerboard pattern (see column 13, lines 19-24). For this group of pixels, the in-focus position was then found by finding the maximum of the correlation measure as the focus plane position was varied by sweeping the lens position (column 13, lines 42-46). This disclosure anticipated features a8 and a9.

Inventive step starting from the embodiment of E15 described in column 11, line 43 to column 13, line 46

In its letter of 4 September 2023, appellant 1 submitted that the subject-matter of claim 1 of the main request was in any event not inventive starting from that embodiment of E15. The appellant explained that this new inventive-step objection had been prompted by the Board's preliminary opinion expressed in the communication under Article 15(1) RPBA 2020. Since appellant 1 had raised a novelty objection in respect of said embodiment of E15 in its statement of grounds of appeal and the respondent had not commented on this issue until the oral proceedings before the Board, the appellant had not needed to raise this inventive-step objection earlier. Moreover, this objection was *prima facie* very relevant, as shown by the fact that the Board started the discussion of the main request with this issue. This objection should therefore be admitted.

Once the in-focus position of the group of four pixels, and thus the range of the object, had been determined by searching for the maximum value of the correlation measure, E15 disclosed that the three-dimensional geometry of the object could be reconstructed by combining this procedure with a beam scanning mechanism, so that the entire object could be scanned with the 2x2 detector (column 13, lines 44-46).

The subject-matter of claims 1 and 19 thus differed from this arrangement only in that a plurality of groups of pixels were used instead of just one. This eliminated the need for a scanning mechanism and simplified the construction of the scanner.

Using large pixel arrays was well known in the art. Consequently, it would have been obvious to the person

skilled in the art to use a larger detector comprising a plurality of juxtaposed 2x2 detectors in order to avoid having to resort to the beam scanning mechanism. In this way, the person skilled in the art would have arrived at the claimed subject-matter without an inventive step.

New auxiliary request 1

Admittance of the request

The issue of static versus time-varying spatial patterns had been discussed throughout the opposition proceedings. Therefore, the new auxiliary request 1 filed during the oral proceedings before the Board, in which the spatial pattern was limited to a static pattern not varying in time, could and should have already been filed in the opposition proceedings.

Moreover, the limitation to a static pattern excluded the calculation of a temporal correlation measure. The new auxiliary request 1 was therefore not convergent with the other previously filed auxiliary requests, all of which encompassed the calculation of a temporal correlation.

Furthermore, the claims of the new auxiliary request 1 were *prima facie* not allowable. The amendments made did not resolve the clarity issues that had previously been raised in writing against the main request. They also *prima facie* introduced new added-matter issues since the calculation of the spatial correlation using a static pattern could not be isolated from the formula at the bottom of page 24, which had been omitted from claims 1 and 18. In addition, the added feature was not

taken literally from a granted claim, but from the description, which raised new undiscussed issues.

The amendments also *prima facie* did not overcome the lack of inventive step starting from E15, which taught that the temporal modulation of the spatial pattern was intended to "simplify the analysis of the signals received at the detector" (column 13, lines 57-62). This was a clear indication to the person skilled in the art that a static pattern without any temporal modulation could be used as an alternative.

For these reasons, the new auxiliary request 1 should not be admitted.

Inventive step starting from the embodiment of E15 described in column 11, line 43 to column 13, line 46

As argued in respect of the admittance of the new auxiliary request 1, E15 described the temporal modulation of the spatial pattern as being advantageous compared with a purely static spatial pattern not varying in time (column 13, lines 57-62). It would therefore have been obvious to the person skilled in the art to use such a static pattern without introducing any temporal modulation, and to adapt the calculation of the correlation measure disclosed in E15 accordingly.

In fact, the temporal modulation of the spatial pattern in E15 was achieved by moving a grid (column 5, lines 43-49) which was itself static. The same was true for the checkerboard pattern shown in Figure 9B, which could therefore also be regarded as a static pattern as claimed.

For these reasons, the limitation to a static pattern could not render the subject-matter of claims 1 and 18 inventive.

Novelty in view of D6

The subject-matter of claims 1 and 18 was not novel over D6. In particular, features a8 and a9 were both disclosed in D6.

a) In one line of argument, each row of pixels of the detector 15 (see Figure 1b), such as the row corresponding to the analogue video signal shown in Figure 5, constituted a group of image pixels.

D6 disclosed the determination, for this group of pixels, of a correlation signal 46 (the "low pass filtered" signal in Figure 5). Even though D6 related to "cross-correlation" and not to "correlation" as claimed, the correlation technique used in the embodiment of Figure 5, also called "synchronous detection" (column 4, lines 47-57), corresponded to a spatial correlation as used in the contested patent. Thus, the correlation signal 46 was a correlation measure between the row of pixels and a weight function indicative of the reference spatial pattern, as required by feature a8.

Comparing this correlation signal with a threshold indicated which of the pixels of the group were in focus for the current focus plane position (pixels belonging to the region marked 523 in Figure 5). Thus, D6 disclosed the determination of "in-focus position(s)" within this particular group of pixels.

In addition, D6 disclosed that this procedure was repeated as the focus plane was being swept over the entire depth of the object (column 4, lines 25-28). The person skilled in the art would actually understand that it was necessary to sweep the focus plane over the entire depth of the object in order to determine an appropriate threshold valid for all the different focus plane positions. Hence, D6 disclosed the determination of the in-focus position(s) within each row of pixels "for a range of focus plane positions", as required by feature a9.

b) In another line of argument, the pixels found to be in focus for a particular position of the focus plane (for example, those pixels belonging to the region marked 523 in Figure 5) themselves formed a group of pixels, of which the particular focus plane position was the "in-focus position". These groups did change from one focus plane position to another, depending on the geometry of the object. However, feature a9 did not require the plurality of groups of pixels for which the in-focus position(s) was/were determined at each focus plane position to be the same plurality of groups for all focus plane positions of the range.

c) In yet another line of argument, the numerical implementation of the low-pass filter of Figure 5 - an alternative mentioned in D6 (column 4, lines 32-35) - required, for each given pixel of the detector, the computation of a local spatial average of the "product" signal over a filter pixel window centred on that pixel, i.e. over a group of pixels. The different filter pixel windows formed a plurality of groups of pixels. These groups did overlap, but features a8 and a9 did not specify the shape and arrangement of the claimed groups of pixels. The resulting averaged signal

calculated over each particular window (i.e. the "low pass filtered" signal at each pixel of the detector) thus constituted a correlation measure evaluated between a group of pixels (the pixels of that particular window) and a reference signal indicative of the spatial pattern, as required by a8.

The filter pixel windows remained unchanged as the focus plane position was varied, and the signal at each pixel was filtered for each focus plane position. The whole procedure described in D6 eventually led to an in-focus position being assigned to a number of pixels of the pixel detector, and thus implicitly to each of the corresponding windows centred on those pixels. This disclosure anticipated feature a9.

Inventive step starting from D6

D6 disclosed that the projected pattern was not limited to horizontal bars as used in the illustrated embodiment. It would have been obvious to the person skilled in the art to use, for example, a dot pattern such as the 2x2 checkerboard pattern of E15. This would have resulted in groups of pixels remaining the same throughout the process of reconstructing the geometry of the object. The subject-matter of claims 1 and 18 was therefore not inventive starting from D6.

Clarity

It was unclear whether and how the "groups of image pixels" of features a8 and a9 were linked. In particular, according to feature a8, it was possible that a correlation measure could be evaluated for only one group of image pixels. In that case, it was unclear how the in-focus position(s) could then be determined

in accordance with feature a9, since this required a correlation measure to be evaluated for "each of a plurality of groups of image pixels", i.e. for more than one group. It was also unclear whether, by contrast, this meant that the plurality of groups in feature a9 was actually limited to a single group of image pixels in that case.

Furthermore, paragraph [0099] of the description of the contested patent stated that a static pattern could be used only if the optical system and camera had a minimum lateral resolution. Independent claims 1 and 18 were silent on this requirement and therefore did not define all the essential features of the invention.

Claims 1 and 18 were therefore not clear. This lack of clarity resulted from the amendment of the claims and was thus open to examination by the Board. In particular, the feature corresponding to feature a8 in the claims as granted did not recite any "group of image pixels".

Added subject-matter

Claims 1 and 18 contained added subject-matter.

Since, in the original claims, the correlation measure was calculated for "at least one image pixel", the person skilled in the art would have understood that the originally claimed scanner was based on temporal correlation only. However, by adding the limitation to a static pattern in the claims of the new auxiliary request 1, the scope of protection had been shifted to a scanner based only on spatial correlation, i.e. an *aliud*, which was not originally disclosed.

There was no basis in the original application for evaluating a correlation measure for exactly one group of image pixels, not least a spatial correlation, without using the specific correlation measure defined by the formula given on page 24, line 31 to page 25, line 5. Omitting this formula from the claims amounted to an inadmissible intermediate generalisation.

Moreover, the original description clearly stated that a static spatial pattern could be used only if a certain criterion regarding the lateral resolution of the optical system and camera was satisfied (page 23, first paragraph). Omitting this criterion from the claims represented a further inadmissible intermediate generalisation.

Sufficiency of disclosure

The claimed invention was not disclosed in a manner sufficiently clear and complete for it to be carried out by the person skilled in the art.

The person skilled in the art was left in the dark as to how the in-focus position of each of a plurality of groups of image pixels (feature a9) could be determined on the basis of a correlation measure evaluated for only one group of pixels (feature a8).

It was also unclear how a group of image pixels could have more than one in-focus position (feature a9). Paragraph [0185] of the patent consistently referred to "the" in-focus position as corresponding to "the global extremum" or "the maximum location". This excluded any other additional in-focus position.

The description did not explain how the position of the focus plane of the pattern on the object could be varied "while maintaining a fixed spatial relation of the scanner and the object" (feature a6). Maintaining such a fixed relation was impossible in practice, especially for a hand-held scanner and an object to be scanned in a patient's oral cavity.

Since a static pattern could be used only if the lateral resolution of the optical system and camera was sufficiently high (paragraph [0099] of the patent) – a requirement on which claims 1 and 18 were silent – some of the claimed embodiments could not work. Thus, the person skilled in the art was not able to put the invention into practice over the whole scope of the claims.

XII. The **respondent's arguments** relevant for the present decision can be summarised as follows.

Main request

Admittance of the request

The main request had been filed at the beginning of the oral proceedings before the Opposition Division in order to respond to the objections previously raised by the appellants. The amendments made to the claims were not complex and, as the Opposition Division found, they *prima facie* overcame those objections. The Opposition Division's decision to admit this request was therefore correct and this request should also be taken into account in the appeal proceedings.

Novelty in view of the embodiment of E15 described in column 11, line 43 to column 13, line 46

This embodiment was explicitly described as an extension of the general embodiment previously disclosed in E15 (column 11, line 43), for which not a spatial but a temporal correlation was calculated on the basis of values assumed by the pixels at different times, with an alternating spatial pattern (bottom of column 5; column 13, lines 40-41: "temporally modulated signal").

Moreover, E15 did not disclose that the in-focus position of a group was determined by analysis of the correlation measure "for a range of focus plane positions" as required by claim 1. Instead, the general procedure described in E15 (see steps 1 to 10 in columns 6 and 7), which also applied to the embodiment under discussion, was to determine the pixels which were in focus at a given focus plane position, and only then to vary the focus plane position. Therefore, at least features a8 and a9 were not disclosed in E15.

Inventive step starting from the embodiment of E15 described in column 11, line 43 to column 13, line 46

The inventive-step objection filed by appellant 1 in its letter of 4 September 2023 was late-filed. Appellant 1 should have expected that the Board might not have been convinced by the novelty objection raised in appellant 1's statement of grounds of appeal in respect of this embodiment of E15; the appellant should therefore have already filed this inventive-step objection with its statement of grounds of appeal as a precaution. Moreover, this objection was *prima facie* unconvincing since this embodiment of E15 was explicitly described as an extension of the embodiment based on temporal correlation previously disclosed in

E15. The person skilled in the art would therefore have had no motivation to deviate from the general procedure described in E15 (see steps 1 to 10 disclosed in columns 6 and 7) and implement features a8 and a9.

New auxiliary request 1

Admittance of the request

The filing of the new auxiliary request 1 was a reaction in good faith to the change in the course of the proceedings resulting from the filing of the new inventive-step objection and its acceptance by the Board. Admitting the new auxiliary request 1 was therefore justified, also on grounds of fairness, and all the more so since the amendments made to the independent claims were not complex, were essentially based on claim 5 as granted and were in line with the position defended by the respondent throughout the opposition proceedings. Furthermore, since the new auxiliary request 1 was to be considered immediately after the main request, it was irrelevant whether it was convergent with the other lower-ranking auxiliary requests previously filed.

Inventive step starting from the embodiment of E15 described in column 11, line 43 to column 13, line 46

According to claims 1 and 18 of the new auxiliary request 1, the spatial pattern incorporated in the probe light should be static and not vary in time.

The temporal modulation of the spatial pattern was at the core of E15. Even if the grid used to generate the spatial pattern in E15 did itself not vary in time, the resulting pattern incorporated in the probe light was

not static but varied in time. Moreover, E15 did not disclose how the described procedures could and should be adapted if the spatial pattern were purely static. The person skilled in the art would therefore not have deviated from the teaching of E15 and suppressed the temporal modulation of the spatial pattern.

It followed that the subject-matter of claims 1 and 18 involved an inventive step starting from E15.

Novelty in view of D6

The subject-matter of claims 1 and 18 was novel over D6.

First, the "cross-correlation" calculated in D6 differed from a correlation measure as used in the scanner of the contested patent. In particular, it was not a single value associated with a given group of pixels but rather a signal having a defined magnitude at each of the pixels. Thus, it could not be used to determine "by analysis of the correlation measure" the in-focus position(s) of a group of pixels "for a range of focus plane positions" as required by feature a9.

The person skilled in the art understood from features a8 and a9 that, for each given group of the claimed plurality of groups of pixels, a correlation measure between that group and the weight function was evaluated for each focus plane position of a range of focus plane positions, and that the in-focus position(s) of that particular group was/were then determined by analysing those correlation measures by determining the focus plane position for which that particular group could be said to be in focus; in practice, this was the focus plane position for which

the correlation measure was at an extremum. This required, notably, that the groups of pixels forming the plurality of groups were predefined and remained the same throughout the procedure for the different focus plane positions considered.

By contrast, the scanner of D6 worked on a completely different principle, searching for which of the pixels of the detector were in focus for each focus plane position. By repeating this search for various focus plane positions, the entire geometry of the object could be reconstructed. Thus, D6 failed to disclose at least feature a9.

Inventive step starting from D6

The person skilled in the art starting from D6 would have had no motivation to arrive at the claimed subject-matter. The subject-matter of claims 1 and 18 therefore involved an inventive step starting from D6.

Clarity

Claims 1 and 18 were clear. In particular, the "means" of feature a8 was, by definition, suitable for estimating a correlation measure between at least one group of image pixels and a weight function. This clearly meant that if a plurality of groups of image pixels were given to the "means", then the "means" would also be able to estimate a correlation measure for each of the plurality of groups of image pixels. Moreover, the claims already defined all the features essential to the definition of the invention.

Added subject-matter

Claims 1 and 18 did not contain any added subject-matter. The addition of the limiting feature that the spatial pattern was a static pattern had narrowed the scope of these claims compared with the scope of the claims as originally filed. The general definition of a correlation measure in the paragraph bridging pages 24 and 25 of the original description was applicable to a single group of pixels. However, the use of a static spatial pattern was not inextricably linked to the formula contained in this passage. Furthermore, in original claim 9, a static pattern was defined without reference to any criterion relating to the lateral resolution of the optical system and the camera. Thus, omitting the formula and criterion from claims 1 and 18 did not constitute an inadmissible intermediate generalisation.

Sufficiency of disclosure

The invention as claimed in the new auxiliary request 1 was sufficiently disclosed. The description of the contested patent contained a detailed description of at least one way of carrying out the claimed invention.

Reasons for the Decision

1. Subject-matter of the contested patent

1.1.1 The contested patent relates to a scanner for determining the three-dimensional geometry of at least a part of the surface of an object, such as the teeth or the ear canal of a subject, and to a corresponding method, defined in independent claims 1 and 19 of the main request, respectively.

1.1.2 An example of a scanner according to claim 1 is shown in Figure 1, reproduced below. A light source (110) in combination with a pattern generating means (130) produces a probe light incorporating a spatial pattern, such as a checkerboard pattern, to illuminate, via transmission through an optical system (150), at least part of the object (200) to be inspected. A camera (180) having an array of sensor elements (181) detects at least part of the light returned from the object and produces an image.

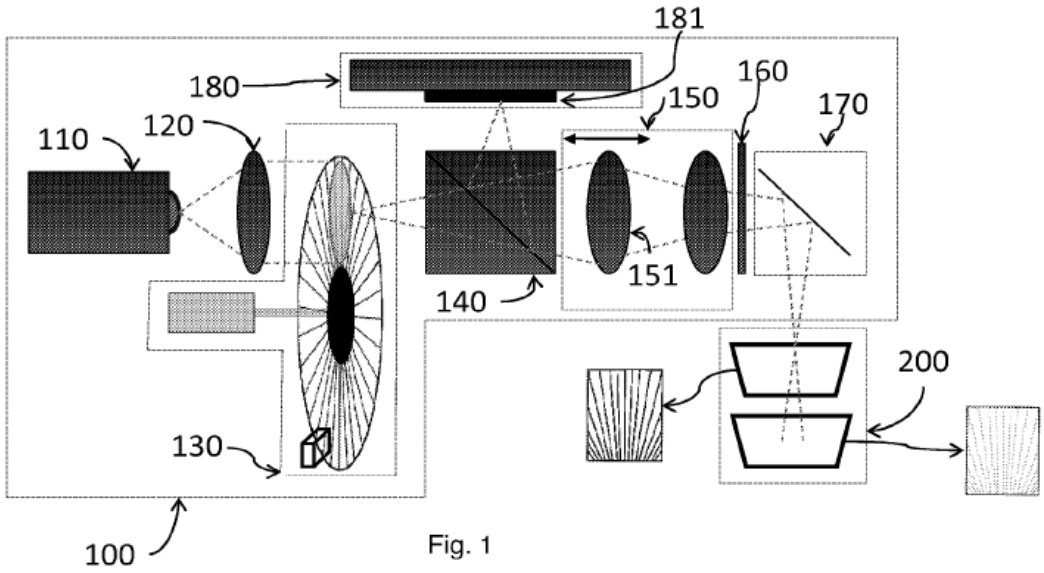

Fig. 1

The scanner further comprises means (151) for varying the position of the focus plane of the pattern on the object (along the optical axis) while maintaining a fixed spatial relation of the scanner and the object (paragraph [0047]).

The scanner works on the principle that, for a given fixed position of the focus plane, in-focus areas of the illuminated object will appear in the obtained image as sharp, high-contrast areas (such as the area 1700 in the centre of Figure 17b, reproduced below, in which the example projected pattern is a static

checkerboard pattern), whereas out-of-focus areas will show less or no contrast (paragraph [0020]).

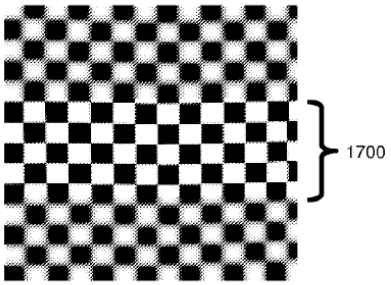

Fig. 17b

In-focus information for a given area of the image can therefore be extracted by estimating the extent to which this area is correlated with the projected spatial pattern (paragraphs [0099]-[0111], [0171]-[0173] and [0176]-[0186]).

For this purpose, the scanner according to claim 1 of the main request comprises "means for evaluating a correlation measure at each focus plane position between at least one group of image pixels and a weight function, wherein the weight function is determined based on information of the configuration of the spatial pattern" (feature a8), and "data processing means for: a) determining by analysis of the correlation measure the in-focus position(s) of: each of a plurality of groups of image pixels for a range of focus plane positions" (feature a9), and then "b) transforming in-focus data into 3D real world coordinates" (feature a10).

1.1.3 The features of the method of claim 19 are essentially the same as those of the scanner of claim 1. Therefore, only the scanner will be discussed below. However, the same considerations apply *mutatis mutandis* to the method.

2. Main request

2.1 Admittance

2.1.1 The main request was submitted for the first time at the beginning of the oral proceedings before the Opposition Division, i.e. late. Exercising its discretion, the Opposition Division decided to admit this request after concluding that it overcame the objections raised earlier and appeared to be *prima facie* allowable (points II.2.5 to II.2.9 of the decision under appeal). The Opposition Division ultimately concluded that it met the requirements of the EPC (point II.7 of the decision).

The appellants argued that the Opposition Division should not have admitted the main request and that, accordingly, it should not be taken into account in the appeal procedure.

2.1.2 A board of appeal should only overrule the way in which a department of first instance exercised its discretion if the board comes to the conclusion that this was done according to the wrong principles or in an unreasonable way (see Case Law of the Boards of Appeal, 10th edition, 2022, IV.C.4.5.2).

The Board sees no reason to doubt that, in admitting the main request, the Opposition Division exercised its discretion in accordance with the proper principles and in a reasonable way. This does not depend on the correctness of the Opposition Division's conclusions on substantive issues relating to this request, in particular with regard to the requirements of Articles 84 and 123(2) EPC, which the appellants contend are not met. There is therefore no reason for

the Board to overrule the Opposition Division's decision to admit this request.

Consequently, the Board decided to take the main request into account in the appeal proceedings.

2.2 Novelty in view of the embodiment of E15 described in column 11, line 43 to column 13, line 46

2.2.1 Appellant 1 raised a novelty objection against claims 1 and 19 of the main request in view of the embodiment of E15 described in column 11, line 43 to column 13, line 46 and shown in Figures 9A-9B and 10 ("the spatial embodiment" of E15).

2.2.2 It is undisputed that this embodiment comprises features a1 to a6 and a10. In particular, the disclosed scanner uses a probe light incorporating a 2x2 checkerboard spatial pattern 7B and a quadrant detector 1B consisting of four spatially adjacent pixels *A*, *B*, *C*, *D* (column 11, lines 45-49; column 12, lines 17-18; column 13, lines 10-12), as shown in Figures 9A and 9B, reproduced below.

FIG. 9A

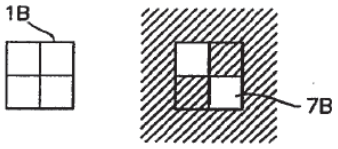

FIG. 9B

The disagreement between the parties concerns features a8 and a9.

2.2.3 E15 discloses that the outputs from the four pixels are combined to form the modulation depth $M'=(A+C)-(B+D)$ (column 13, lines 10-16). As put forward by the appellants, M' can be rewritten as the sum of four terms $f_i I_i$, where $I_1=A$, $I_2=B$, $I_3=C$, $I_4=D$, $f_1=f_3=+1$ and

f_2=f_4=-1, hence as the spatial correlation measure between the (single) group formed by the four pixels *A*, *B*, *C*, *D*, and a weight function indicative of a 2x2 checkerboard pattern, calculated in accordance with the formulae in paragraphs [0106]-[0108] of the contested patent.

It is true that the checkerboard spatial pattern 7B is temporally modulated (column 11, lines 66-67). However, as argued by the appellants, this is not excluded by the wording of claims 1 and 19, which only requires the probe light to incorporate "a spatial pattern". Moreover, even if the spatial embodiment is presented as an extension of the "general principle" described earlier in E15, the values *A*, *B*, *C* and *D* on which *M'* is based are explicitly the values assumed by the four pixels simultaneously (column 13, lines 10-11), which is in accordance with the definition of the spatial correlation given in the contested patent (paragraph [0099]).

The Board therefore agrees with the appellants that this anticipates feature a8.

2.2.4 E15 further discloses that a signal *M* is then computed from the modulation depth *M'* (column 13, lines 18-25) and that "[t]he lens sweep position corresponding to the maximum *M* value can thus be determined and hence the range of the object" (column 13, lines 42-46). In other words, the same calculation of *M'* and *M* is made for several successive positions of the lens, thus "for a range of focus plane positions", and the position for which *M* is at a maximum is determined, i.e. the "in-focus position" of the group of pixels, which eventually allows the distance from the quadrant detector to the surface of the object being inspected

to be determined. The Board therefore agrees with the appellants that this disclosure anticipates "data processing means for: determining by analysis of the correlation measure the in-focus position(s) of: [the group of four pixels A, B, C, D] for a range of focus plane positions".

However, feature a9 requires the determination of the in-focus position(s) of "each of a plurality of groups of image pixels", i.e. of more than one single group. It follows that, contrary to the appellants' assertion, the spatial embodiment of E15 does not comprise feature a9.

2.2.5 The subject-matter of claims 1 and 19 of the main request is therefore novel over this embodiment.

2.3 Inventive step starting from the embodiment of E15 described in column 11, line 43 to column 13, line 46

2.3.1 Admittance of this objection

In its letter of 4 September 2023, appellant 1 submitted that the subject-matter of claims 1 and 19 of the main request was in any event not inventive starting from the spatial embodiment of E15. The respondent requested that this objection not be admitted.

It is undisputed that this newly filed objection represents an amendment to appellant 1's appeal case filed after the notification of the summons to oral proceedings. The admittance of this objection is thus subject to Article 13(2) RPBA 2020, under which any such amendment shall, in principle, not be taken into account unless there are exceptional circumstances,

which have been justified with cogent reasons by the party concerned. Furthermore, when exercising its discretion under this provision, the Board may also rely on the criteria set out in Article 13(1) RPBA 2020, such as the suitability of the amendment to resolve the issues which were raised by the Board and whether the amendment is detrimental to procedural economy.

The spatial embodiment of E15 is not discussed in the decision under appeal, which, as far as E15 is concerned, only deals with another embodiment described earlier in that document (see point II.5.6 of the decision). Moreover, the question of whether claims 1 and 19, especially feature a9, require one or more groups of pixels is addressed in the decision only in the context of clarity, with the Opposition Division concluding that the claims were unclear in this respect (see points II.2.4 and II.2.5). As explained by appellant 1, although it had raised a lack of novelty over the spatial embodiment of E15 in its statement of grounds of appeal, the respondent did not respond to this objection until the oral proceedings before the Board. The appellant had not been confronted with an opinion on its novelty objection until the Board's preliminary opinion set out in its communication under Article 15(1) RPBA 2020, in which the Board found the objection unconvincing given the Board's view that feature a9 clearly required more than one group of pixels (point 8.2 in combination with point 3.3 of the Board's communication). The Board accepts appellant 1's argument that the newly filed inventive-step objection starting from the spatial embodiment of E15 was prompted by the Board's preliminary opinion.

The newly filed inventive-step objection builds on appellant 1's previous novelty attack and the Board's interpretation of feature a9. It is not complex, could be immediately understood by the Board and the other parties, and appeared to the Board to be *prima facie* prejudicial to the main request.

Consequently, the Board considered that there were exceptional circumstances justifying the admittance of this objection. The Board therefore decided to take it into account.

2.3.2 As argued by appellant 1, E15 further discloses that "[b]y combining this procedure with a beam scanning mechanism, 2-dimensional or 3-dimensional range maps can be constructed" (column 13, lines 44-46). In other words, the three-dimensional geometry of the entire object can be reconstructed by scanning the object with the quadrant detector and repeating the range determination process on the basis of the analysis of the correlation measure discussed above at each scanned position.

The subject-matter of claims 1 and 19 thus differs from this disclosure in E15 only in that the in-focus position(s) of a plurality of groups of pixels – i.e. not just of one group – is/are determined in feature a9. As argued by the appellant, this eliminates the need for a scanning mechanism and simplifies the construction of the scanner.

The Board agrees with the appellant that, in view of the common general knowledge, it would have been obvious to the person skilled in the art to use a larger detector comprising a plurality of juxtaposed 2x2 detectors in order to avoid having to resort to the

beam scanning mechanism. In this way, the person skilled in the art would have arrived at the claimed subject-matter without inventive skill.

The respondent countered that the person skilled in the art starting from E15 would have had no motivation to deviate from the general procedure described in E15, in particular steps 1 to 10 disclosed in columns 6 and 7. This is not convincing. These steps are actually described in the context of a different embodiment using a larger detector comprising a linear array of pixels rather than a quadrant detector as in the spatial embodiment.

It follows that the subject-matter of claims 1 and 19 of the main request does not involve an inventive step over the spatial embodiment of E15.

3. New auxiliary request 1

3.1 Admittance of the request

3.1.1 Following the discussion of the spatial embodiment of E15 at the oral proceedings before the Board and the Board's conclusion that the subject-matter of claims 1 and 19 lacked inventive step over that embodiment, the respondent filed a new auxiliary request 1, which it requested to be considered before the previously filed auxiliary requests. This request sought to overcome the inventive-step objection newly filed by appellant 1 and admitted by the Board by further specifying that the claimed spatial pattern was "a static pattern that does not vary in time". The appellants requested that this request not be admitted.

Like the admittance of the inventive-step objection starting from the spatial embodiment of E15, the admittance of this request at this stage of the appeal proceedings is governed by Article 13(2) RPBA 2020.

3.1.2 As argued by the appellants, it is correct that the nature of the spatial pattern was, in general, a subject of discussion in the opposition proceedings. Nevertheless, the filing of the new auxiliary request 1 was a direct response to the inventive-step objection starting from the spatial embodiment of E15 which had been raised for the first time in the appeal proceedings and then admitted and found convincing by the Board as set out above (see point 2.3.1). In the Board's view, this in turn constituted exceptional circumstances that justified the admittance of the new request.

Moreover, the amendments to the independent claims in this new request are essentially limited to restricting the spatial pattern to a static pattern, as defined in claim 5 as granted. These amendments are not complex and are consistent with the position defended by the respondent in the opposition proceedings, namely to limit the correlation measure to a spatial correlation. Since the new auxiliary request 1 is a response to a newly filed objection and is, moreover, to be considered immediately after the main request, it is irrelevant whether it is convergent with the previously filed auxiliary requests. With regard to the main request, the new auxiliary request 1 is convergent.

In addition, in the Board's view, these amendments addressed the inventive-step objection clearly and in a straightforward manner, *prima facie* overcame it and did not change the substance of the debate on the other

contentious issues at stake. Even at this late stage of the proceedings, the Board thus considered it appropriate to give the respondent an opportunity to overcome the newly raised objection by filing a claim request which was *prima facie* allowable, thereby maintaining a fair balance between the opportunities afforded to the parties.

For these reasons, the Board decided to admit the new auxiliary request 1.

3.2 Inventive step starting from the embodiment of E15 described in column 11, line 43 to column 13, line 46

E15 explicitly disclosed that the checkerboard pattern 7B used in the spatial embodiment was modulated in time, with the opposite pairs of quadrants being alternately bright and dark (column 11, lines 66-67; column 12, lines 17-18). Thus, even if the resulting pattern remained a checkerboard pattern, it varied in time and was not static as required by claims 1 and 18 of the new auxiliary request 1, contrary to the appellants' argument.

Furthermore, as argued by the respondent, the temporal modulation of the spatial pattern was at the core of the scanner disclosed in E15. Therefore, contrary to the appellants' view, the statement that a temporally modulated spatial pattern was advantageous compared with a purely static pattern not varying in time (column 13, lines 57-62) would not have been understood by the person skilled in the art as an indication that the temporal modulation of the checkerboard pattern should be removed. On the contrary, without the benefit of hindsight, the person skilled in the art starting from E15, even from the spatial embodiment discussed

above, would not have been motivated to use a static pattern that does not vary in time.

It follows that the subject-matter of claims 1 and 18 of the new auxiliary request 1 involves an inventive step over the spatial embodiment of E15.

3.3 Novelty in view of D6

The appellants argued that the subject-matter of claims 1 and 18 of the new auxiliary request 1 was not novel in view of D6. None of the various lines of argument put forward convinces the Board.

3.3.1 In one line of argument, the appellants contended that each row of pixels of the detector, such as the row corresponding to the x-axis in the graphs of Figure 5, reproduced below, formed a group of pixels.

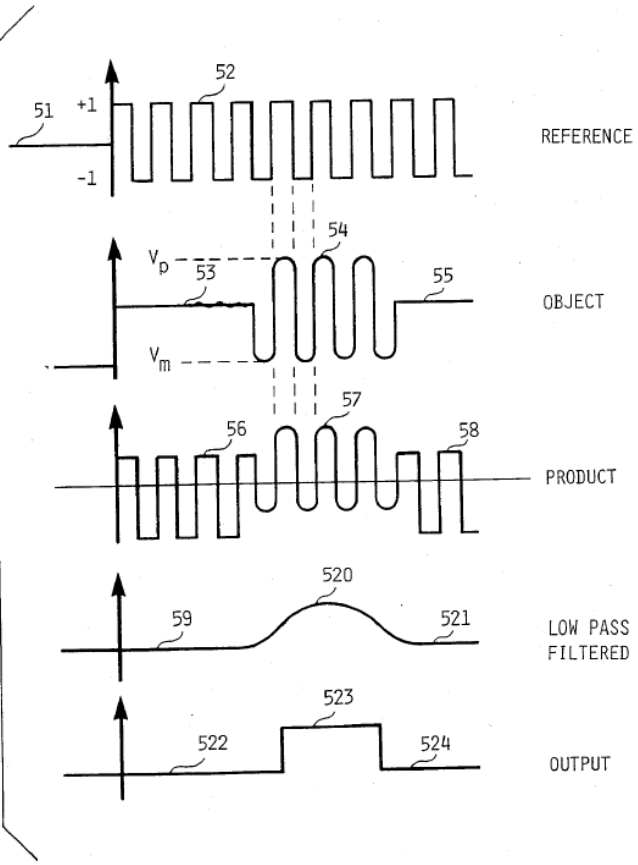

FIG. 5

Firstly, the appellants submitted that the "low pass filtered" analogue signal shown in Figure 5 constituted a correlation measure between that group of pixels and the "reference" signal shown in the same figure, which is indicative of the spatial pattern.

The Board does not accept this argument. The claimed "correlation measure between at least one group of image pixels and a weight function" is a "measure" of the degree of correlation between the at least one group and the weight function. In the context of the contested patent, it is a value which quantifies how much the at least one group *as a whole* and the weight function are correlated with each other. This understanding is confirmed not only by paragraph [0039] of the patent, but also throughout the patent, which contains several expressions of the "magnitude" of the correlation measure A_j calculated for a given group j of pixels i, which is consistently a value associated with the whole group j (see e.g. paragraphs [0058] and [0060]). The "low pass filtered" analogue signal, on the other hand, is a signal which assumes a different value at each pixel of the row, thus indicating at most how much the "object" signal is correlated with the "reference" signal *locally*, i.e. *at that particular pixel*.

Secondly, the appellants pointed out that comparing the "low pass filtered" signal with a threshold indicated which pixels of the row were in focus for the current focus plane position (such as the pixels corresponding to the region 523). According to the appellants, this could be equated with determining the "in-focus position(s)" of the row. The Board disagrees. Feature a9 requires the "in-focus position(s)" of each

group of pixels to be determined, not the in-focus "pixels" within the group.

3.3.2 In another line of argument, the appellants noted that the pixels found to be in focus for a particular position of the focus plane (for example, those pixels belonging to the region marked 523 in Figure 5) themselves formed a group of pixels. According to the appellants, this particular focus plane position could be regarded as the in-focus position of this group.

This is not convincing either. Feature a9 requires the in-focus position(s) to be determined "by analysis of the correlation measure". However, as stated in point 3.3.1 above, the Board does not consider the "low pass filtered" signal, on the basis of which the in-focus pixels 523 have been determined by comparison with a threshold, to be a correlation measure within the meaning of the claimed invention. It follows that, in accordance with this line of argument, the in-focus position of the group of pixels 523 is not determined on the basis of a correlation measure as required by feature a9.

What is more, in practice, depending on the geometry of the scanned object, different groups of in-focus pixels will be found for the different focus plane positions considered. However, as defended by the respondent, when reading claims 1 and 18 in a technically sensible way, the person skilled in the art understands that the plurality of groups referred to in feature a9 are groups for which a correlation measure is calculated in accordance with feature a8, and that these groups must remain the same as the focus plane position is varied within the range of the claimed focus plane positions so that the in-focus position(s) of each of the groups

can be determined by analysing the calculated correlation measures.

The knowledge of a single correlation measure between at least one group of pixels and the weight function, evaluated in accordance with feature a8, cannot alone lead to the determination of an in-focus position for this at least one group of pixels. That is because, as set out in point 3.3.1 above, the correlation measure is a value characterising the at least one group of pixels as a whole.

Therefore, since feature a9 stipulates determining the in-focus position(s) of each of a plurality of groups of pixels "for a range of focus plane positions", the person skilled in the art understands that for each group of the claimed plurality of groups of pixels, a correlation measure is calculated for various focus plane positions within a range of focus plane positions, and that the in-focus position(s) of this particular group is/are then determined "by analysis" of the calculated correlation measures by determining the focus plane position(s) for which this particular group can be said to be in focus, this/these focus plane position(s) reasonably constituting the "in-focus position(s)" of the group; in practice, this is the focus plane position for which the correlation measure is at an extremum, as explained in paragraph [0062] of the patent. This requires, *inter alia*, the groups of pixels constituting the plurality of groups to be predefined and to remain the same for the different focus plane positions considered.

Appellant 2, in particular, arrived at the same interpretation of the claimed features, as discussed in

points 46-54 and 60 of its statement of grounds of appeal.

3.3.3 In yet another line of argument, the appellants argued that the numerical implementation of the low-pass filter of Figure 5 (which is indeed an alternative mentioned in D6; see column 4, lines 32-35) required, by construction, that the value of the output "low pass filtered" signal at each pixel of the detector be computed as a local spatial average of the input "product" signal over a filter pixel window centred on that pixel, hence over a group of pixels. The numerical implementation of the filter thus implicitly defined a plurality of groups of pixels, each centred on a pixel of the detector.

However, even if it were accepted that such groups of pixels are implicitly disclosed in D6, D6 does not disclose "determining by analysis of the correlation measure the in-focus position(s) of each of: [these groups of pixels] for a range of focus plane positions" as interpreted in point 3.3.2 above, last paragraph. In particular, even if it is true that the whole procedure described in D6 may ultimately lead to an in-focus position being attributed to a plurality of pixels of the detector, the person skilled in the art would not consider the various determined in-focus position(s) to be the in-focus position(s) of each of the plurality of the implicit filter pixel windows used in the numerical implementation of the low-pass filter.

3.3.4 It follows that D6 does not disclose at least feature a9. The subject-matter of claims 1 and 18 of the new auxiliary request 1 is therefore novel in view of D6.

3.4 Inventive step starting from D6

The appellants' inventive-step objection starting from D6 is based on the argument that it would be obvious for the person skilled in the art to use spatial patterns other than the horizontal bars shown in Figure 3a, for example a 2x2 checkerboard pattern as known from E15.

However, the considerations in point 3.3 above, and in particular those relating to the interpretation of feature a9, do not depend on the geometry of the spatial pattern used.

It follows that, contrary to the appellants' view and as argued by the respondent, the person skilled in the art starting from D6 would not arrive at the subject-matter of claims 1 and 18 in an obvious manner, even if other spatial patterns were used. The subject-matter of claims 1 and 18 of the new auxiliary request 1 is therefore inventive starting from D6.

3.5 Novelty in view of D4 and the other embodiment of E15

It is undisputed that the spatial patterns used in the scanner of D4 and in the other embodiments of E15 (see in particular column 5, line 60 to column 6, line 11) are not "a static pattern that does not vary in time" as required by claims 1 and 18 of the new auxiliary request 1.

The novelty objections in respect of these known systems, raised in writing by appellant 1 against claims 1 and 19 of the main request (see section 3.2 and points 3.3.1 and 3.3.2 of appellant 1's statement of grounds of appeal), are therefore not relevant to

the claims of the new auxiliary request 1. The appellants did not address these objections again at the oral proceedings before the Board.

3.6 Clarity

Contrary to the appellants' view, claims 1 and 18 of the new auxiliary request 1 meet the requirements of Article 84 EPC.

3.6.1 The appellants noted that the wording of feature a9 refers to "a plurality of groups of image pixels", which clearly requires more than one group of pixels, whereas feature a8 refers to "at least one group of image pixels", which may require only one group.

As considered by the Opposition Division (point II.2.5 of the decision under appeal), the fact that the "means" of feature a8 could thus appear to be unsuitable, in principle, for evaluating a correlation measure for all the groups referred to in feature a9 was already present in the independent claims as granted, in which the corresponding feature a8 referred to "at least one image pixel", i.e. possibly only one pixel and thus less than a plurality of groups of image pixels. Therefore, it is questionable whether the possible lack of clarity alleged by the appellants was introduced by the amendment of the claims and is, accordingly, open to examination by the Board in accordance with G 3/14.

In any event, as explained in point 3.3.2 above, the person skilled in the art interpreting the claims clearly understands that the determination made in feature a9 is made for a plurality of groups of image pixels, and that for each of them a correlation measure

is to be calculated in accordance with feature a8 for each focus plane position within the claimed range.

3.6.2 The appellants also asserted that claims 1 and 18 of the new auxiliary request 1 were silent on the requirement that the optical system and the camera should have a sufficient lateral resolution. According to the appellants, paragraph [0099] of the patent explained that this requirement was essential when using a static pattern. Therefore, the independent claims did not define all the essential features of the invention, contrary to the requirements of Article 84 EPC.

This does not convince the Board. This statement in paragraph [0099] merely reflects the fact that - as with any optical device including a camera - the resolution of the optical system and the camera must be adapted to the nature of the object to be scanned in order to produce meaningful results ("what is needed for the scan of the object"; emphasis added by the Board). The Board acknowledges that, since a spatial correlation measure is computed with sensor signals recorded at different sensor sites (hence using at least two pixels), the resolution of the object geometry reconstructed using a technique based on spatial correlation will be lower, namely at least two times lower, than the resolution of the image on which the correlation calculations are performed, i.e. lower than the resolution of the optical system and camera used to produce that image. Conversely, to obtain a reconstructed scan of the object with a given, "needed", resolution, the optical system and camera must have a resolution which is at least two times higher than that of the scan.

However, this inherent relationship between the resolution of the optical system and the camera and the resolution of the reconstructed geometry is already implicit in claims 1 and 18, since feature a9 provides for determining the in-focus position(s) not of a plurality of image pixels, but of a plurality of "groups of image pixels", and a group of pixels comprises at least two pixels (see also paragraph [0101]: "[t]he resolution of the scan, i.e. the measured 3D geometry, will then be determined by the size of these groups of sensor elements").

Moreover, since the scanner and method of claims 1 and 18 are not limited to scanning a particular type of object, the Board agrees with the respondent that it is not essential to the definition of the invention that these claims explicitly define a minimum value for the lateral resolution of the optical system and camera, as contended by the appellants. It follows that, as submitted by the respondent, claims 1 and 18 specify all the features essential to the definition of the invention.

3.7 Added subject-matter

The appellants' objections that claims 1 and 18 of the new auxiliary request 1 contain added subject-matter in breach of Article 123(2) EPC are not convincing.

3.7.1 Claims 1 and 18 of the new auxiliary request 1 are based on claims 1 and 138 as originally filed. Contrary to the appellants' assertion, the person skilled in the art would not construe the original claims to be directed to methods based solely on temporal correlation. On the contrary, by referring to "at least one pixel", original feature a8 provided for the

calculation of the correlation measure used in both alternatives defined in original feature a9, which all parties agree correspond to temporal and spatial correlation, respectively.

Deleting the temporal correlation alternative in feature a9 and adding the feature that the spatial pattern is a static pattern that does not vary in time therefore did not change the scope of the claims to an *aliud*, as argued by the appellants, but simply limited it to one of the two alternatives originally claimed.

In any event, the description as originally filed provided ample support for a scanner and a method based solely on spatial correlation and using a static pattern that does not vary in time; see for example paragraphs [0099]-[0111], [0171]-[0173] and [0176]-[0186].

3.7.2 In addition to the above-mentioned amendments, feature a8 has been amended from "at least one image pixel" to "at least one group of image pixels".

As argued by the respondent, the passage on page 24, line 31 to page 25, line 4 of the original description gives the person skilled in the art a generic definition of a correlation measure A_j between a group j of $n>1$ image pixels and a weight function defined by coefficients $f_{i,j}$ reflecting the spatial pattern. This definition of A_j is independent of the number of groups of pixels considered and, in particular, is also applicable to a single group. In fact, this definition appears to be a particular implementation, for any number of groups, of the general definition of a correlation measure given on page 14, lines 18-27 for a set, i.e. a group, of $n>1$ pixels.

Implementing this definition in a scanner, e.g. according to original claim 1, therefore supports a means for evaluating a correlation measure at each focus plane position between "at least one group of image pixels" and a weight function as defined in feature a8.

3.7.3 The above definition applies regardless of whether the pattern is static or varies over time (see page 14, line 24: "at different times and/or at different sensors"), thus *a fortiori* for a static pattern as defined in claims 1 and 18 of the new auxiliary request 1.

Moreover, the person skilled in the art understands that the correlation formulae on pages 14 and 24 of the description as filed are not restrictive. What matters is simply that a correlation measure between the at least one group of pixels and a weight function reflecting the pattern is evaluated.

The absence of a specific formula to define the correlation measure in feature a8 therefore does not represent an inadmissible intermediate generalisation as alleged by the appellants.

3.7.4 In view of the considerations in point 3.6.2 above, omitting from the claims a reference to the lateral resolution of the optical system and camera does not represent an inadmissible intermediate generalisation either. In this regard, the Board notes that claim 9 as originally filed provides support for a static pattern without reference to any such criterion.

3.8 Sufficiency of disclosure

The appellants contended that the invention as claimed in the new auxiliary request 1 was insufficiently disclosed. The Board does not share this view.

3.8.1 As put forward by the respondent, the patent specification gives the person skilled in the art a detailed description of a scanner and a method as claimed in the new auxiliary request 1, based on a static spatial pattern and spatial correlation calculations performed in accordance with features a8 and a9 (see for example paragraphs [0099]-[0111], [0171]-[0173] and [0176]-[0186] of the description).

In particular, contrary to the appellants' contention, the person skilled in the art would have no difficulty in conceiving of appropriate means for evaluating the correlation measure between each of the groups of image pixels referred to in feature a9 and a weight function, for example by implementing the calculation of the correlation measure defined by the formulae in paragraphs [0106] and [0108].

As already stated above, appellant 2 itself arrived at a meaningful interpretation of the claimed features on the basis of what it considered the person skilled in the art would reasonably understand from the patent as a whole (see points 38-54 and 60 of appellant 2's statement of grounds of appeal).

3.8.2 The appellants also contended that it was unclear how a group of image pixels could have more than one in-focus position, as suggested by feature a9.

The Board does not see any lack of disclosure in this respect. Contrary to the appellants' argument, the

patent specification does not define the in-focus position of a given group of pixels only as "the global maximum" of the correlation measure when the focus plane position is varied over a range of positions (paragraph [0185]), but paragraph [0108] also refers to "an extremum value" of the correlation measure, and paragraph [0063] actually explains that the correlation measure can have multiple local extrema, resulting in multiple in-focus positions corresponding to the reflection of the probe light on internal surfaces of the object if the latter is sufficiently translucent.

3.8.3 The appellants also argued that the person skilled in the art would not be able to construct the claimed feature of "means for varying the position of the focus plane of the pattern on the object while maintaining a fixed spatial relation of the scanner and the object".

This is not convincing either. The person skilled in the art would understand, in particular from paragraphs [0013] and [0047] of the patent, that the position of the focus plane of the pattern on the object must be varied without requiring the scanner to move relative to the object. In other words, the position must in practice be varied sufficiently quickly with respect to any movement of the scanner that a user may be holding. The patent discloses various measures for this purpose (paragraphs [0048]-[0053]), including several measures for reducing the effect of shaking or vibration, which the person skilled in the art would implement without technical hindrance to arrive at a working hand-held scanner.

3.8.4 Contrary to the appellants' argument, the fact that claims 1 and 18 do not define a specific minimum lateral resolution for the optical system and the

camera does not render the invention insufficiently disclosed either. On the basis of the teaching of paragraph [0099] (see point 3.6.2 above) of the patent and using common general knowledge, the person skilled in the art would obviously design these components to have a sufficient lateral resolution adapted to the objects targeted by the scanner in order to obtain a meaningful scan.

3.8.5 The Board therefore concludes that, contrary to the appellants' objections, the invention as claimed in the new auxiliary request 1 is disclosed in the patent in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.

4. Conclusion

It follows from the above considerations that none of the objections raised by the appellants prejudice the maintenance of the contested patent as amended on the basis of the claims of the new auxiliary request 1.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the Opposition Division with the order to maintain the patent with the following claims and a description to be adapted thereto:

claims 1 to 18 of new auxiliary request 1 filed at the oral proceedings before the Board

The Registrar: The Chairman:

A. Chavinier-Tomsic M. Alvazzi Delfrate

Decision electronically authenticated