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D E C I S I O N
of 22 January 1998

Case Number: T 0579/96 - 3.4.2

Application Number: 85900918.5

Publication Number: 0174939

IPC: G01N 21/88, G01N 21/55

Language of the proceedings: EN

Title of invention:
Panel surface flaw inspection

Patentee:
Diffracto Ltd., et al

Opponent:
Siemens AG

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 102(3)

Keyword:
"Main request: novelty (yes), inventive step (yes)"

Decisions cited:
T 0806/90

Catchword:
-

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Case Number: T 0579/96 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 22 January 1998

Appellant: (Proprietor of the patent)
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Respondent: (Opponent)
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Representative:
-

Decision under appeal:
Decision of the Opposition Division of the European Patent Office posted 20 May 1996 revoking European patent No. 0 174 939 pursuant to Article 102(1) EPC.

Composition of the Board:

Chairman: E. Turrini
Members: M. Chomentowski
B. J. Schachenmann

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Summary of Facts and Submissions

1. The appellant is proprietor of European patent No. 0 174 939, which made reference to, inter alia, E1 = GB-A-1 461 866, E2 = DE-A-3 243 680 and E4 = US-A-3 892 494 and which was granted with 23 claims on the basis of European patent application No. 85 900 918.5. The only independent claims of the patent read as follows:

"1. A method of inspecting a surface or determining a geometric distortion therein comprising:
directing light from a light source towards the surface;
retroreflecting light from said surface by means of a retroreflector positioned on the same side of the surface as the light source and comprising a large number of small retroreflective elements for returning incident light substantially in the same direction as that from which it has come, light from said light source being reflected by said surface and subsequently by said retroreflector, being retroreflected back to said surface,
characterised in that,
the total area of the surface under inspection is illuminated at all points simultaneously with light from said light source (500),
and light re-reflected from said surface is observed, either visually, or by forming an image of the surface and detecting light and dark areas in said image, from a position in the direction or close to the direction of the light from the light source (500)."

"15. An apparatus for inspecting a surface or determining a geometric distortion therein comprising:
a light source arranged to direct light onto the surface to be inspected,

a retroreflector positioned on the same side of the surface as the light source (500) and comprising a large number of small retroreflective elements for returning incident light substantially in the same direction as that from which it has come,
characterised in that,
the light source is arranged to simultaneously illuminate all points of the surface to be inspected, imaging means are located to form an image of the surface to be inspected, and detecting means are arranged to detect dark or bright areas in said image."

II. The respondent filed an opposition to the European patent on the grounds that the subject-matter of the European patent extended beyond the content of the application as filed and that it was not patentable having regard to inter alia E1, E2, E4 and E5 = US-A-4 310 242.

III. The patent, in amended form, in which the last section of claim 1 beginning with "and light re-reflected" is replaced by "light re-reflected from said surface is optically imaged on a focal surface of a human eye or a TV camera positioned in the direction or close to the direction of light from the light source, and observing light and dark areas in said image", was revoked.

The Opposition Division found that the formal requirements concerning the amendments in claim 1 were satisfied and that the subject-matter of claim 1 was novel; it was also found that said subject-matter could not be objected with respect to inventive step having regard to E1 because therein the forming of an image with dark and light areas was not established and having regard to E5 because this document related to the projection of a pattern through a transparent

object and did not involve principally light reflected by its surface; however, the following was found with respect to inventive step having regard to E4 and E2:

The first part of claim 1 was known from E4. However, in the known technique, contrary to claim 1,

(1) it was not the total area of the surface under inspection which was illuminated at all points simultaneously, but a narrow beam from a laser which was scanned point-by-point in two dimensions over the surface by a flying spot scanner, and, moreover,

(2) light re-reflected from said surface was not optically imaged on a focal surface of a human eye or a TV camera positioned in the direction or close to the direction of said light source, and light and dark areas in said image were not observed, but, the light re-reflected was detected by a photodetector, the signal from which was applied to a cathodic ray tube (CRT) in synchronism with the scanning, for display of a picture of the defects.

The problem to be solved by the invention according to the submitted claim 1 was to be regarded as to replace the complicated scanning system for illumination by a more convenient and cheaper apparatus. No inventive contribution could be seen in formulating this problem.

With respect to the solution to this problem, as TV cameras became cheaper, it was considered obvious to replace a flying light spot scanner by the use of a TV camera, the general illumination being part of said replacement step. General illumination and TV camera observation to detect defects in a surface was also

well known, e.g. from E2. As stated by the Board of Appeal in decision T 806/90 dated 12 May 1992, unpublished, concerning a similar defect detection apparatus based on the same principle of use of a retroreflector, these methods were however technically equivalent. The subject-matter of the patent was thus arrived at without an inventive step, the same applying to claim 15 for the same reasons.

IV. The appellant (patent proprietor) lodged an appeal against this decision.

V. During the oral proceedings of 22 January 1998, held on request of the appellant, it was demonstrated how the technique in suit worked, and the appellant requested that the decision under appeal be set aside and that the European patent be maintained in amended form, in particular, according to a main request, with the patent documents having formed the basis for the decision of the Opposition Division.

The appellant submitted the following arguments in support of his main request:

As can be seen directly from the technical demonstration made during the oral proceedings, the claimed technique provides, with simple, easily available means, a clear determination of the defects in a surface of an observed body. Concerning the methods of E4 and of E2, it was to be noted with respect to the findings in the decision under appeal having regard to the above-mentioned appeal case T 806/90 that, first, there was no "optical equivalence" of both known methods because of the aperture of a stop provided in the apparatus of E4 for restricting the lateral extent of the incident light beam but also of the retroreflected light beam, this resulting in some of the reflected light being lost;

in any case, Boards of Appeal were not bound by the findings on the technical merits in other appeal cases. Concerning document E5, it was directed at the determination of defects inside of bodies, and not at the surface thereof. E1, which was concerned with the assessment of the "finish" or "gloss" of bodies, also related to another problem. Therefore, the subject-matter of claim 1 of the main request was not obvious having regard to the state of the art.

VI. The respondent (opponent) requested that the appeal be dismissed and the patent be revoked. He argued as follows in support of his request:

Because of the similarities between the present case and the appeal case T 806/90, wherein the international application WO 85/03776, i.e. the patent document having led to the patent application forming the basis of the present patent in suit, had been concerned in objections of lack of patentability, and because of the fact that it was not derivable that the light stop provided in E4 directly and unambiguously resulted in loosing part of the retro-reflected optical beams, the principle of optical equivalence stated in the prior decision T 806/90 was still valid and could be applied to the present case, so that the method of the main request did not involve an inventive step having regard to E4 and E2. Doubts about the legal certainty attached to decisions of Boards of Appeal could arise if closely related cases could lead to different technical findings, in particular, when the same Board is concerned; in this context, it was to be taken into account that a manufacturer could have relied on the above-mentioned prior decision, trusting that similar findings could

be awaited in similar cases. Thus, he could have initiated manufacturing of the same objects, thereby possibly getting into trouble, if in the present case the Board came to different conclusions.

In any case, E5 and E1 were also concerned with the observation of defects or of the state of the surface of bodies by the same method and could, alone or in combination with the other prior art documents, lead in an obvious way to the technique of the main request, which thus lacked an inventive step.

Reasons for the Decision

1. The appeal is admissible.

2. *Main request*

2.1 Allowability of the amendments

The Board is satisfied that the amendments having led to the present text of the main request are allowable (Articles 123(3) and (2) EPC). The same applies to the other requirements of the Convention, such as the clarity of the claims (Article 84 EPC). These findings have not been disputed either by the respondent during the appeal procedure.

2.2 Novelty of claim 1

The subject-matter of claim 1 of the main request does not form part of the state of the art, and this has not been disputed by the respondent either. Therefore, the subject-matter of said claim 1 is new in the sense of Article 54 EPC.

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2.3 Inventive step

2.3.1 It has not been disputed that the method of inspecting a surface (7) or determining a geometric distortion therein known from E4 (see the whole document, and more in particular the examples illustrated by Figures 3 and 4) comprises:
directing light from a light source (1) towards the surface (7);
retroreflecting light from said surface by means of a retroreflector (8) positioned on the same side of the surface (7) as the light source and comprising a large number of small retroreflective elements for returning incident light substantially in the same direction as that from which it has come, light from said light source being reflected by said surface (7) and subsequently by said retroreflector (8), being retroreflected back to said surface (7).

It has not been disputed either that, however, in the method of E4, a narrow beam of light, for instance from a laser, is scanned point-by-point in two dimensions over the surface to be inspected by a flying spot scanner, that light re-reflected is detected by a photodetector, the signal from which was applied to a cathodic ray tube (CRT) in synchronism with the scanning, for display of a picture of the defects, and that, thus, contrary to the method of claim 1 of the main request, the known method does not comprise the features that

(a) the total area of the surface under inspection is illuminated at all points simultaneously with light from said light source, that

(b) light re-reflected from said surface is optically imaged on a focal surface of a human eye or a TV camera positioned in the direction or close to the direction of light from the light source, and that

(c) there is a step of observing light and dark areas in said image.

2.3.2 It is credible that, as mentioned in the decision under appeal (see page 7, paragraph 3), a problem of the method of E4 can be seen in the complicated scanning system for illuminating the surface to be inspected, and that the object of the method in dispute can consist in solving this problem by replacing said complicated scanning system by more convenient and cheaper apparatus.

2.3.3 Another method of inspection of defects in a surface is known from E2, which uses general illumination of the object to be inspected. In this respect, the following is to be noted: as stressed by the respondent and as also mentioned in the decision under appeal, in another appeal case of the Board of Appeal 3.4.2 having led to the above-mentioned decision T 806/90, E4, E2 and international application WO 85/03776, i.e. the patent document having led to the patent application forming the basis of the present patent in suit, had been concerned in objections of lack of patentability; in said decision, the following was stated having regard to the obviousness of taking E2 into account when starting from E4 as the closest prior art:

The two alternatives, i.e. to optically scan the object by a punctual light beam and then observe the general resulting image, on the one hand, or to generally illuminate the object to be inspected and

punctually observing the resulting image, on the other hand, are in principle equivalent; it is clear for any person skilled in optics that, from the point of view of the geometry of the light rays, one arrives at the same result if one isolates a particular light ray from a light beam in one or in the other of two conjugated surfaces; indeed, it was to be noted with respect to the inspection of distortions in a surface that the possibility of general illumination of the object and the scanning of the image of said object with a video camera was already indicated in E2 (see in particular Figure 1 and 2; page 11, lines 14 to 26 and page 15, lines 21 to 24). Thus, the use of a video camera and general illumination of the object to be inspected did not constitute anything unusual and, for the reasons already mentioned, was obvious when starting from E4.

2.3.3.1 However, the following is to be noted in this respect:

According to E4 (see column 5, line 16 to column 6, line 60; Figure 1), light is directed from the light source (1) towards the surface (7) to be inspected through the aperture of an adjustable stop (4) and is then scanned on said surface by scanning means comprising moving mirrors (53, 56); light retroreflected from said surface by means of the retroreflector (8) passes back through the aperture of the stop (4) before being directed towards a photovoltaic cell (11); not all the light deflected by the distortions in the surface reaches the retroreflector and, because of slight diffusion introduced by the retroreflector, part of the retroreflected light will fail to pass through the aperture of the stop (4) and thus the strength of the received signal will be reduced. It was the understanding of the expert accompanying the appellant that, taking in particular into account the diffusion

of light arising at the surface to be inspected and to the variety of defects which can be present there, the method of E4 has a further drawback in that an important part of the signal may be lost because of the stop (4). Although as argued by the respondent there can be situations, in particular in relation with specific shapes of the defects, in which no signal is lost and moreover the aperture of a camera and the iris of the eye also constitute adjustable stops, however, the explanations of the expert of the appellant could be accepted that general, unrestricted illumination and optically imaging in a focal surface of a TV camera were not equivalent, in the present context, to optical scanning and forming an image in that the former could result in less signal loss and thus in a better contrast of the image to be checked.

2.3.3.2 Concerning the technique of E2 (see in particular claim 1) which had been cited in the above-mentioned decision as a supplementary indication that general illumination together with a video camera were not unusual, it is to be noted that, although it is for the same purpose, it however uses no retroreflector, so that the light passes the surface to be inspected only once and not twice, and the light source therein is mentioned as being for illuminating the surface with beams resulting in a projected pattern. Thus, as convincingly argued by the appellant, a combination of E4 and E2 is not obvious and in any case does not lead in an obvious way to the method of the main request.

2.3.3.3 In this respect, the respondent has presented the following comments: doubts about the legal certainty attached to decisions of Boards of Appeal could arise if closely related cases, involving the same documents, could lead to different technical findings, in particular when the same Board is concerned; it should also be taken into account that a manufacturer

could have concluded from the above-mentioned decision that similar findings could be expected in closely similar cases and he could have initiated manufacturing of the objects concerned by said above-mentioned decision, thereby possibly getting into trouble if later cases led to different findings.

However, these considerations, which were not supported by any reference to provisions of the Convention or any other legal source, could not convince because, as argued by the appellant, Boards of Appeal must treat and decide each appeal case independently and on its own merits. They are not bound, concerning the assessment of technical matters, by decisions issued in different cases. In particular, for the reasons set out here above and concerning the credible explanations of the appellant's expert about differences in contrast obtained by the method of the main request and the method disclosed in E4, respectively, it was not possible, in the present case, to accept the respondent's argument of a mere equivalence of the optical means based on said previous decision.

Incidentally, it is to be noted that, in any case, a manufacturer in the situation mentioned by the respondent had to take into account that, when the above-mentioned decision T 806/90 was given, the application having led to the present patent, which in form of the international application WO 85/03776 was part of the appeal in said decision T 806/90, was still pending and that, later, a patent could be granted on this application which in accordance with Article 64 EPC could confer on its proprietor protection according to the national patent legislation, what eventually happened.

2.3.4 Indeed, as further argued by the respondent, a technique is known from E5 (see column 1, lines 11 to 43; column 2, lines 22 to 58; Figure 1) which is for optical evaluation of objects by using illumination, a retroreflector and a video detection device. However, the argument cannot convince since this other known method is for testing transparent bodies by directing, through the body, light which is first condensed by a lens (2) and projected through an interchangeable target transparency (3) carrying a pattern, so that, although E4 shows both inspection through a surface and on a surface, the skilled person is not prompted by the content of E5 to use general, unrestricted illumination of the object to be inspected.

Indeed, as also argued by the respondent, it is known from E1 (see page 1, lines 10 to 43; page 1, line 78 to page 2, line 54; see in particular Figures 4 and 6; see also the claims) an optical method for the assessment of the "finish" or "gloss" of a surface using a retroreflecting device in a reflectometer. However, this argument cannot convince either in that a detector, for instance for reflectivity, and not a TV camera is used in E1, and in that there is no definite indication about the forming, at the location of the detector, of light and dark areas. Therefore, E1, alone or in combination with the other cited documents, does not lead in an obvious way to the method of claim 1 of the main request as far as it is based on the use of a TV camera.

2.3.5 Concerning the alternative in claim 1 of the main request according to which light re-reflected from said surface is optically imaged on a focal surface of a human eye, it is to be noted that all the cited documents stress the use of some form of apparatus-aided detection and, for instance in E1 (see in particular Figure 4), where in some drawings no

detector is shown, there is no derivable indication that such observation, which is mentioned at another text location, page 1, lines 44 to 49, is intended in the context of the technique presented.

The following is further to be noted in this respect:

During the oral proceedings, the appellant made a technical demonstration of the method with an electric lamp and with a retroreflector, whereby especially distortions in the surface of an object, which under conventional observation were not easy to detect, could be easily detected visually without any particular restriction of the orientation of said means. Thus, with very simple means, an effect was shown which, as indicated in the patent in suit, could easily be used in the industry for inspecting the surface of fabricated objects.

2.3.6 As convincingly argued by the appellant, the simplicity of the method of the main request and the effects achieved, together with the relatively long period of time between the publication dates of E4 or E1, i.e. 1975 and 1977, and the priority date of the patent in suit, i.e. 1984, constitute an indication that, starting from any of these documents, it was not obvious to the skilled person in this field to use optical imaging on the focal surface of the eyes of the operator or a TV camera in this context; even if, as argued by the respondent, it was about 1984 that inexpensive TV cameras appeared on the market, TV cameras were anyway available before that date, without the skilled person taking them into account for improving his technique. Such argument would in any case not apply to the even simpler visual alternative of the claimed method.

2.3.7 Therefore, the subject-matter of claim 1 of the main request involves an inventive step in the sense of Article 56 EPC.

2.4 The subject-matter of claim 15 of the main request, which concerns an apparatus and which recites apparatus features corresponding to the method features of claim 1, also involves an inventive step for the same reasons (Article 56 EPC).

3. Thus, the patent can be maintained in amended form and it is not necessary to consider any further request of the appellant (Article 102(3) EPC).

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to maintain the patent in amended form on the basis of claim 1 annexed to the decision under appeal, claims 2 to 23, description and drawings as granted.

The Registrar: The Chairman:

P. Martorana E. Turrini