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Datasheet for the decision of 30 October 2025

Case Number: T 1842/23 - 3.2.05

Application Number: 16825055.3

Publication Number: 3320385

IPC: B42D25/324

Language of the proceedings: EN

Title of invention:
Optical products

Patent Proprietor:
Wavefront Technology, Inc.

Opponent:
Giesecke+Devrient Currency Technology GmbH

Relevant legal provisions:
EPC Art. 83, 100(b)
RPBA 2020 Art. 13(2)

Keyword:
Sufficiency of disclosure (no)
Amendment of the respondent's case (no)

Decisions cited:
T 0247/20

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Boards of Appeal

Chambres de recours

Boards of Appeal of the
European Patent Office
Richard-Reitzner-Allee 8
85540 Haar
GERMANY
Tel. +49 (0)89 2399-0

Case Number: T 1842/23 - 3.2.05

D E C I S I O N
of Technical Board of Appeal 3.2.05
of 30 October 2025

Appellant: (Opponent)	Giesecke+Devrient Currency Technology GmbH Prinzregentenstraße 159 81677 München (DE)
Representative:	Zeuner Summerer Stütz Patent- und Rechtsanwälte Partnerschaft Nußbaumstraße 8 80336 München (DE)
Respondent: (Patent Proprietor)	Wavefront Technology, Inc. 7350 Somerset Blvd Paramount, CA 90723 (US)
Representative:	Mark Phillip Houghton Patent Outsourcing Limited 1 King Street Bakewell, Derbyshire DE45 1DZ (GB)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 11 September 2023 rejecting the opposition filed against European patent No. 3320385 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	P. Lanz
Members:	O. Randl
	A. Bacchin

Summary of Facts and Submissions

I. The opponent filed an appeal against the opposition division's decision to reject the opposition against European patent No. 3 320 385.

II. The board issued a communication pursuant to Article 15(1) RPBA on 27 June 2025.

III. Oral proceedings before the board took place by videoconference on 30 October 2025.

IV. The appellant requested that the decision under appeal be set aside and the patent be revoked.

The respondent requested that the appeal be dismissed or, as an auxiliary measure, that the decision under appeal be set aside and the patent be maintained as amended on the basis of the third subsidiary auxiliary request.

V. Claim 1 of the patent as granted (main request) reads (the feature references used by the board have been inserted in square brackets):

"1. [**A**] An optical product (10', 1000) configured, when illuminated, to reproduce by reflected or transmitted light, a 3D image of at least a part of a 3D object, said optical product (10', 1000) comprising:
[**B**] a first surface; and
a second surface opposite said first surface,
[**C**] said second surface comprising a plurality of portions (P'_1, P'_2, ... P'_n,; P_{A1}, P_{A2}, ... P_{An}), each portion (P'_n; P_{An},) corresponding to a point on a

surface of said 3D object, [**D**] each portion (P'_n; P_{An},) comprising non-holographic features (E_1, E_2, ... E_n; F_1) configured to produce at least part of said 3D image of said 3D object,
wherein [**E**] a gradient in said non-holographic features (E_1, E_2, ... E_n; F_1) correlates to an inclination of said surface of said 3D object at said corresponding point, and
wherein [**F**] an orientation of said non-holographic features (E_1, E_2, ... E_n; F_1) correlates to an orientation of said surface of said 3D object at said corresponding point,
characterized in that, [**G**] said non-holographic features (E_1, E_2, ... E_n; F_1) comprise specular reflecting features and diffusing features that provide greyscale in said 3D image."

Claim 1 of subsidiary auxiliary request 3 differs from claim 1 of the main request in the additional features "[**K2**] the specular reflecting features and the diffusing features each have sizes and are distributed within said plurality of portions (P'_1, P'_2, ... P'_n; P_{A1}, P_{A2}, ... P_{An}) to provide said greyscale in said 3D image, wherein [**K3'**] the sizes include a width of a top surface of the specular reflecting and diffusing features".

VI. The parties' relevant submissions may be summarised as follows:

(a) Main request: sufficiency of disclosure

(i) Respondent

The invention was sufficiently disclosed. Features E and F had to be considered alongside the other

features, particularly the feature that the optical product reproduces at least part of a 3D object.

According to T 19/90, there was a presumption of sufficient disclosure in a patent. An objection based on insufficient disclosure presupposed serious substantiated doubts based on verifiable facts (see decision T 617/07). In the present case, no such facts had been presented.

According to decision T 1076/21, the burden of proof lay with the opponent, and the benefit of the doubt went to the proprietor. The opponent had not asserted that the burden of proof had shifted. This only occurred when the board was satisfied that the presented facts, arguments and evidence were sufficient to discharge the opponent's burden of proof. However, no concrete evidence had been provided. The opponent had only provided arguments, although it could have provided real non-working samples. Therefore the burden of proof remained with the opponent. None of the specific exceptions retained in the case law applied to the present case: (i) there were no new or unusual parameters present in the patent; (ii) the physical principles involved (Lambert's cosine law for diffuse and Snell's law for specular reflection) were commonplace; (iii) there was not an infinite range of possibilities covered. The skilled person was not "walking a tightrope": the effect was obtained even when there were quite large changes in angle.

According to decision T 292/85, in principle sufficiency of disclosure was achieved if at least one way enabling the person skilled in the art to carry out the invention was clearly indicated. The board had

acknowledged that paragraph [0077] of the patent disclosed a way to carry out the invention.

Decision T 409/91 stated that the protection conferred by a patent should correspond to its technical contribution to the art. The application as filed had to contain sufficient information to allow those skilled in the art, using their common general knowledge, to carry out the invention within the whole area claimed. The patent complied with this requirement. The main method of mimicking the gradients was described in paragraph [0077]. Furthermore, the averaging of gradients and orientations was described in paragraphs [0078] and [0080], respectively. The percentage change in orientation with lateral distance was described in paragraph [0080]. Piecewise linear approximation was described in paragraphs [0082] and [0162]. There were many ways to carry out piecewise approximation, with linear or non-linear features correlating to other linear or non-linear features. Thus the skilled person had numerous tools at their disposal to carry out the invention.

Not every instance falling within the scope of the claim needed to be exemplified in the patent. That was where the skilled person's common general knowledge came into play. The fact that the term 'correlate' was vague was not a matter of sufficiency of disclosure but of clarity. Although the term was broad, it had limits. A skilled person would be willing to understand the claim and would not interpret it in a way that led to impossibilities. The example provided by the opponent, in which the correlation is an inversion, did not work and therefore was outside the scope of the claim. This could be seen in the example of Fresnel lenses, where the inversion transformed a convergent lens into a

divergent one. If a 3D image of a 3D object could not be obtained, the product was outside the scope of the claim. Therefore the skilled person had the necessary tools to carry out the invention and could expect a positive outcome.

The opponent's argument of randomness was unfounded. References to random heights or widths in paragraph [0093] of the patent did not distract the skilled person from understanding how the effect worked. The actual size of the non-holographic features only affected the resolution of the 3D image. The height variation was within the thickness of the film (i.e. between 50 µm and 100 µm). The argument that diffuse features destroyed the correlation was unpersuasive. There was no reason why diffuse features should not have a gradient of orientation. The argument based on average vs. individual gradients was not convincing. Based on the standard definition of 'correlate', a skilled person would understand that there was no randomness. The term 'correlate' implied a relationship. From paragraph [0078] of the patent, in which the notion of averages was employed, the skilled person would have understood that some variation around direct 1:1 mimicking was permissible. Features D and F were not incompatible with the greyscale. There was no boundary that the skilled person would be unable to cross. Regarding the need for a research programme, it should be borne in mind that some work was always necessary in implementing embodiments of a patent. The technology involved was quite common and only basic calculations had to be carried out.

(ii) Appellant

The real question concerned the breadth of the term 'correlate'. This term was so broad that the skilled person would not understand how this teaching could be reproduced. It referred to a relationship between two things or quantities, in this case the slope or gradient in the optical product and in the image to be adjusted. Of course, technically nonsensical variants were excluded in claim interpretation, but all technically meaningful embodiments had to be disclosed by the patent so clearly and completely that the person skilled in the art could actually carry them out. These requirements were higher for very broad terms than for narrow ones. The term 'correlation' covered a wide range of possibilities, so more than one embodiment was required. The correlation could be positive or negative, linear or non-linear. It might also include a stochastic component. Only one embodiment was described in the patent, namely mimicking the slopes, i.e. a positive, linear, extremely strong correlation. No other conceivable variants that fell under the term were taught. They were not impossible, and therefore the opponent could not provide any proof of impossibility, but there was simply no teaching on how these variants should be performed. In this respect, the question of the burden of proof did not arise. The greyscale provided by the specular and scattering features of the optical product also contributed to the configuration. A case could be imagined where the slopes or gradients themselves were not yet sufficient to generate the 3D image, but this was compensated for by appropriately selected greyscales. When recreating a sphere, the gradients and orientations could be selected exactly as they existed in the sphere. The

greyscales could reinforce the effect, but could also change it. It could also be imagined that the gradients varied randomly locally on a scale below the resolution limit of the human eye, but that the appearance of the sphere was not affected. It was therefore not impossible that other correlations also led to the visualisation of the 3D object, but the patent contained no teaching in this respect. The skilled person was also unable to recognise which variants worked on the basis of the teaching of the patent and their common general knowledge. Thus a research programme was imposed on the skilled person, which pleaded against sufficiency of disclosure. The alleged embodiments beyond mimicking cited by the patent proprietor did not qualify as such. The patent explained in detail how the averaged gradient could be calculated, but this added nothing to the understanding of the term 'correlate'. As a result, the patent only provided a single embodiment in which the gradients were essentially the same. No other conceivable variants were addressed. Feature A did not allow a narrow interpretation of the term 'correlated' to be derived either. Firstly, this feature was an indication of purpose or result that did not contain a reproducible teaching. If this were to exclude all non-feasible embodiments, Article 83 EPC or the requirement of feasibility over the entire scope of the claim would be superfluous. Secondly, feature A being a functional feature, it had to contain a generalisable teaching which made the range of all variants falling within that definition accessible to the skilled person.

(b) **Subsidiary auxiliary request 3: sufficiency of disclosure**

(i) Respondent

The features of claim 2 as granted had been incorporated into claim 1. These features were also disclosed in paragraphs [0159] and [0160] of the patent. Although these paragraphs related to data files, there was a correspondence between the data and the product. The first part of paragraph [0160] disclosed the size and distribution of the portions in correlation with greyscale. This relationship was the same as that disclosed in the amended portion of claim 1. The latter part of that paragraph introduced the discussion of the slope of the 3D object replicated in the 3D image. The size of the portions was explicitly correlated to the slope. Clearly, this was not a one-to-one mimicry, given that the size of an area was correlated to an angle.

When asked how features K2 and K3 qualified the correlation in feature E, the respondent explained that size was a factor contributing to the greyscale of the 3D image. The skilled person would have to interpret this in terms of a limiting feature, which was where paragraph [0160] came in. While this paragraph did not explicitly refer to specular or diffusing features, it did mention lenses, prisms and mirrors. The amendment limited the scope of the claim to the embodiments disclosed in paragraphs [0159] and [0160], which provided another example of a correlation.

(ii) Appellant

An additional variable was introduced: the size of the sections, which could also vary. The objections to the main application therefore still applied.

Paragraphs [0150] to [0160] did not deal with the optical product itself, but with the data file used to manufacture it. This was evident from the labelling of the sections and features with lowercase letters ('p' and 'f'), as opposed to the labelling of sections and features of the product with uppercase letters. Figures 3A to 3D illustrated these data files. Paragraph [0159] did not add anything new to what had already been discussed. The only relationship between the added features and paragraph [0160] was the word 'size'. However, this referred to different things: the claim was about the size of specular and diffusive scattering features, whereas the term in paragraph [0160] referred to the overall size of the portions (p1 to pn). These two quantities were completely independent of each other. A large portion could contain many small scattering elements or one large element. Furthermore, there was no connection between the gradient of the 3D object and the slope of the optical product. The latter was independent of the size of the areas or the scattering features. In areas with a steep gradient, the portions should be smaller, and in areas with a flat gradient, larger. This had no influence on the correlation between the gradient and the inclination of the object (feature E).

(c) Admittance of the respondent's arguments based on paragraphs [0159] and [0160] of the patent

(i) Appellant

The patent proprietor had amended its case for appeal: the teaching of paragraphs [0159] and [0160] had not been previously discussed in the proceedings in connection with sufficiency of disclosure. This new argument should therefore not be admitted at this late stage (Article 13(2) RPBA). Alternatively, the opponent should be granted an interruption of 15 to 20 minutes to familiarise itself with this embodiment.

(ii) Respondent

Paragraph [0159] had been referenced in sections A.e.4 and A.e.5 of the written submission dated 29 September 2025. Paragraph [0160] and surrounding paragraphs had been quoted in previous submissions. Paragraphs [0159], [0160] and [0162] formed part of the same line of reasoning. Therefore this did not constitute an amendment to the patent proprietor's case, but sought to highlight issues that had already been raised. Furthermore, this particular request had been on file since the opposition proceedings began. There was no objection to the opponent being given time to consider the argument.

Reasons for the Decision

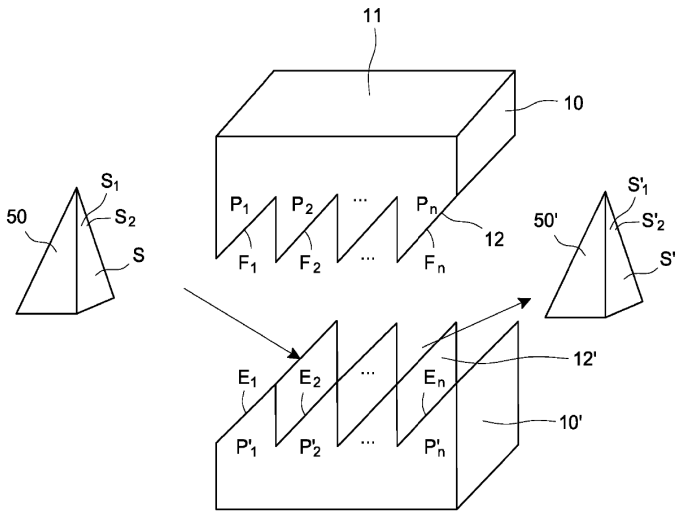
1. Main request: sufficiency of disclosure

1.1 The invention concerns an optical product configured to reproduce a 3D image of a 3D object. The core of the invention lies in the geometry of the optical product's surface. It is made up of portions comprising non-holographic features configured such that their gradient and orientation 'correlate' to the inclination and orientation of the corresponding part of the surface of the 3D object.

The verb 'correlate' is not defined in the patent. It is commonly understood to express the idea of a mutual relation between two things (see the relevant entry in the online Oxford English Dictionary [www.oed.com/dictionary/correlate_v?tab=meaning_and_use#8204945], consulted on 28 May 2025).

Consequently, the invention as defined in claim 1 requires there to be some mutual relation between the gradient of each portion of the optical product and the inclination of the surface of the 3D object at the point to which the portion corresponds. Moreover, there must be some mutual relation between the orientation of each portion and the orientation of the corresponding surface of the 3D object. The nature of these mutual relations is undefined in claim 1.

Paragraph [0077] of the patent refers to the embodiment of Fig. 1A. It states that the slopes of the features F of the master 10 can mimic the surface normals of the 3D object 50. According to the OED, when used for an inanimate object, the verb "mimic" expresses the idea of close resemblance, especially in structure or function. Paragraph [0041] also mentions mimicking and compares the approach to what is done in Fresnel lenses, which are well known to the skilled person. The board is satisfied that this offers the skilled person a way of achieving a correlation within the meaning of claim 1.



According to the established case law of the boards, the disclosure of one way of performing the invention is only sufficient if it allows the invention to be performed over substantially the whole range claimed (see Case Law of the Boards of Appeal, 11th edition, July 2025, section II.C.5.2). This does not mean that there may not be 'islands' of non-working embodiments within the scope of the patent. However, the skilled person must be able, based on the description of the invention and their common general knowledge, to carry out virtually all the technically reasonable embodiments encompassed by the claim.

In the present case, the question of sufficiency of disclosure boils down to the question of whether the

disclosure of one particular way of correlating the surface portions of the non-holographic features with the surface portions of the 3D object (i.e. mimicking and its variations) enables the skilled person to carry out the invention using all sorts of technically meaningful correlations.

1.2 The patent proprietor argued that there was a presumption of sufficiency and that the opponent had failed to discharge the burden of proof because it had only provided arguments instead of supplying examples of non-working optical products falling within the scope of the claim.

The board does not share the view that a patent always benefits from a presumption of sufficiency of disclosure. A patent claiming an invention of very broad scope needs to supply sufficient information for the invention to be sufficiently disclosed for it to be carried out by the skilled person.

In the present case, the opponent could not have established insufficiency of disclosure by providing samples of non-working optical products. This is because the core of the objection is not that there are non-working embodiments but that the patent does not supply the skilled person with sufficient information for them to carry out the invention other than by reproducing the sole embodiment disclosed, to which the claim is not limited. The opponent has discharged its burden of proof by cogently setting out this allegedly insufficient disclosure.

1.3 The patent proprietor argued that the patent disclosed several ways of carrying out the invention, referring in particular to the averaging of gradients and

orientations as described in paragraphs [0078] and [0080], the percentage change in orientation per lateral distance disclosed in paragraph [0080] and piecewise linear approximation described in paragraphs [0082] and [0162]. In the board's view, this teaching does not provide different ways of carrying out the invention. What is suggested is that the mimicking does not have to be strict but allows for various approximations. Nonetheless, what is taught is still mimicking of approximations and not a distinct way of correlating the gradient and orientation of the portions of the non-holographic features to the inclination and orientation of the corresponding part of the surface of the 3D object. Therefore, in the board's view, the patent discloses basically only one way of carrying out the invention.

Consequently, the skilled person would have been at a loss as to how to carry out the invention for correlations that significantly differ from mimicking. They would not have been able to do so without performing a research programme, establishing through trial and error whether the claimed optical product was achieved. This amounts to an undue burden.

It follows that the ground for opposition under Article 100(b) prejudices maintenance of the patent as granted.

Consequently, the main request must be rejected.

2. Subsidiary auxiliary request 3

Claim 1 of subsidiary auxiliary request 3 differs from claim 1 of the main request in features K2 and K3', according to which the specular reflecting features and

the diffusing features have sizes and are distributed within the surface portions of the optical product to provide the greyscale. The sizes must include a width of a top surface of the specular reflecting and diffusing features.

2.1 During the oral proceedings before the board, the respondent argued that this amendment ensured that the claimed invention complied with the requirements of Article 83 EPC. This assertion was based, in particular, on the disclosure in paragraphs [0159] and [0160] of the patent. The appellant objected to the admittance of these oral submissions.

The board is satisfied that the respondent's oral submissions based on paragraphs [0159] and [0160] of the patent remain within the framework of the respondent's written submissions and merely represent a deepening of the original lines of argument (see e.g. T 247/20, Catchword). Hence they do not constitute an amendment to its appeal case within the meaning of Article 13 RPBA. Consequently, these submissions are taken into account by the board.

2.2 However, the amendment is not suitable for overcoming the deficiency that led to the dismissal of the main request. As noted above (see point 1.), the patent taken as a whole discloses basically only one way of carrying out the invention, whereas the scope of claim 1 by far exceeds embodiments obtainable via this disclosure. To overcome this objection, an amendment limiting the scope of claim 1 would have to reduce the scope of the claim such that its scope substantially coincides with the embodiments that are made available to the skilled person by the patent. The amendment consisting in the addition of features K2 and K3' does

not achieve this. It introduces the notion of size for the specular reflecting and diffusing features and requires them to be distributed in a particular way. This amendment has no bearing on the interpretation of the correlations in features E and F.

The information in paragraphs [0159] and [0160] is not helpful in this context. These paragraphs do not describe different methods of achieving the claimed correlations. Furthermore, they are irrelevant to the amended claims because they concern the sizes of the lens/prism/mirror rather than the sizes of the specular reflecting and diffusing features, and they are said to be 'related' to the size of the portions. In fact, paragraph [0160] introduces another unspecified correlation by suggesting that the size of the lens, prism or mirror may be related to the steepness or shallowness of the recorded object.

In view of the above, the board concludes that the subject-matter of claim 1 of subsidiary auxiliary request 3 does not comply with the requirements of Article 83 EPC. Consequently, it is not possible to maintain the patent in amended form on the basis of subsidiary auxiliary request 3.

3. Conclusion

As none of the respondent's requests is allowable, the patent must be revoked.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

N. Schneider P. Lanz

Decision electronically authenticated