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Datasheet for the decision of 2 May 2018

Case Number: T 0520/14 - 3.4.03

Application Number: 04255790.0

Publication Number: 1530413

IPC: H05K7/20

Language of the proceedings: EN

Title of invention:
Emissive display device comprising a heat spreader

Patent Proprietor:
NeoGraf Solutions, LLC

Opponent:
SGL Carbon SE

Headword:

Relevant legal provisions:
EPC 1973 Art. 56, 84
EPC Art. 52(1), 101(3)(a), 123(2)

Keyword:
Amendments - added subject-matter (yes)
Inventive step - auxiliary request (no)
Claims - clarity after amendment (no)

Decisions cited:
G 0003/14, T 0425/98

Catchword:

Europäisches Patentamt
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Beschwerdekammern

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Case Number: T 0520/14 - 3.4.03

D E C I S I O N
of Technical Board of Appeal 3.4.03
of 2 May 2018

Appellant: (Patent Proprietor)	NeoGraf Solutions, LLC 11709 Madison Ave Lakewood, OH 44107 (US)
Representative:	Brand, Thomas Louis TL Brand & Co 17 Hanover Square London W1S 1BN (GB)
Respondent: (Opponent)	SGL Carbon SE Rheingaustrasse 182 65203 Wiesbaden (DE)
Representative:	Botzenhardt, Sandra SGL Carbon GmbH Werner-von-Siemens-Strasse 18 86405 Meitingen (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 2 January 2014 revoking European patent No. 1530413 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman	G. Eliasson
Members:	S. Ward
	T. Bokor

Summary of Facts and Submissions

I. This is an appeal by the patent proprietor against the decision of the Opposition Division to revoke the European patent EP 1 530 413 on the grounds that the subject-matter of the main request and of auxiliary requests 4-6 did not comply with the requirements of Article 123(2) EPC, and that the subject-matter of auxiliary requests 1-3 did not involve an inventive step within the meaning of Article 56 EPC.

II. The opposition was filed against the patent in its entirety. Grounds for the opposition were lack of inventive step, insufficient disclosure and unallowable extension of subject-matter (Articles 100(a), (b) and (c), 52(1) and 56 EPC). The objection based on Article 100 (b) EPC was subsequently withdrawn (see the contested decision, Grounds, point 1).

III. The following documents are referred to in this decision:

D3: US 5 831 374 A

D9: Datasheet: Technical Data Cu/Mo/Cu Alloys versus graphite; 11 September 2013

D11: GrafTech International; Technical Data Sheet 321: SPREADERSHIELD™ Heat Spreaders; 23 January 2013

D17: GrafTech International: Thermal Images with Maximum and Centerline Temperatures

D19: Panasonic datasheet: "PGS" Graphite Sheets; Appendix A; pages EC178-EC181

D20: Panasonic datasheet: Thin and High Thermal Conductivity PGS Graphite Sheet; Appendix B.

IV. At the end of the oral proceedings held before the Board the appellant-proprietor (hereinafter, the proprietor) requested that the decision under appeal be set aside, and that the patent be maintained in an amended form on the basis of any of the Main Request or Auxiliary Requests 1 or 2, all filed with the grounds of appeal dated 29 April 2014. The respondent-opponent (hereinafter, the opponent) requested that the appeal be dismissed.

V. Claim 1 of the main request is identical to claim 1 as granted and reads as follows:

"An emissive display device having a plurality of discharge cells, the emissive display device comprising a heat spreader having two major surfaces, the heat spreader comprising at least one sheet of compressed particles of exfoliated graphite and an adhesive wherein substantially all of one of the major surfaces of the heat spreader is in thermal contact with the emissive display device such that it overlays a plurality of the discharge cells and the adhesive adheres the heat spreader to the emissive display device sufficiently to maintain the heat spreader in position regardless of the orientation of the emissive display device."

Auxiliary request 1 is unchanged from auxiliary request 1 on which the contested decision was based; claim 1 reads as follows:

"An emissive display device having a plurality of discharge cells, the emissive display device comprising at least one sheet of compressed particles of exfoliated graphite having two major surfaces and an adhesive, wherein all of one of the major surfaces of

the at least one sheet of compressed particles of exfoliated graphite is in thermal contact with the back of the emissive display device such that it overlays a plurality of the discharge cells and is configured to spread heat which may arise in different locations on the emissive display device, and wherein the adhesive adheres the at least one sheet of compressed particles of exfoliated graphite to the emissive display device sufficiently to maintain the at least one sheet of compressed particles of exfoliated graphite in position regardless of the orientation of the emissive display device."

Claim 1 of auxiliary request 2 reads as follows:

"An emissive display device having a plurality of discharge cells, the emissive display device comprising at least one sheet of compressed particles of exfoliated graphite having two major surfaces and an adhesive, wherein all of one of the major surfaces of the at least one sheet of compressed particles of exfoliated graphite is in thermal contact with the back of the emissive display device such that it overlays a plurality of the discharge cells and is configured to spread heat which may arise in different locations on the emissive display device, the at least one sheet of compressed particles of exfoliated graphite being configured to be adhered to the emissive display device after removing a release material previously overlaying the adhesive, with the adhesive being sandwiched between the at least one sheet of compressed particles of exfoliated graphite and the release material, wherein the adhesive and release material are configured to provide an average release load of no greater than 40 grams per centimeter at a release speed of one meter per second without without causing

undesirable damage to the at least one sheet of compressed particles of exfoliated graphite and wherein further the adhesive adheres the at least one sheet of compressed particles of exfoliated graphite to the emissive display device sufficiently to maintain the at least one sheet of compressed particles of exfoliated graphite in position regardless of the orientation of the emissive display device."

VI. With the summons to oral proceedings the Board sent the parties a communication under Article 15(1) RPBA. The Board discussed *inter alia* whether the main request and auxiliary request 1 complied with the requirements of Article 123(2) EPC, and whether the claimed subject-matter involved an inventive step. It was also discussed whether the additional features of auxiliary request 2 imposed any further limitation on the claimed device.

VII. The proprietor's arguments, in so far as they are relevant to the present decision, are essentially as follows:

(a) Concerning Article 123(2) EPC in relation to claim 1 of the main request, there was a clear basis in the application as filed for an "emissive display device having a plurality of discharge cells". It was undisputed that plasma panel displays were disclosed, and paragraph [0065] of the description as filed clearly indicated that the invention extended to equivalent emissive displays.

The claimed "heat spreader having two major surfaces, the heat spreader comprising at least one sheet of compressed particles of exfoliated graphite" also complied with the requirements of Article 123(2) EPC.

Throughout the application as filed, the "heat spreader" was disclosed as being either a single sheet of compressed particles of exfoliated graphite or a laminate of sheets, at least one of which was a sheet of compressed particles of exfoliated graphite. No other type of heat spreader was disclosed. The skilled addressee would understand "comprising at least one sheet of compressed particles of exfoliated graphite" to mean that the heat spreader took the form of one of these two disclosed arrangements. A single sheet was disclosed as having two major surfaces (paragraph [0015]), and it was implicit that a laminate of sheets would also have two major (external) surfaces. The disputed feature therefore had a clear basis in the application as filed.

Claim 1 of Auxiliary Requests 1 and 2 had been amended to state that it was the sheet of compressed particles of exfoliated graphite that had two major surfaces, which was clearly disclosed in the application as filed (paragraph [0015]).

The Opponent was incorrect in arguing that the claims went beyond the original disclosure in failing to specify that the adhesive was on a surface facing the display. The wording of claim 1 was taken from paragraphs [0070] to [0072] of the application as filed, which stated that the heat spreader had a layer of adhesive thereon to adhere the heat spreader to the display panel, without reference to the position of said layer.

(b) In relation to inventive step, pyrolytic graphite sheets were known to have a higher in-plane thermal conductivity and a lower through-thickness thermal impedance than the exfoliated graphite. Pyrolytic

graphite was therefore better at conducting heat both through-plane and in-plane than exfoliated graphite, and hence the skilled person would not consider modifying the arrangement of D3 by replacing the pyrolytic graphite material disclosed therein by an exfoliated graphite material.

The inventors of the present invention had found that, despite having lower through-plane and in-plane conductivities, exfoliated graphite was surprisingly good for use as a heat spreader, as demonstrated in D17, which compared PGS 70 micron (a pyrolytic graphite sheet from Panasonic) with SS400 (an exfoliated graphite sheet from GrafTech). Both types of sheet were available before the priority date of the present application (the pyrolytic graphite sheet SS1500 shown in D17 was developed after the priority date). Although the difference in thicknesses of the sheets in D17 would have some influence on the heat spreading properties, this would be limited, as shown by comparing the heat spread for the two SS400 sheets. The chief factor explaining the superior heat spreading of the exfoliated graphite sheets was the material.

An exfoliated graphite sheet was thought to allow heat to be stored within it, rather than simply allowing the heat to pass through it, as is the case with pyrolytic graphite. It was this property that allowed the exfoliated graphite sheet - surprisingly - to function better as a heat spreader in an emissive display device than pyrolytic graphite. The greater flexibility mentioned in paragraph [0068] of the description as filed might also provide a reason for the improved performance. This technical effect would not be expected by the skilled person.

The functionality of the exfoliated graphite sheets of the present invention was directly contrary to the teaching of D3, as the lower through plane conductivity served to store and gradually dissipate the stored heat in-plane rather than transfer it rapidly through the sheet, as was the objective in D3.

Thus, even if exfoliated graphite sheets were known in the art, the invention was based on the surprising technical effect that its lower thermal conductivity properties actually improved its function as a heat spreader, which would not have been obvious to the skilled person.

(c) Auxiliary Request 2 should be admitted into the proceedings. The proprietor could not have been expected to file this request during the first instance proceedings as it addressed the inventiveness objections of the Opposition Division to the previously filed Auxiliary Requests.

The features of Claim 1 of Auxiliary Request 2 defined the adhesive load of the adhesive material that is present in the final product. The defined release load reduced delamination and therefore had a direct effect on the graphite material present in the claimed emissive display device.

The phrase "without without causing undesirable damage" was not unclear. In practice, any type of damage to the exfoliated graphite sheet would be undesirable, and the feature should be interpreted in that light.

It had been found that no damage was caused to the exfoliated graphite sheet if the release load between the release liner and the adhesive material was no

greater than 40g per cm at a release speed of one meter per second, as currently claimed. There was no suggestion in any of the cited prior art documents that this would be beneficial.

A sheet of compressed particles of exfoliated graphite only contained mechanical bonds holding the material together, and hence delamination was more of an issue than with pyrolytic graphite.

VIII. The opponent's arguments, in so far as they are relevant to the present decision, were essentially as follows:

(a) In relation to the requirements of Article 123(2) EPC, claim 1 of the main request defined an "emissive display device having a plurality of discharge cells", whereas the only displays having a plurality of discharge cells defined in the application as filed were plasma panel displays. Claim 1 therefore included display devices having a plurality of discharge cells which were nevertheless not plasma panel displays. There was no basis in the application as filed for such displays.

The feature, "a heat spreader having two major surfaces, the heat spreader comprising at least one sheet of compressed particles of exfoliated graphite" had no basis in the original application, which only disclosed the *sheet* having "opposed major surfaces". Even if the description only disclosed heat spreaders comprising just a single sheet or a plurality of sheets, the heat spreader defined in claim 1 of the main request included embodiments having elements other than sheets in combination with having "two major

surfaces". There was no basis in the application as filed for claiming such embodiments.

Claim 1 of the main request comprised embodiments in which the adhesive was on a main surface and also on the side surfaces, whereas it was clear from the application as filed (at least in relation to the "release material") that the adhesive was only on a main surface.

In paragraph [0067] of the description as originally filed it was disclosed that the heat spreader covered the back surface of a plasma display panel, whereas claim 1 was not thus limited, contrary to the requirements of Article 123(2) EPC.

Objections against claim 1 of the main request under Article 123(2) EPC (in particular in relation to the adhesive) also applied to claim 1 of auxiliary requests 1 and 2.

(b) It was not the case that D3 was only concerned with the through-plane conduction to the heat sink. In-plane spreading of the generated heat was also a consideration, as acknowledged in the contested decision (Grounds, point 3.9).

Replacing the pyrolytic graphite in D3 by exfoliated graphite would not solve any problem, but would merely lead to a deterioration in the heat spreading properties. There was no experimental evidence which showed any advantages, and a purely disadvantageous alteration of the prior art was not a basis for acknowledging inventive step. The differences shown in D17 were caused only by the different thicknesses of the sheets.

Auxiliary request 2 was filed on appeal and could have been filed earlier. Furthermore, it went in a different direction to all previous requests, and therefore should not be admitted.

In claim 1 of auxiliary request 2, the feature "without causing undesirable damage to the at least one sheet of compressed particles of exfoliated graphite" was not in any granted claim, and was therefore open to a clarity objection. At least the term "undesirable" was unclear as it implied that some types of damage might be tolerable.

Reasons for the Decision

1. The appeal is admissible.

2. *Main Request: Article 123(2) EPC*

2.1 A first objection under Article 123(2) EPC relates to the claimed "emissive display device having a plurality of discharge cells". There is no dispute that the application as filed discloses plasma display panels, and that these are emissive displays comprising a plurality of discharge cells. The opponent argued that there exist types of emissive display device which have a plurality of discharge cells but which are not plasma display panels. Such displays are not disclosed in the application as filed, but are nevertheless now included in the claimed subject-matter. The proprietor agreed that such displays existed, but argued that they were, at least implicitly, disclosed in the application.

On this point, the Board finds itself in disagreement with both parties. Gas discharge displays have been known for decades, and the first prototypes for displays based on a plurality of discharge cells (in the form of a matrix array) were built in the 1950s and 1960s. From the earliest days such displays were commonly referred to as "plasma displays" or "plasma display panels".

This terminology is reflected in paragraph [0004] of the description as filed, in which it is stated that a plasma display panel "is a display apparatus containing a plurality of discharge cells", which the Board understands to be a definition of the term "plasma display panel". There is no hint or suggestion that a plasma display panel is merely one type of display containing a plurality of discharge cells.

A simple and effective counter-argument against the Board's position would have been to cite an example of a display device having a plurality of discharge cells which is not considered to be a plasma display panel. It is therefore telling that the opponent, in response to a direct question during the oral proceedings, was unable to do so.

For this reason the Board is not persuaded by the opponent's arguments. In the opinion of the Board, a "display device having a plurality of discharge cells" and a "plasma display panel" are, as a simple matter of definition, synonymous, and hence claim 1 does not represent an inadmissible extension of subject-matter in this respect.

2.2 The Board is also not persuaded by the opponent's argument (made in the written procedure, but not pursued in oral proceedings) that claim 1 of the main request does not meet the requirements of Article 123(2) EPC for failing to specify that the adhesive was only on a main surface, and not on a side surface. Various passages of the description, including those cited by the proprietor (paragraphs [0070] to [0072] of the application as filed) are considered to give an adequate basis for the claimed formulation.

2.3 Moreover, while claim 1 does not explicitly specify that the heat spreader is located at the back of the display panel, it would be implicit to the skilled person that this is where it must be, and hence no failure to meet the requirements of Article 123(2) EPC is seen in this respect, as alleged by the opponent.

2.4 The final feature of claim 1 of the main request objected to by the opponent for not complying with the requirements of Article 123(2) EPC is: "a heat spreader having two major surfaces, the heat spreader comprising at least one sheet of compressed particles of exfoliated graphite". By contrast, claim 1 as originally filed defined a "heat spreader ... comprising at least one sheet of compressed particles of exfoliated graphite", (with no mention of "major surfaces").

The term "comprising" is generally "interpreted as encompassing all the specifically mentioned features as well [as] optional, additional, unspecified ones" (T 425/98, Reasons, point 3.1). The heat spreader of original claim 1 was therefore defined such that it must include at least one sheet of compressed particles of exfoliated graphite, but might also include

essentially anything else, at least to the extent that such additional features would not be logically or technically absurd. In particular the additional features need not be sheet-like or planar.

In the description as filed, all of the disclosed heat spreaders are either in the form of a single sheet of compressed particles of exfoliated graphite or of a laminate having at least one such sheet, and hence they all have two major surfaces.

The application as filed therefore discloses heat spreaders at two levels of generality: the heat spreaders defined in claim 1 consist of a sheet of compressed particles of exfoliated graphite plus essentially any other features, while the heat spreaders of the description are single sheets or laminates of sheets, thereby having two major surfaces.

2.5 Claim 1 of the present main request defines a heat spreader at a third level of generality, consisting of a sheet of compressed particles of exfoliated graphite plus any other features, but subject to the further constraint that the heat spreader has two major surfaces, even where the other features are not sheet-like or planar. A heat spreader at this level of generality is not disclosed in the application as filed.

2.6 The proprietor's argument that the heat spreader of claim 1 of the main request is to be understood to be limited to one of the two arrangements disclosed in the description is not found persuasive. This argument amounts to asserting that the invention defined by the claims is to be understood as being limited to the specific embodiments set out in the description. This

assertion is clearly incorrect, and is explicitly contradicted by the description itself (paragraph [0080]).

2.7 Consequently, the Board finds that claim 1 of the main request does not meet the requirements of Article 123(2) EPC.

3. *Auxiliary Request 1: Article 123(2) EPC*

In claim 1 of auxiliary request 1, the objection mentioned under points 2.4 to 2.6, above, has been overcome by amendment. The objections mentioned under points 2.1 to 2.3 were seen by the opponent as applying also to claim 1 of auxiliary request 1, but these objections are not found persuasive for the reasons already set out in connection with the main request. Claim 1 of auxiliary request 1 is therefore found to meet the requirements of Article 123(2) EPC.

4. *Auxiliary Request 1: Inventive Step*

4.1 There is no dispute that D3 is the closest prior art and that the emissive display device of claim 1 of auxiliary request 1 differs from D3 only in comprising:

"*at least one sheet of compressed particles of exfoliated graphite*".

By contrast, D3 discloses an emissive display device (PDP) having a heat equalizing layer which may be in the form of a graphite sheet manufactured according to the passages from column 11, line 49 to column 14, line 22. Although the term is not employed in D3, it is undisputed that this sheet is of the type referred to as "pyrolytic graphite" in the art.

4.2 According to the proprietor, the problem solved by the distinguishing feature is to provide improved in-plane heat spreading properties.

4.3 D3 gives considerable attention to the need for in-plane heat equalisation (column 7, lines 55-65; column 10, lines 18-20 and 48-55; and column 13, lines 45-52), and the Board does not share the proprietor's view that this is merely an ancillary consideration. Starting from D3, the skilled person would therefore be motivated to solve the problem of improving the in-plane heat equalisation.

4.4 It is not disputed that a skilled person, faced with the problem of providing a heat equalising layer having superior heat spreading properties than those of D3, and relying on conventional notions, would not select a material having a lower in-plane thermal conductivity, which would be expected (at least for comparable thicknesses) to have inferior heat spreading properties. Equally undisputed is that the skilled person, at the priority date of the opposed patent, would have been aware that exfoliated graphite sheets have a considerably lower in-plane thermal conductivity than the pyrolytic graphite sheets of D3.

The point of dispute is what conclusion to draw from the above facts. The opponent argues that no persuasive evidence has been adduced that the conventional beliefs in the art are incorrect, and so the claimed use of exfoliated graphite sheets would not solve the posed problem, and would merely result in the sort of foreseeable deterioration of the prior art which could not be the basis for acknowledging an inventive step.

The proprietor argues that the inventors have discovered the surprising technical effect that, in practice, exfoliated graphite sheets provide better heat spreading properties than the pyrolytic graphite sheets of D3. The claimed solution, being counterintuitive, would not be obvious to the skilled person.

4.5 The success or failure of the proprietor's argument is clearly dependent on whether the alleged effect actually exists. Since the Board has no means of determining independently whether this effect is real or not, the question to be decided is whether the evidence provided by the proprietor plausibly demonstrates that exfoliated graphite sheets, despite their considerably lower in-plane thermal conductivity, nevertheless provide better in-plane heat spreading characteristics than pyrolytic graphite sheets.

4.6 Although some generally advantageous properties of exfoliated graphite sheets are mentioned in the description, the evidence for the specific technical effect on which the proprietor's inventive step argument is based is document D17 (in combination with data sheets D9, D11, D19 and D20, which provide information about the products mentioned in D17).

It was stated by the proprietor (and not challenged by the opponent) that sheet types PGS 70 micron and SS400 shown in D17 were available before the priority date. According to D19 and D20, PGS 70 micron (pyrolytic graphite) has an in-plane thermal conductivity of 750-950 W/mK and a through plane thermal conductivity of 15 W/mK. The comparable figures for SS400 (exfoliated graphite) are 400 and 3.7 W/mK (see D9 and D11). The graphite of sheet SS400 therefore has an in-

plane thermal conductivity which is about half of that of PGS 70 micron, and would therefore conventionally be supposed to have inferior heat spreading properties.

According to the proprietor, D17 shows - surprisingly - that this is not the case. In D17, thermal images of four sheets are shown, the sheets being in an arrangement whereby the "thermal interfaces are held in contact with a heat source by four clamps and the heat source is run at a constant power output. The thermal images show the thermal interfaces once they have reached steady state" (statement of grounds of appeal, point 35). Exfoliated graphite sheets SS400 (the lower figures in D17) are shown, unexpectedly, to have a better lateral heat distribution than sheets of pyrolytic graphite (PGS 70 micron).

4.7 The Board does not believe that D17 provides conclusive, or even plausible, evidence for the alleged surprising effect. The thermal images of D17 do not represent a comparison of like with like, in that there are very significant differences in the thicknesses of the films depicted.

In the opinion of the Board, there is nothing in the images of D17 which cannot be explained by a conventional analysis based on the generally accepted physical principle that the capacity of an object to conduct heat away from a heat source increases with increasing thermal conductivity and with increasing area perpendicular to the direction of heat flow. According to such an analysis, the lower in-plane thermal conductivity of SS400 (half that of PGS 70 micron) would indeed have the expected negative effect on its heat spreading properties, but this would be more than compensated by the much greater thickness of

SS400 250 micron (3.6 times as thick as PGS 70 micron) or SS400 500 micron (7.1 times as thick as PGS 70 micron).

4.8 The proprietor accepted that the difference in thicknesses might have some effect, but argued that it would not be significant, as shown by a similarity in the images for SS400 in the 250 and 500 micron thicknesses. In this respect also, the Board sees nothing in the images of D17 which goes beyond what would be conventionally expected, or which would require invoking a surprising technical effect.

D17 shows that the thin 70 micron sheet results in a temperature distribution with a significant thermal peak at the centre, whereas SS400 250 microns results in a significant improvement with a much flatter temperature distribution. Starting from this much flatter temperature distribution, the scope for further improvement of the flatness is necessarily limited, and hence the effect of doubling the thickness to 500 microns inevitably appears somewhat incremental.

An examination of temperature differences between the central point and points away from the centre shows that SS400 500 microns has a generally flatter temperature distribution than than SS400 250 microns, and therefore represents the sort of incremental improvement which would be conventionally expected.

4.9 The proprietor also argued that sheet SS1500 (top right figure in D17), even if not available to the public at the priority date of the patent, could be used as evidence in a comparison of the properties of pyrolytic and exfoliated graphite sheets. However, even if this evidence were taken into account, the Board does not

see why it would alter the above conclusions. On the contrary, sheets SS1500 25 micron and PGS 70 micron appear to result in significantly different temperature distributions, which, given that they are both formed of pyrolytic graphite, would appear to be explicable only in terms of sheet thicknesses.

4.10 In summary, while it cannot be excluded that the surprising effect mentioned above exists, the onus is on the proprietor to provide proof. It would presumably have been possible for the proprietor to create samples of exfoliated and pyrolytic graphite sheets of the same thickness, and to use them to produce thermal images similar to those of D17, thereby eliminating the influence of variations in thickness. However, the proprietor chose to provide only D17, and the Board can only judge this matter on the evidence actually provided, which, for the reasons set out above, fails to persuade the Board of the existence of the technical effect asserted by the proprietor.

4.11 Consequently, the technical problem can only be seen as the less demanding one of providing an alternative material for the heat equaliser of D3. D3 mentions the possibility of using "normal graphite" as an alternative to pyrolytic graphite (column 16, lines 29-33), and other forms of graphite known at the priority date, such as exfoliated graphite, would be obvious possibilities.

The skilled person would be aware that exfoliated graphite has a lower in-plane thermal conductivity than pyrolytic graphite, which, for an identical sheet thickness would result in inferior heat spreading properties. However, unless it was imperative to provide a very thin heat equaliser, merely increasing

the thickness of the exfoliated graphite sheet would compensate for this drawback. Moreover, the opponent's submission at oral proceedings that pyrolytic graphite is much more expensive than exfoliated graphite was not challenged by the proprietor, and would provide a clear and obvious motivation for the skilled person to consider the use of exfoliated graphite in circumstances where a somewhat reduced in-plane thermal conductivity could be tolerated.

4.12 Hence, starting from document D3, and on the basis of the common knowledge in the art at the priority date of the opposed patent, the skilled person would be led to the distinguishing feature of the claim as a solution to the posed problem. The subject-matter of claim 1 of auxiliary request 1 does not therefore involve an inventive step within the meaning of Article 52(1) EPC and Article 56 EPC 1973.

5. *Auxiliary Request 2: Admission into the Proceedings*

5.1 The Board can accept that the nature of the objections of an opposition division may only become fully apparent to a proprietor during oral proceedings, or even on receipt of the written decision. Under certain circumstances, therefore, it may be reasonable to allow a proprietor to respond by filing a limited number of new requests early in the appeal proceedings.

5.2 In the present case, auxiliary request 2 is the sole new request, and was filed at the earliest possible stage of the appeal proceedings, i.e. with the statement of grounds of appeal. Auxiliary request 2 is therefore admitted into the proceedings.

6. *Auxiliary Request 2: Clarity*

6.1 Claim 1 of auxiliary request 2 comprises the following feature:

"without causing undesirable damage to the at least one sheet of compressed particles of exfoliated graphite".

This feature was not part of any granted claim, and hence is open to a clarity objection (G 3/14, Catchword).

6.2 In the product defined by claim 1, a surface of a sheet of exfoliated graphite is adhered to an emissive display device, and hence this surface is not directly visible. It is therefore not entirely clear to the Board how the skilled person would determine, by inspection of this product, whether this surface was damaged or not. Moreover, as argued by the opponent, the phrase "undesirable damage" raises doubts whether some damage might be tolerable.

However, even if the Board accepted that the skilled person would be able to determine whether the sheet was damaged, and that having no "undesirable damage" meant having essentially no damage, the claimed subject-matter would still not be clear within the meaning of Article 84 EPC 1973 for the following reasons:

6.3 Under the above assumptions, a skilled person would be able to identify, by inspection, an emissive display device having all of the concrete features of claim 1, including an essentially undamaged exfoliated graphite sheet.

However, in order to ascertain whether this device fell within the ambit of the claim, the skilled person would

also have to be able to determine the history of the exfoliated graphite sheet.

In particular, the skilled person would need to be able to distinguish between:

- undamaged exfoliated graphite sheets having previously undergone, during manufacturing, the removal of a release material as set out in the claim; and
- undamaged exfoliated graphite sheets which have not previously undergone the removal of the claimed release material, for example where no release material was used, and the adhesive was applied directly during manufacturing.

6.4 The Board does not see how a skilled person, by inspection of the device, could possibly make such a distinction or infer the previous manufacturing history, since the evidence - an undamaged graphite sheet - would be identical in both cases.

As a result, claim 1 of auxiliary request 2 would not allow a skilled person to determine unambiguously which devices would fall within the ambit of the claim and which would not. It is therefore not clear within the meaning of Article 84 EPC 1973.

7. *Auxiliary Request 2: Inventive Step*

7.1 In any event, the Board also believes that the features added to claim 1 of auxiliary request 2 compared to claim 1 of auxiliary request 1 do not make any contribution to rendering the claimed subject-matter inventive. These features are as follows:

(a) *"the at least one sheet of compressed particles of exfoliated graphite being configured to be adhered to the emissive display device after removing a release material previously overlaying the adhesive, with the adhesive being sandwiched between the at least one sheet of compressed particles of exfoliated graphite and the release material"* and

(b) *"wherein the adhesive and release material are configured to provide an average release load of no greater than 40 grams per centimeter at a release speed of one meter per second without causing undesirable damage to the at least one sheet of compressed particles of exfoliated graphite"*.

7.2 Feature (a) specifies that the adhesive was at one time covered by a "release material", which was subsequently removed during manufacture and does not form part of the final product.

Feature (b) is not seen as providing any limitation of the adhesive *per se*, but rather defines parameters relating to the process of removal of the release layer, which is not part of the claimed device, prior to mounting the sheet.

The Board therefore does not believe that it has been convincingly demonstrated that the features of claim 1 of auxiliary request 2 which are additional to those of claim 1 of auxiliary request 1 would actually result in a recognisably different device. Consequently, the conclusion that claim 1 of auxiliary request 1 does not involve an inventive step within the meaning of Article 52(1) EPC and Article 56 EPC 1973 applies equally to claim 1 of auxiliary request 2.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

S. Sánchez Chiquero G. Eliasson

Decision electronically authenticated