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**Datasheet for the decision  
of 4 December 2017**

**Case Number:** T 1735/12 - 3.3.01

**Application Number:** 05730999.9

**Publication Number:** 1751240

**IPC:** C09D11/02, C09D11/10, B41M1/10

**Language of the proceedings:** EN

**Title of invention:**  
PHOTOINITIATORS FOR USE IN INTAGLIO PRINTING INKS

**Patent Proprietor:**  
Sun Chemical Corporation

**Opponent:**  
SICPA HOLDING SA

**Headword:**  
Intaglio printing ink/SUN

**Relevant legal provisions:**  
EPC Art. 83, 56  
EPC R. 106

**Keyword:**

Main request, auxiliary request 1: sufficiency of disclosure  
(no)

Auxiliary request 2: sufficiency of disclosure (yes), inventive  
step (yes)

**Decisions cited:**

**Catchword:**



**Beschwerdekammern**  
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Case Number: T 1735/12 - 3.3.01

**D E C I S I O N**  
**of Technical Board of Appeal 3.3.01**  
**of 4 December 2017**

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**Decision under appeal:** **Decision of the Opposition Division of the  
European Patent Office posted on 14 May 2012  
rejecting the opposition filed against European  
patent No. 1751240 pursuant to Article 101(2)  
EPC.**

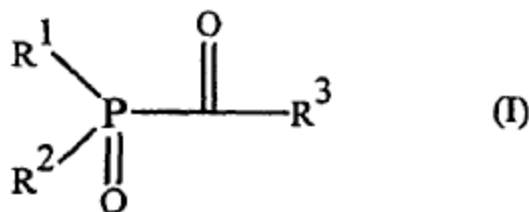
**Composition of the Board:**

**Chairman** A. Lindner  
**Members:** J. Molina de Alba  
M. Blasi

## Summary of Facts and Submissions

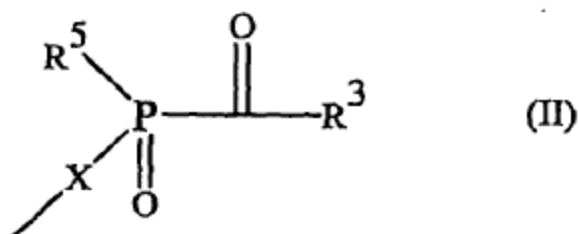
- I. The present appeal lies from the decision of the opposition division to reject the opposition filed against European patent No. 1 751 240.
- II. Claim 1 of the patent as granted reads as follows:

"1. An energy curable intaglio printing ink, curing by free radical acrylate chemistry, and including a photoinitiator comprising an acylphosphine oxide, whereby the ink does not fluoresce in at least the visible light wavelength region when exposed to ultraviolet light, and in which said acylphosphine oxide is a compound of formula (I):



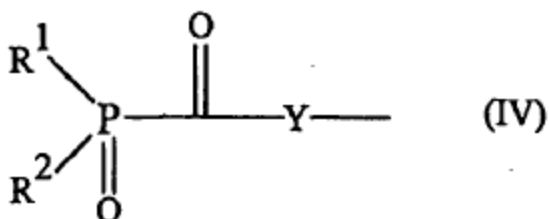
in which:

R<sup>1</sup> and R<sup>2</sup> are independently selected from C<sub>1</sub>-C<sub>12</sub> alkyl groups, C<sub>3</sub>-C<sub>7</sub> cycloalkyl groups, aryl groups, aralkyl groups, heterocyclic groups having from 3 to 7 ring atoms, of which at least one is a sulphur or nitrogen atom and groups of formula -COR<sup>3</sup>; or R<sup>2</sup> represents a group of formula -OR<sup>4</sup>, where R<sup>4</sup> represents a C<sub>1</sub>-C<sub>6</sub> alkyl group, an aryl group, an aralkyl group or a cationic group or atom, or R<sup>2</sup> represents a group of formula (II):



where X represents a C<sub>1</sub>-C<sub>18</sub> alkylene group or a biphenyldiyl group, and R<sup>5</sup> represents any of the groups represented by R<sup>1</sup> or a group of formula-OR<sup>4</sup>; and

R<sup>3</sup> represents a C<sub>1</sub>-C<sub>6</sub> alkyl group, an aryl group, a heterocyclic group having from 3 to 7 ring atoms, of which at least one is a sulphur or nitrogen atom, or a group of formula (IV):



where Y represents a C<sub>1</sub>-C<sub>18</sub> alkylene group a phenylene group, a cyclohexylene group or a biphenyldiyl group."

- III. In the following, any reference to fluorescence in the present decision is to be understood as meaning fluorescence in the visible light wavelength region upon exposure to UV light.
- IV. The evidence invoked by the parties during the opposition/appeal proceedings includes *inter alia* the following prior art documents:

- (1) WO 02/094952
- (3) Sumiyoshi T. et al., *Polymer*, 26, 1985, 141-146
- (4) Decker C. et al., *Polymer*, 42, 2001, 7551-7560
- (5) US 2003/0119932
- (7) Allen N.S. et al., *Surface Coating International*, 2, 1999, 67-76
- (9) Segurola J. et al., *Polymer Degradation and Stability*, 64, 1999, 39-48

V. In the decision under appeal, the opposition division found that none of the grounds for opposition raised by the opponent, namely Article 100(c), (b) and (a) EPC (lack of novelty and inventive step), prejudiced the maintenance of the patent as granted.

The division held *inter alia* that the invention underlying the patent was sufficiently disclosed because, even if the acylphosphine oxide photoinitiators in the ink of claim 1 were known from document (3) to exhibit fluorescence, the ink might nevertheless not fluoresce due to the presence of other components or to its exposure to oxygen.

In its analysis of inventive step, the opposition division identified document (1) as the closest prior art, because it was the only document on file which dealt with inks for intaglio printing of security documents. The ink in granted claim 1 differed from the one in document (1) by its photoinitiator, which, as shown in Table 2 of the patent, provided non-fluorescent cured inks. This lack of fluorescence in

the cured inks was considered by the division to be surprising, because the photoinitiators defined in claim 1 were fluorescent, as taught in document (3). On this basis, an inventive step was acknowledged.

- VI. The opponent (appellant) filed an appeal against this decision.
- VII. With letter dated 12 April 2013, the patentee (respondent) referred to the claim set filed in opposition with letter dated 22 October 2010 as auxiliary request 1. In addition, two further claim sets were filed as auxiliary requests 2 and 3. Auxiliary requests 1 and 2 are discussed in the present decision:

Claim 1 of auxiliary request 1 differs from granted claim 1 in that the ink further contains a pigment.

Clam 1 of auxiliary request 2, which corresponds to granted claim 8, reads as follows:

"1. A method of producing a document, which comprises intaglio printing on a substrate which does not fluoresce in at least the visible region under ultraviolet light using an intaglio printing ink, curing by free radical acrylate chemistry, and which includes a photoinitiator comprising an acylphosphine oxide, and curing the ink by exposure to a source of radiant energy."

- VIII. In its preliminary opinion, sent as an annex to the summons to oral proceedings, the board *inter alia* noted that it interpreted the feature in granted claim 1 "whereby the ink does not fluoresce" as referring to the cured ink rather than to the uncured ink. In

accordance with this construction, the board considered the invention underlying granted claim 1 to be sufficiently disclosed. In addition, the board concurred with the opposition division that document (1) was the most suitable starting point for the assessment of inventive step and that its combination with documents (3), (4), (7) or (9) did not render the solution proposed in granted claim 1 obvious.

IX. Oral proceedings were held before the board on 4 December 2017.

During the course of the oral proceedings and having heard the parties on the construction of granted claim 1, the board indicated that it would agree with the parties' interpretation of claim 1 that it required that the uncured ink did not fluoresce.

After the board announced its conclusion on the issue of sufficiency of disclosure with regard to the main request and auxiliary requests 1 and 3, the respondent submitted the following objection under Rule 106 EPC in writing: *"By deciding that the subject-matter of the main request and auxiliary requests 1 and 3 was not sufficiently disclosed under Art. 83 EPC the Board of Appeal deviated from the consistent case law and established legal principles of the EPC and the member states. The burden of proof was entirely with the opponent. The proprietor should have been given the chance to file experiments. Proprietor's right to be heard was violated. We request that the proceedings be continued in writing, or the proprietor be given the opportunity to produce appropriate experiments in preparation for adjourned oral proceedings."*



In addition, the respondent filed a further set of claims as auxiliary request 4.

- X. The appellant's arguments, insofar as they are relevant to the present decision, may be summarised as follows:

In its discussion of sufficiency of disclosure in relation to the main request (patent as granted), the appellant submitted that claim 1 defined an intaglio printing ink which did not fluoresce in its uncured state. This was clear from the fact that the ink was curable and contained a photoinitiator. The problem of sufficiency of disclosure arose from the fact that the acylphosphine oxide photoinitiators defined in claim 1 were known to be fluorescent (see document (3), page 142, Figure 1), but the patent did not contain any information on how to suppress this fluorescence in the uncured ink. Claim 1 specified only two of the ink components, namely a polymerisable acrylate component and a photoinitiator known to be fluorescent. The patent however neither made credible that said acrylate component suppressed the photoinitiator's fluorescence, nor provided any guidance on how to select additional components suitable to do it. Moreover, the patent presented no measures of fluorescence in uncured inks. Therefore, it failed to prove that the uncured inks were indeed not fluorescent. In summary, the patent neither made plausible that the uncured ink showed no fluorescence nor contained any information on how to suppress the photoinitiator's fluorescence in the uncured ink. In such a situation, the burden of proving that the skilled person was able to prepare a non-fluorescent, uncured ink as defined in claim 1 was with the respondent, and it had not been discharged.

For the same reasons, the invention underlying auxiliary request 1 also lacked sufficiency of disclosure.

In its analysis of the inventive step of the method in claim 1 of auxiliary request 2, the appellant regarded document (5) as the most suitable starting point, because it dealt with energy-curable compositions useful as printing inks of all types (see paragraph [0129]), which comprised the photoinitiators of the patent. The appellant emphasised that the inks in the examples of document (5) were very similar to those in document (1), which confirmed that the compositions in document (5) were suitable as intaglio printing inks. The appellant noted likewise that intaglio printing inks differed from other printing inks only by their viscosity, which could be easily and routinely adjusted by a skilled person.

Considering document (1) as the closest prior art, the appellant identified the nature of the photoinitiator in claim 1 as the distinguishing feature and, because the claim did not require the ink to lack fluorescence, the objective technical problem was the provision of an alternative intaglio printing ink.

The solution proposed in claim 1 was obvious in the light of document (4), because intaglio printing required curing of thick ink layers and document (4) disclosed that acylphosphine oxide photoinitiators were the most efficient photoinitiators in terms of polymerisation rate and cure extent, and this allowed them to deep-through cure thick specimens (see abstract; and sections 3.2 and 4). Furthermore, document (4) made explicit reference to UV-curable printing inks on page 7556, right column, paragraph 2.

In case the board held that the aspect of fluorescence had to be considered in the formulation of the problem to be solved, the appellant argued that the skilled person would have expected the final inks to be non-fluorescent, because document (4) taught that acylphosphine oxide photoinitiators were fully consumed upon exposure to sunlight. This was even more apparent knowing that inks were generally cured by irradiation with a focused beam. Hence, it would have been obvious to the skilled person that acylphosphine oxide photoinitiators would leave no fluorescent residues in the cured ink. This argument was reinforced by the passage bridging pages 46 and 47 in document (9), which stated that acylphosphine oxide photoinitiators are bleached upon exposure to daylight.

Lastly, in relation to the statement in paragraph [0005] of document (5) that acylphosphine oxides were very effective photoinitiators but that they were not fully consumed upon curing, the appellant contended that this was not credible, because it was not in line with the teaching of documents (4) and (9).

XI. The respondent's arguments, insofar as they are relevant to the present decision, may be summarised as follows:

Regarding the issue of sufficiency of disclosure, the respondent concurred with the appellant that the lack of fluorescence mentioned in claim 1 of the main request (patent as granted) indeed referred to the uncured ink. However, this was not an obstacle for the skilled person to carry out the invention, because the patent specification explained how to prepare the claimed inks and the examples showed that, contrary to

the inks of the prior art, those according to claim 1 were not fluorescent. Furthermore, the patent specification explained in detail the additional ingredients that could be added to the ink, and the lack of fluorescence shown in the patent examples for cured inks made it plausible that uncured inks did not fluoresce either.

With respect to the teaching in document (3) that photoinitiators as defined in claim 1 were fluorescent, the respondent argued that the photoinitiator environment in document (3) differed from that in the claimed inks and that this could have a decisive influence on their fluorescence. Thus, as the appellant had failed to discharge its burden to prove that the claimed inks fluoresce, the invention had to be acknowledged as being sufficiently disclosed.

For the same reasons, the invention underlying auxiliary request 1 was also sufficiently disclosed.

On the issue of the inventive step of the method in claim 1 of auxiliary request 2, the respondent viewed document (1) as the closest prior art, because it was specifically directed to intaglio printing inks and their use for printing security documents. By contrast, document (5) related to printing inks of all types and did not deal with the specific problems raised in the patent regarding the printing of security documents.

Starting from document (1), the respondent agreed with the appellant that the nature of the photoinitiator in claim 1 was the distinguishing feature. However, the respondent dissented in the formulation of the problem to be solved which, in its opinion, lay in the provision of a method of producing a document by

intaglio printing on a substrate which did not fluoresce, characterised by the fact that the printing ink did not fluoresce either. The comparative tests presented in Table 2 of the patent provided evidence that the solution proposed in claim 1 effectively solved the problem posed, while the use of photoinitiators other than those proposed in claim 1 resulted in fluorescent inks.

As to obviousness, the skilled person would not have taken document (4) into consideration, firstly because document (4) mentioned neither intaglio printing inks nor fluorescence, secondly because document (4) referred in its abstract to exterior applications rather than to inks, and thirdly because document (4) disclosed not only the photoinitiators in claim 1 but also others, such as Irgacure 369, which, as shown in Table 2 of the patent, resulted in fluorescent inks.

With reference to the passage bridging pages 46 and 47 of document (9), the respondent argued that all photoinitiators decompose during irradiation but, in general, the resulting inks still fluoresce, because photoinitiators are not fully decomposed (chemical reactions never reach 100% conversion) or because decomposition products also fluoresce. This could be seen from the results in Table 2 of the patent. Hence, the respondent's finding that acylphosphine oxide photoinitiators yield non-fluorescent inks was surprising. Moreover, as this effect had been shown for two members of the acylphosphine oxide photoinitiator family that were structurally quite different, it could be expected to occur across the whole scope of claim 1.

XII. The final requests of the parties were as follows:

- 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, alternatively, that the patent be maintained in amended form on the basis of the claims of auxiliary request 1, filed with letter of 22 October 2010 in the opposition proceedings, or auxiliary requests 2 or 3, filed with the reply to the statement of grounds of appeal of 12 April 2013, or, by way of a further alternative, on the basis of the claims of auxiliary request 4 filed at the oral proceedings on 4 December 2017.

XIII. At the end of the oral proceedings, the decision of the board was announced.

### **Reasons for the Decision**

1. The appeal is admissible.
2. *Main request - Sufficiency of disclosure (Articles 100(b) and 83 EPC)*
  - 2.1 *Construction of claim 1*

The appellant's objection of lack of sufficiency was based on the premise that the feature in granted claim 1 "whereby the ink does not fluoresce in at least the visible light wavelength region when exposed to ultraviolet light" referred to the uncured ink rather than to the ink obtained after curing. Conversely, the board held in its preliminary opinion that, although

claim 1 referred to "curable" inks (i.e. uncured inks), a reading of the patent specification, in particular of paragraphs [0015] and [0016] and the examples therein, seemed to convey that the requirement of non-fluorescence was essential after ink curing rather than before it. In this context, considering that the construction of claim 1 was crucial for the assessment of sufficiency and inventive step, the board sought to clarify this issue at the beginning of the oral proceedings.

The parties agreed that claim 1 effectively requires that the ink does not fluoresce in its uncured state. In addition, the respondent noted that this made sense, because a non-fluorescent, uncured ink would result in a likewise non-fluorescent ink after curing.

In view of the parties' opinion, the board accepted the construction that the ink in granted claim 1 does not fluoresce in its uncured state.

## 2.2 *Lack of fluorescence in the uncured ink*

Figure 1 in document (3) shows that the compound 2,4,6-trimethylbenzoyldiphenylphosphine oxide is fluorescent. This compound is known as Lucerin TPO and is the acylphosphine oxide photoinitiator in example 1 of the patent. Thus, claim 1 defines a non-fluorescent, uncured ink which contains a fluorescent compound as one of its essential components. This was not contested by the respondent.

In such a situation, where in view of the prior art claim 1 contains an inherent contradiction, the board holds that the question of whether the claimed composition can be plausibly prepared is fully

justified. The patent does not, however, help to answer this question, because it does not contain any proof or explanation that could counter the inconsistency. Thus, although the patent discloses in its examples compositions that are said to be according to claim 1, their fluorescence was measured only after curing, when the photoinitiator was deemed not to be present any more, or at least not in appreciable amounts. Hence, the patent does not make it plausible that uncured inks containing an acylphosphine oxide photoinitiator as defined in claim 1 and an acrylate component may not fluoresce. For this reason, the board holds that the patent does not disclose the invention underlying granted claim 1 in a manner sufficiently clear and complete for the skilled person to carry it out.

On this issue, the respondent argued that the patent contains sufficient information for the preparation of the inks disclosed in claim 1, including a detailed explanation of their possible additional ingredients. At the same time, it gave three reasons to support its assertion that the claimed uncured ink plausibly did not fluoresce: Firstly, the examples in the patent (see Table 2) showed that the claimed inks did not fluoresce while those according to the prior art did; this lack of fluorescence in the cured inks made it plausible that the uncured inks lacked fluorescence too. Secondly, the uncured ink would lack fluorescence because components present in its composition would suppress the photoinitiator's fluorescence. And thirdly, the environment of the acylphosphine oxide photoinitiator in document (3) was different to the one in the claimed inks (benzene, methanol or dichloromethane in document (3) vs. acrylates in the patent), so it was not derivable from document (3) that



the photoinitiator of claim 1 was fluorescent when present in the claimed inks.

The board did not find these arguments convincing because, although the patent teaches how to prepare an energy printing ink curable by free radical acrylate chemistry which comprises an acylphosphine oxide photoinitiator, it does not provide any information on how to prepare such an ink which fulfils the requirement of not being fluorescent, and it does not even make it plausible that such inks may be prepared at all. The patent does not recognise the difficulty of providing a non-fluorescent, uncured ink as defined in claim 1, but this difficulty becomes apparent when reading document (3), which discloses the fluorescent properties of an acylphosphine oxide according to claim 1. In this respect, the respondent's argument that the different environment of the photoinitiator in the ink of claim 1 (i.e. acrylate chemistry or additional, unspecified components) might suppress fluorescence is an unsupported allegation. The respondent has provided neither a convincing explanation on how this might possibly happen according to the general knowledge in the field, nor experimental evidence proving the correctness of its argument. Thus, the argument cannot be accepted by the board. Also the respondent's assertion that a lack of fluorescence in the cured ink would render it plausible that the uncured ink was not fluorescent is purely speculative.

In view of the above, the board came to the conclusion that, having regard to document (3), it is not credible that the inks illustrated in the patent lack fluorescence in their uncured state.

3. *Auxiliary request 1 - Sufficiency of disclosure  
(Article 83 EPC)*

Claim 1 of auxiliary request 1 is directed to an ink as defined in granted claim 1, which further contains a pigment.

The parties did not provide any additional arguments on this request.

The board considers that the addition of a pigment does not change the situation discussed in relation to the main request. Consequently, for the reasons already explained, the invention underlying auxiliary request 1 is also not sufficiently disclosed.

4. *Objection according to Rule 106 EPC - Right to be heard  
(Article 113(1) EPC)*

- 4.1 In the course of oral proceedings before the board, the respondent raised an objection under Rule 106 EPC (see section IX above and minutes of the oral proceedings before the board). In its opinion, the board's conclusion that the invention underlying claim 1 of the main request and auxiliary requests 1 and 3 was not sufficiently disclosed deviated from the established case law, according to which the burden of proof was entirely with the appellant. This deviation had taken the respondent by surprise and violated its right to be heard. Therefore, it requested that the proceedings be continued in writing or that the oral proceedings be adjourned to give the respondent the opportunity to produce appropriate experiments.

The different aspects of this objection are dealt with in the following points.

4.2 *Established case law regarding the burden of proof*

In its objection under Rule 106 EPC, the respondent generally referred to the consistent case law and established legal principles of the EPC and the member states which, in its opinion, stated that the burden of proof was with the appellant. In this respect, the board draws attention to chapter III.G.5.1 of the book "Case Law of the Boards of Appeal of the European Patent Office", 8th edition 2016, which summarises the case law and principles referred to by the respondent. In particular, the first paragraph in that chapter reads as follows (emphasis in the original):

*"In the absence of relevant EPC provisions, the principles concerning the allocation of the burden of proof have been developed through the case law of the boards of appeal. **Each party bears the burden of proof for the facts it alleges.**"*

The same chapter establishes further in point III.G.5.1.2(c), which is particularly related to the burden of proof in connection with sufficiency of disclosure (emphasis in the original):

*"The burden of proof of insufficiency is as a general rule on the **opponents**, who should prove that despite making all reasonable efforts they were unable to put the invention into practice. If the patentee is claiming a result, which the prevailing technical opinion suggests is not achievable, and if the opponents are not able to repeat the method in the patent, they cannot be expected to do more than the patentee. Then, the burden of proof is on the patentee to show that the extraction method in the patent works*

*as stated so that at least one way of putting the invention into practice has been given to the skilled person".*

Bearing this established case law in mind, the board agrees that the appellant originally had the burden of proving that the invention was not sufficiently disclosed. However, this burden was met by the appellant when it filed document (3), evidencing that the claimed composition could not be plausibly prepared. Thus, the burden of proof was shifted to the respondent, who, nevertheless, did not provide evidence to discharge it. Hence, contrary to the respondent's opinion, the burden of proof was not with the appellant when the board had to decide on this issue, nor did the board deviate from the consistent case law and established legal principles of the EPC.

#### *4.3 Respondent taken by surprise*

As explained in point 4.2 above, the board does not agree that it deviated from the established case law. In addition, the reasons why the invention underlying the patent as granted and auxiliary requests 1 and 3 was not sufficiently disclosed were set out by the appellant in the statement of grounds of appeal (see points 2.3 and 2.4). These reasons were further discussed in the course of oral proceedings, and the respondent had ample opportunity to comment thereon. Accordingly, even if the respondent might have been taken by surprise on a personal level, from an objective point of view, the board cannot accept the respondent's assertion that the board's conclusion on sufficiency of disclosure had taken it by surprise and that it had thus had no opportunity to present its comments on this topic (see also Case Law of the Boards

of Appeal of the European Patent Office, 8th edition 2016, chapter III.B.2.3.1 and IV.F.3.13.8).

For the sake of completeness, the board acknowledges that at oral proceedings it deviated from its preliminary opinion on the issue of sufficiency of disclosure. This deviation was, however, a direct consequence of the construction of claim 1 on which both parties agreed at the beginning of the oral proceedings (see above point 2.1). As this construction was contrary to the one set out by the board in its preliminary opinion, it could be foreseen that its assumption by the board would have implications for the assessment of sufficiency.

Therefore, the board rejects the respondent's contention that it had been taken by surprise.

4.4 *Continuation of the proceedings in writing or adjournment of oral proceedings to file experimental evidence*

The respondent argued that, having been taken by surprise by the board's conclusion on sufficiency of disclosure and in order to avoid a violation of the respondent's right to be heard, the board should have continued the proceedings in writing or adjourned the oral proceedings in order to give it the opportunity of filing experimental evidence.

As explained in point 4.3 above, the board rejects the respondent's claim that it had been taken by surprise, because the board's conclusion on sufficiency of disclosure was based on an argument that was on file from the beginning of the appeal proceedings (see statement of grounds of appeal, sections 2.3 and 2.4).

Despite this, during the entire written proceedings, the respondent did not file any evidence to counter the lack of plausibility that had been made credible by the appellant. Taking the procedural history of this argument into account, there was, in the board's opinion, no justifiable reason for granting the respondent's request for a continuation of the proceedings in writing or for an adjournment of the oral proceedings, especially as oral proceedings are, as a general rule, scheduled with a view to ensuring that the case is ready for decision at the conclusion of the oral proceedings (see Article 15(6) RPBA).

In consequence, the board held that delaying the proceedings at such a late stage in order for the respondent to file evidence was against the principles of fairness and procedural economy.

4.5 Following the above, the board concluded that it had not violated the respondent's right to be heard (Article 113(1) EPC) and dismissed the objection under Rule 106 EPC and the respondent's request for adjournment of the oral proceedings or continuation of the proceedings in writing.

5. *Auxiliary request 2 - Inventive step (Article 56 EPC)*

5.1 *Field of the invention*

The patent relates to the use of certain acylphosphine oxides as photoinitiators in the preparation of energy curable intaglio printing inks which cure by free radical acrylate chemistry. These inks are characterised by the fact that, once cured, they do not fluoresce. This property makes the inks useful for the production of security documents, because the lack of

fluorescence means that it is possible to determine whether or not a security document, e.g. a banknote, is counterfeit (see paragraphs [0001], [0015] and [0016] in the patent).

Claim 1 of auxiliary request 2 is directed in particular to the production of a document by intaglio printing of a non-fluorescent substrate with the energy curable inks of the invention.

## 5.2 *Choice of the closest prior art*

In its inventive step analysis of the method of claim 1 of auxiliary request 2, the respondent considered document (1) as the closest prior art. By contrast, the appellant viewed document (5) as the most suitable starting point.

Document (1) is directed to the production of security documents by the intaglio printing process using an ink that contains a photoinitiator and cures by free radical acrylate chemistry upon UV radiation (see claim 1; page 1, paragraph 1; paragraph bridging pages 4 and 5; and paragraph bridging pages 6 and 7). Thus, the problem tackled in document (1) is closely related to the one in the patent. In addition, having regard to their compositions, the uncured inks disclosed in the patent and those in document (1) differ only by their photoinitiators. Hence, document (1) represents a promising starting point for the assessment of inventive step.

Document (5) deals with the problem of yellowing in substrates obtained by curing ethylenically unsaturated polymerisable compounds, e.g. acrylates, with acylphosphine oxide photoinitiators (see paragraphs

[0002], [0075] and [0076]; and claims 1, 11 and 12). This problem arises from the fact that acylphosphine oxide compounds, albeit being very effective photoinitiators, are not fully consumed upon curing. Therefore, the resulting cured substrate often has an undesired yellow colour (see paragraph [0005]). The solution proposed in document (5) is curing the composition in the presence of low levels of certain red, blue or violet pigments (see paragraph [0007]). Cured substrates according to document (5) are, for instance, printing inks (see paragraphs [0120] and [0129] and examples 1, 4 and 5).

Having regard to the fact that document (5) mentions inks in general as one of several types of composition, that it is completely silent on intaglio printing inks, and that it is concerned with a problem other than the printing of security documents, it is difficult for the board to see what motivation would lead the skilled person to modify the compositions in document (5) in order to produce a non-fluorescent document by an intaglio printing process as defined in claim 1 of auxiliary request 2. Therefore, in the board's view, document (5) is not a suitable starting point for the assessment of inventive step.

In conclusion, document (1) represents the closest prior art.

### 5.3 *Problem to be solved*

Starting from document (1) and in line with the respondent's submissions, the objective technical problem may be defined as the provision of a method of producing a non-fluorescent document by intaglio printing.



The solution proposed in claim 1 consists of printing a non-fluorescent substrate with an intaglio printing ink that contains an acylphosphine oxide photoinitiator and cures by free radical acrylate chemistry.

The board is satisfied that this solution solves the problem posed, because examples 1 and 2 in Table 2 of the patent prove that intaglio printing inks cured by acrylate chemistry using two different members of the photoinitiator family of acylphosphine oxides indeed show no fluorescence.

The appellant did not agree with the mention in the objective technical problem of the requirement that the ink should not fluoresce, because this was not a feature specified in claim 1. Accordingly, the appellant formulated the problem to be solved as the provision of an alternative intaglio printing ink.

The board cannot agree with that view, because the objective technical problem needs to take account of the effect shown in the patent and based on the distinguishing feature(s) over the state of the art. Otherwise, the problem would not reflect the patent proprietor's intention as stated in the patent specification and fulfilled by the solution proposed in the claims. In the present case, the patent shows in Table 2 that cured inks according to the method of claim 1 did not fluoresce, while those prepared using other photoinitiators of the prior art did. Hence, the formulation of the problem has to include the aspect that the ink does not fluoresce.

#### 5.4 *Obviousness*

Regarding the question of whether or not the solution proposed in claim 1 was obvious, the premise underlying the parties' arguments was that, in order to obtain a cured ink which does not fluoresce, the minimum requirement is that the photoinitiator should be fully consumed in the curing process. Eventually, products resulting from photoinitiator decomposition and remaining in the ink should not fluoresce either.

The appellant submitted that, starting from document (1), the skilled person would have been prompted to use acylphosphine oxides as photoinitiators, because document (4) (see abstract; Chart 1; Figures 1, 3, 9 and 13) presents these photoinitiators as the most efficient ones in terms of polymerisation rate and cure extent compared with typical radical photoinitiators, including those tested in Table 2 of the patent. Moreover, document (4) made it obvious in the passage on page 7556, left column, lines 1 to 3, that the photoinitiator was fully consumed upon curing, as it stated that the amount of residual photoinitiator in the UV-cured coating will be low, dropping to zero within minutes upon exposure to sunlight. Lastly, the fact that acylphosphine oxides achieve a deep-through cure (see document (4), page 7553, right column, paragraph 2; and page 7556, right column, paragraph 3) was a clear hint that they were suitable for intaglio printing inks, which were known to be thicker than other inks.

Similar teachings could be found in document (3) (see page 141), document (7) (see "Acylphosphine Oxides" on page 68 and "Reactivity of near UV photoinitiators" on pages 69 and 70) and document (9). In particular, document (9) disclosed in the paragraph bridging pages 46 and 47 that acylphosphine oxides produce little

yellowing and that this decreases by degradation of the remaining photoinitiator upon absorption of light.

Accordingly, in the appellant's view, it would have been obvious to the skilled person that the use of acylphosphine oxides as photoinitiators in the inks of document (1) yielded cured inks with no remaining fluorescence, thereby solving the problem posed.

The board does not find the appellant's argument convincing. It agrees with the respondent that, although documents (3), (4), (7) and (9) disclose the high efficiency of acylphosphine oxides as photoinitiators, this does not necessarily imply that they decompose to 100% and that they do not generate any fluorescent decomposition product which remains in the ink. This argument is confirmed by the passage in paragraph [0005] of document (5), which, despite having been filed after documents (3), (4), (7) and (9) were published, still acknowledged that acylphosphine oxides compounds are very effective photoinitiators but that they are not fully consumed upon curing. On this point, the appellant considered that the statement in paragraph [0005] of document (5) had to be disregarded, because it was not credible, as it contradicted the teaching of documents (4) and (9). The board, nevertheless, does not see a contradiction between document (5) and documents (4) and (9), since a rapid and efficient reaction does not equate with a conversion of 100%, nor does it imply that no fluorescent decomposition products are generated.

Consequently, it cannot be derived from the evidence on file that the use of acylphosphine oxide photoinitiators would have appeared to the skilled person as an obvious solution to the problem posed. Therefore, the board

cannot conclude that the method defined in claim 1 of auxiliary request 2 was obvious. This applies likewise to all the other claims in auxiliary request 2, since they are all dependent on claim 1.

6. *Further objections*

The appellant confirmed at oral proceedings that its only objection to the claims of auxiliary request 2 was lack of inventive step. The board does not see any reason to raise further objections against this request either.

**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 in the following version:

Claims 1 to 12 of auxiliary request 2 filed with the reply to the statement of grounds of appeal, and a description to be adapted thereto.

The Registrar:

The Chairman:



M. Schalow

A. Lindner

Decision electronically authenticated