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D E C I S I O N
of 8 December 2004

Case Number: T 0528/00 - 3.4.2

Application Number: 93918462.8

Publication Number: 0654150

IPC: G03F 7/09

Language of the proceedings: EN

Title of invention:

A flexographic printing element having an IR ablatable layer
and process for making a flexographic printing plate

Applicant:

E.I. DU PONT DE NEMOURS AND COMPANY

Opponent:

-

Headword:

-

Relevant legal provisions:

EPC Art. 56

Keyword:

"Inventive step - no (main and five auxiliary requests)"

Decisions cited:

-

Catchword:

-



Case Number: T 0528/00 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 8 December 2004

Appellant: E.I. DU PONT DE NEMOURS AND COMPANY
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Representative: Towler, Philip Dean
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 13 March 2000
revoking European patent No. 0654150 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: A. G. Klein
Members: M. A. Rayner
J. H. P. Willems

Summary of Facts and Submissions

I. The patent proprietor has appealed against the decision of the opposition division revoking European patent 654 150 (application number 93 918 462.8, published application WO94/03838), which concerns flexographic printing. In the decision under appeal, reference was made to, amongst others, the following documents:

P2 US-A-4 132 168

P11 US-A-4 460 675.

II. The opposition division was of the view that the problem addressed by the patent was to avoid use of a phototool, the solution offered being to put a selectively ablatable infrared layer on top of a conventional presensitised printing element. The element known from document P11 has an elastomeric layer providing a hard, smooth printing surface. Use of an infrared ablatable layer for a mask or template was known from document P2 for planographic printing and the skilled person knew that wavelengths used for photopolymerisation and infrared ablation are different and thus do not interfere with each others function. The technical fields of the disclosure of documents P11 and P2 are very similar and a combination of their teachings renders the subject matter claimed in the patent obvious.

III. Both former opponents responded to the appeal, but then withdrew their oppositions, and in consequence were thereafter no longer party to the substantive appeal proceedings.

IV. Oral proceedings were requested on an auxiliary basis with the appeal and appointed consequent thereto by the board. In a communication annexed to the summons to oral proceedings, the board expressed serious doubts about the case presented by the appellant. In advance of the oral proceedings, the appellant filed a declaration by Dr Roxy Ni Fan, who is named in the patent specification as inventor.

V. The appellant requests the setting aside of the decision of the opposition division and maintenance of the patent on the basis of sets of claims according to a main or alternatively first to fifth auxiliary requests filed with its letter of 8 November 2004.

VI. The independent claims according to the requests of the appellant are worded as follows:-

(a) Main Request

"1. A photosensitive printing element used for preparing flexographic printing plates comprising:

(a) a support,

(b) a photopolymerizable layer comprising an elastomeric binder, at least one monomer and an initiator having sensitivity to non-infrared, actinic radiation, said layer being soluble, swellable or dispersible in a developer solution prior to exposure to actinic radiation;

(c) at least one barrier layer which is soluble, swellable or dispersible or liftable in the developer solution for the photopolymerizable layer prior to

exposure to actinic radiation; and which is selected from

(c1) a first type of barrier layer which is insensitive to actinic radiation and is soluble, swellable, dispersible or liftable in developer solutions for the photopolymerizable layer both before and after exposure to actinic radiation, and

(c2) a second type of barrier layer which is an elastomeric binder layer that becomes photosensitive when in contact with migrating monomer from the photopolymerizable layer and is soluble, swellable or dispersible in the developer solution prior to exposure to actinic radiation, but is not affected by the developer solution after exposure to actinic radiation and

(d) at least one layer of infrared radiation sensitive material which is substantially opaque to actinic radiation having a binder,

wherein the infrared-sensitive material is ablatable from the surface of the barrier layer upon exposure to infrared laser radiation.

4. A process for making a flexographic printing plate which comprises:

(1) imagewise ablating layer (d) of the element of claim 1 with infrared laser radiation to form a mask;

(2) overall exposing the photosensitive element to actinic radiation through the mask; and

(3) treating the product of step (2) with at least one developer solution to remove (i) the infrared-sensitive material which was not removed during step (1), (ii) the areas of the barrier layer which were not exposed to actinic radiation, and (iii)

the areas of the photopolymerizable layer (b) which were not exposed to actinic radiation."

(b) First Auxiliary Request

"1. A photosensitive printing element used for preparing flexographic printing plates comprising:

(a) a support,

(b) a photopolymerizable layer comprising an elastomeric binder, at least one monomer and an initiator having sensitivity to non-infrared, actinic radiation, said layer being soluble, swellable or dispersible in a developer solution prior to exposure to actinic radiation;

(c) at least one barrier layer which is soluble, swellable or dispersible or liftable in the developer solution for the photopolymerizable layer prior to exposure to actinic radiation, which is insensitive to actinic radiation and is soluble, swellable, dispersible or liftable in developer solutions for the photopolymerizable layer both before and after exposure to actinic radiation, and

(d) at least one layer of infrared radiation sensitive material which is substantially opaque to actinic radiation having a binder,

wherein the infrared-sensitive material is ablatable from the surface of the barrier layer upon exposure to infrared laser radiation.

4. A process for making a flexographic printing plate which comprises

(1) imagewise ablating layer (d) of the element of claim 1 with infrared laser radiation to form a mask;

(2) overall exposing the photosensitive element to actinic radiation through the mask; and

(3) treating the product of step (2) with at least one developer solution to remove (i) the infrared-sensitive material which was not removed during step (1), (ii) the areas of the barrier layer which were not exposed to actinic radiation, and (iii) the areas of the photopolymerizable layer (b) which were not exposed to actinic radiation."

(c) Second Auxiliary Request

"1. A photosensitive printing element used for preparing flexographic printing plates comprising:

(a) a support,

(b) a photopolymerizable layer comprising an elastomeric binder, at least one monomer and an initiator having sensitivity to non-infrared, actinic radiation, said layer being soluble, swellable or dispersible in a developer solution prior to exposure to actinic radiation;

(c) at least one barrier layer which is soluble, swellable or dispersible or liftable in the developer solution for the photopolymerizable layer prior to exposure to actinic radiation, which is an elastomeric binder layer that becomes photosensitive when in contact with migrating monomer from the photopolymerizable layer and is soluble, swellable or dispersible in the developer solution prior to exposure to actinic radiation, but is not affected by the developer solution after exposure to actinic radiation and

(d) at least one layer of infrared radiation sensitive material which is substantially opaque to actinic radiation having a binder,

wherein the infrared-sensitive material is ablatable from the surface of the barrier layer upon exposure to infrared laser radiation.

4. A process for making a flexographic printing plate which comprises:

(1) imagewise ablating layer (d) of the element of claim I with infrared laser radiation to form a mask;

(2) overall exposing the photosensitive element to actinic radiation through the mask; and

(3) treating the product of step (2) with at least one developer solution to remove (i) the infrared-sensitive material which was not removed during step (1), (ii) the areas of the barrier layer which were not exposed to actinic radiation, and (iii) the areas of the photopolymerizable layer (b) which were not exposed to actinic radiation."

(d) Third Auxiliary Request

"1. A process for making a flexographic printing plate which comprises:

(1) imagewise ablating layer (d) of a photosensitive element with infrared laser radiation to form a mask, said photosensitive element comprising:

(a) a support,

(b) a photopolymerizable layer comprising an elastomeric binder, at least one monomer and an initiator having sensitivity to non-infrared, actinic

radiation, said layer being soluble, swellable or dispersible in a developer solution prior to exposure to actinic radiation;

(c) at least one barrier layer which is soluble, swellable or dispersible or liftable in the developer solution for the photopolymerizable layer prior to exposure to actinic radiation; and which is selected from

(c1) a first type of barrier layer which is insensitive to actinic radiation and is soluble, swellable, dispersible or liftable in developer solutions for the photopolymerizable layer both before and after exposure to actinic radiation, and

(c2) a second type of barrier layer which is an elastomeric binder layer that becomes photosensitive when in contact with migrating monomer from the photopolymerizable layer and is soluble, swellable or dispersible in the developer solution prior to exposure to actinic radiation, but is not affected by the developer solution after exposure to actinic radiation and

(d) at least one layer of infrared radiation sensitive material which is substantially opaque to actinic radiation having a binder,

(2) overall exposing the photosensitive element to actinic radiation through the mask; and

(3) treating the product of step (2) with at least one developer solution to remove (i) the infrared-sensitive material which was not removed during step (1), (ii) the areas of the barrier layer which were not exposed to actinic radiation, and (iii) the areas of the photopolymerizable layer (b) which were not exposed to actinic radiation."

(e) Fourth Auxiliary Request

"1. A process for making a flexographic printing plate which comprises:

(1) imagewise ablating layer (d) of a photosensitive element with infrared laser radiation to form a mask, said photosensitive element comprising:

(a) a support,

(b) a photopolymerizable layer comprising an elastomeric binder, at least one monomer and an initiator having sensitivity to non-infrared, actinic radiation, said layer being soluble, swellable or dispersible in a developer solution prior to exposure to actinic radiation;

(c) at least one barrier layer which is soluble, swellable or dispersible or liftable in the developer solution for the photopolymerizable layer prior to exposure to actinic radiation and which is insensitive to actinic radiation and is soluble, swellable, dispersible or liftable in developer solutions for the photopolymerizable layer both before and after exposure to actinic radiation, and

(d) at least one layer of infrared radiation sensitive material which is substantially opaque to actinic radiation having a binder,

(2) overall exposing the photosensitive element to actinic radiation through the mask; and

(3) treating the product of step (2) with at least one developer solution to remove (i) the infrared-sensitive material which was not removed during step (1), (ii) the areas of the barrier layer which were not exposed to actinic radiation, and (iii)

the areas of the photopolymerizable layer (b) which were not exposed to actinic radiation."

(f) Fifth Auxiliary Request

"1. A process for making a flexographic printing plate which comprises:

(1) imagewise ablating layer (d) of a photosensitive element with infrared laser radiation to form a mask, said photosensitive element comprising:

(a) a support,

(b) a photopolymerizable layer comprising an elastomeric binder, at least one monomer and an initiator having sensitivity to non-infrared, actinic radiation, said layer being soluble, swellable or dispersible in a developer solution prior to exposure to actinic radiation;

(c) at least one barrier layer which is soluble, swellable or dispersible or liftable in the developer solution for the photopolymerizable layer prior to exposure to actinic radiation and which is an elastomeric binder layer that becomes photosensitive when in contact with migrating monomer from the photopolymerizable layer and is soluble, swellable or dispersible in the developer solution prior to exposure to actinic radiation, but is not affected by the developer solution after exposure to actinic radiation, and

(d) at least one layer of infrared radiation sensitive material which is substantially opaque to actinic radiation having a binder,

(2) overall exposing the photosensitive element to actinic radiation through the mask; and

(3) treating the product of step (2) with at least one developer solution to remove (i) the infrared-sensitive material which was not removed during step (1), (ii) the areas of the barrier layer which were not exposed to actinic radiation, and (iii) the areas of the photopolymerizable layer (b) which were not exposed to actinic radiation."

VII. With reference to the terminology of the claims, the appellant submitted that independent process claims of the requests specifically state that the processes "comprise" the recited steps. Thus, additional unspecified features of the process relating to preferred embodiments of the invention are not excluded. The independent claims are not in a closed "consisting of" format. The appellant stressed during the oral proceedings that the independent claims include embodiments with more than one layer, in particular there is no limitation for example to an elastomer layer being directly in contact with the non actinic ablatable layer. Indeed, no such particular embodiment was given in the detailed description of the patent.

VIII. In support of substantive patentability the appellant argued that the supports disclosed in document P2 would be unsuitable for use in a flexographic printing process as a dimensionally stable support is required for the planographic printing plate of document P2. None of the bases used in the examples, for example aluminium or aluminium-paper foil laminate, would be suitable for a flexographic process as they are too inflexible. The skilled person would thus not have considered document P2.

- IX. Another line of argument is based on consideration of document P11 in the light of the knowledge of the skilled person, as represented in practice by the inventor. The inventor explained in her declaration and during the oral proceedings that despite being thoroughly familiar with documents P11 and P2, her understanding was that simply substituting an infrared sensitive masking layer as disclosed in document P2 for the conventional phototool used in document P11 would not work. It was found that the photosensitive layer according to document P11 contains sufficient monomer to migrate into the binder of an overlying infrared sensitive layer to cause tackiness, altering the resulting plate compositions in every layer, thereby causing numerous problems during the plate making process and resulting in poor plate performance. The view at the time was that, even if the infrared sensitive layer were not in direct contact with the photopolymerizable layer, the monomer would migrate into an adjacent capping layer, thereby causing a similar problem if the infrared sensitive layer contacted an adjacent layer containing sufficient migratory monomer. Only experimentation with different barrier layers of various thickness led to the realisation that, even though a barrier layer may become photosensitive when in contact with the underlying photopolymerisable layer due to monomer migration, such a barrier layer could still have a thickness sufficient to minimize monomer migration.
- X. Even had the skilled person considered document P2, in the absence of any disclosure in document P11 that the elastomeric layer functions as a barrier layer, it would not have been obvious to the skilled person that

coating the layer of infrared sensitive material of document P2 on the elastomeric capping layer of document P11 would have produced a functional element. Indeed column 10, line 11 of document P11 explains that a hard surface of the polymerised film is for preventing the transparency from sticking or adhering to the surface of the photopolymer element, which is not relevant to the invention. There is, moreover, no disclosure of a barrier layer between ultraviolet sensitive and opaque layers in document P2. Even a putative combination would have led to a result different to what is claimed as document P2 provides two entirely different solutions to the problem of monomer migration, firstly that the photosensitive material (negative working diazo composition) does not contain migratable monomers and secondly vacuum deposition of metallic layers which also contain no migratable monomers.

- XI. During the oral proceedings, the board expressed the view that if the skilled person had expected migration of monomer to the non actinic ablatable layer, then it would have been obvious to use a barrier layer of some sort to prevent this. Replying to the board, the inventor expressed the view that the skilled person would have expected the monomer to migrate even through layer of the type disclosed in document P11. However, it had surprisingly been found that a configuration just like that disclosed in document P11 does not in fact suffer from the migration problem as migration of the monomer was not so fast as had been thought. During the oral proceedings, the appellant confirmed that the disclosure of document P11 met the independent claims except for the infrared sensitive layer.

XII. At the end of the oral proceedings, the board gave its decision.

Reasons for the Decision

1. The appeal complies with the provisions mentioned in Rule 65(1) EPC and is therefore admissible.

2. *Terminology*

2.1 The board is not in disagreement with the approach of the appellant in relation to the number of layers given in section VII of the facts and submissions above.

2.2 In the appeal proceedings, reference has been made by the appellant to layers of c1 and c2 type. This terminology refers to features in claim 1 of the main request referenced as c1 and c2. In the description of the patent in dispute, examples are given (see, for example, page 4, lines 21 to 42 of the patent). An example of a c1 type layer is a polyamide (see page 4, line 26 of the patent). A suitable composition for a c2 type layer is an elastomeric composition as disclosed in the multilayer cover element disclosed in document P11 (see page 4, line 41 of the patent).

3. *Main Request - Novelty*

3.1 In the view of the board, document P11 is a suitable choice for the closest prior art document because it relates to flexographic printing. Pertinent disclosure of this document includes claim 1 thereof fleshed out

with for instance example 1 in the detailed disclosure. Such relevant disclosure is summarised in point 3.2.

- 3.2 A process for preparing a flexographic printing plate, comprising exposing to actinic radiation through an image a flexographic photopolymerizable element. The element (see claim 1) comprises a photopolymerizable composition comprising an elastomeric binder, an ethylenically unsaturated compound having at least one terminal ethylenic group, and a photoinitiator or photoinitiator system. The photopolymerisable composition is disposed between a support and a multilayer cover element to form a photopolymerizable layer therebetween. The multilayer cover element comprises a polyamide layer (example 1, column 14, lines 4 and 5) adhered to an elastomeric coating, the latter contacting the photopolymer (example 1, column 13, lines 50-51) and being photosensitive or becoming photosensitive by contact with the photopolymerizable layer. The polyamide layer is covered with an image bearing transparency and the photopolymer layer exposed example 1, column 14, lines 6 to 10). After exposure the transparency is removed and the polyamide layer and unpolymerised areas of the element removed by developer example 1, column 14, lines 17-22). The polymerised photosensitive overcoat has a deep blue contrasting colour and is free of both orange peel and surface streaks.
- 3.3 In document P11, the polyamide layer is therefore a c1 layer and the elastomeric layer a c2 layer. Accordingly, the subject matter of present claim 1 differs from the closest disclosure by virtue of its feature (d) pertaining to the at least one layer of a laser

infrared radiation sensitive material. Therefore, the subject matter of claim 1 is novel within the meaning of Article 54 EPC.

4. Inventive step

4.1 The underlying problem addressed by the features of claim 1 novel over the disclosure of document P11 is avoiding use of a phototool in imagewise exposing a photosensitive layer.

4.2 This underlying problem is, as such, addressed and solved by the teaching of document P2, which relates to positive or negative working lithographic plates (column 2, line 5) and mentions a diazo composition (column 2, line 50) as photosensitive layer. The document is concerned with elimination of a master transparency (the term used in this document for a phototool) through use of an ablatable non-actinic layer, which layer can be a metal layer or a dispersion of metal or carbon particles in an organic binder (column 2, lines 17-18). In other words, use of a phototool is avoided according to document P2 by replacement with the ablatable layer with disclosure of using a dispersion of metal or carbon particles in an organic binder, i.e. meeting feature (d) of the claim. The subject matter of claim is 1 therefore obvious in the light of a combination of documents P11 and P2.

4.3 According to the appellant, as document P2 is directed to planographic printing, which has features not compatible with flexographic printing, the skilled person would not have considered combining the teachings of documents P2 and P11. The board finds the

approach of the opposition division more convincing, i.e. that the skilled person would not have expected problems in transposing the technique from planographic plates (document P2) to the closely related field of flexographic printing. This is because the problem is not to change the type of printing but to avoid using a phototool, thus as the skilled person starting from document P11 would have stayed in the field of flexographic printing, features such as rigidity, which are plainly specific to planographic printing, would simply have been ignored. The appellant's line of argument that the skilled person would not have considered document P2 therefore failed to persuade the board of inventive step. One can also add that there is a certain inconsistency in the position of the appellant because the inventor did consider document P2, albeit then rejecting it in the different context of direct application of an infrared ablatable layer to the photosensitive layer.

- 4.4 The submissions of the appellant on inventive step are also confused because they entail obscuring the nature of the closest prior art. The approach of the appellant involving problems of monomer migration does not in fact take document P11 as closest prior art but is predicated on starting with a different element, namely an element with direct application of the infrared ablatable element to the photopolymerisable layer, i.e. an element without any c1 or c2 layer at all, performance problems being caused by migration of monomer into the directly overlying infrared ablatable layer. In other words, to get to the starting point selected by the appellant, it is first necessary to dispense with c1 and c2 layers of the element according

to document P11. While document P11 mentions the surface of the polymeric film (i.e. a c1 layer) prevents a transparency (i.e. a phototool) from sticking, this has no direct relevance to application of an infrared ablatable layer. More significantly, the elastomeric layer (i.e. c2 layer) is even specified as having advantages in relation to freedom from peel and streaks. The board is thus satisfied the skilled person had no reason for dispensing with a c1 film, and let alone a c2 film. Therefore, moving away from document P11 as closest prior art to a, for the appellant more favourable prior art, is not correct in the view of the board. The consequence of starting with the correct as opposed to the incorrect closest prior art is that the entire line of argument based on any false assumption or expectation of migration in the case of the element disclosed in document P11 collapses, as this correct prior art, does not suffer from the migration problem, as is admitted by the appellant. So far as considerations of thickness of the barrier layers are concerned, there is no thickness claimed, and in any case the thickness used is the comparable to that disclosed in document P11. Such considerations are therefore not relevant.

- 4.5 It can also be remarked that the appellant was very insistent about the possibility of the claimed subject matter involving the possibility of providing further undefined barrier layers, so that even if, despite the closest prior art in document P11 having a barrier layer, although it is not explicitly so called, the skilled person should suspect a problem with migration, a first rudimentary option would have been to provide some kind of further undefined barrier layer to stop

this. The board does not therefore see any support for inventive step offered by document P11 not explicitly reciting a barrier layer in these terms. Since document P11 already has a barrier layer, whether or not document P2 has a barrier layer is moreover not relevant. It was of course possible for the skilled person to modify the teaching of the prior art disclosures in respect of photopolymerisable material or the infrared ablatable layers. In doing so it may have been possible to produce differing results. However, these possibilities are not relevant to the obviousness of the subject matter claimed. Starting with the disclosure of document P11 means starting from the material there disclosed, not a diazo compound. The skilled person will also choose an infrared ablatable layer compatible with a flexographic printing plate. The board does not therefore consider assessing things the skilled person could have done to detract from the obviousness of what this person would have done in the light of the teaching of document P2 to avoid using a phototool starting from the correct closest prior art according to document P11.

4.6 The board therefore saw nothing in the case of the appellant which could change its conclusion that the subject matter of claim 1 of the main request cannot be considered to involve an inventive step within the meaning of Article 56 EPC.

4.7 Process claim 4 concerns making a flexographic plate and includes the ablating and exposure steps and developing steps, all of which follow from the same disclosures of documents P2 and P11 in an analogous way to the features of the element claims dealt with above.

Therefore, the subject matter of this claims likewise cannot be considered to involve an inventive step within the meaning of Article 56 EPC.

5. *Auxiliary Requests*

- 5.1 The first and second auxiliary requests mention explicitly just the c1 or c2 layer respectively. However, corresponding to the linguistic meaning, the appellant explained that the claims did not exclude further other unspecified layers, for example of c2 or c1 type. The claims were not to be understood, for example, as requiring in the case of say claim 1 of auxiliary request 2, that the (c2-type) layer was directly in contact with the non actinic ablatable layer.
- 5.2 The third auxiliary request corresponds to the method claim of the main request and the fourth and fifth auxiliary requests, which are also method claims, mention explicitly just the c1 or c2 layer, respectively.
- 5.3 Accordingly, as stated by the representative of the appellant, the auxiliary requests do not contain any subject matter to be considered in the context of substantive patentability, which was not contained in the main request. Therefore, the subject matter of the independent claims of the first to fifth auxiliary requests cannot be considered to involve an inventive step for reasons corresponding to those given for the main request.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

P. Martorana

A. G. Klein