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**Datasheet for the decision
of 12 January 2016**

Case Number: T 0392/11 - 3.4.03

Application Number: 01928609.5

Publication Number: 1282838

IPC: G03F7/36

Language of the proceedings: EN

Title of invention:

PROCESS FOR PREPARING A FLEXOGRAPHIC PRINTING PLATE

Patent Proprietor:

E. I. du Pont de Nemours and Company

Opponent:

Jenkins, Peter David

Headword:

Relevant legal provisions:

EPC 1973 Art. 83, 100(b)

Keyword:

Sufficiency of disclosure - main request (no) - auxiliary
request (no)

Decisions cited:

Catchword:



**Beschwerdekammern
Boards of Appeal
Chambres de recours**

European Patent Office
D-80298 MUNICH
GERMANY
Tel. +49 (0) 89 2399-0
Fax +49 (0) 89 2399-4465

Case Number: T 0392/11 - 3.4.03

**D E C I S I O N
of Technical Board of Appeal 3.4.03
of 12 January 2016**

Appellant: E. I. du Pont de Nemours and Company
(Patent Proprietor) Chestnut Run Plaza
974 Center Road
P.O. Box 2915
Wilmington, DE 19805 (US)

Representative: Matthews, Derek Peter
Dehns
St Bride's House
10 Salisbury Square
London EC4Y 8JD (GB)

Respondent: Jenkins, Peter David
(Opponent) Page White & Farrer
Bedford House
John Street
London WC1N 2BF (GB)

Representative: Jenkins, Peter David
Page White & Farrer
Bedford House
John Street
London WC1N 2BF (GB)

Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 9 December 2010
revoking European patent No. 1282838 pursuant to
Article 101(2) EPC.**

Composition of the Board:

Chairman G. Eliasson
Members: T. M. Häusser
C. Schmidt

Summary of Facts and Submissions

- I. The appeal of the proprietor concerns the decision of the opposition division to revoke the European patent No. EP-B-1 282 838 for lack of sufficient disclosure (Article 101(2) EPC and Article 100 (b) EPC 1973).
- II. The opposition had been filed against the patent as a whole, *inter alia* on the ground that the patent lacked sufficient disclosure.
- III. At the oral proceedings before the board the appellant (patent proprietor) requested that the decision under appeal be set aside and that the patent be maintained on the basis of the main request or - alternatively - on the basis of the auxiliary request, both filed with letter dated 14 December 2015.

The respondent (opponent) requested that the appeal be dismissed.

- IV. Reference is made to the following documents:

- D13: Declaration of Mark A. Hackler,
dated 12 October 2006,
- D14: Declaration of Christoph Mengel,
dated 26 February 2008,
- D15: Declaration of Deborah Johnson,
dated 27 August 2003.

- V. The wording of the independent claims of the main request and the auxiliary request is as follows:

Main request:

"1. A process for producing a flexographic printing plate comprising:

- i) providing a photosensitive element comprising
 - a) a support;
 - b) at least one photopolymerizable elastomeric layer on the support, said layer being made of photopolymerizable material and having a composition comprising at least one thermoplastic binder; at least one compound capable of addition polymerization; and a photoinitiator; wherein the layer has a melt flow index of at least 4 grams/10 min. through a 0.0825 inch (2.0955 mm) orifice under a 2.16 kilogram weight at 140°C, determined according to ASTM-D-1238-98, and wherein the layer when exposed to actinic radiation to determine a log-log plot of the dynamic storage modulus (G') versus frequency (f), exhibits a slope of less than 0.18, wherein the slope is determined by linear regression of the curve of said log-log plot, wherein said dynamic storage modulus is obtained by exposing a 1 mm thick plate of said photopolymerizable material to ultraviolet radiation of wavelength 340 to 380 nm at an energy exposure of 800 mJ/cm² and measuring said dynamic storage modulus over a frequency range of 1.6 to 50 Hz at a temperature of 140°C ± 2°C in a parallel-plate geometry with a plate diameter of 30 millimeters and with constant stress and a torque amplitude of 5 milliNewton-meter;
 - ii) imagewise exposing the element to actinic radiation to polymerize areas exposed to radiation; and
 - iii) thermally treating the element of ii) to remove unpolymerized material from the element and form a relief surface."

"4. A process for producing a flexographic printing plate comprising:

- i) providing a photosensitive element comprising

- a) a support;
- b) at least one photopolymerizable elastomeric layer on the support, said layer being made of photopolymerizable material and having a composition comprising at least one thermoplastic binder; at least one compound capable of addition polymerization; and a photoinitiator; wherein the layer when exposed to actinic radiation to determine a log-log plot of the dynamic storage modulus (G') versus frequency (f), exhibits a slope of less than 0.20, wherein the slope is determined by linear regression of the curve of said log-log plot, wherein said dynamic storage modulus is obtained by exposing a 1 mm thick plate of said photopolymerizable material to ultraviolet radiation of wavelength 340 to 380 nm at an energy exposure of 800 mJ/cm² and measuring said dynamic storage modulus over a frequency range of 1.6 to 50 Hz at a temperature of 140°C ± 2°C in a parallel-plate geometry with a plate diameter of 30 millimeters and with constant stress and a torque amplitude of 5 milliNewton-meter;
- ii) imagewise exposing the photopolymerizable layer to actinic radiation through an in-situ mask in the presence of atmospheric oxygen to polymerize areas exposed to radiation; and
- iii) thermally treating the element of ii) to remove unpolymerized material from the element and form a relief surface."

Auxiliary request:

The claims of the auxiliary request differ from the claims of the main request in that claim 1 of the main request and the corresponding dependent claims are deleted. Claim 1 of the auxiliary request is identical with claim 4 of the main request.

VI. The parties argued essentially as follows regarding sufficiency of the disclosure in relation to the determination of the slope of a log-log plot of the dynamic storage modulus G' vs. frequency, in the following referred to as "the slope of G' ":

a) Appellant (patent proprietor)

The test method of determining the slope of G' was known in the art and could be carried out using the commercially available apparatus "Rheolab MC 120" as described on page 17, lines 22-24 of the application as filed. Since it was impossible to test the printing plate directly, testing was carried out on a test sample. The results could confidently be assumed to apply to the whole from which the sample was drawn. The results obtained from the test sample provided everything that was necessary to know about the material of the printing plate. In particular, they were sufficient for obtaining a printing plate with a defined relief pattern.

The figures for the slope of G' reported in documents D13 and D14 were consistent within the applicable precision with the figures provided in the patent. The slope of G' could therefore be reproducibly determined. Concerning the respondent's document D15 it was impossible in the absence of further information to determine why the value given in section 9 of that document for Example 1 of the patent differed from the value in the patent itself.

Therefore, the invention was disclosed sufficiently clear and complete for it to be carried out by a skilled person.

b) Respondent (opponent)

It was indicated in the independent claims of the main request and auxiliary request that the elastomeric layer of the printing plate exhibited certain values for the slope of G' . By contrast, the determination of the slope was claimed to be determined based on the testing of a 1 mm thick plate of the photopolymerizable material. However, the skilled person was not provided with any guidance from the patent as to how to determine the required slope for the layer from that obtained using the test plate. A change in specimen geometry and the presence or absence of the support had an effect on the results obtained. Furthermore, as exemplified by Table 2 of D13, the level of energy exposure had a significant effect on the slope obtained, which decreased as the exposure energy was increased.

There was no disclosure in the patent about how to convert the results of the slope of G' obtained for the specific test plate of 1 mm thickness to the printing plate of any thickness. In particular, there was no indication what energy and wavelength needed to be used for the exposure of the elastomeric layer of the printing plate in order to achieve the desired slope of G' .

Therefore, the invention was not disclosed sufficiently clear and complete for it to be carried out by a skilled person.

Reasons for the Decision

1. The invention

The invention concerns (see paragraphs [0001] and [0013]) the preparation of flexographic printing plates from a photosensitive element with a photo-polymerizable elastomeric layer including the steps of image-wise exposing the element with radiation to polymerize areas exposed to the radiation and thermally treating the element with absorbent material to remove unpolymerized material from the element to form a relief surface.

In order to ensure the generation of a desired relief and good printing performance, the photo-polymerizable elastomeric layer needs to have certain rheological properties. In particular, the mechanical strength of the photo-polymerizable elastomeric layer is critical for fine features of the printing plate. The slope of G' is a means to quantify the degree of the mechanical strength of the photo-polymerizable material in the exposed state at a given set of conditions. That slope is obtained by means of a linear regression of the logarithm of the dynamic storage modulus G' as a function of the logarithm of the frequency f , measured in Hz. Photo-polymeric materials having a high mechanical strength have a small value for the slope of G' while weaker cross-linked systems have higher values (paragraphs [0021]-[0023]).

The slope of G' is not measured directly on the printing plate but indirectly using a test plate, namely a photo-polymerizable elastomeric layer of 1 mm thickness which is tested using a parallel-plate geometry with a 30 mm plate diameter. After that the test plate has been exposed to 800 mJ/cm^2 of ultraviolet radiation of wavelength 340-380 nm, the testing is conducted at a temperature of $140^\circ\text{C} \pm 2^\circ\text{C}$ using

constant stress and a torque amplitude of 5 milliNewton-meter. The linear regression is performed on a log-log plot between the frequencies of 1.6 to 50 Hz (paragraphs [0049]-[0050]).

2. Main request - sufficiency of the disclosure

2.1 The opposition division held in the appealed decision that the disclosure of the patent was insufficient in relation to the determination of the slope of G' (see point 3.5 of the decision).

In particular, it was held in the decision (see point 3.5.3) that the way of exposing the layer before the measurement of the slope of G' should be precisely defined. However, according to the specification of the patent the skilled person has many different possibilities to select measurement conditions, in particular in relation to the energy density, wavelength, use of a UV filter, and exposure time, which all had a profound effect on the measured value of the slope of G'. It was therefore concluded that the specification does not give a rule how to select the measurement conditions in order to obtain reproducible values for the slope of G'.

The appellant has filed new claims with the letter setting out the grounds of appeals, with amendments according to which the conditions employed during the measurement of the slope of G' are precisely stated. In particular, in claims 1 and 4 of the main request the following conditions are explicitly specified (see the respective last part of feature i) b) of the claims): determining the slope in the range 1.6-50 Hz using linear regression; measuring at a temperature of $140^{\circ}\text{C} \pm 2^{\circ}\text{C}$ in a parallel-plate geometry with 30 mm plate dia-

meter using constant stress and a torque amplitude of 5 mN-meter; employing a test plate of photo-polymerizable material having 1 mm thickness and an energy exposure of 800 mJ/cm² using UV radiation of 340-380 nm wavelength.

It is therefore no longer left open in the claims under what conditions the measurement of the slope of G' is to be performed. The opposition division's objection is thus deemed to have been overcome by the claim amendments.

2.2 However, the board considers that the assessment of whether the invention can be regarded as sufficiently disclosed requires close examination to what extent the value of the slope of G' as determined using a test plate (see respective feature i) b) of claims 1 and 4 of the main request) is applicable to the photo-sensitive element of the flexographic printing plate (see respective features ii) and iii) of claims 1 and 4 of the main request).

2.2.1 It is established case law that the requirement that the invention be disclosed in a manner sufficiently clear and complete for it to be carried out by the skilled person (Articles 83 and 100(b) EPC 1973) is only fulfilled if the disclosure allows the invention to be performed in the whole range claimed, i. e. if it allows the skilled person to obtain substantially all embodiments falling within the ambit of the claims (see Case Law of the Boards of Appeal of the EPO, 7th edition 2013, sections 4.4 and 6.1.2 of part II.C.).

2.2.2 As indicated under point 2.1 above it is specified in claims 1 and 4 of the main request *inter alia* that the slope of G' is determined using a test plate of photo-

polymerizable material having 1 mm thickness and an energy exposure of 800 mJ/cm² using UV radiation of 340-380 nm wavelength.

By contrast, there is no indication in these claims regarding the thickness of the photo-polymerizable elastomeric layer *of the flexographic printing plate* (see the respective first part of feature i) b) of the claims) or regarding the characteristics of the actinic radiation used for polymerizing that layer (see the respective feature ii) of the claims).

In view of the above, the invention can only be considered as sufficiently disclosed if the disclosure allows the skilled person to perform the invention in the whole range claimed, i. e. for a photo-polymerizable elastomeric printing layer having an arbitrary thickness which is exposed to arbitrary actinic radiation.

- 2.2.3 The appellant stated that testing was carried out on a test sample as it was impossible to test the printing plate directly. The results provided everything that was necessary to know about the material of the printing plate and could confidently be assumed to apply to the whole from which the sample was drawn.

However, since the exposure conditions determine the degree of cross-linking in the exposed areas, the value of the slope of G' depends crucially on these conditions. This is evident from the specification of the patent (see paragraph [0023]) and is also reflected in the values of the slope of G' for different exposure conditions provided in columns 3 to 5 of Table 2 of document D13. Furthermore, the board agrees with the respondent in that the slope of G' also depends on the

thickness of the photo-polymerizable elastomeric layer, at least when the exposure conditions are specified - such as in the patent - as energy per unit area ("mJ/cm²" or "mJoules/cm²" in paragraphs [0019], [0023] and [0051]). Indeed, it is evident that for a given value of the exposure energy per unit area, the degree of cross-linking and thus the value of the slope of G' depends on the layer thickness.

The value of the slope of G' obtained using a test plate of specific thickness (1 mm) which is exposed to radiation of specific energy density (800 mJ/cm²) and in a specific wavelength range (340-380 nm) is thus not generally applicable to a photo-polymerizable elastomeric printing layer having an arbitrary thickness which is exposed to arbitrary actinic radiation.

2.2.4 The above conditions concerning test plate thickness and energy density cited in claims 1 and 4 of the main request as being used during the measurement of the slope of G' are reported in the patent as the conditions used for the specific disclosed embodiments of the invention, i. e. Examples 1 to 3. Moreover, a "CYREL® 1002" exposure unit is used to expose the test plates for 8 min through a UV filter (see paragraphs [0023] and [0049]-[0051]).

By contrast, as described in paragraph [0052] the photo-sensitive elements of the flexographic printing plates have a thickness of 1.7 mm in all embodiments of the invention (Examples 1 to 3). The photo-polymerizable elastomeric layer of the respective photo-sensitive elements can be assumed to have about this thickness, since the thicknesses of the other layers of the photo-sensitive elements (support, cover sheet, radiation opaque layer) are small compared to

that of the photo-polymerizable elastomeric layer (see paragraphs [0026]-[0031] and [0076]). Furthermore, in relation to Examples 1 and 2 it is stated that the exposure unit "CYREL® 1002" is used applying first a back exposure of 50 s followed by a main exposure of 12 min (paragraphs [0056] and [0066]). In relation to Example 3 it is stated that the "CYREL 1002E exposure unit (1450 mJ/cm²/min)" is used applying a main exposure of 8 min through the *in situ* mask preceded by a back exposure of 60 s (paragraphs [0074] and [0076]). Back exposure is described in paragraph [0040] as an exposure to actinic radiation through the support in order to create a shallow layer of polymerized material on the support side. For none of the embodiments it is mentioned that the UV filter that is used for the exposure of the test plates is also used for the exposure of the flexographic printing plates.

The thickness of the photo-polymerizable elastomeric layer of the printing plate differs thus considerably from the thickness of the corresponding test plate for each embodiment of the invention (Examples 1 to 3). Moreover, for each embodiment the exposure conditions differ between the test plate exposure and the printing plate exposure. There is no evidence that the slope of G' of the photo-polymerizable elastomeric layer of the printing plate is in fact identical or even comparable to that of the photo-polymerizable elastomeric layer of the test plate. In view of the complex mechanisms involved in the cross-linking in the photo-polymerizable material upon exposure to actinic radiation, this is not considered to be evident for the skilled person, either.

Moreover, there is no indication in the patent how a photo-polymerizable elastomeric layer of the flexo-

graphic printing plate could be manufactured in such a way as to have a slope of G' of less than 0.18 (claim 1 of the main request) or less than 0.20 (claim 4 of the main request), when a photo-polymerizable elastomeric layer having an arbitrary thickness is employed which is exposed to arbitrary actinic radiation.

2.2.5 It is concluded that the disclosure does not allow the skilled person to obtain substantially all embodiments falling within the ambit of the claims 1 or 4 of the main request. Consequently, the requirement of sufficiency of the disclosure is not fulfilled in relation to the main request.

3. Auxiliary request - sufficiency of the disclosure

Claim 1 of the auxiliary request is identical with claim 4 of the main request. Therefore, the above objections in relation to claim 4 of the main request apply to claim 1 of the auxiliary request.

Consequently, the requirement of sufficiency of the disclosure is not fulfilled in relation to the auxiliary request, either.

4. Conclusion

Since the requirement of sufficiency of disclosure is not fulfilled in relation to main request and the auxiliary request, the patent has to be revoked (Article 101(3)(b) EPC and Articles 83 and 100(b) EPC 1973). The appeal is therefore to be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



S. Sánchez Chiquero

G. Eliasson

Decision electronically authenticated