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**Datasheet for the decision
of 1 April 2022**

Case Number: T 0889/19 - 3.3.03

Application Number: 13848110.6

Publication Number: 2821431

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B65D65/02, A61L2/08, C07C63/26,
C08L27/06, C08G63/183,
C08L67/03

Language of the proceedings: EN

Title of invention:
ESTER-BASED COMPOSITION, METHOD FOR PREPARING SAME, AND RESIN
COMPOSITION COMPRISING ESTER COMPOSITION

Patent Proprietor:
LG Chem, Ltd.

Opponent:
Evonik Operations GmbH

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step - obvious solution

Decisions cited:

T 0551/89



Beschwerdekammern

Boards of Appeal

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Case Number: T 0889/19 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 1 April 2022

Appellant: Evonik Operations GmbH
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Respondent: LG Chem, Ltd.
(Patent Proprietor) 128 Yeoui-daero
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Representative: Goddar, Heinz J.
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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 5 February 2019
rejecting the opposition filed against European
patent No. 2821431 pursuant to Article 101(2)
EPC.**

Composition of the Board:

Chairman D. Semino
Members: M. Barrère
W. Ungler

Summary of Facts and Submissions

- I. The appeal of the opponent lies against the decision of the opposition division rejecting the opposition against European Patent number 2 821 431.
- II. The following documents were *inter alia* cited in the opposition division's decision:
- E3: KR 10-2013-0035493
E3a: English translation of E3
E4: "Plasticisers, Principles and Practice", Alan S. Wilson, The Institute of Materials, 1995, pages 134-137
- III. In that decision the opposition division held, among others, that the subject-matter of granted claim 1 involved an inventive step over E3 alone or in combination with E4.
- IV. The opponent (appellant) filed an appeal against said decision.
- V. With the rejoinder to the statement of grounds of appeal, the patent proprietor (respondent) filed three sets of claims as auxiliary requests 1-3.
- VI. Oral proceedings were held before the Board on 1 April 2022.
- VII. The appellant requested that the decision under appeal be set aside and the patent be revoked.

The respondent requested that the appeal be dismissed (main request), in the alternative that the patent be

maintained on the basis of one of auxiliary requests 1 to 3 filed with the rejoinder to the statement of grounds of appeal.

VIII. Claim 1 as granted (main request of the respondent) read as follows:

"1. An ester composition comprising:

a terephthalate compound substituted with a non-hybrid and non-branch type alkyl group,

a terephthalate compound substituted with a hybrid and branch type alkyl group, and

a terephthalate compound substituted with a non-hybrid and branch type alkyl group,

respectively by amounts of 0.5 wt% to 9.5 wt%, 14.5 wt% to 43.8 wt%, and 46.7 wt% to 85 wt% based on a total amount of the ester composition."

Claim 1 of auxiliary request 1 differed from granted claim 1 in that the following feature was added at the end of the claim:

"wherein in the terephthalate compound substituted with a hybrid and branch type alkyl group at least one of the alkyl groups has a number of carbon atoms from 6 to 10."

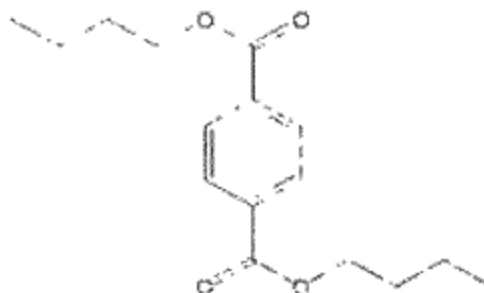
Claim 1 of auxiliary request 2 differed from granted claim 1 in that the following feature was added at the end of the claim:

"wherein in the terephthalate compound substituted with a non-hybrid and branch type alkyl group at least one of the alkyl groups has a number of carbon atoms from 6 to 10."

Claim 1 of auxiliary request 3 differed from granted claim 1 in that the following features were added at the end of the claim:

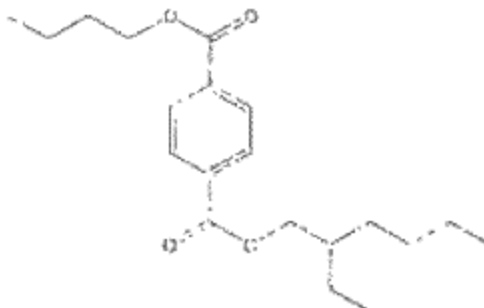
"wherein the terephthalate compound substituted with the non-hybrid and non-branch type alkyl group is dibutyl terephthalate (DBTP) represented by following Chemical Formula 1

[Chemical Formula 1]



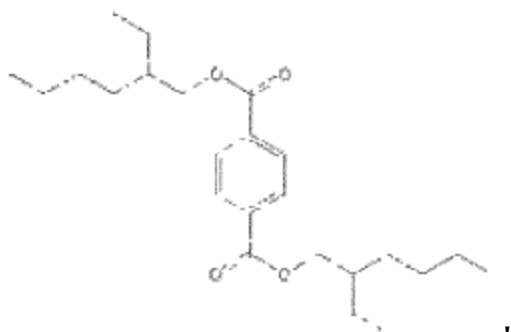
wherein the terephthalate compound substituted with the hybrid and branch type alkyl group is 1-butyl 4-(2-ethylhexyl)terephthalate (BEHTP) represented by following Chemical Formula 2,

[Chemical Formula 2]



wherein the terephthalate compound substituted with the non-hybrid and branch type alkyl group is di-(2-ethylhexyl)terephthalate (DEHTP) represented by following Chemical Formula 3,

[Chemical Formula 3]



The remaining claims of these requests are not relevant to this decision.

- IX. The appellant's submissions, in so far as they are pertinent to the present decision, may be derived from the reasons for the decision below. They were essentially as follows:

The subject-matter of claim 1 as granted did not involve an inventive step over E3 alone or in combination with E4.

The arguments put forward for the main request applied *mutatis mutatis* to auxiliary requests 1-3.

- X. The respondent's submissions, in so far as they are pertinent to the present decision, may be derived from the reasons for the decision below. They were essentially as follows:

The subject-matter of claim 1 as granted involved an inventive step over E3 alone or in combination with E4.

The arguments put forward for the main request applied *mutatis mutatis* to auxiliary requests 1-3.

Reasons for the Decision

Main request (patent as granted)

1. Novelty objection

1.1 During the oral proceedings, the board decided not to take into account the novelty objection based on document E3. However, since this decision was not relevant to the outcome of the proceedings, no reasons have to be provided in the present decision.

2. Inventive step over E3

2.1 Closest prior art and distinguishing features

There was no dispute between the parties that

E3 was the closest prior art for the subject-matter of granted claim 1 and that

claim 1 differed from example 2 of E3 in that the ester composition comprised 0.5 and 9.5 wt.% of non-hybrid and non-branched terephthalate.

The Board sees no reason to depart from that view.

For the sake of clarity of the following reasoning, it is noted that example 2 of E3 (paragraphs [0035]-[0040] and [0045]-[0048]; reference is made here and in what

follows to the translation of E3 into English E3a) discloses an ester composition comprising:

10 wt% of dibutyl terephthalate (DBTP) corresponding to a non-hybrid and non-branched (NH/NB) terephthalate according to claim 1,

30 wt% of 1-butyl 4-(2-ethylhexyl)terephthalate (BEHTP) corresponding to a hybrid and branched (H/B) terephthalate according to claim 1, and

60 wt% of di-(2-ethylhexyl)terephthalate (DEHTP) corresponding to a non-hybrid and branched (NH/B) terephthalate according to claim 1.

Hence the amount of the NH/NB terephthalate DBTP (10 wt%) is above the range of 0.5 to 9.5 wt% as defined in granted claim 1.

2.2 Problem to be solved

The ester compositions of the opposed patent are used as plasticisers for resin materials (see opposed patent, paragraphs [0047]-[0049]).

The opposed patent provides examples of ester compositions with a content of DBTP in the range of 0,5 to 15.2 wt% (see examples 1-7 and comparative examples 2-3). Tables 2-3 of the opposed patent show that reducing the DBTP content in the ester composition to 9.5 wt% or less leads to a reduction in weight and migration loss and to an improvement in the heat resistance of the plasticised material in terms of mechanical properties. It should however be noted that these properties are interrelated. Indeed, if part of the plasticiser is lost through migration or

volatilisation, the mechanical properties of the plasticised material (such as the flexibility) will obviously be impaired.

The respondent submitted additional experimental data showing the same trend between 10 wt% and 9.5 wt% of DBTP (see rejoinder to the statement of grounds of appeal, page 22, example 9 vs. comparative example 4).

Based on these data, the Board considers that it is credible that the reduction of the amount of DBTP from 10 wt% to 9.5 wt% or less is associated with the technical effect identified by the respondent.

The objective problem to be solved over E3 may therefore be formulated as the provision of a plasticiser which improves the heat resistance of the plasticised material.

At the oral proceedings before the Board the respondent agreed with this formulation of the objective problem which is based on the effect already acknowledged in the preliminary opinion of the Board sent in preparation of the oral proceedings.

2.3 Obviousness

It remains to be assessed whether, based on E3 alone or in combination with E4, it was obvious to the skilled person wishing to improve the heat resistance of the plasticised material of E3 to reduce the amount of NH/NB terephthalate (such as DBTP) from 10 wt% to 0.5-9.5 wt% in the ester composition.

2.3.1 The Board notes that the ester compounds used in example 2 of E3 are the same as the preferred compounds of the opposed patent, namely:

dibutyl terephthalate (DBTP) corresponding to a NH/NB terephthalate,

1-butyl 4-(2-ethylhexyl)terephthalate (BEHTP) corresponding to a H/B terephthalate, and

di-(2-ethylhexyl)terephthalate (DEHTP) corresponding to a NH/B terephthalate.

These terephthalates are not identical in terms of the alkyl chain lengths. While DBTP includes two relatively short C4 linear alkyl substituents (butyl), BEHTP and DEHTP comprise bulky substituents, respectively:

a C8 branched alkyl substituent (ethylhexyl) in addition to a C4 linear alkyl substituent (butyl), or

two C8 branched alkyl substituents (ethylhexyl).

For the Board it makes no doubt that DBTP (due to its significantly lower molecular weight compared to BEHTP and DEHTP) must have a higher volatility than the other two terephthalates.

Likewise it is common general knowledge that the degree of branching of a plasticiser as well as the number of C-atoms influence its migration behaviour. Indeed with increasing branching and number of C-atoms, the tendency of a plasticizer to migrate upon storage decreases (see E4, page 135, paragraph 4.8.2). Thus, it

it is clear that DBTP must have a higher tendency to migrate than BEHTP and DEHTP.

It can therefore be concluded that DBTP is both more volatile and more prone to migration than BEHTP and DEHTP.

The Board is therefore of the opinion that it is obvious to reduce the amount of DBTP in example 2 of E3 in order to reduce the volatile and migration loss of the terephthalate mixture upon heat storage of the plasticised material.

As pointed out previously (see point 2.2), the maintenance of the mechanical properties upon heat storage is only a direct consequence of the plasticiser mixture being less volatile and less prone to migration. Therefore the effect in terms of mechanical properties does not contribute positively to the establishment of an inventive step.

On the basis of common general knowledge and E4, it was therefore obvious for the skilled person, wishing to improve the heat resistance of the plasticised material of E3, to reduce the amount of the volatile DBTP from 10 wt% to 0.5-9.5 wt%.

- 2.3.2 The respondent argued in addition that E3 taught away from decreasing the amount of NH/NB terephthalate.

While it is acknowledged that E3 teaches that a composition with an amount of NH/NB terephthalate above 10 wt% is advantageous for the processability and foaming behaviour (see paragraph [0025]), the Board considers that this teaching is not relevant for a person skilled in the art who wishes to increase the

heat resistance independently of other properties. It is indeed clear to the skilled person that the choice of a plasticiser is a trade-off between opposing effects. For example, it belongs to common general knowledge that increasing the carbon number of a dialkylphthalate plasticiser reduces volatility and migration (thus improving heat resistance) but increases viscosity (thereby lowering processability) (see E4, page 135, paragraph 4.8.2).

Therefore, the teaching of E3 would not prevent the skilled person (wishing to improve the heat resistance of the plasticised material of E3) from further reducing the amount of DBTP in example 2 of E3.

- 2.3.3 The respondent further pointed out that the reduction of the DBTP content from 10 wt% to 9.5 wt% or less was associated to a large increase in heat resistance. The skilled person could not have expected such a significant improvement.

The Board does not deny that the reduction of the DBTP content between 10 and 9.5 wt.% appears to have a significant effect on the heat resistance (see letter of the respondent dated 11 February 2022, page 3). However it is considered that an effect which is to be expected as the result of an obvious measure cannot contribute to recognition of an inventive step, even if the scale of this effect is surprising to the skilled person (see e.g. T 551/89, reason 4.4, last paragraph). So it is obvious to reduce the amount of DBTP to improve the heat resistance, even if this improvement goes beyond the expectation of the skilled person.

- 2.3.4 The respondent also argued that the teaching of E4 would only apply to phthalate plasticisers and not to terephthalates.

It is not contested that paragraph 4.8 of E4 pertains to dialkyl phthalates (see E4, page 134). However, the Board sees no reasons why the teaching in this document may not be generalised to other dialkyl esters such as dialkyl terephthalates. Furthermore the cited passage of E4 relates to the effect of the alkyl groups on the plasticiser properties. It is reasonable to assume the effect of the alkyl groups should be the same independently of the ester plasticiser.

- 2.3.5 The respondent further held that the skilled person would rather increase the chain length of the NH/NB terephthalate than decrease its amount (see E4, page 135).

The Board does not dispute that increasing the chain length of the NH/NB terephthalate could have been another option to improve the heat resistance of the plasticised material of E3. However, the fact that several possibilities for solving a particular problem are known does not make any of them inventive. In other words, it is considered obvious to reduce the amount of DBTP in order to improve the heat resistance, even if the skilled person could also have increased the chain length of the alkyl groups in order to solve the same problem. Moreover, contrary to the respondent's opinion, it is indeed easier for the skilled person to use the same esters as in E3 in different quantities than to prepare a new NH/NB terephthalate with longer alkyl chain lengths.

- 2.4 Therefore the subject-matter of granted claim 1 does not involve an inventive step over E3 in combination with common general knowledge or with E4.

Auxiliary requests 1-3

3. Both parties in appeal had no additional and separate arguments on inventive step for auxiliary requests 1-3, thereby accepting that any conclusion reached for granted claim 1 equally applied to the subject-matter of claim 1 according to these requests. The Board has no reason to come to a different conclusion (see point 2. of the decision and the fact that all of the amended features are already covered by example 2 of E3 and do not result in any additional distinguishing feature). Therefore the subject-matter of claim 1 according to auxiliary requests 1-3 lacks an inventive step over E3 in combination with common general knowledge or with E4.
4. Since none of the requests of the respondent is allowable, there is no need to deal with any other issue and the patent is to be revoked.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:

The Chairman:



B. ter Heijden

D. Semino

Decision electronically authenticated