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**Datasheet for the decision
of 23 November 2017**

Case Number: T 1404/15 - 3.3.03

Application Number: 05105540.8

Publication Number: 1609821

IPC: C08L83/08, C09D183/08,
G03G15/20

Language of the proceedings: EN

Title of invention:

Amino-functional siloxane copolymer release agents for fuser members

Applicant:

Xerox Corporation

Relevant legal provisions:

EPC Art. 56
RPBA Art. 12(4)

Keyword:

Inventive step - (no)
Late-filed requests - requests identical to requests not admitted in first instance proceedings



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Case Number: T 1404/15 - 3.3.03

D E C I S I O N
of Technical Board of Appeal 3.3.03
of 23 November 2017

Appellant: Xerox Corporation
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Representative: Grünecker Patent- und Rechtsanwälte
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Decision under appeal: **Decision of the Examining Division of the
European Patent Office posted on 17 February
2015 refusing European patent application No.
05105540.8 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman D. Semino
Members: O. Dury
C. Brandt

Summary of Facts and Submissions

I. The appeal by the applicant (appellant) lies against the decision of the examining division posted on 17 February 2015 refusing European patent application No. 05105540.8.

II. In the decision under appeal the following documents were cited:

D1: US 2001/0019768

D2: EP-A-0 662 645

D3: EP-A-0 657 789

D4: US 2002/0102374

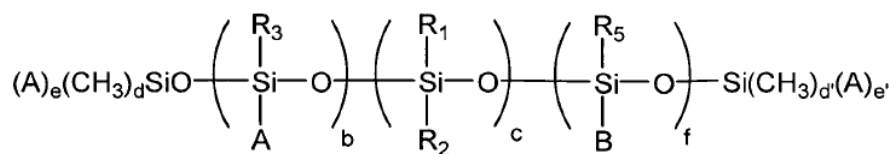
D5: JP 2000 131986

D6: US 5 157 445

III. That decision was based on a main request filed with letter of 31 January 2014 and two auxiliary requests filed with letter of 17 November 2014.

Claim 1 of the main request read as follows:

"1. A fuser member comprising:
a substrate;
an outer polymeric layer; and
a release agent material coating on the outer polymeric layer, wherein the release agent material coating comprises a copolymer having the following formula:



wherein A and B are different, and each represents $-R_4-X$, wherein R_4 represents an alkyl group having from 1 to 10 carbons, X represents $-NH_2$ or $-NHR_6NH_2$ with R_6 representing an alkyl group having from 1 to 10 carbons; R_1 and R_2 are the same or different and each is selected from the group consisting of an alkyl having from 1 to 25 carbons, an aryl having from 4 to 10 carbons, and an arylalkyl; R_3 and R_5 are the same or different and each is selected from the group consisting of an alkyl having from 1 to 25 carbons, an aryl having from 4 to 10 carbons, an arylalkyl, and a substituted diorganosiloxane chain having from 1 to 500 siloxane units; b and c are numbers and are the same or different and each satisfy the conditions of $0 < b \leq 10$ and $10 \leq c \leq 1,000$ and $0 < f \leq 10$; d and d' are numbers and are the same or different and are 2 or 3, and e and e' are numbers and are the same or different and are 0 or 1, and satisfy the conditions that $d + e = 3$ and $d' + e' = 3$, and $b + c + f$ is from 10 to 1,000."

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

"wherein said copolymer has an amino functionality provided by aminopropyl methyl siloxy groups, and wherein said copolymer has an amino functionality provided by N-(2-aminoethyl)-3-aminopropyl siloxy groups."

Claim 1 of auxiliary request 2 differed from claim 1 of auxiliary request 1 in that the definition of R₁ and R₂ ("R₁ and R₂ are ... and an arylalkyl") was replaced by

"R₁ and R₂ are the same or different and each is selected from the group consisting of methyl, ethyl, propyl, butyl, cyclobutyl, cyclopentyl, phenyl, methylphenyl, ethylphenyl and propylphenyl".

IV. In that decision, the examining division held in particular that:

- The copolymers defined in claim 1 of the main request only differed from the teaching of the closest prior art D6 in that two different amino groups were pendant groups whereas D6 disclosed explicitly and directly one pendant amino group and one terminal amino group.

In the absence of any comparative example or any surprising effect related to said distinguishing feature, the objective problem was to provide an alternative polysiloxane for the same intended use as in D6.

The solution to that problem proposed in claim 1 of the main request was obvious because D6 itself taught that different amino groups could be either pendant or terminal, as shown by the amino silicone α_2 disclosed therein. Besides, D1 to D5 showed that amino-polysiloxanes used as release agents in a fuser member could present a broad variety of structures with many alternative amino groups placed either at the end or along the polysiloxane chain.

- Auxiliary requests 1 and 2 were not admitted to the proceedings pursuant to Rule 137(3) EPC, *inter alia* because they could not unambiguously solve the objection pursuant to Article 56 EPC retained against the main request.

- v. In its statement of grounds of appeal the appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the main request or, alternatively, on the basis of any of auxiliary requests 1 or 2, all requests as filed therewith. Those requests corresponded to the main request and auxiliary requests 1 and 2, respectively, dealt with in the contested decision.

- VI. In a communication following the summons to oral proceedings, the Board identified relevant issues to be addressed during the oral proceedings, in particular in respect of inventive step over D6.

- VII. At the beginning of the oral proceedings, which were held on 23 November 2017, the appellant declared that he had no further submissions to make in addition to those made in writing and requested a decision on the state of the file.

- VIII. The appellant's arguments, as far as relevant for the present decision, may be summarized as follows:

Main request - Article 56 EPC

- (a) The amino functional polysiloxanes defined in operative claim 1 differed from those according to D6 in that they contained at least two different repeating units comprising a different pendent functional amino group and further at least one

repeating unit which did not comprise an amino group. In that respect, D6 did not disclose polysiloxanes comprising three different repeating units, but only copolymers with two different repeating units, whereby only one of those units comprised an amino group. D6 was also not limited to copolymers but also encompassed homopolymers. In polysiloxane α_2 of D6, a single amine-containing repeating unit was present in the main chain and a different amine containing unit was only present as an end-group.

- (b) The problem to be solved was to provide a fuser member comprising a release agent which provided sufficient wetting for the fuser member, which had little interaction with copy substrates, prevented ink adhesion to the final copy substrate and did not react to any components of the toner.

Example 3 and 4 of the application as filed were illustrative of the teaching of D6 and of operative claim 1, respectively. Those examples showed that the polysiloxanes being claimed were at least as good as those of the prior art, but were obtainable as a single material and not as a blend of materials as in D6.

- (c) Neither D6, nor D1 to D5 suggested polysiloxanes with three different units, nor with two repeating units comprising different pendent amino groups.
- (d) For those reasons, the subject-matter of operative claim 1 was inventive.

Auxiliary requests 1 and 2 - Admittance

- (e) Auxiliary requests 1 and 2 were resubmitted with the initial appeal substantiation, in direct response to the decision of the examining division. Therefore, those requests were filed in accordance with the rules of procedures of the Boards of Appeal.

- (f) Regarding inventive step, the subject-matter of claim 1 of auxiliary requests 1 and 2 was, as compared to the main request, directed to polysiloxanes with two specific amino functionalities, the combination of which was not disclosed in D6.

- (g) Under those circumstances, it was not justified not to admit auxiliary requests 1 and 2 to the proceedings.

IX. The appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the main request or, alternatively, on the basis of any of auxiliary requests 1-2, all requests as filed with its statement of grounds of appeal.

At the beginning of the oral proceedings held on 23 November 2017 the appellant further requested a decision on the basis of the state of the file.

Reasons for the Decision

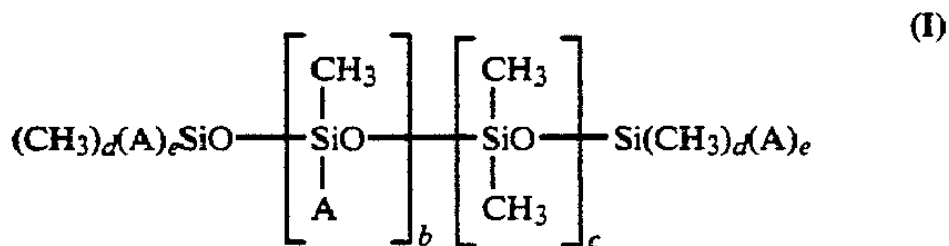
Main request

1. Inventive step

1.1 Closest prior art

1.1.1 Although the subject-matter of operative claim 1 is directed to a fuser member, the sole issue at stake in the contested decision and during the appeal proceedings was whether or not it was inventive to use the specific polysiloxane which is comprised in the release agent material coating according to claim 1 instead of the polysiloxane(s) taught in D6 for the same use. There is no reason to deviate from that view and that issue is also dealt with hereinafter.

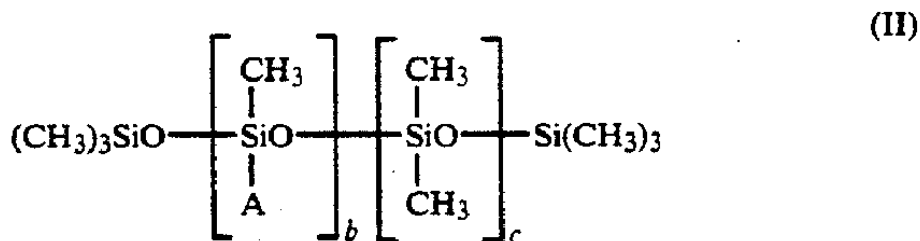
1.1.2 There is also no reason to deviate from the examining division's opinion, which was shared by the appellant, according to which D6 is the closest prior art. In particular, D6 discloses a functional group-containing organopolysiloxane of a general formula (I):



where A represents -R¹-X or -R¹-O-Y_f-H (in which R₁ represents an alkylene group having from 1 to 8 carbon atoms; X represents -NH₂ or -NHR² NH₂ with R² being an alkylene group having from 1 to 8 carbon atoms; Y

represents an alkylene group having from 2 to 4 carbon atoms; and f represents an integer of from 0 to 10); b and c each satisfy the conditions of $0 \leq b \leq 10$ and $10 \leq c \leq 1,000$ but both b and c must not be 0 at the same time; and d is 2 or 3, e is 0 or 1, and $d + e = 3$; the organopolysiloxane having a viscosity of from 10 to 100,000 cs at 25° C (claim 1).

Claim 2 of D6 further discloses embodiments of formula (I) satisfying the general formula (II):



where A represents $-\text{R}^1-\text{X}$, in which R^1 represents an alkylene group having from 1 to 8 carbon atoms, and X represents $-\text{NH}_2$; and b and c each satisfy the conditions of $0 < b \leq 10$ and $10 \leq c \leq 1,000$.

Of particular interest are also:

- the amine modified oils α_1 , α_2 and β mentioned at column 4, lines 3-15 of D6, namely

Amine-modified oil α_1 : formula (I)

d=3 and e=0, and

A (in the chain moiety)-
 $-\text{CH}_2\text{CH}_2\text{CH}_2\text{NHCH}_2\text{CH}_2\text{NH}_2$

Amine-modified oil α_2 : formula (I)

d=2 and e=1 (at one end), d=3 and e=0 (at the other end), and

A (in the chain moiety)-
 $-\text{CH}_2\text{CH}_2\text{CH}_2\text{NHCH}_2\text{CH}_2\text{NH}_2$

A (at one end) $-\text{CH}_2\text{CH}_2\text{CH}_2\text{NH}_2$

Amine-modified oil β : formula (II)

d=3 and e=0, and

A (in the chain moiety) $-\text{CH}_2\text{CH}_2\text{CH}_2\text{NH}_2$

- amine modified oils A to G indicated at column 6, lines 15-23 of D6, namely

As amine-modified oil α_1 of formula (I)

Amine A Oil: amine equivalent of 40,000

Amine B Oil: amine equivalent of 139,000

Amine C Oil: amine equivalent of 195,000

Amine D Oil: amine equivalent of 7,640

As amine-modified oil α_2 of formula (II)

Amine E Oil: amine equivalent of 32,500

As amine-modified oil β of formula (II)

Amine F Oil: amine equivalent of 28,600

Amine G Oil: amine equivalent of 36,500 ;

- the amine modified oil β of formula (II) having an amine equivalent of 100 000 and a viscosity of 300 cst (D6: columns 23-25: experimental examples 13-16).

1.2 Distinguishing feature(s)

1.2.1 The subject-matter of operative claim 1 differs from each of the specific oils indicated in section 1.1.2 at least in that it contains two different amino functional units (indicated with the indexes b and f in the formula of operative claim 1) in the polymer chain (i.e. not as endgroups) each of those units being present in an amount of 1 to 10 units. Polysiloxanes exhibiting such a structure are not explicitly disclosed in D6 because in formula (I), b may be 0 and in formulae (I) and (II) it is not specifically indicated that different groups A may be present simultaneously in the main chain (unit indicated with index "b"). Also, none of the amine modified oils identified in section 1.1.2 above exhibit two different amino functional units in the main chain.

1.2.2 In that respect, the polysiloxane according to claim 1 with e.g. either b or f equal to 1 specifically differs from the amine modified oil α_2 at column 4, lines 7-12

and at column 6, lines 19-20 of D6 only in that one of the two amino functional groups is located in the polymer chain instead of being an endgroup.

- 1.2.3 The appellant argued that formula (I) of D6 encompassed homopolymers since it allowed for either b or c to be zero as long as both b and c are not simultaneously zero. Therefore, the polysiloxanes defined in operative claim 1 differed from those of D6 also in that they had to be copolymers.

Even if the Board does not find the appellant's argument as persuasive there is no need to elaborate further on the issue, as D6 discloses explicitly at least one embodiment (α_2 , see point 1.2.2) of a copolymer with a single distinguishing feature with respect to the polysiloxane in claim 1.

- 1.3 Defining the problem solved in view of the closest prior art
 - 1.3.1 The appellant argued that the technical problem to be solved over D6 was to provide a fuser member comprising a release agent which provides sufficient wetting for the fuser member, which has little interaction with copy substrates, prevents ink adhesion to the final copy substrate and does not react to any components of the toner.
 - 1.3.2 The sole example of the application that may possibly illustrate a polysiloxane comprising two different amino functional units in the main chain as defined in claim 1 appears to be example 4, in which octamethyltetracyclosiloxane is reacted with trimethyl silanol (non-amino functional endblocker), "amino propyl methyl siloxane", "N-(2-amino ethyl)-3-

aminopropyl methyl siloxane" and a ring opening catalyst (potassium silanolate). In that respect, the exact nature of compounds "amino propyl methyl siloxane" and "N-(2-amino ethyl)-3-aminopropyl methyl siloxane" is not indicated in the application as filed and the appellant did not identify which compounds were meant, in particular not even in reply to the Board's communication wherein the question was asked (section 3.3.2.a). There is further no evidence on file that the compound prepared in example 4 is indeed according to the formula of claim 1, in particular regarding the amount of each of the three comonomers.

For those reasons, the appellant has not shown that example 4 of the application as filed effectively illustrates the subject-matter of operative claim 1.

- 1.3.3 The appellant argued that example 4 of the application as filed showed that similar properties than those obtained in example 3 of the application as filed were obtained, whereby said example 3 illustrated the teaching of copolymer blends according to D6.

However, it is derivable from the indication in paragraphs 60 and 84 ("It is assumed that", "It is expected that...") of the application as filed, that the appellant's conclusions indicated in the application as filed were merely speculative.

Besides, as already indicated in the contested decision, it is not clear from the information provided in the application as filed what was effectively done in said example 3 (page 5: section 9) and the appellant did not provide any information in that respect in reply to the Board's communication in which that issue was addressed (section 3.3.2.c).

Therefore, it cannot be concluded that examples 3 and 4 of the application as filed illustrate the comparison between the subject-matter of operative claim 1 and D6 as argued by the appellant.

- 1.3.4 The appellant argued in addition that the copolymers of claim 1 allow to avoid using blends of different silicones according to the teaching of D6.

However, for the reasons indicated in sections 1.3.2 and 1.3.3 above there is also in that respect no evidence on file. Besides, D6 is not limited to blends (see e.g. claim 4 and column 4, lines 48-50: the additional polysiloxane to be used in a blend is indicated as an optional component) and the amine modified oil β of formula (II) of D6 was e.g. successfully used alone in experimental examples 13-16 of D6. Also, the subject-matter of operative claim 1 does not exclude the use of blends of polysiloxanes, but only requires that at least a copolymer according to the formula defined therein is present.

Therefore, the appellant's argument is not persuasive.

- 1.3.5 In view of the above, the problem effectively solved over D6 can only be formulated as residing in the provision of fuser members comprising other polysiloxanes for a release agent material coating, which is in line with the problem considered by the examining division (section 11 of the decision).

- 1.4 Assessing whether the proposed solution is obvious having regard to the state of the art

- 1.4.1 The question remains to be answered if the skilled person desiring to solve the problem identified as indicated above, would, in view of D6, possibly in combination with other prior art or with common general knowledge, have modified the disclosure of D6 in such a way as to arrive at the claimed subject matter.
- 1.4.2 In that respect D6, although it does not explicitly disclose polysiloxanes with repeating units having two different amine functionalities in its main chain nevertheless teaches that polysiloxane of formulae (I) and (II) of D6 may be used, whereby it was not shown by the appellant that the skilled person would have had any reason to consider that different rests A would not be contemplated as functional units within the polymer main chain defined in those formulae.

To the contrary, amine-modified oil α_2 of D6 shows that polysiloxanes having two different amine functionalities as rests A within a single polymer are effectively taught in D6. Although said embodiment of D6 is directed to a polysiloxane wherein a single amine functionality is present in the polymer main chain, it was not shown that there would be any reason to conclude that different rests A should not be used in the main chain (repeating unit with index "b" in formulae (I) and (II) of D6).

- 1.4.3 It is further indicated in the application as filed that the preparation of polysiloxane copolymers as defined in operative claim 1 is made according to methods which are usual in the art (paragraphs 60, 65). That statement was further confirmed by the appellant in its reply of 16 October 2017 (section I: paragraph bridging pages 1 and 2). Therefore, the skilled person contemplating using polysiloxanes according to

operative claim 1 would have had no difficulty to prepare such polysiloxanes.

1.4.4 In view of the above, it is obvious to provide an alternative to the amino functional siloxanes of D6 by using amino functional polysiloxanes containing at least two different repeating units comprising a different pendent functional amino group and further at least one repeating unit not comprising an amino group according to operative claim 1.

1.5 For those reasons, the main request does not fulfill the requirements of Article 56 EPC.

Auxiliary requests 1 and 2

2. Admittance

2.1 Auxiliary requests 1 and 2 are identical to auxiliary requests 1 and 2 which were not admitted to the proceedings pursuant to Rule 137(3) EPC by the opposition division, *inter alia* because they could not unambiguously solve the objection pursuant to Article 56 EPC retained against the main request.

Under such circumstances, it has to be assessed if it would be justified not to admit to the proceedings those auxiliary requests pursuant to Article 12(4) RPBA.

2.2 In that respect, it was not argued by the appellant that the examining division did not exercise its discretion in accordance with the right principles or in an unreasonable way.

2.3 The amendments made in claim 1 of each of auxiliary requests 1 and 2 effectively limit the polysiloxanes defined in claim 1 by specifying the two amine functionalities present therein. The amendments of claim 1 of auxiliary request 2 further limit the definition of rests R_1 and R_2 .

Apart from the mere statement that the specific combination of amine functionalities thus defined was not disclosed in D6, which appears to be an argument regarding novelty or at most the presence of further distinguishing features, no additional argument why the amendments made in claim 1 of auxiliary requests 1 and 2 contributed to an inventive step as compared to the main request was put forward by the appellant.

Under those circumstances, it was neither shown that the examining division's opinion in respect of Article 56 EPC was wrong, nor explained why the Board should deviate from the examining division's conclusion in that regard.

2.4 For those reasons, the Board, making use of its discretion pursuant to Article 12(4) RPBA, finds it appropriate not to admit auxiliary requests 1 and 2 to the proceedings.

3. As the only appellant's request which is in the proceedings (main request) is not allowable, the appeal has to be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



B. ter Heijden

D. Semino

Decision electronically authenticated