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Datasheet for the decision of 25 April 2023

Case Number: T 1140/21 - 3.3.07

Application Number: 05728472.1

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Language of the proceedings: EN

Title of invention:
Hair processing compositions and methods for processing hair

Patent Proprietor:
KAO CORPORATION

Opponent:
Henkel AG & Co. KGaA

Headword:
Hair processing compositions and methods for processing hair/ KAO

Relevant legal provisions:
EPC Art. 56

Keyword:
Main request - Inventive (Yes)

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Case Number: T 1140/21 - 3.3.07

D E C I S I O N
of Technical Board of Appeal 3.3.07
of 25 April 2023

Appellant: (Opponent)	Henkel AG & Co. KGaA Henkelstrasse 67 40589 Düsseldorf (DE)
Representative:	LKGLOBAL Lorenz & Kopf Patentanwalt Attorney at Law PartG mbB Brienner Straße 11 80333 München (DE)
Respondent: (Patent Proprietor)	KAO CORPORATION 14-10, Nihonbashi Kayabacho 1-chome, Chuo-ku, Tokyo 103-8210 (JP)
Representative:	Hoffmann Eitle Patent- und Rechtsanwälte PartmbB Arabellastraße 30 81925 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 21 May 2021 rejecting the opposition filed against European patent No. 1736139 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	A. Usuelli
Members:	D. Boulois
	A. Jimenez

Summary of Facts and Submissions

I. European patent No. 1 736 139 was granted on the basis of a set of 6 claims.

Independent claim 1 as granted read as follows:

"1. A method for processing hair, which comprises mixing while stirring a hair processing composition comprising:

a first agent comprising an alkoxysilane represented by the following formula (1):

$R^1_pSi(OR^2)_{4-p}$ (1)

wherein R^1 and R^2 represent a straight or branched alkyl group having 1 to 6 carbon atoms or a straight or branched alkenyl group having 2 to 6 carbon atoms, p "R^1" (s) and (4-p) "R^2" (s) may be the same or different,
and p represents an integer of from 0 to 3;

and a second agent comprising an organic acid and water, wherein the composition has a pH in a range of from 2 to 5,

and applying the composition to hair to allow a silanol compound represented by general formula (2):

$R^1_pSi(OH)_n(OR^2)_{4-p-n}$ (2)

wherein R^1, R^2 and p have the same meaning as above, n is an integer of not less than 1 and not more than (4-p), and p "R^1" (s) and (4-p-n) "R^2" (s) may be the same or different, and generated through the hydrolysis of the alkoxysilane represented by general formula (1), to penetrate into the hair."

II. The patent had been opposed under Article 100 (a) EPC on the ground that its subject-matter lacked inventive step.

III. The appeal lies from the decision of the opposition division to reject the opposition.

IV. The documents cited during the opposition proceedings included the following:

D1: US 2 782 790 A
D2: DE 10233963 A1
D3: US 4 344 763 A
D4: WO 2004012691 A1
D5: EP 1 172 079 A1
D6: WO 9844906 A1

V. According to the decision under appeal, D1 was considered to represent the closest prior art, in particular in view of example 10. Compared with the teaching of D1, the silane of formula (1) overlapped with the formula depicted on column 2 of D1, but the substituent definitions in D1 were broader. The penetration into hair of the silanol generated from the silane of formula (1) was also considered to be a distinguishing feature versus D1. The technical problem was seen as a method for imparting good strength and body to hair fibers. The solution was not obvious.

VI. The opponent (hereinafter the appellant) filed an appeal against said decision.

VII. With the reply to the statement of grounds of appeal dated 24 January 2022 the patent proprietor filed auxiliary requests 1 to 9 corresponding respectively to the auxiliary requests filed during the opposition proceedings on 20 March 2020.

VIII. In a communication dated 26 January 2023, the Board expressed *inter alia* its preliminary opinion that the main request was inventive over D1.

IX. Oral proceedings took place on 25 April 2023.

X. The arguments of the appellant may be summarised as follows:

Main request - Inventive step

The closest prior art was D1, in particular example 10. The distinguishing features were the presence of water and the subsequent application of the aqueous composition on the hair or the sequence of the steps. The pH value could not constitute a technical difference in view of the application of water to the hair; in D1 when silanol is on the hair the pH had already the same values as claimed. An hydrolysis was explicitly disclosed in D1, and an hydrolysis required water. There was no technical effect, and the problem was the provision of an alternative method for processing the hair. The solution was obvious in view of D1.

XI. The arguments of the respondent may be summarised as follows:

Main request - Inventive step

The sequence of application onto the hair was a further difference between the claimed subject-matter and D1. In example 10, if the pH were calculated, it would be outside the claimed range. The composition of example 10 comprised tricholorosilane, a very strong acid, which lowered the pH at the hair to a lower level than the claimed pH, such as 0.5. The polymerization was not so quick in D1 as in the patent, and there was no penetration of silanol in D1. Table 6 of the patent showed an improved effect on hair, while the comparative example 23 did not show an enhanced effect. The skilled person would not modify D1 to arrive at the claimed subject-matter.

XII. Requests

The appellant requested that the decision under appeal be set aside and that the patent be revoked.

The respondent requested that the appeal be dismissed, alternatively that the decision under appeal be set aside and the patent be maintained according to the sets of claims filed as auxiliary requests 1-9 on 24 January 2022 with the reply to the statement of grounds of appeal.

Reasons for the Decision

1. Main request - Inventive step

1.1 The claimed invention relates to a method for processing hair, which comprises mixing while stirring a hair processing composition comprising a first agent comprising alkoxysilane and a second agent comprising an organic acid and water, wherein the composition has a pH in a range of from 2 to 5, and applying the composition to hair to allow the formed silanol compound to penetrate into the hair.

The claimed method allows in particular to control moderately the polymerization rate of the silanol compounds produced by the hydrolysis of the alkoxysilane, and as a consequence allows the silanol compounds to penetrate into hair and polymerize inside the hair, thereby imparting excellent strength/ body to the hair (see par. [0008]-[0009]). According to the invention, it is indeed possible to stabilize the silanol compounds as monomolecules or lower molecules such as dimmers or trimmers, whereby enabling efficient penetration of the silanol compound into the inside of the hair.

1.2 D1 was considered to represent the closest prior art by the opposition division in its decision. The appellant also took D1 as starting point for the assessment of inventive step in its statement of grounds of appeal.

D1 relates to a method for conditioning hair in the absence of heat. The inventors of D1 found that an organo-silane having at least two readily hydrolyzable groups directly attached to the silicon may be applied

to the hair in non-aqueous medium without modification of the organo-silane and that before, but preferably after the elimination of the diluent with which the organo-silane is applied, the organo-silane may almost immediately be hydrolyzed to the corresponding silanol and condensed to an organo-silicon polymer *in situ* on the hair, by the application of moisture thereby, to condition the hair (see D1, col. 2, lines 3-28).

D1 emphasizes that, when the organo-silane monomer contains two hydrolyzable groups, hydrolyzation and substantially simultaneous condensation occur in aqueous medium to form relatively straight chain polymers capable of setting the hair in positions held during the polymerization (see col. 2, l. 30-58; col. 3, lines 20-45; col. 5, line 73 - col. 6, line 9). The silicon polymer formed on the surface of the hair functions to render the hair fibers repellent to moisture (see col. 6, lines 20-41).

D1 mentions furthermore that, where it is desirable to catalyze hydrolyzation and polymer formation, it is expedient to embody some of the chloro silanes which rapidly hydrolyze and contain released acid in amounts sufficient to catalyze the polymerization of the silanes (see D1, col. 7, lines 5-18).

Example 10 of D1 discloses a "rapid acting composition" comprising inter alia 1-4 weight% of methyl trimethoxy silane, 1-2 weight% of methyltrichloro silane, 1-3 weight% of hexadecyl tricholro silane and 1 weight% of acetic acid in a solvent, which can be a hydrocarbon, an aromatic solvent, ether or chlorinated solvent.

1.3 In the Board's view, the distinguishing features between the subject-matter of claim 1 and the disclosure of D1 are the following:
a) the mixing step of the alkoxysilane with an organic acid and water,
b) the presence of water in the claimed composition, and therefore a pH of the aqueous composition comprised between 2 and 5,

With regard to point a), the composition disclosed in example 10 of D1 comprises acetic acid and silanes, and water might be added after application of the composition by wetting the hair (see D1, col 6, lines 24-41 or claim 1). Hence, a mixing step as claimed is not disclosed in D1.

As to point b), i.e the pH after application of the composition disclosed in D1 on the hair and further moistening, it does not appear credible that, in D1, the pH value after moistening the hair might be comprised between 2 and 5. In this regard, the explanations given by the respondent in its reply to the statement of grounds of appeal as to the impact on the pH of the release of hydrochloric acid caused by the hydrolyzation of the chloro silanes present in the composition of example 10 of D1, convince the Board that the pH on hair is well below the value of 2.0. The respondent showed indeed that the trichlorosilanes in example 10 provide sufficient chlorine to produce about 1 wt.% HCl, in the case only 1 wt.% of each trichlorosilane would be present in the composition; this would be sufficient to lead to a pH value well below the claimed range. This mechanism of action is confirmed theoretically by the explanations given in D1 in column 7, lines 5-18 of D1, namely that "*where it is desirable to catalyze hydrolyzation and polymer*

formation, instead of incorporating acids or alkalies in the treating composition to accelerate the reaction, it is more expedient to embody some of the chloro silanes which rapidly hydrolyze and contain released acids in amounts sufficient to catalyze the polymerization of the oxy silanes or other silanes which might be present in dominant proportions".

With respect to the claimed penetration of silanol into the hair, the appellant considered that it could not constitute a further distinguishing feature over the disclosure of D1. In the Board's view, it is clear that the purpose of the teaching of D1 is to polymerize rapidly the silanol to a silicon polymer which remains on the surface of the hair and not to promote the hair penetration of silanol; this rapid polymerization is in particular the purpose of the composition of example 10 which is named "*a rapid acting composition*" and contains chlorosilanes to accelerate said polymerization. Even if it is impossible to conclude from the teaching of D1 that silanol would be available for a sufficient time to penetrate into the hair, and even if this has not been proven by the appellant, the Board does not exclude that small amounts of silanol might nevertheless penetrate the hair. This appears to be shown in comparative example 1, Figure 5 and Table 6 of the patent. Hence, the penetration of the silanol into the hair will not be considered as a distinguishing feature between the claimed subject-matter and the disclosure of D1.

1.4 According to the appellant, the objective technical problem has to be defined as the provision of a method which reduces the washing out of organic silicone components from the hair.

The respondent defines the technical problem as the provision of a method that leads to better feeling of strength and body and better manageability of the hair.

The opposition division considered the technical problem to be the provision of a method for imparting good strength/body to hair fibers.

1.5 Examples 1 and 2 and their corresponding Figures 1 or 4 of the patent show the penetration of large amounts of silanol into the hair from a composition at pH 4.0, and the incidence of the pH on this penetration, since at pH 1.0 (see Comparative example 1 and Figure 5) the silicon compounds were mainly present on the surface of the hair and did not penetrate in large amounts into the inside of the hair. The amount of silicon into the hair is 2.5 to 3.0% by weight of the hair in example 1 for the composition at pH 4.0, while it is 3500 ppm, i.e. 0.35%, in comparative example 1 for the composition at pH 1.0 (see par. [0075]).

Table 6 of Example 3 confirms this technical effect and shows the consequent effect on the hair property, such as an improved feeling of strength/body or manageability of hair. A direct comparison between the application of the composition of example 22 at pH 3.1 versus the composition of example 23 with hydrochloric acid at pH 1.0 shows an enhanced feeling of strength/ body of hair and manageability of hair in favour of the process performed with composition of example 22 over the composition of example 23.

1.6 In view of this disclosure, the objective technical problem is as defined by the respondent or the opposition division in its decision. In view of the examples, this problem has been convincingly solved.

1.7 The claimed solution is a process as claimed with in particular a mixing step of the alkoxysilane with an organic acid, the presence of water in the claimed composition, and a pH of the aqueous composition comprised between 2 and 5.

1.8 The claimed solution is not obvious in view of the disclosure of D1.

First, the purpose of the process disclosed in D1 is different, and even the contrary of the process claimed in claim 1 of the main request. It intends indeed to polymerize rapidly the silanol formed by hydrolysis of the silane to a silicon polymer which condenses and remains on the surface of the hair to render the hair fibers repellent to moisture (see D1, col 6, lines 10-41). On the other hand, the claimed process leads to slower the polymerization rate of the silanol compound produced by the hydrolysis of the alkoxysilane, in particular by the pH of the composition, and as a consequence allows the silanol compounds to penetrate into hair and polymerize there.

Then, D1 teaches to even accelerate the polymerization of the silanol, *ex situ*. This is done by catalysing the hydrolyzation of the silane and the polymer formation through the addition of an acid in the treating composition to accelerate the reactions, for instance by the addition of a chloro silane, as used in example 10 of D1.

Finally, the goal of D1 is totally different and is to provide a rapid setting of the hair by hydrolyzation of the silane into silanol and substantially simultaneous polymerization of the organo-silane onto the hair,

which allows straightening kinky or curling hair (see col. 1, lines 15-21, col. 2, lines 24-29; col. 3, lines 28). The purpose of the present claimed invention is different, i.e. to impart strength and body of the hair, meaning improving the elasticity or flexibility of the hair (see for instance par. [0014] of the specification). In view of the different goals, the skilled person would find no relevant information in D1 on how to modify the process disclosed therein in order to solve the technical problem.

Hence, starting from D1, the skilled person finds no teaching to retard the polymerization so that silanol can penetrate into the hair fiber.

Consequently, the claimed solution is not obvious in view of D1 and the main request meets the requirements of Article 56 EPC.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

B. Atienza Vivancos A. Usuelli

Decision electronically authenticated