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Application No.: 79 302 754.1
Publication No.: 0 012 033
Title of invention: Non-woven fabrics and their preparation

Classification: ~~D04H 1/64, C08F 220/18, A61L 15/00~~

D E C I S I O N
of 8 May 1991

Proprietor of the patent: Rohm and Haas Company

Opponent: 01 BASF AG
02 Hoechst AG

Headword:

EPC Articles 54 and 56

Keyword: "Novelty and inventive step (yes)"

Headnote

Summary of Facts and Submissions

I. European patent No. 0 012 033 was granted with effect from 25 May 1983 on the basis of European patent application 79 302 754.1 filed on 3 December 1979, priority being claimed from United States application No. 966 422 dated 4 December 1978.

II. The patent was opposed by the Appellants (Opponents 2) and Opponents 1.

The grounds of opposition invoked were lack of novelty and/or inventive step with respect to the state of the art represented by the following documents:

- (D1) US-A-3 600 209
- (D2) US-A-3 321 431
- (D3) US-A-2 931 749
- (D4) "Kunststoffe", volume 59 (1956), pages 247 to 251
- (D5) Encyclopaedia of Polymer Science and Technology, John Wiley and Sons, (1964), volume 1, page 499
- (D6) Webster's New Collegiate Dictionary, (1959), page 792
- (D7) BE-A-838 650 (Derwent Abstract)
- (D8) "Dangerous Properties of Industrial Materials", Reinhold Publishing Corporation, (1963), pages 397 and 398.

III. By its interlocutory decision of 21 July 1987 the Opposition Division found that the patent was to be maintained on the basis of the amended documents as specified in the communication pursuant to Rule 58(4) EPC, issued on 11 November 1986.

Claim 1 of these documents reads as follows:

"A non-woven fabric suitable for use as diaper coverstock comprising a non-woven web of fibres at least 50% of which, based on the dry fibre weight, are hydrophobic fibres having, when dry, a moisture regain at 21.1°C (70°F) and 65% relative humidity of less than 2¹/₂%, bonded together by a polymeric binder comprising an emulsion copolymer of one or more monomers containing a carboxylic (-COOH) group in free acid or salt form, characterised in that the binder is an essentially uncrosslinked water-insoluble, hydrophobic emulsion copolymer having a molecular weight greater than 100,000 and derived from a monomer composition comprising, by weight of total monomers:

- a) from 1-8% of at least one monoethylenically unsaturated carboxylic acid in free acid or salt form;
- b) from 50-75% of one or more C₄-C₈ alkyl acrylates- and
- c) from 20-49% of one or more of methyl methacrylate, styrene or α-methyl styrene, the binder further being free of nitriles, amides, substituted amides, formaldehyde condensates and, in general, formaldehyde and substances giving rise to formaldehyde."

Dependent Claims 2 to 8 relate to preferred embodiments of the fabric according to Claim 1.

Claim 9 relates to a diaper comprising, as a coverstock, fabric as claimed in any one of Claims 1 to 8.

IV. The Appellants filed an appeal against this decision on 23 September 1987, with instructions to debit the appeal fee from their account.

The statement of grounds of appeal was filed on 24 November 1987.

They requested that the decision under appeal be set aside and that the patent be revoked in its entirety.

V. Oral proceedings were held in accordance with the auxiliary requests of both parties on 8 May 1991. The duly summoned Opponents 1 did not attend.

VI. The arguments of the Appellants in support of their request for revocation of the patent can be summarised as follows:

Document D1 related to a suede-like sheet material comprising a non-woven web of fibres bonded together by a polymeric binder corresponding to that defined in present Claim 1. In order to improve the nap of the material various additives to the binder were proposed. It was however clear that these additives could be dispensed with if the improved nap was not required. In the decision under appeal attention was focussed on Example 4 wherein the binder contained a crosslinking agent. The binder of Example 5, however, contained no such crosslinking agent and must therefore be "essentially uncrosslinked" as required by present Claim 1. The suede-like material produced in Example 5 was in view of its softness and porosity eminently suitable for use as a diaper coverstock. It was in any case unclear what limitation this latter term imposed on the claim since in the patent specification it was proposed to use up to 400% add-on weight of binder. It seemed very unlikely that a fabric with this amount of binder would be sufficiently soft and porous for use as a diaper coverstock.

Document D3 concerned bonded non-woven fibrous products stated as being useful inter alia as sanitary napkin covers and disposable diapers. The binder was an emulsion copolymer obtained from a monomer composition comprising at least one monoethylenically unsaturated carboxylic acid, corresponding to feature (a) of present Claim 1, at least one monomer which in itself would yield a soft homopolymer, corresponding to feature (b) of the claim, and at least one monomer which in itself would yield a hard homopolymer, corresponding to feature (c) of the claim. The skilled man would be able to choose the particular monomers amongst those listed and the amounts of these monomers in the composition in accordance with the desired properties of the binder. Furthermore, although Claim 1 of document D3 referred to the binder being crosslinked, Example 1 for instance contained no crosslinking agent and would therefore be "essentially uncrosslinked" within the terms of present Claim 1 of the contested patent. The product of this Example was a soft, coherent, extremely porous fabric that was clearly suitable for use as a diaper coverstock.

With respect to document D2 it was pointed out that the amide groups present in the polymer binder would not have any toxic properties provided that an unreacted monomer was properly removed.

- VII. At the oral proceedings the Respondents submitted new pages 4 and 6 of the description to replace the equivalent pages specified in the communication pursuant to Rule 58(4) EPC of 11 November 1986 and requested maintenance of the patent in this amended form.

In support of their request the Respondents put forward the following arguments:

The term "essentially uncrosslinked" as used in Claim 1 was intended to mean that any crosslinking present had no practical significance with respect to the properties of the binder. In particular, the binder by being essentially uncrosslinked was capable of being successfully heat or solvent sealed.

The suede-like material according to document D1 was clearly unsuitable for use as a diaper coverstock since it would not readily permit body fluids initially impinged thereon to pass into the internal absorbent core of the diaper. The monomer constituents of the binder according to Example 4 corresponded to those specified in Claim 1 of the contested patent but in the finished material the binder was undoubtedly crosslinked through the presence of the well known crosslinking agent zinc oxide. In Example 5 referred to by the Appellants the binder did not correspond to that claimed: ethyl acrylate was used instead of a C₄-C₈ alkyl acrylate, the proportion of ethyl acrylate was higher than that specified for the C₄-C₈ alkyl acrylate, and the proportion of styrene was much lower than that required. Although the binder composition of Example 5 was not described as comprising a crosslinking agent this did not mean that in the finished material the binder was essentially uncrosslinked since crosslinking could be induced through the selection of an appropriate curing temperature.

Although the binder compositions mentioned in document D3 were to some extent similar to that specified in Claim 1 of the contested patent, these binders were in the finished product always crosslinked so that the product was solvent and heat resistant. This was quite clearly specified throughout document D3. The crosslinking could be obtained with or without the use of a suitable crosslinking agent. It was not clear that the fabric of

Example 1 was indeed suitable for use as a diaper coverstock since although stated to be soft and porous no indication of its wet strength or abrasion resistance was given. In any case the fibres of the web were not hydrophobic as specified in present Claim 1 and ethyl acrylate was used rather than the C₄-C₈ alkyl acrylate as required by the claim.

Reasons for the Decision

1. The appeal complies with the requirements of Articles 106 to 108 and Rules 1(1) and 64 EPC: it is, therefore, admissible.
2. Formal allowability of the amendments
 - 2.1 In comparison with Claim 1 of the granted patent the present Claim 1 has been amended in three respects. It is now stated that
 - (a) the non-woven fabric is suitable for use as a diaper coverstock,
 - (b) the binder is essentially uncrosslinked,
 - (c) the binder, in addition to being free of formaldehyde condensates as specified in granted Claim 1, is also free of nitriles, amides, substituted amides and, in general, formaldehyde and substances giving rise to formaldehyde.
 - 2.2 The feature that the non-woven fabric should be suitable for use as a diaper coverstock is disclosed in the application as filed at pages 1, line 12; page 3, lines 5 and 6; page 11, line 30 to page 12, line 7; page 14, lines 1 to 5 and in Claim 15. The inclusion of this feature restricts Claim 1 to those fabrics which exhibit

the physical properties normally required from a diaper coverstock. These properties, some of which are specifically mentioned in the patent specification and others of which are well known, include high wet strength, moisture-perviousness, softness and abrasion resistance. The fact that a fabric with these properties will also be suitable for other uses, such as mentioned at page 6, lines 6 to 8, of the patent specification does not render the claim unclear in this respect. Furthermore, the ~~deletion from the description at page 6, lines 4 and 5, of the suggestion that high amounts of binder (up to 400% by weight on the weight of fibres) are conceivable~~ has removed any doubt that the present Claim 1 is intended to cover fabrics which might indeed not be suitable for the stated use.

2.3 The feature that the binder is essentially uncrosslinked is disclosed in the application as filed at page 3, line 35 to page 4, line 16; page 11, lines 7 and 8 and page 14, lines 21 to 26. It is evident from these passages that the binder may exhibit a small degree of crosslinking but, as explained by the Respondents at the oral proceedings, any crosslinking should not be such as to have any significant effect on the properties of the binder, in particular its ability to be heat or solvent sealed. The question of whether or not a binder is essentially uncrosslinked can accordingly be readily determined by the skilled man on the basis of macroscopic parameters. This feature can therefore not be seen as introducing obscurity into the claim.

2.4 The feature that the binder is free of nitriles, amides, substituted amides, formaldehyde condensates and, in general, formaldehyde and substances giving rise to formaldehyde is disclosed in the application as filed at

page 10, lines 24 to 39 and in Claim 3. The inclusion of this feature restricts Claim 1 to those fabrics which are free of these substances which on the one hand are well known as crosslinking agents and on the other hand as being potentially hazardous to health.

2.5 In summary, therefore, all of the amendments to Claim 1 are clear, find adequate support in the original disclosure and restrict the extent of protection of the claim. There is therefore no objection to them under Article 84, Article 123(2) or Article 123(3) EPC.

2.6 Present Claim 9 has been amended in comparison with the granted Claim 9 to make it clear that it relates to a diaper comprising, as a coverstock, a fabric as claimed in any one of Claims 1 to 8.

3. Novelty

3.1 The suede-like fabric according to document D1 is stated to be soft, microporous and to have high water vapour permeability. It is, however, evident that any fabric which can be designated as suede-like would not have sufficient moisture-perviousness to make it suitable for use as a diaper coverstock as required by present Claim 1. Furthermore, the binder composition according to Example 4, which corresponds in terms of the monomers used with the features (a) to (c) of Claim 1, also contains the crosslinking agent zinc oxide so that the binder in the finished fabric is clearly not essentially uncrosslinked. It is true that the binder of Example 5 is not stated to contain any crosslinking agent, which does not of course preclude that the binder is indeed crosslinked by virtue of the particular monomers involved and the curing temperature used, but the composition of this binder does not correspond to that required by Claim 1. It comprises

about 87% of ethyl acrylate instead of the 50-75% of C₄-C₈ alkyl acrylates specified in feature (b), and about 10% styrene instead of the 20-49% of one or more of methylmethacrylate, styrene or α -methyl styrene specified in feature (c).

- 3.2 Document D2 relates to the preparation of aqueous copolymer emulsions which contain as an essential constituent ethylenically unsaturated amide monomeric units. These emulsions are stated to be useful in surface coating, adhesive and sizing applications. There is no mention in document D2 of the use of the emulsions for bonding non-woven webs of hydrophobic fibres as specified in present Claim 1 of the contested patent, nor do the emulsions conform with the terms of that claim since they are not free of amides.
- 3.3 Document D3 is specifically and exclusively concerned with bonded non-woven fibrous products in which the copolymer binder is crosslinked to give a product that is heat and solvent resistant, see for example Claim 1. As explained in column 1, lines 65 to 70 and column 2, lines 43 to 59, curing of the binder to the required heat and solvent resistant condition can be effected with or without the presence of an aminoplast as crosslinking agent depending on the choice of the proportions and nature of the monomeric units in the binder. The requirement of present Claim 1 of the contested patent that the binder be essentially uncrosslinked therefore provides a fundamental distinction over this prior art. Thus, as far as Example 1 of document D3 is concerned, which was particularly relied upon by the Appellants, it is true that the binder proposed there does not contain an aminoplast crosslinking agent but having regard to the general teachings of this prior art it can only be assumed that satisfactory crosslinking was obtained in the finished product. The

emulsion copolymer binder of Example 1 of document D3 is in any case not derived from a monomer composition comprising 50-75% of one or more C₄-C₈ alkyl acrylates, as specified in feature (b) of present Claim 1, but instead comprises 66% of ethyl acrylate. Furthermore, the fibres of the non-woven web are a 75/25 mixture of rayon and bleached cotton and are accordingly not hydrophobic as specified in present Claim 1, compare the Table bridging pages 3 and 4 of the patent specification.

3.4 In summary, the subject-matter of present Claim 1 is for the above reasons novel with respect to the disclosures of documents D1 to D3. The remaining documents D4 to D8 cited in the opposition proceedings, which have not since been referred to in the appeal proceedings, are less relevant and do not need to be considered further.

4. Inventive step

4.1 The technical problem which the present invention sets out to solve is to provide a polymer bonded non-woven fabric which is particularly suited for use as a diaper coverstock. This fabric must therefore not only exhibit the physical characteristics mentioned in point 2.2 above but also avoid containing any substances which might constitute a health hazard and furthermore be compatible with modern diaper production techniques.

This problem has been solved by the fabric proposed in present Claim 1. Through the use of a binder derived from a monomer composition as defined in the claim it has proved possible to obtain adequate physical properties in the fabric without the need to crosslink the binder. Thus, not only can the known potentially hazardous crosslinking agents be dispensed with but also the fabric can be heat

or solvent sealed in the course of manufacture of a diaper.

- 4.2 The most relevant state of the art for the judgment of inventive step is considered by the Board to be constituted by document D3 since this is the only document that mentions the production of fabrics suitable for use as a diaper coverstock, see the reference to sanitary napkin covers and disposable diapers at column 10, line 61.

Furthermore, the polymeric binder proposed in document D3 conforms in general terms to that specified in present Claim 1 in that it is derived from a monomer composition comprising at least one monoethylenically unsaturated carboxylic acid, at least one monomer which in itself forms a soft homopolymer and at least one monomer which in itself forms a hard homopolymer. Amongst the possible "soft" monomers listed are a number of C₄-C₈ alkyl acrylates corresponding to feature (b) of present claim and amongst the "hard" monomers the three alternatives specified in feature (c) of the claim. This binder is also stated to be particularly useful for bonding hydrophobic fibres.

However, the whole thrust of the teaching of document D3 is that crosslinking of the binder is essential to develop the required properties of the fabrics described there. Nowhere in this document can any suggestion be found that by choosing the particular monomer constituents and their proportions as specified in present Claim 1 a binder could be obtained which would give the required properties without the need for crosslinking.

- 4.3 The desired properties of a material intended to resemble natural suede are so different from those of a fabric

intended to be suitable for use as a diaper coverstock that in the Board's opinion the skilled man concerned with development of the latter would be unlikely to consider document D1, which is specifically concerned with improving the surface appearance and feel of an artificial suede, as a possible source of helpful information. However, even if he were to refer to this document, he would find that where in Example 4 a terpolymer binder corresponding in composition to that specified in present Claim 1 is proposed for bonding hydrophobic fibres it is also proposed that the binder be crosslinked. Thus document D1 does not teach the skilled man that a terpolymer binder of this composition can, in an essentially uncrosslinked state, develop the degree of wet strength and abrasion resistance in the non-woven fibrous web required in a fabric suitable for use as a diaper coverstock. It is conceivable, having regard to the fact that the terpolymer binder of Example 5 is not stated to comprise a crosslinking agent, that the skilled man would consider this binder as being capable of bonding hydrophobic fibres in an essentially uncrosslinked state. However, as set out in point 3.1 above the composition of the terpolymer according to Example 5 differs significantly in three respects from that specified in present Claim 1. Thus the teachings of document D1, whether taken in isolation or in combination with those of document D3, cannot lead the skilled man to the fabric defined in the claim.

4.4 The emulsion copolymer resins prepared according to document D2 contain as an essential component amides and accordingly do not conform with the requirements of present Claim 1. Furthermore, there is no mention in document D2 of the use of these resins in the production of fabrics of any description from bonded non-woven fibrous webs. This prior art document does not therefore

contain any teachings which could be relevant to the present invention.

- 4.5 As indicated in point 3.4 above the documents D4 to D8 are less relevant than those already discussed and cannot give any lead to the invention presently claimed.
- 4.6 The Board therefore comes to the conclusion that the subject-matter of Claim 1 cannot be derived in an obvious manner from the state of the art and accordingly involves an inventive step as required by Articles 52(1) and 56 EPC.

This claim, together with the Claims 2 to 9 appended thereto and the revised description can accordingly form the basis for maintaining the patent in amended form.

Order

For these reasons, it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to maintain the patent on the basis of the following documents:

Claims: 1 filed on 14 August 1984,
 2 to 9 filed on 23 June 1986;

Description: pages 2 to 5 and 7 to 13 of the patent specification with pages 2, 3, 4 and 5 amended according to the request filed on 14 August 1984,

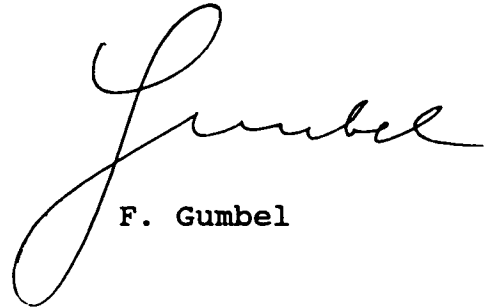
replacement page 3, to be renumbered 2A,
filed on 23 June 1986,
replacement page 4, to be renumbered 2B,
submitted at the oral proceedings,
page 6 of the patent specification submitted
at the oral proceedings.

The Registrar:



S. Fabiani

The Chairman:



F. Gumbel

