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D E C I S I O N
of 24 October 1997

Case Number: T 0398/94 - 3.3.3

Application Number: 86306078.6

Publication Number: 0215565

IPC: C08F 246/00

Language of the proceedings: EN

Title of invention:
Dispersing agents

Patentee:
Allied Colloids Limited

Opponent:
Röhm GmbH
S.N.F. S.A.

Headword:
-

Relevant legal provisions:
EPC Art. 56, 84
EPC R. 29

Keyword:
"Clarity (yes); use not exclusively defined by compositional features"
"Inventive step (yes); no disclosure of viscosity reducing effect of the relevant copolymers"

Decisions cited:
T 0501/94

Catchword:
-



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Boards of Appeal

Chambres de recours

Case Number: T 0398/94 - 3.3.3

D E C I S I O N
of the Technical Board of Appeal 3.3.3
of 24 October 1997

Other party:
(Opponent 01)

Röhm GmbH
Kirschenallee
D-64293 Darmstadt (DE)

Representative:

Appellant:
(Opponent 02)

S.N.F. S.A.
41, Rue Jean-Huss
F-42000 Saint-Etienne (FR)

Representative:

Maiwald, Walter, Dr. Dipl.-Chem.
Maiwald & Partner
Poccistrasse 11
80336 München (DE)

Respondent:
(Proprietor of the patent)

Allied Colloids Limited
P.O. Box 38
Low Moor
Bradford
West Yorkshire BD12 0JZ (GB)

Representative:

Lawrence, Peter Robin Broughton
Gill Jennings & Every
Broadgate House
7 Eldon Street
London EC2M 7LH (GB)

Decision under appeal:

Interlocutory decision of the Opposition Division
of the European Patent Office posted 4 May 1994
concerning maintenance of European patent
No. 0 215 565 in amended form.

Composition of the Board:

Chairman: C. Gérardin
Members: R. Young
J. A. Stephens-Ofner

Summary of Facts and Submissions

- I. The mention of the grant of European patent No. 0 215 565, in respect of European patent application No. 86 306 078.6, filed on 6 August 1986 and claiming GB priorities of 12 August 1985 (GB 8520218) and 14 February 1986 (GB 8603650) respectively was announced on 24 July 1991 (Bulletin 91/30).
- II. Notices of Opposition were filed on 9 April 1992 (Opponent 01) on the grounds of lack of novelty and inventive step, and on 24 April 1992 (Opponent 02) on the ground of lack of inventive step. The oppositions were supported inter alia by the following documents:
- D1: EP-A-0 003 235;
D2: EP-A-0 147 745;
D3: Chemical Abstracts 99-145063b;
D4: EP-A-0 048 094; and
D5: GB-A-1 273 552.
- III. By a decision issued in writing on 4 May 1994, the Opposition Division found, following its announcement, at the end of oral proceedings held on 26 January 1994, of its intention to maintain the patent in amended form on the basis of an auxiliary request, that the patent could be maintained on the basis of a set of Claims 1 to 8, the text of which had been filed on 19 April 1994. Claim 1 reads as follows:
- "Use of a copolymer as a dispersing agent for reducing the viscosity of a dispersion of particles that have hydrophobic surfaces, characterised in that the said dispersing agent is a water-soluble copolymer comprising

(a) 30-99% of a water-soluble monomer,
(b) 0-40% of a water-insoluble monomer and
(c) 1-70% of a monomer that carries a pendant group $-A_m B_n A_p R$ wherein B is ethyleneoxy, n is an integer of at least 2, A is propyleneoxy or butyleneoxy, m and p are each an integer less than n and preferably below 5 and most preferably zero, and R is a hydrophobic group containing at least 8 carbon atoms, all percentages being by weight, and in which the molecular weight of the copolymer is in the range 500-100000."

Claims 2 to 8 are directed to elaborations of the use according to Claim 1.

According to the decision, as far as it related to the above request, the subject-matter claimed in the patent in suit was novel, and the problem to be solved, in the light of the closest state of the art, D1, was reducing the viscosity of a dispersion of particles having hydrophobic surfaces. Whilst D1 described a flowable, i.e. reduced viscosity colouring dispersion comprising pigments of titanium dioxide and a copolymer corresponding to that defined in Claim 1 of the patent in suit, pigments of titanium oxide had hydrophilic surfaces and hence D1 did not suggest the dispersion of particles having hydrophobic surfaces. Nor did any of the remaining documents D2 to D5 explicitly teach the use of such a copolymer in reducing the viscosity of particles having hydrophobic surfaces. Consequently the claimed subject-matter involved an inventive step.

IV. On 6 May 1994, a Notice of Appeal against the above decision was filed by Opponent 02, together with payment of the prescribed fee.

In the Statement of Grounds of Appeal, filed on 1 September 1994, the Appellant (Opponent 02) referred to its arguments submitted during opposition proceedings and presented the following further arguments:

- (a) Claim 1 contravened Article 84 and Rule 29 EPC, since, whilst the pre-characterising portion of Claim 1 was directed to a use, the polymers defined in the characterising portion also belonged to the state of the art; furthermore, it was neither grammatically correct nor logical to characterise a use by compositional features of the used component; this gave the impression that the polymers per se were protected by the patent in suit.
- (b) The copolymers, which were known inter alia from D1, were taught in the latter document to exhibit thickening properties at pH values between 8 and 9, and to function as dispersing agents at neutral or acidic pH's; the disclosure of D1 was not, however, limited to dispersions of hydrophilic particles, but referred to pigments in general; these could be, as was commonly known, either hydrophilic or hydrophobic; consequently, it was obvious to use the polymers of D1 to form dispersions of hydrophobic particles.
- (c) Taking further into account that it was well known in the art that polymers containing hydrophilic acid groups and polymers having hydrophobic alkyl groups could interact both with particles having hydrophilic surfaces and with particles having hydrophobic surfaces, the dispersing behaviour of the particles was to be expected.

The Appellant also filed a declaration by Prof. A. Knöchel of the University of Hamburg, citing for the first time:

D6: DE-A-2 454 971; and

D7: L. & M. Fieser, "Organische Chemie", Verlag Chemie, Weinheim 1965, 333.

Furthermore, the Statement of Grounds of Appeal referred for the first time to the following documents:

D8: US-A-4 384 096; and

D9: Römpf Chemie Lexikon, 9th edition, page 2424.

V. The Respondent (Patentee) disagreed, in a submission filed on 17 March 1995, with the arguments of the Appellant, and contended in particular that the patent in suit provided a viscosity-reducing dispersing agent and not, as was the case in D1, merely a viscosifier that stabilised a dispersion by thickening of the continuous phase. Whether or not the declaration of Prof. Knöchel might be relevant to the mechanism by which the defined results according to the patent in suit were achieved, it was not relevant to the question of whether the claimed subject-matter was obvious in view of D1 or any of the other citations.

VI. The Appellant requested that the decision under appeal be set aside and the patent revoked in its entirety. A previous subsidiary request for oral proceedings (Statement of Grounds of Appeal, page 4) was withdrawn, according to a letter filed on 8 December 1995.

The Respondent requested as main request that the appeal be dismissed, i.e. that the patent be maintained in the form found allowable in the decision under appeal, and confirmed, in a letter filed on 2 January 1996, that oral proceedings were requested in the alternative.

Reasons for the Decision

1. The appeal is admissible.
2. *Late-filed documents*

Document D6, cited in the Declaration of Prof. Knöchel, is also cited in D1. Whilst it does not automatically form part of the proceedings (T 501/94, OJ EPO 1997, 193), its content is considered sufficiently relevant, not only for the purposes of understanding the disclosure of D1, but also the Declaration of Prof. Knöchel, that the Board has decided, in its discretion, exceptionally to admit it to the appeal proceedings (Article 114(1) EPC).

Documents D7 and D9 merely support statements grounded in the general knowledge of the skilled person and which have not been contested. Hence, there is no need to refer to them. They are excluded from the proceedings (Article 114(2) EPC).

Document D8, although acknowledged in the patent in suit (page 2, line 40) is only one of several such references and cannot, therefore, be regarded a priori as the closest or even important prior art for the purposes of elucidating or understanding the technical problem set out in the description.

Furthermore, no explanation has been offered by the Appellant as to why its relevance would justify its admission at the present, late stage of the proceedings. Nor is such relevance apparent to the Board. It is therefore excluded from the proceedings (Article 114(2) EPC).

3. *Text of the patent in suit*

The present decision is based, in accordance with the request of the Respondent, on the text of the patent in suit amended as specified in the submission filed on 21 April 1994, that is:

Claims:

Claims 1 to 8 filed on 21 April 1994 with letter dated 19 April 1994;

Description:

page 2 of the patent as granted; and
pages 3, 4, 5, 6 and 7 as filed on 21 April 1994 with letter dated 19 April 1994, page 8 of the description having been deleted.

4. *Allowability of amendments*

No objection under Article 123(2) and (3) EPC was raised in the decision under appeal or by the Appellant to the amendments forming the request of the Respondent. Nor does the Board see any reason to raise any objection of its own, since the amendments amount only to the deletion of one alternative embodiment (the use of the copolymers in connection with particles having hydrophilic surfaces), in both the claims and description, and hence neither incorporates additional subject-matter nor involves a broadening of the scope of protection.

Hence, the amendments are allowable under Article 123 EPC.

5. *Two part form; clarity*

5.1 With regard to the objection, raised by the Appellant, to the two-part form of Claim 1, it is evident, from the acknowledgment in the introductory description of the patent in suit, that the use, for reducing the viscosity of a dispersion of particles, of a polymeric dispersant, such as a low molecular weight sodium polyacrylate, belongs to the state of the art (page 2, lines 3 to 7). The presentation, in the pre-characterising portion of Claim 1, of such a use, characterised by a different polymeric dispersant thus corresponds, in the Board's view, to a correct use of the two part form. Whether the copolymers may be known for some other use is irrelevant. Consequently, Claim 1 is held to meet the requirements of Rule 29(1) EPC.

5.2 The inclusion of compositional features in the defined use, also objected to by the Appellant, does not in itself introduce obscurity into Claim 1, because the use is not defined exclusively in terms of such features. On the contrary, it is clear that an essential feature of the use is that it shall be "for reducing the viscosity of a dispersion". Hence, there is no reason for concluding that protection for the copolymers per se is sought. That such a use may be partly defined in terms of polymer characteristics does not in itself involve obscurity either. Nor is there any doubt as to the respective antecedents of the numerical values in Claim 2. Hence, there is no lack of clarity in these claims.

5.3 Nor is the Board aware of any other lack of clarity. Thus the claims are held to meet the requirements of Article 84 EPC.

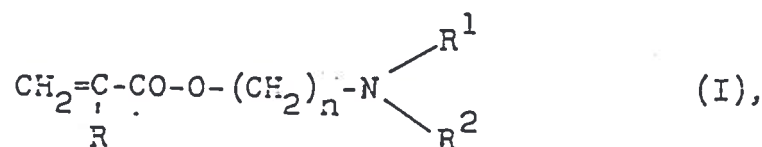
6. *The closest state of the art*

The patent in suit is concerned with the use of a copolymer as a dispersing agent for controlling the viscosity of a dispersion of particles (Claim 1). Such a use is, however, known from D1, which was, by common consent, the closest state of the art.

6.1 According to D1, there are provided water-soluble copolymers of ionisable hydrophilic monomers (page 1, lines 5 to 19). These copolymers are presented as a development of D6, itself relating to a copolymer of non-ionisable units of polyethylene glycol (meth)acrylate and methacrylate for use as a thickener for paint dispersions.

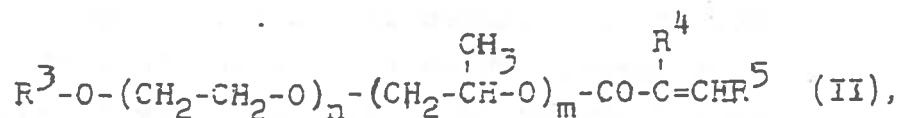
The copolymers according to D1 are made up of:

- (a) 80 to 2 wt% of an ethylenically unsaturated C₃ to C₅ carboxylic acid, acrylamidodimethylpropanesulphonic acid, vinylsulphonic acid, vinylphosphonic acid or an ester of the formula (I):



wherein R = H, -CH₃, n = 1 to 4 and R¹, R² = alkyl groups with 1 to 4 carbon atoms, or mixtures thereof, and

- (b) 20 to 98 wt% of a polymerisable, ethylenically unsaturated compound of the formula (II)



wherein R^3 = an alkyl group with 1 to 20 carbon atoms or a phenyl group optionally substituted with an alkyl group of 1 to 12 carbon atoms, R^4 = H or $-CH_3$, R^5 = H, n = 2 to 100 and m = 0 to 50 (page 1, line 20 to page 2, line 20).

- 6.1.1 The copolymers exhibit simultaneously characteristics of dispersing agents and thickeners in one substance (page 2, lines 22 to 25).
- 6.1.2 They may be used as thickeners for polymer dispersions, and increase in particular the viscosity of such dispersions at medium shear rates (>5 and $<500 \text{ sec}^{-1}$) without forming flow boundaries (page 6, lines 19 to 24).
- 6.1.3 Besides their favourable characteristics as thickeners, the copolymers have excellent dispersing agent characteristics for pigments and fillers, which are used in the production of aqueous polymer dispersion based paints and coatings. It is possible to prepare gloss paints on the basis of titanium dioxide pigments and fine particle size polymer dispersions, with pigment volume concentrations of around 20. The copolymers can furthermore be used as dispersing agents and thickeners in the preparation of paper coating compositions. The copolymer is added in amounts of 0.1 to 10, preferably 0.5 to 5% (page 7, lines 1 to 21).

- 6.1.4 According to Example 1, a water soluble copolymer prepared from the monomers: $C_{16}H_{33}-O-(CH_2-CH_2-O)_{80}-CO-CH=CH_2$, and methacrylic acid in the ratio 280:140 by weight is obtained as a 25% solution in aqueous isopropanol, which forms a low tack film when spread on a glass surface. The viscosity of aqueous solutions of the copolymer increases with the addition of alkali (page 8, line 25 to page 9, line 19).
- 6.1.4.1 A gloss paint is prepared from a pigment paste obtained by milling a commercial titanium dioxide pigment (80 pbw) with the 25% solution of the water soluble copolymer mentioned above (40 pbw) and 50:50 isopropanol/water (40 pbw). The paste (15 pbw) is mixed with a 50% aqueous dispersion of a 50/47.5/0.5 styrene/butyl acrylate/acrylic acid copolymer (35 pbw); and water (5 pbw) to form a paint having good flow characteristics at a pigment volume concentration of about 10 (page 9, lines 21 to 35).
- 6.1.4.2 To demonstrate its thickening effect, the copolymer is added to a 45% aqueous dispersion of a methyl methacrylate/ethylhexylacrylate/N-methylolmethacrylamide (54.5/43.5/2.0) copolymer, in amounts of 2.5, 10 and 15 wt% respectively, based on the copolymer solids, and the pH adjusted to a value in the range of 8 to 9. A marked thickening effect is obtained at shear rates of $>1 <500 \text{ sec}^{-1}$. The viscosity at a copolymer concentration of 5 wt% is 1 000 mPa.s (page 10, lines 5 to 25 in connection with the graphical figure).
- 6.1.5 The remaining Examples 2 to 14 measure the thickening effects on dispersions of copolymers having different monomer combinations and/or using different solvents.

- 6.2 It has not been contested that the copolymer of Example 1 of D1 falls within the terms of the formula in Claim 1 of the patent in suit. Its capabilities as a dispersing agent are not, however, explicitly associated with any viscosity-reducing effect on a dispersion of particles. This is entirely consistent with the remaining examples of D1, in all of which the relevant copolymer is disclosed as a thickener.
- 6.3 Furthermore, it is confirmed by the presentation, in the introduction of D1, of the copolymers as a development of the nonionic copolymers according to D6, since the latter are themselves disclosed exclusively as thickening agents (section 6.1, above). In this connection, it is stated in D6 that a latex paint should be sufficiently viscous to prevent a noticeable sedimentation of pigments on storage (page 3, first complete paragraph).
- 6.4 Finally, a closer examination of the acknowledgment of prior art in the patent in suit shows that the art was aware that particles can be held in dispersion by a suspending effect involving thickening of the aqueous medium (page 2, lines 8 to 9). Consequently, the possession, by a copolymer, of dispersing agent properties is not incompatible with thickening properties.
- 6.5 Even the reference, in Example 1 of D1, to the good flowability obtained in the preparation of a gloss paint from a pigment paste containing the dispersion polymer does not predicate a different conclusion. Although this phrase was interpreted, in the decision under appeal, as associating such flowability with a reduction in viscosity (Reasons for the decision, point 2.2, last sentence), this is not the point, since it does not apply to a dispersion, but only to the paste. It is the dispersion of a quite different

polymer which is added to dilute the paste (section 6.1.5 above). Whilst the paste may become thinner, the added dispersion will, on the contrary, quite evidently become, if anything, thicker. There is therefore no justification for concluding that a reduction of viscosity of a dispersion has been disclosed.

- 6.6 Consequently, it is not directly and unambiguously derivable from D1 that the dispersing characteristics of the copolymers are associated with a thinning or viscosity reducing effect (sections 6.1.1; 6.1.3, above).
- 6.7 In this connection, the Declaration of Prof. Knöchel discusses the dispersion copolymers in terms of: hydrophilic, ionic interactions of the hydrophilic acid groups with particles having polar surfaces; hydrophobic interactions (e.g. dispersion interactions) with nonpolar components of the relevant formulations (paints, coating agents, sealants and adhesives); and the solubilising effect of the partly polar, partly non-polar polyethylene group (passage bridging pages 1 and 2). It does not, however, refer to any viscosity reducing or thinning effect. On the contrary, it refers, in this context, to the disclosure, in D6, of such hydrophilic and hydrophobic functions in thickeners (Declaration, page 2, penultimate paragraph).
- 6.8 Nor does D1 refer specifically to the hydrophilic nature of the titanium dioxide particles. Whilst it may have been common ground that the surface of such particles is in fact hydrophilic (minutes of oral proceedings before the Opposition Division, page 3, point 6) there is no reference in D1 to this property of titanium dioxide.

6.9 In summary, D1 does not disclose, either explicitly or implicitly, any dispersion thinning or viscosity reducing effect of the relevant copolymers, let alone associate such a property with the flow characteristics of a dispersion of particles having hydrophilic surfaces.

7. *The technical problem and its solution*

It follows from the above, that the formulation, in the decision under appeal, of the technical problem in terms of "reducing the viscosity of a dispersion of particles that have hydrophobic surfaces" is too specific, since it already identifies both the thinning effect and its association with the degree of hydrophilic character of the particles, neither of which has been shown to belong to the disclosure of D1.

7.1 Compared with this disclosure, the technical problem is, in the Board's view, to be seen in the provision of further useful applications of the dispersion copolymers.

7.2 The solution proposed according to Claim 1 of the patent in suit is to use such copolymers for reducing the viscosity of dispersions of particles that have hydrophobic surfaces.

7.3 It can be seen from the results of the examples in the patent in suit that the dispersion copolymers are capable, when added at appropriate levels, of reducing the viscosity of highly loaded aqueous dispersions of particles having hydrophobic surfaces, such as activated charcoal (20% dispersion) or finely ground coal (70% dispersion), by a factor typically of the order of 10 to 40 (Examples 1 and 2; Tables 2

and 3). Consequently, it is credible that the claimed measures provide an effective solution of the stated problem.

8. *Novelty*

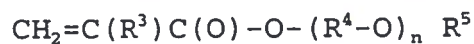
Novelty was not contested in the appeal. Consequently, the claimed subject-matter is held to be novel.

9. *Inventive step*

9.1 It is necessary to answer the question whether the skilled person, in possession of D1 and looking for further applications for the copolymers disclosed therein, would have expected them to have a useful thinning or viscosity reducing effect on dispersions of particles having hydrophobic surfaces.

Since, for the reasons given above, D1 does not associate a thinning effect with the dispersion copolymers in the first place, it cannot offer a hint to such capabilities in relation to a different class of particles. In other words, there is no hint in D1 of the solution to the technical problem.

9.2 According to D2, there is disclosed, in a cleaning composition for washing applications, a lime soap dispersant comprising a homo- or copolymer of a polyalkylene glycol monoacrylate of the formula:



where R^3 is hydrogen or methyl, R^4 is an alkylene group of 1 to 4 carbon atoms, R^5 is hydrogen, an alkyl or alkenyl group of 1 to 30 carbon atoms, an

aryl group of 6 to 10 carbon atoms or an aralkyl group of 7 to 30 carbon atoms, and n is a number in the range of 2 to 50 (Claim 1). In the most preferred embodiment, R⁵ is hydrogen (page 10, lines 28, 29).

The lime soap dispersant breaks down or disperses large-sized lime soap aggregates to micron or even sub-micron particles resulting in a milky dispersion, so that lime scum on fabrics can be prevented (page 2, lines 19 to 29).

According to the examples, the lime soap dispersion property of polyethylene glycol monomethacrylate and copolymers thereof with 2-acrylamido-2-methyl propane sulphonic acid was tested (page 18, lines 10 to 18).

9.2.1 Thus, whilst D2 refers in general terms to the use of pendant hydrophobic group containing ethoxylated copolymers to disperse lime soap scum, it only exemplifies such use with copolymers in which the pendant group is hydrogen and therefore not hydrophobic. Thus, there is no disclosure of a specific lime soap dispersion comprising a copolymer as claimed in the patent in suit.

9.2.2 Furthermore, the disclosure is entirely silent as to the viscosity of the dispersions. In particular, there is no suggestion of a reduction in the viscosity of such a dispersion.

9.2.3 Consequently, there is no hint in D2 to the relevant effect, let alone in combination with the relevant copolymers. In other words, there is no pointer to the solution of the stated problem.

9.3 Similar considerations apply to D3, which discloses polyalkylene glycol monomethacrylates as dispersing agents for cements, since (a) the monomethacrylate is

derived from polyethyleneglycol methyl ether, so that the pendant group is not a hydrophobic group as required by the claimed solution, and (b) there is no suggestion of a reduction in viscosity of the resulting dispersion. Hence, the disclosure of D3 does not offer a hint to the solution of the technical problem, either.

9.4 According to D4, a homopolymer or copolymer of acrylamide is polymerised by a process employing an initiator or a chain transfer agent, preferably a mercaptan, which comprises a hydrophobic group, whereby the acrylamide polymer is believed to bear the hydrophobic group (Claims 1 and 4; page 1, lines 1 to 10). Whilst there is a mention of the effectiveness of the polymers as dispersants (page 7, last line), they are repeatedly referred to as thickeners or viscosity improvers (page 4, lines 5 to 6 and 27 to 29; page 6, lines 28 to 32; page 7, lines 7 to 11; page 8, lines 8 to 11; and page 9, lines 19 to 21). Consequently, D4 offers no more assistance to the skilled person than D1, and even if it did, the polymers do not comprise a polyoxyalkylene group. Consequently, the result of using the polymers according to D4 would in any case not correspond to the solution of the stated problem.

9.5 The disclosure of D5, which is concerned with the preparation of certain sterol-containing polyoxyalkyl allyl ethers and copolymers derived from them (Claims 1, 5), states that the copolymers are "dispersing, emulsifying suspending and thickening agents..." (page 2, lines 75 to 81). It also states that they can be used to render aqueous systems thixotropic (page 2, lines 81 to 83).

The latter disclosure is considered to run directly counter to the solution of the technical problem, since the agents function in a thixotropic system to re-establish a viscous, gelled state, and not to bring about a reduction in viscosity of a dispersion.

Consequently, there is no hint to the solution of the stated problem in D5.

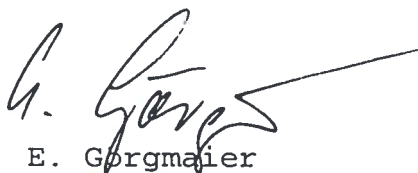
- 9.6 The argument of the Appellant, that the reference to dispersing properties renders it obvious to use the claimed copolymers to reduce the viscosity of dispersions (section IV-(b), above) begs the question, since, for the reasons given above, dispersing properties are not to be equated with a reduction in viscosity. On the contrary, they are associated, in the cited documents, with a viscosity increasing effect.
- 9.7 Nor does the Declaration of Prof. Knöchel add anything to the case of the Appellant, since it merely discusses possible mechanisms of dispersion, without mentioning the crucial effect of reduction in viscosity, let alone why this should have been expected by the skilled person.
- 9.8 The other arguments, submitted in the proceedings before the Opposition Division, which have been referred to by the Appellant, are considered to have been adequately dealt with in the decision under appeal.
- 9.9 In the light of the above, the solution of the stated problem does not arise in an obvious way from the state of the art. Consequently, the subject-matter of Claim 1, and, by the same token, that of dependent Claims 2 to 8 involves an inventive step.

Order

For these reasons it is decided that:

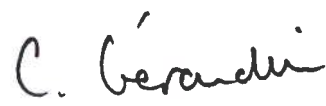
The appeal is dismissed.

The Registrar:



E. Gorgmajer

The Chairman:



C. Gérardin