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DECISION
of 12 December 2003

Case Number: T 0976/02 - 3.3.3

Application Number: 92114098.4

Publication Number: 0528409

IPC: C08F 8/48

Language of the proceedings: EN

Title of invention:
Cationic polymer flocculating agents

Patentee:
Dia-Nitrix Co., Ltd.

Opponent:
BASF Aktiengesellschaft, Ludwigshafen
SNF

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56

Keyword:
"Novelty (yes) - contradictory reproduction of prior art"
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-

Case Number: T 0976/02 - 3.3.3

DECISION

of the Technical Board of Appeal 3.3.3
of 12 December 2003

Appellant: (Opponent 01)	BASF Aktiengesellschaft, Ludwigshafen -Patentabteilung - C6- Carl-Bosch-Strasse 38 D-67056 Ludwigshafen (DE)
Representative:	Isenbruck, Günter, Dr. Isenbruck, Bösl, Hörschler, Wichmann, Huhn Patentanwälte Theodor-Heuss-Anlage 12 D-68165 Mannheim (DE)
Other Party: (Opponent 02)	SNF 41, Rue Jean-Huss F-42028 Sait-Etienne Cedex 1 (FR)
Representative:	Maiwald, Walter, Dr. Dipl.-Chem. Maiwald Patentanwalts GmbH Postfach 33 05 23 D-80065 München (DE)
Respondent: (Proprietor of the patent)	Dia-Nitrix Co., Ltd. 12-5, Kyobashi 1-chome Chuo-ku Tokyo 104-0031 (JP)
Representative:	TER MEER STEINMEISTER & PARTNER GbR Patentanwälte Mauerkircherstrasse 45 D-81679 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office dated 25 June 2002 and posted 11 July 2002 rejecting the opposition filed against European patent No. 0528409 pursuant to Article 102(2) EPC.**

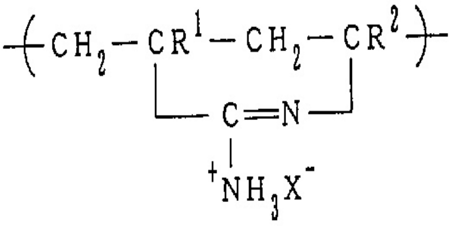
Composition of the Board:

Chairman: R. Young
Members: W. Sieber
E. Dufrasne

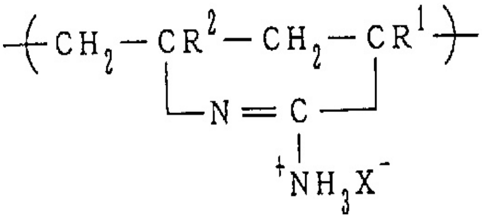
Summary of Facts and Submissions

I. The mention of the grant of European patent No. 0 528 409, with 31 claims, in respect of European patent application no. 92 114 098.4 in the name of Mitsubishi Chemical Corporation, filed on 18 August 1992 and claiming a JP priority of 20 August 1991 (JP 208314/91), was published on 22 May 1996 (Bulletin 1996/21). The independent claims 1, 19, 23 and 24 read as follows:

"1. A cationic polymer flocculating agent, which contains 20 to 90% by mole of a repeating unit represented by the formula (1) and/or (2):

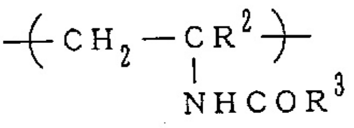


(1)



(2)

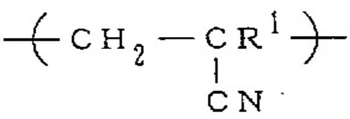
0 to 2% by mole of a repeating unit represented by the formula (3):



(3)

$$-\left(CH_2 - \underset{\displaystyle NHCOR^3}{CR^2} \right)-$$

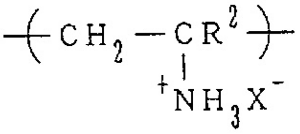
0 to 70% by mole of a repeating unit represented by the formula (4):



(4)

$$-\left(CH_2 - \underset{\displaystyle CN}{CR^1} \right)-$$

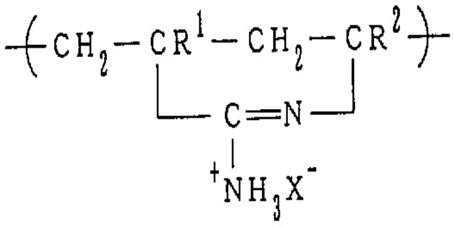
and 0 to 70% by mole of a repeating unit represented by the formula (5):



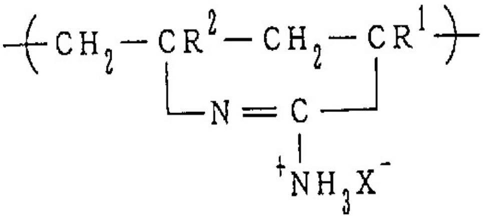
$$-\!\left(\mathrm{CH_2-\underset{{}^{+}NH_3X^{-}}{CR^2}}\right)\!- \qquad (5)$$

wherein R¹ and R² independently denote a hydrogen atom or a methyl group, R³ denotes an alkyl group having 1 to 4 carbon atoms or a hydrogen atom, and X⁻ denotes an anion; and which has a reduced viscosity of 0.1 to 10 dl/g as measured in a 1N saline solution of 0.1 g/dl at 25°C.

19. A cationic polymer flocculating agent, which contains 50 to 90% by mole of a repeating unit represented by the formula (1) and/or (2):

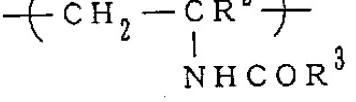


(1)



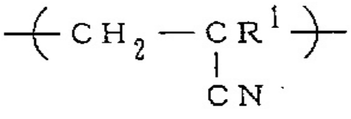
(2)

further containing 2 to 20% by mole of a repeating unit represented by the formula (3):



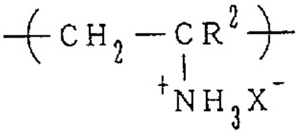
$$-\!\left(\mathrm{CH_2-\underset{NHCOR^3}{CR^2}}\right)\!- \qquad (3)$$

0 to 48% by mole of a repeating unit repesented *[sic]* by the formula (4):



$$-\!\left(\mathrm{CH_2-\underset{CN}{CR^1}}\right)\!- \qquad (4)$$

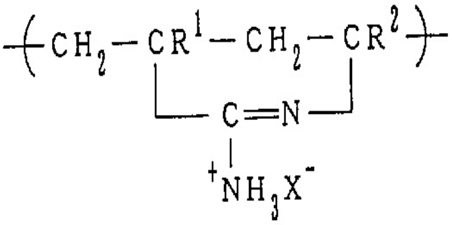
and 0 to 48% by mole of a repeating unit represented by the formula (5):



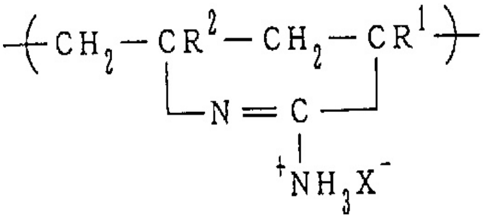
$$-\!\left(CH_2-\underset{{}^{+}NH_3X^{-}}{CR^2}\right)\!- \qquad (5)$$

wherein R¹ nd *[sic]* R² independently denote a hydrogen atom or a methyl group, R³ denotes an alkyl group having 1 to 4 carbon atoms or a hydrogen atom, and X^- denotes an anion, and which has a reduced viscosity of 0.1 to 10 dl/g as measured in a 1N saline solution of 0.1 g/dl at 25°C.

23. A process for treating organic sludge comprising adding to the organic sludge, a cationic polymer flocculating agent which contains 20 to 90% by mole of a repeating unit represented by the formula (1) and/or (2):

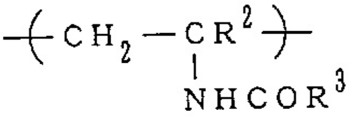


(1)



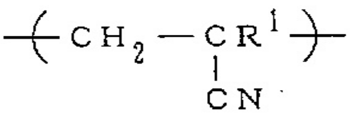
(2)

0 to 2% by mole of a repeating unit represented by the formula (3):



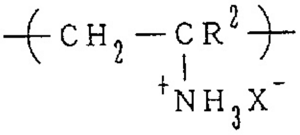
$$-\!\left(CH_2-\underset{NHCOR^3}{CR^2}\right)\!- \qquad (3)$$

0 to 70% by mole of a repeating unit represented by the formula (4):



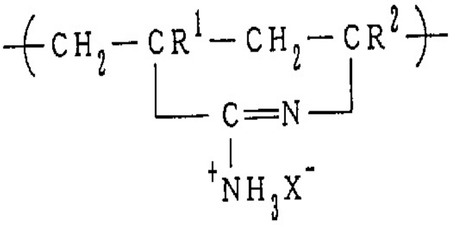
$$-\!\left(CH_2-\underset{CN}{CR^1}\right)\!- \qquad (4)$$

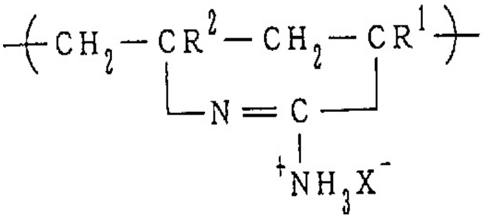
and 0 to 70% by mole of a repeating unit represented by the formula (5):


$$-\!\left(CH_2-\underset{\underset{{}^{+}NH_3X^-}{|}}{CR^2}\right)\!- \qquad (5)$$

whereinR¹ and R² independently denote a hydrogen atom or a methyl group, R³ denotes an alkyl group having 1 to 4 carbon atoms or a hydrogen atom, and X⁻ denotes an anion; and which has a reduced viscosity of 0.1 to 10 dl/g as measured in a 1N saline solution of 0.1 g/dl at 25°C.

24. A process for treating organic sludge comprising adding to the organic sludge, a cationic polymer flocculating agent which contains 50 to 90% by mole of a repeating unit represented by the formula (1) and/or (2):


(1)


(2)

wherein R¹ and R² independently denote a hydrogen atom or a methyl group, and X⁻ denotes an anion; and which has a reduced viscosity of 0.1 to 10 dl/g as measured in a 1N saline solution of 0.1 g/dl at 25°C."

Claims 2 to 18, 20 to 22 and 25 to 31 were dependent claims directed to elaborations of the subject-matter of the independent claims.

II. Notices of opposition were filed by:

(a) BASF AG (opponent 01) on 16 January 1997, and

(b) SNF (opponent 02) on 18 February 1997.

The grounds of opposition raised by both opponents were the grounds of Article 100(a) EPC, ie lack of novelty and lack of inventive step. The oppositions were supported - *inter alia* - by the following document:

D1: EP-A-0 251 182 (& US-A-4 957 977).

III. By a decision which was announced orally on 25 June 2002 and issued in writing on 11 July 2002, the opposition division rejected the oppositions.

(c) The decision held that the claimed subject-matter was novel over the N-vinylamine copolymers disclosed in D1, and in particular over copolymer H prepared in Example A8 of D1. Although D1 did not indicate the presence of amidine structural units in the N-vinylamine copolymers, both opponents argued that the preparation conditions disclosed for Example A8 would inevitably lead to a copolymer containing the amidine structural units required in the patent in suit. In order to identify the true structure of the copolymer of Example A8, both opponent 01 and the proprietor repeated that example and analysed the structure of the respectively produced copolymer by ^{13}C NMR spectroscopy, however with diverging results. Opponent 01 obtained in two experiments two different copolymers which fell within the scope of Claim 1 of the patent in suit, whereas the proprietor obtained a copolymer which fell outside the scope of Claim 1. Since the opposition division saw no reason to challenge the reliability of the results provided by the proprietor but found a lack of completeness in the opponent's ^{13}C NMR data, it decided, in favour of the proprietor, that the claimed subject-matter was novel over D1.

(d) According to the decision, the claimed subject-matter represented also a non obvious alternative to the teaching of D1 which was considered to be the closest prior art. Starting from D1, only an *ex post facto* analysis, based on the knowledge of the correct structure of copolymer H of Example A8 (which was not apparent from D1), would permit a person skilled in the art to arrive at something falling within the scope of the granted claims.

IV. On 20 September 2002, opponent 01 (hereinafter referred to as the appellant) lodged an appeal against the above decision and paid the prescribed fee on the same day. The statement of grounds of appeal was filed on 21 November 2002.

V. The arguments presented by the appellant in the statement of grounds of appeal and during the oral proceedings held on 12 December 2003 may be summarized as follows:

(a) According to D1, the N-vinylamine copolymers were obtained by modifying N-vinylformamide copolymers under acidic conditions. As set out in the general disclosure on page 9 of D1, an amount of 0.1 to 2 equivalents of acid might be used in the modification reaction whereby the temperature is from 40 to 100°C. If two equivalents of acid would be combined with the other process conditions of Example A8, a person skilled in the art would arrive at a polymer falling within the scope of the patent in suit.

(b) In order further to substantiate its novelty objection based on Example A8 of D1, the appellant repeated this example for a third time. According to the data submitted, the obtained polymer fell within the scope of Claim 1. As regards the diverging data between its own three repetitions of Example A8 on the one hand and the differences between these data and those of the proprietor's repetition on the other hand, the appellant saw various possible reasons for these differences: the use of a different pulse delay time in the ^{13}C NMR measurement, the inaccuracy of the ^{13}C NMR measurement or a lack of accuracy when repeating the experiment of the prior art.

(c) As to the issue of inventive step, the appellant regarded D1 as the closest prior art. The objective technical problem of the patent in suit could only be seen in providing further polymer flocculating agents because the existence of advantageous properties over D1 had not been demonstrated. Since, however, the process conditions described in D1 overlapped with those disclosed in the patent in suit, a person would provide further flocculating agents simply by working within the process conditions disclosed in D1. In another approach, pursued at the oral proceedings, the appellant started from copolymer H obtained in Example A8 as the closest prior art which exhibited the best flocculating properties of all polymers disclosed in D1 (Table 3 of D1). A person skilled in the art would realize that this example used the most "severe" conditions in the modification reaction, ie 95°C in combination with one equivalent of hydrochloric acid. Looking for a further improvement in the flocculating properties, a person skilled in the art would try to achieve a higher rate of modification by increasing the temperature and/or the amount of acid in the modification reaction and would thus arrive at a polymer falling within the scope of Claim 1.

VI. The proprietor of the patent (the respondent) presented its counterarguments in a written submission filed on 15 September 2003 and at the oral proceedings. They can be summarized as follows:

(a) Apart from the fact that D1 did not disclose the structural units required in the patent in suit, D1 also did not contain a direct and unambiguous disclosure of a combination of process conditions that inevitably would have produced a polymer falling within the scope of the patent in suit.

(b) As regards the appellant's repetition of Example A8 of D1, the proprietor questioned the reliability of these data and therefore did not accept them as a novelty destroying evidence. Not only was there an enormous variation within the appellant's three different sets of data, these data were also not in line with those reported in the patent in suit itself.

(c) The problem underlying the present invention was to provide cationic polymeric flocculating agents having improved flocculating performance in terms of dehydrating properties, filterability and stability upon storage. This problem was solved by a polymer containing the structural units defined in Claims 1 and 19, respectively, in particular the amidine units (1) and/or (2). Since D1 did not disclose amidine units at all, there was no incentive for a person skilled in art to focus on these units in order to solve the posed problem. Therefore, the appellant's arguments were based on hindsight. A skilled person would also not choose copolymer H of Example A8 as the starting point in D1 since the flocculating properties of this polymer were similar to the properties of the other polymers disclosed in D1. Thus, there was no incentive to further increase the reaction temperature or the amount of acid used in Example A8. Again, the appellant's arguments in this respect were based on hindsight.

VII. Opponent 02 has not submitted any written comments during the appeal proceedings and was also not represented at the oral proceedings. Because it had been duly summoned, however, the oral proceedings were continued in its absence in accordance with Rule 71(2) EPC.

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

The respondent requested that

- the appeal be dismissed and the patent be maintained as granted (main request); or, in the alternative,

- on the basis of Claims 1 to 30 filed as auxiliary request I on 25 April 2002 during the opposition procedure, or

- on the basis of Claims 1 to 28 filed as auxiliary request II on 25 April 2002.

Since, however, auxiliary requests I and II are of no relevance for this decision, they are not further specified.

Reasons for the Decision

1. The appeal complies with Articles 106 to 108 EPC and Rule 64 EPC and is therefore admissible.

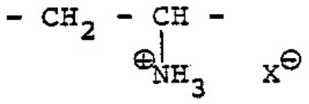
The patent in suit

2. The patent in suit is concerned in general terms with a cationic polymer flocculating agent containing an amidine structural unit, ie a unit represented by the formulae (1) and/or (2). The content of the repeating unit (3) in the cationic polymer, ie a N-formyl substituted amino group, is generally up to 2% by mole in order to achieve an excellent performance as flocculating agent. However, when the proportion of amidine unit is 50% by mole or more, flocculating agents having good performance may be obtained even if larger amounts of repeating unit (3) are present (page 4, lines 30 to 35 of the patent specification). Consequently, the patent in suit claims two different cationic polymer flocculating agents having an amidine structural unit: one embodiment with a low content of repeating unit (3), ie up to 2% by mole (Claim 1), and another embodiment with a higher content of repeating unit (3), ie 2 to 20% by mole (Claim 19). Preferably, the polymers according to Claims 1 and 19 are prepared by copolymerizing N-vinylformamide with acrylonitrile and modifying the resulting copolymer under acidic conditions in a single step. In this reaction, it is believed that the formyl-substituted amino groups are intermediately converted into primary amino groups which are then reacted with the adjacent cyano groups to produce the amidine structure. The amidinization reaction may be carried out by adding to the copolymer 0.5 to 5.0 equivalents, preferably 1.0 to 3.0 equivalents of a strong acid, such as hydrochloric acid, based on one equivalent of the substituted amino group in the copolymer, and heating at a temperature of 80 to 150°C, preferably 90 to 120°C, for 0.5 to 20 hours

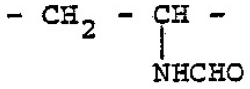
(page 4, lines 2 to 5 of the patent specification). Generally, the amidinization may proceed better and more completely with a larger equivalent ratio of strong acid relative to substituted amino groups and at higher reaction temperatures (page 4, lines 5 to 7).

Novelty (main request)

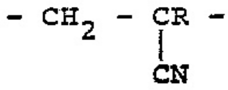
3. The only document cited by the appellant as being relevant for the question of novelty is D1. This document discloses in Claim 6 a flocculating agent comprising a N-vinylamine copolymer which has structural units represented by the formulas (I) to (V):


$$-CH_2-\underset{\oplus NH_3}{\underset{|}{CH}}-\quad X^{\ominus}$$

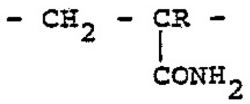
(I)


$$-CH_2-\underset{NHCHO}{\underset{|}{CH}}-$$

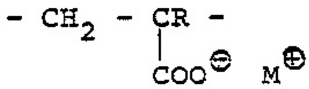
(II)


$$-CH_2-\underset{CN}{\underset{|}{CR}}-$$

(III)


$$-CH_2-\underset{CONH_2}{\underset{|}{CR}}-$$

(IV)


$$-CH_2-\underset{COO^{\ominus}}{\underset{|}{CR}}-\quad M^{\oplus}$$

(V),

and has a reduced viscosity of 0.l to l0 dl/g as measured in an aqueous lN sodium chloride solution at a concentration of 0.l g/dl at 25°C. The N-vinylamine copolymer can be obtained by modifying the formyl groups in a N-vinylformamide copolymer under an acidic condition (page 9, lines 1 to 2). D1 does not, however, refer to the presence of the amidine structural units (1) and/or (2) required in the patent in suit.

4. Although the amidine structural units (1) and/or (2) are not referred to in D1, it is conspicuous that not only the starting materials for producing the polymers of the patent in suit and those of D1 are the same ones, but also the general method for preparing the polymers of the patent in suit and those of D1 are similar to each other. According to page 9, lines 49 to 56 of D1, the amount of acid used in the modifying reaction may be from 0.l to 2 equivalents and the reaction temperature is usually from 40 to 100°C. Hence, these two ranges overlap to some degree with the ranges indicated in the patent in suit (0.5 to 5 equivalents and 80 to 150°C, respectively). Nevertheless, no particular combination of process conditions can be found in the general disclosure of D1, let alone a combination of a high amount of acid and a high temperature which is, according to the patent in suit a favourable combination for the formation of the amidine structure (see point 2, above). Also the appellant's suggested combination of two equivalents acid, ie the upper limit of the range disclosed on page 9, with other process features from Example A8 of D1, in particular a reaction temperature of 95°C and a reaction time of 8 hours, is not directly and unambiguously derivable from D1. Consequently, the general disclosure of D1 does not refer to a combination of process features that would inherently produce a copolymer falling within the scope of the patent in suit.

5. The only combinations of process conditions actually contemplated in D1 can be found in the examples of D1. Therefore, the decisive question is whether or not the process conditions of a particular example of D1 produce a copolymer meeting the requirements of the patent in suit.

6. In this respect, the focus in the course of the present opposition and appeal procedure lay only on Example A8 of D1 where a N-vinylformamide copolymer was modified at a temperature of 95°C for 8 hours in the presence of one equivalent of hydrochloric acid. To substantiate its novelty objection, the appellant repeated Example A8 in total three times and submitted three different data sets according to which the copolymer of Example A8 falls within the scope of Claim 1 of the patent in suit. On the other hand, the proprietor's repetition of Example A8 submitted on 24 February 2000 shows that a copolymer produced according to this example is outside the scope of the patent in suit. The data of the appellant's three experiments and those of the proprietor's repetition are listed below. For comparative reasons, the data for copolymer H obtained in Example A8 (Table 2 of D1) are given, but, since D1 does not identify an amidine structure, only those data are listed which can be unequivocally attributed to other structural units indicated in the claims of the patent in suit.

formula	Date	AMD (1)+(2)	Formyl (3)	CN (4)	NH_2	COOH	Lac	6AMD
BASF	29/03/99	41	1	10	42	-	-	-
BASF	27/09/00	58.97	1.70	21.97	8.98	3.58	0	-
BASF	21/11/02	52.1	1.6	22.4	18.7	4.0	1.2	-
Propr.	24/02/00	44.4	3.2	27.2	19.6	2.1	1.3	2.3
Ex.A8			4	32		2		

7. As regards the various reports of the appellant, the first analysis submitted on 29 March 1999 does not contain any details concerning the preparation of the copolymer or the method of analysis. Therefore, this report can not be taken into account.

In the appellant's second report submitted on 27 September 2000, the ^{13}C NMR measurement was carried out with a pulse delay time of 10 seconds whereas the proprietor used in its experiment a pulse delay time of 5 seconds. This raised the question whether the different methods of measurement could be the reason for the diverging results. It is true that the patent in suit does not further specify the ^{13}C NMR method so that, in principle, a person skilled in the art could use any suitable pulse delay time in the measurement. However, there is no need to discuss this issue further, since the appellant's second analysis report is also incomplete and does not qualify as a novelty destroying evidence. As already pointed out in the decision under appeal, only part of the spectrum was provided and only 95.2% of the units were identified. Apart from that, according to the proprietor's uncontested calculations and additional experimental tests submitted on 25 April 2002 there could not be obtained any substantial difference in the test results when employing a pulse delay time of 5 seconds or 10 seconds, respectively, whether theoretically or experimentally.

Only the appellant's third analysis report submitted with the statement of grounds of appeal can be taken into account for further consideration because it is the only report that provides all the details with regard to the preparation of the polymer and its ^{13}C NMR analysis.

8. Having regard to this third analysis report of the appellant and the proprietor's repetition of Example A8 of D1, both parties claimed that the procedure described in Example A8 of D1 was exactly repeated. Nevertheless, there is a considerable discrepancy between the respective data sets. Irrespective of the discrepancy in the measured values, the experiments of both parties demonstrate that copolymer H produced in Example A8 of D1 must indeed have contained some amidine structural units. Consequently, D1 had failed correctly to identify the true structure of copolymer H of Example A8 leading now to an uncertainty concerning the actual amidine content in the copolymer of that example.

9. *Prima facie*, both the appellant's and the proprietor's experiments appear to be correct repetitions of Example A8 of D1. The only apparent difference is that the appellant carried out the experiment in a scale twice as large as reported in Example A8 of D1 whereas the proprietor repeated the experiment in a scale of

10:1. However, these measures were merely taken to assure the accuracy of the operations and cannot explain the diverging results. The discrepancy can also not be attributed to a different ^{13}C NMR analysis method since the appellant adopted in its third analysis report a method identical to the one given in the proprietor's experiment, ie both parties used a pulse delay time of 5 seconds.

9.1 However, the proprietor questioned the reliability of the appellant's data since these data were not only in contrast to its own test results but also in contrast to the data reported in the patent in suit itself. As can be seen from Examples 6 to 8 in the patent in suit, under the conditions of an excess amount of hydrochloric acid (two equivalents) and a temperature of 95°C deformylation is completed immediately (0% by mole of formyl unit (3)) and amidinization proceeds as time passes: 20% by mole of amidine units (1) and/or (2) after 2 hours (Example 6), 33% by mole after 4 hours (Example 7) and 43% by mole after 8 hours (Example 8). On the other hand, Example 11 shows that at a temperature of 100°C and a reaction time of 5 hours amidinization proceeds (54% by mole units (1) and/or (2)) but a large amount of formyl groups is left in the copolymer (12% by mole of unit (3)) when the amount of hydrochloric acid is not in access, ie one equivalent. In view of these results, it can be assumed that, under the conditions of Example A8 in D1 in which the temperature was 95°C, the reaction time was 8 hours and the hydrochloric acid was not in excess, amidinization proceeds slowly and a considerable amount of formyl groups is left in the copolymer. This expected result can indeed be found in the proprietor's experiment whereas the appellant's result with 52% by mole of units (1) and/or (2) and only 1.6 % by mole of unit (3) is not in line with the teaching in the patent in suit. This is a first indication of the probity of the proprietor's data regarding the reworking of Example A8 of D1.

9.2 Another indication in favour of the proprietor's data can be found when looking at the other functional groups in the copolymer, such as the already mentioned formyl group (3), the cyano group (4) and the acid group. Since however wrong the prior art may have been with respect to the amidine structure, these other functional groups are not part of the amidine structure so that the respective ^{13}C NMR values reported in D1 for these groups should correspond with the values in the experiments of the parties. Although neither the appellant nor the proprietor reaches exactly the values reported in D1, it can be seen from a comparison of the third, fourth and fifth lines of the table (point 6, above) that the proprietor's data are considerably closer to those reported in D1 whereas the appellant's data diverge as far as 50%. Hence, the proprietor's data appear also in this respect more reliable than those of the appellant.

9.3 Finally, the appellant, who had the burden to prove that the claimed subject-matter was directly and unambiguously derivable from D1, has not challenged the validity of the proprietor's data and, *a fortiori*, has not shown why these data should not qualify as a reliable reproduction of Example A8 of D1.

10. Summing up:

  - D1 does not mention an amidine structure.

  - The general disclosure of D1 does not refer to a combination of process conditions that would inevitably produce a copolymer falling within the scope of the patent in suit.

  - As regards the novelty objection based on the reworking of Example A8, there is considerable uncertainty as to the actual amount of amidine structural units in copolymer H of that example. It was, however, the burden of the appellant to show that the subject-matter claimed in the patent in suit was directly and unambiguously derivable from the disclosure of D1. This it has not done, for the reasons given above.

11. Consequently, the claimed subject-matter is held to be novel over D1.

Problem and solution

12. The patent in suit is concerned in general terms with a cationic polymer flocculating agent containing an amidine structural unit represented by formula (1) and/or (2) with a varying amount of structural unit (3) (see point 2, above). It has been found that the cationic polymers specified in Claims 1 and 19, respectively, "have a remarkably excellent performance as flocculating agent, in particular for organic sludge" (page 2, lines 13 to 15 of the patent specification). As is apparent from the examples in the

patent in suit, filtration of organic sludge treated with the claimed cationic polymer flocculating agent may be performed at a high speed and cakes with low water content may be obtained after dehydration. At the same time, the flocculating agents are thermally stable.

13. Document D1 discloses likewise a polymer providing an excellent flocculating effect in the treatment of waste water (page 4, lines 15 to 19). Although D1 does not mention the presence of amidine structural units (1) and/or (2) in the polymer at all, this document is considered by the board, in line with all parties, as the closest prior disclosing technical effects, purpose and intended use most similar to the claimed subject-matter.

14. The appellant asserted that the patent in suit did not contain comparative examples corresponding to D1, and in particular to Example A8, and that no advantageous properties had been shown in view of D1, so that the objective problem could only reside in providing further flocculating agents (see point V(c), above). Contrary to this position of the appellant, which was not further elaborated, Comparative Examples 1 and 3 to 6 in the patent in suit were prepared according to the general teaching of D1. It is immediately evident from the data in Tables 1 to 3 in the patent in suit that the "inventive" examples exhibit in fact improved and advantageous flocculating properties when compared with Comparative Examples 1 and 3 to 6. Therefore, the objective technical problem to be solved by the patent in suit has to be seen in the provision of cationic polymer flocculating agents with improved flocculating properties. This problem is solved, as demonstrated in

the examples in the patent in suit, by the features identified in Claim 1 and 19, respectively.

Inventive step (main request)

15. The only document cited by the appellant as being relevant for the question of inventive step is D1. Thus, it remains to be decided whether the proposed solution, ie a specified amount of amidine structural unit in the polymer, is obvious from this document.

16. As already mentioned in point 3 above, D1 itself does not mention an amidine structure at all. Consequently, D1 cannot contain a teaching relating to the relevance of amidine units in a polymer in order to improve the flocculating properties thereof. Hence, the claimed subject-matter is not obvious from D1.

17. In the oral proceedings, the appellant argued that a person skilled in the art reading D1 would not only look at the structure of the copolymers reported in D1 but also at their performance. In this respect, the skilled person would notice that copolymer H obtained under the conditions of Example A8 exhibited the best flocculating properties of all copolymers tested in D1 (Table 3). Thus, when trying to further improve the flocculating properties, the skilled person would start from copolymer H. Since this copolymer was obtained under the most "severe" modification condition of all examples (95°C, 8 hours, one equivalent of hydrochloric acid), the skilled person would try to achieve a still higher degree of modification by increasing the amount of hydrochloric acid and/or the temperature within the limits generally disclosed in D1 (two equivalents;

100°C) and would automatically arrive at a copolymer falling within the scope of the patent in suit.

18. For the following reasons, however, the appellant's argumentation is not convincing. Firstly, copolymer H of D1 has nearly the same flocculating properties as copolymers E and F. Differences of less than 1% between the properties of these three copolymers are merely marginal so that it is at least questionable whether a person skilled in the art would focus on copolymer H as the starting point. Secondly, the skilled person would learn from the data in Table 3 of D1 that a copolymer modified at 75°C with one equivalent of hydrochloric acid, ie copolymer E, has almost the same flocculating properties as a copolymer modified at 95°C with one equivalent of hydrochloric acid, ie copolymer H. In other words, an increase of 20°C in the modification temperature does not significantly improve the flocculating properties. This fact in itself bears no incentive for the skilled person to increase the modification temperature in the expectation of a further improvement in the flocculating properties. Thirdly, D1 contains no incentive to increase the amount of hydrochloric acid employed in Example A8. The framework of D1 is a copolymer defined by structural units which requires – *inter alia* – a minimum of 2% by mole of units containing a formyl group. An increase of the amount of hydrochloric acid in Example A8 would certainly reduce the amount of formyl groups further with the risk to fall below the required minimum. In other words, the skilled person would have to go against the essential teaching of D1, a procedure a skilled person would not seriously contemplate. Moreover, it appears that the appellant's argumentation

is based on hindsight since without the knowledge of the teaching of the patent in suit a person skilled in the art had no incentive whatsoever further to increase the modification temperature and/or the amount of hydrochloric acid employed in Example A8 of D1.

19. In summary, D1 cannot render the claimed subject-matter obvious. The subject-matter of Claims 1 and 19 as granted, and, by the same token, that of Claims 2 to 18 and 20 to 31 involves an inventive step within the meaning of Article 56 EPC.

20. It follows, in view of the above, that the patent can be maintained as granted (main request of the proprietor).

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:	The Chairman:
E. Görgmaier	R. Young