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File Number: T 340/89 - 3.3.1  
Application No.: 81 302 694.5  
Publication No.: 0 042 295  
Title of invention: Carbon-caffeine separation

Classification: C07D 473/12

DECISION  
of 22 January 1991

Applicant:

Proprietor of the patent: General Foods Corporation

Opponent: Société des Produits Nestlé S.A.

Headword: Caffeine/General Foods

EPC Article 56

Keyword: "Inventive step (confirmed)"

Headnote



Case Number : T 340/89 - 3.3.1

**D E C I S I O N**  
of the Technical Board of Appeal 3.3.1  
of 22 January 1991

**Appellant :** Société des Produits Nestlé S.A.  
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**Respondent :** General Foods Corporation  
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**Representative :** Baillie, Iain Cameron et al  
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**Decision under appeal :** Interlocutory decision of the Opposition Division of  
the European Patent Office dated 8 May 1989  
concerning maintenance of European patent  
No. 0 042 295 in amended form.

**Composition of the Board :**

**Chairman :** K.J.A. Jahn  
**Members :** R.W. Andrews  
J-C. Saisset

## Summary of Facts and Submissions

- I. The grant of European patent No. 0 042 295, in respect of European patent application No. 81 302 694.5 filed on 18 June 1981, was published on 1 August 1984 (cf. Bulletin 84/31).
- II. On 26 April 1985 a notice of opposition was filed in which the revocation of the patent on the grounds laid down in Article 100(a) EPC was requested. The opposition was supported, *inter alia*, by the following documents:
- (1) DD-A-78586
  - (5) Merck Index 9th Edition Compound No. 1623 (1978)
  - (6) US-A-2 416 484 and
  - (7) US-A-2 391 981.
- III. By an interlocutory decision dated 8 May 1989, the Opposition Division maintained the patent in the form as amended during the oral proceedings held on 25 October 1988.

The Opposition Division held that the proposed solution to the problem of improving the recovery of caffeine from activated carbon was surprising. Although the Opponent maintained that the Patentee had reformulated the problem underlying the disputed patent in an unallowable manner, the Opposition Division considered that an additional statement of advantage may be accepted as evidence in support of inventive step. In the absence of any evidence to the contrary, the Opposition Division accepted the Patentee's statement that the source of the caffeine does not affect the outcome of the claimed process and that all the solvents specified in Claim 1 would give the desired results.

IV. An appeal was lodged against the decision on 24 May 1989 with payment of the prescribed fee. In the Statement of Grounds of Appeal filed on 14 September 1989 and during the oral proceedings held on 22 January 1991, the Appellant contended that the skilled person could only deduce from the original disclosure that the problem was to desorb caffeine as selectively and completely as possible from the activated carbon. Therefore, the Patentee's attempt to reformulate the technical problem in the suggested manner is unallowable and all arguments based on the desorption of the co-adsorbed impurities must be disregarded when considering the question of inventive step.

Furthermore, the Appellant alleged that the advantages of the process of the disputed patent are only obtained if the caffeine adsorbed on the activated carbon is obtained by the aqueous extraction of green coffee beans. However, the disputed patent is completely silent with respect to this particular decaffeination process. Moreover, if it desired to render the activated carbon selective with respect to caffeine, it is advantageous if the solvent used for desorption does not desorb the non-caffeine constituents from the activated carbon.

While the Appellant admitted that the use of glacial acetic acid and the other acids mentioned in Claim 1 may be considered inventive, he maintained that the acids and alcohols specified in Claim 1 are so chemically different that it is not permissible to transfer any advantageous effects demonstrated for glacial acetic acid to the specific alcohols. In addition, the Appellant considered that the use of ethanol was, *prima facie*, obvious and, therefore, an especially drastic surprising effect must

occur for its use to be considered inventive. The fact that it is effective or that its effectiveness is at the level of other organic solvents is not surprising.

- V. The Respondent maintained that it was allowable to reformulate the technical problem in the suggested manner since there is no teaching in the disputed patent that the desorption of co-adsorbed impurities is undesirable. Rather, the claimed process maximises the recovery of the adsorbed caffeine in the context of the decaffeination of vegetable materials.

Furthermore, the Respondent contended that the disclosure of documents (6) and (7) do not render the use of ethanol or the other specified alcohols to desorb caffeine from activated carbon obvious.

- VI. The Appellant requested that the decision under appeal be set aside and the patent be revoked. The Respondent requested that the patent be maintained in amended form on the basis of the main request or, alternatively, on the basis of the auxiliary request; both submitted during oral proceedings. The only independent claim in accordance with the main request reads as follows:

"A process for recovering caffeine from activated carbon comprising:

contacting activated carbon having caffeine obtained from decaffeination of vegetable material adsorbed thereon with a liquid, edible, non-toxic, food-grade caffeine solvent which consists essentially of an organic acid selected from glacial acetic acid, propionic acid, or butyric acid or an alcohol selected from ethanol, isopropanol, benzyl alcohol, butanol, or amyl alcohol, or an azeotrope comprising at least one of these, and which solvent is

capable of displacing at least a portion of the caffeine from active sites on the carbon;

maintaining the contact for a period of time and at a temperature effective for the solvent to displace at least a portion of the caffeine from the carbon and dissolve the displaced caffeine; and

separating caffeine from the solvent."

The main claim in accordance with the auxiliary request is identical with the above claim apart from the deletion of ethanol from the specified alcohols.

- VII. At the conclusion of the oral proceedings the Board's decision to maintain the patent in amended form in accordance with the Respondent's main request was announced.

#### Reasons for the Decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is, therefore, admissible.
2. There are no formal objections to the claims in accordance with both requests under Article 123 EPC. In particular, the expression "obtained from decaffeination of vegetable material" finds support on page 1, lines 7 to 9 of the published patent application (cf. also column 1, lines 8 to 10 of the printed patent specification). The clarification of the main claims by the replacement of the expression "the aforementioned acids and alcohols" by the word "these" is justified by the original disclosure on page 4, lines 18 to 23 of the published patent application (cf. column 3, lines 24 to 29 of the printed patent

specification). Finally, the deletion of the term "comprises" and its replacement by the expression "consists essentially of" is necessary to clearly distinguish the claimed process from a prior art one in which a mixture of ammonia and ethanol is used to desorb caffeine from activated carbon (cf. Chemical Abstracts, Volume 54, 12720f-h, 1960). The Board agrees with the Respondent's opinion that the expression "consists essentially of" is to be construed as meaning that the solvents used in the claimed process are pure apart from the presence of unavoidable impurities.

Claims 2 to 9 in accordance with both the main and auxiliary requests correspond to Claims 3 to 10 as filed and Claims 2 to 9 as granted.

3. The patent in suit relates to a process for recovering the caffeine resulting from the decaffeination of vegetable material, such as green coffee beans, from an activated carbon adsorbent. Document (1), which is considered to represent the closest state of the art, discloses a process for recovering caffeine from caffeine-containing activated carbon by extracting the carbon with 5 to 15%, preferably 7-10% solutions of aqueous acids, neutralising the extract and, thereafter, precipitating the caffeine in the cold (cf. Claim 1). Aqueous acetic acid is disclosed as being suitable for use in this prior art process (cf. Claim 3).

However, it was considered that the aqueous acid solutions of this prior art process did not desorb a sufficient amount of the caffeine from spent carbon which had been used to adsorb caffeine resulting from the decaffeination of vegetable material.

- 3.1 Therefore, in the light of this closest prior art, the technical problem underlying the disputed patent may be seen in providing a process in which the recovery of caffeine obtained from the decaffeination of vegetable material, such as coffee beans, is improved as compared with that obtained by means of this prior art process (see also, column 1, lines 18 to 22 in conjunction with lines 47 to 53 of the published patent specification).

According to the disputed patent, this technical problem is essentially solved by extracting the spent carbon with one of the solvents or azeotropes specified in Claim 1. In view of the Examples in the disputed patent and the results of the tests filed on 26 April 1983 and 9 September 1983 and in Table II filed on 24 August 1987, the Board is satisfied that this problem is effectively solved (cf. 73-99% recovery obtained using glacial acetic acid; ethanol and isopropanol recovering 74% and 63% respectively of the amount recovered by glacial acetic acid).

- 3.2 In his response dated 19 August 1987, the Patentee (Respondent) submitted that the problem underlying the disputed patent was to find a solvent which will remove the caffeine and certain non-caffeine materials which have been adsorbed by the activated carbon to such an extent that the activated carbon after regeneration can be reused more efficiently in a decaffeination process than could activated carbon treated with a solvent in the prior art. In the Appellant's opinion, the reformulation of the technical problem in this manner was unallowable since this problem could not be derived from the disclosure of the disputed patent.

In the Board's judgement, it is not necessary to formulate the technical problem addressed and solved by the disputed patent in the manner suggested by the Respondent and,



therefore, there is no need to decide in this case whether such a reformulation is allowable or not.

4. After examination of the cited documents, the Board has reached the conclusion that the claimed process is novel. Since novelty is no longer in dispute, it is not necessary to give detailed reasons for this finding.
5. It still remains to be examined whether the requirement of inventive step is met by the claimed subject-matter.
- 5.1 As previously mentioned, document (1) discloses the use of 1 to 15% aqueous acids, including acetic acid to recover caffeine from activated carbon (cf. Claims 1 and 3).

According to this document, a number of disadvantages are associated with the use of organic solvents to recover caffeine from activated carbon and (cf. column 1, line 22 to column 2, line 17), in view of this, the invention disclosed therein was aimed at avoiding their use.

Therefore, the teaching of this document would not provide the skilled person with any encouragement to consider using organic solvents or any indication that the use of the solvents specified in the present claim would solve the technical problem underlying the disputed patent.

- 5.2 Document (5), which is an entry concerned with caffeine in a standard chemical handbook, discloses the solubility of pure caffeine in various solvents, such as water, ethanol, acetone, chloroform, diethyl ether and benzene. It is true that the skilled person is aware that an adsorbed substance can only be recovered from an adsorbent if it is soluble, at least to some extent, in the desorbing solvent. However, the skilled person is also aware that factors other than solubility are also involved and influence the solvent's desorption ability. Therefore,

merely knowing the solubility of caffeine in a specific solvent would not enable the skilled person to predict the effectiveness of that solvent to desorb caffeine from activated carbon, particularly in the view of the presence of co-adsorbed non-caffeine materials which may influence the desorption of the caffeine. Thus, the knowledge provided by this document would not enable the skilled person to foresee the proposed solution to the technical problem underlying the patent in suit.

5.3 Document (6) discloses that caffeine may be desorbed from clay by organic non-chlorinated polar solvents such as, for example, methanol, ethanol, acetone, methyl acetate, pyridine, aniline, piperidine, ethanolamine, diethanolamine or mixtures thereof, a mixture with other organic components of relatively low polarity or with inorganic solvents such as water (cf. Examples 28 to 42 in columns 5 and 6). Thus, the teaching of this document implies that practically any non-chlorinated polar solvent is suitable for desorbing caffeine from clay. However, the mere mention of ethanol as one possible solvent for this purpose would not lead the skilled person to the idea that ethanol and the other alcohols referred to in the present Claim 1 would be so effective in desorbing caffeine from a different adsorbent, viz. activated carbon, that they would solve the problem underlying the disputed patent; particularly in view of the undisputed statement in the patent in suit at column 1, lines 15 to 18 that carbon holds caffeine very tenaciously.

5.4 Document (7) discloses a process for the decaffeination and recovery of the caffeine comprising dissolving the caffeine from the coffee in a chlorinated organic solvent of relatively low polarity, adsorbing the caffeine from said solvent on clay, desorbing the caffeine from the clay by a non-chlorinated organic solvent of relatively high

polarity and recovering the caffeine from said second solvent (cf. Claim 1). According to this document (cf. right-hand column of page 1, lines 36 to 42) suitable solvents are the non-chlorinated polar solvents disclosed in document (6). For the reasons given above in paragraph 5.3, the teaching of document (7) does not render the proposed solution to the problem underlying the disputed patent obvious.

- 5.5 The Appellant's argument that the skilled person, wishing to avoid the use of chlorinated solvents to desorb caffeine from activated carbon, would immediately select ethanol in view of the teaching of documents (6) and (7) cannot be followed. The technical problem underlying the disputed patent is not to provide a desorption process for caffeine in which the use of halogenated solvents is avoided, but to provide improved caffeine recovery from activated carbon as compared to that obtained according to the process of document (1).
- 5.6 In the Board's judgement, the Appellant's allegation that the advantages of the present process are only achieved if the absorbed caffeine is obtained by the aqueous extraction of green coffee beans is unjustified since the Examples of the disputed patent demonstrate that a high recovery of caffeine is obtained when the caffeine is extracted from coffee beans by at least two other processes. In the absence of any evidence to support this allegation of the Appellant, the Board considers it plausible that the advantageous results of the claimed process are achieved, irrespective of the process by which the starting material, i.e. the caffeine containing carbon of the present process, is produced, provided that the source of caffeine is a vegetable material.


6. Therefore, in the Board's judgement, the proposed solution to the technical problem underlying the disputed patent is inventive. The subject-matter of Claim 1 in accordance with the main request, therefore, involves an inventive step. Dependent Claims 2 to 9 of this request, which relate to preferred embodiments of the process of Claim 1, are allowable.
7. In view of the above finding, it is not necessary to consider the Respondent's auxiliary request.

#### Order

For these reasons, it is decided that:

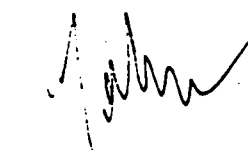
1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to maintain the patent in amended form on the basis of the claims in accordance with the main request.

The Registrar:



E. Görgmaier

The Chairman:



K.J.A. Jahn