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Case Number: T 155 / 82

DECISION
of the Technical Board of Appeal 3.3.1
of 2 August 1983

Appellant: Metsaliiton Teollisuus OY &
Battelle Memorial Institute

Representative: Dousse, Blasco
7, route de Drize
CH-1227 Carouge/Genève

Decision under appeal: Decision of Examining Division 024
Office dated 4 June 1982 of the European Patent
application No 80 900 300.7 refusing European patent
EPC pursuant to Article 97(1)

Composition of the Board:

Chairman: D. Cadman

Member: G. Szabo

Member: L. Gotti Porcinari

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SUMMARY OF FACTS AND SUBMISSIONS

I. The European patent application 80 900 300.7 filed under the Patent Cooperation Treaty (PCT) on 14 January 1980 and published by the international bureau of WIPO on 24 July 1980 with the publication number WO 80/01490, for which the priority of the prior application in Switzerland (388/79-8) dated 16 January 1979 is claimed, was refused by the decision of the Examining Division 024 of the European Patent Office dated 4 June 1982. The decision was based on 9 claims. The main claim 1 had the following wording:

1. A process for treating black-liquor and separating the organic components thereof from the water phase without having to convert said water to water vapor in which said black-liquor is contacted with a reducing gas such as carbon monoxide and/or hydrogen under heat and pressure until substantially all the organic matter dissolved therein is converted to liquid and gas products, the liquefied portion thereof forming a liquid oil phase insoluble in the water phase and easily separable therefrom which comprises operating without the use of added catalysts and achieving oil yields of at least 70% on theory".

II. The reason given for the refusal was that the subject matter of the claims did not involve an inventive step. The liquefaction of the contents of black liquors was already recommended in an article (El-Saied, H. J. appl. Chem. Biotechnol., 1977, 27, 443-462). The known process also used carbon monoxide at elevated temperatures. It was obvious to eliminate any preliminary precipitation

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and purification steps, which had been features of the process according to the state of the art. The use of calcium hydroxide as a catalyst in the preferred method described in the cited reference would not have created prejudice against the direct treatment of the liquor itself under similar conditions, since this was only an optional feature and the applicants method is not confined to the so called Kraft black liquors which contain sulphates incompatible with such catalysts. The high conversion rate obtained by the claimed process was not relevant either, since this would always be aimed at.

- III. The applicant lodged an appeal against the decision of the 4 June 1982 on the 9 July 1982 with payment of the fee, and filed a statement setting out the grounds together with new evidence.
- IV. In reply to various demands from the rapporteur to limit the claims to Kraft processes and to conditions supported by the application, which necessarily provide separable oily products, the appellants submitted new pages and amended claims on the 8 April and 22 June 1983. The amended main claim now has the following wording:

"1. A process for treating Kraft black liquor and separating the organic components thereof from the water phase without having to convert said water to water vapor, in which said Kraft black liquor is contacted with carbon monoxide under a pressure of 145 - 220 bar and a temperature of typically 210 - 330°C until substantially all organic matter dissolved therein is converted to liquid and gas products, the liquefied portion forming a liquid oil phase insoluble in the water phase and easily separable therefrom."

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- V. The appellants argue that the cited reference related only to the liquefaction of some precipitated fractions in the black liquor, including those which had been the products of further purification. The reference to liquefaction of the black liquor "as a whole ... without ...costly purification treatments" must be interpreted to mean the precipitated material before further fractionation is carried out, otherwise the statement would be inconsistent with the rest of the article. The discovery that the liquid itself can be directly treated with superior results was surprising in the light of what could be expected on the basis of the state of the art.
- VI. The appellants requested that the decision under appeal be set aside and that the patent be granted with the amended claims.

REASONS FOR THE DECISION

1. The appeal complies with Articles 106 - 108 and Rule 64 EPC and is, therefore, admissible.
2. The amended claims are supported by the disclosure. The specification and the examples provide a sufficient basis for the restricted temperature and pressure ranges, which characterise the processing conditions associated with the high oil yield (cf. page 3, line 31; page 6, line 34 and page 7 lines 5 and 21).

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3. The alleged invention is aiming at the direct conversion of the organic contents of waste black liquors which issue from the Kraft pulping process in the paper industry, into easily separable oily materials. The solution of the problem comprises the treatment of such liquors with carbon monoxide at a temperature from 210 to 330° and a pressure of 145 to 200 bar. The closest prior art, the El-Saied article, discloses a method which involves the ageing of the black liquor prior to precipitation with acid. The lignohemicellulose obtained in this manner is further purified to provide a fraction mainly consisting of lignin. Either of such materials is suitable, as a dried solid starting material, for a treatment with carbon-monoxide in an aqueous suspension at temperatures between 370°C and 440°C. The statement in the conclusions of the article that the black liquor can be purified "as a whole, i.e. without the need of costly purification treatments" must be understood in this sense, i.e. the precipitated lignohemicellulose need not be further treated. In any case, the cited reference recommends a temperature range which is higher than that employed by the present process, and uses the black liquor from soda pulping instead of that from the Kraft process. The subject matter of the amended claims is therefore novel.
4. It appears that the El-Saied process only converts a part of the precipitated organic material into a benzene extractable, i.e. oily, fraction. Although the article tabulates the conversion rates and the yield of the oily product (Table 2), the latter is only expressed in relation to the total non-gaseous output, which includes all the unwanted solid residue. If the conversion rate is high, i.e. very little solid is produced according to the definition of the term, this depresses the absolute yield of the oily fraction even if the latter is relatively high in comparison to the solids produced by the

- method. The best result is less than 40% for the oily fraction in absolute terms on input, when recalculated by combining the two indices into one, and the outcome is then still associated with about the same amount of undesirable solid material in the product (Example 1a in Table 2). The use of catalysts improves the results in this respect no further (Examples 1 to 3 in Table 4 only represent 36-37% oil on precipitated input, when recalculated from "conversion" and "yield").
5. The closest art gives little encouragement towards a high degree of conversion into oil, using the total organic content of the liquor. It is suggested that only up to two thirds of the contents can be precipitated in the manner described in the El-Saied article. This means that the suggested yield for the El-Saied method was only about 25% calculated on the available source. Whenever the temperature was lowered in the El-Saied method to less than the recommended 370°C, the re-calculated overall yield was reduced to about 15 and 30% (Examples 8 and 9). Furthermore, according to the evidence filed with the appeal the actual yield was even less than 5% when processed at 370°C, whilst the results according to the present process provided over 70% on total organics in the liquor.
 6. It appears, therefore, that a substantially higher output of the oily product can be provided than expected, under the conditions specified for the present process, without the simultaneous production of undesirable solid particles in the product. This is an improvement in quantity and quality, and is partly achieved by lowering the temperature range for the process, in contradiction to what would have been considered beneficial on the

basis of the state of the art. The direct treatment of the mixture of organic ingredients in the liquor is very successful, although normally better results are obtained when various fractions are separately treated. Thus the process represents a modification of what existed in the art in a direction where no real progress was envisaged. The subject matter of claim 1 and that of the other claims is therefore considered to have an inventive step.

ORDER

1. The decision of the Examining Division of the European Patent Office of 4 June 1982 is set aside.
2. The case is remitted to the first instance with the order to grant a European patent on the basis of the following documents:
 - 2.1 Page 1 of the specification, submitted on 8 April 1983 (received on 11 April 1983);
 - 2.2 page 2, and pages 4 to 9, submitted on 22 June 1983 (received on 25 June 1983);
 - 2.3 page 3, submitted on 22 June 1983 (received on 25 June 1983) as further amended in letter from appellants dated 6 July 1983;
 - 2.4 claims 1 to 5, submitted on 22 June 1983 (received on 25 June 1983).

The Registrar
signed J. Bergeron

The Chairman
signed D. Cadman