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19

Veröffentlichung im Amtsblatt	Ja/Nein
Publication in the Official Journal	Yes/No
Publication au Journal Officiel	Oui/Non

Aktenzeichen / Case Number / N° du recours : T 285/86 - 3.2.1

Anmeldenummer / Filing No / N° de la demande : 80 300 798.8

Veröffentlichungs-Nr. / Publication No / N° de la publication : 0 017 368

Bezeichnung der Erfindung: Method and apparatus for cryogenic grinding
Title of invention:
Titre de l'invention :

Klassifikation / Classification / Classement : B02C 19/18

ENTSCHEIDUNG / DECISION
vom / of / du 27 April 1988

Anmelder / Applicant / Demandeur :

Patentinhaber / Proprietor of the patent /
Titulaire du brevet : Air Products and Chemicals, Inc.

Einsprechender / Opponent / Opposant : Linde AG

Stichwort / Headword / Référence :

EPÜ / EPC / CBE Article 56

Kennwort / Keyword / Mot clé : Inventive step (yes)

Leitsatz / Headnote / Sommaire

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Case Number : T 285/86 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal
of 27 April 1988

Appellant : (Opponent)
Linde Aktiengesellschaft
Zentrale Patentabteilung
Dr. Carl-von-Linde-Straße 6-14
D-8023 Höllriegelskreuth (DE)

Representative :

Respondent : (Proprietor of the patent)
Air Products and Chemicals, Inc.
P.O. Box 538
Allentown, Pennsylvania 18105 (US)

Representative :
Lucas, Brian Ronald
Lucas, George & Co.
135 Westhall Road
Warlingham
Surrey CR3 9HJ (GB)

Decision under appeal :
Interlocutory decision of the Opposition Division of the European Patent Office dated 24 June 1986 concerning maintenance of European Patent No. 0 017 368 in amended form.

Composition of the Board :

Chairman : P. Delbecque
Members : F. Gumbel
O. Bossung

Summary of Facts and Submissions

I. Patent No. 0 017 368 was granted on 17 November 1982 with fifteen claims in response to the European patent application No. 80 300 798.8, filed on 14 March 1980 and published on 15 October 1980.

II. A notice of opposition to this patent was filed on 12 August 1983, requesting that it be revoked in its entirety since its subject-matter failed to meet the requirement of an inventive step pursuant to Articles 52(1) and 56 EPC. In support of this objection the Opponent (Appellants) referred to the following documents:

(1) Brochure from the firm Pallmann, K 474D, published October 1975

(2) Brochure from the firm Pallmann, A 500D, published September 1975

(3) DE-C-1 004 460

III. By an interlocutory decision dated 24 June 1986 the Opposition Division maintained the patent in amended form on the basis of Claims 1 and 6 as amended on 6 December 1983.

IV. The Appellants lodged an appeal against this decision on 21 August 1986 and paid the appeal fee the same day. In their Statement of Grounds of Appeal filed on 7 October 1986 they upheld their opinion that the subject-matter of Claim 1 and likewise of Claim 6 does not involve an

inventive step. In this context they referred to US-A-4 073 443 for the first time and, in addition, to document (3) mentioned in the opposition proceedings.

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

V. During the Oral Proceedings held on 27 April 1988 the Respondents submitted a set of amended claims and an amended description and requested that the patent be maintained on the basis of these new documents together with the drawings as granted.

The Appellants maintained their requests as stated above. They argued, in substance, that

- the finding of the Opposition Division under point II.4 of its decision, according to which features (b) and c) are not compatible if transferred to the apparatus shown in document (1) and, consequently, their combination was not obvious when using this apparatus, was not correct, since it is not in the first place the gap between the mill plates which controls the gas flow through the mill, but rather the combined effect of the gas lines coming from control device 14 and ventilator 12;

- it is clear to any practitioner that repeated circulation of the material in the mill would produce undesired heat leading to an excessive consumption of nitrogen; hence it was obvious to try to avoid this drawback by delivering as much material as possible from the mill before the completion of one circuit; the figure "at least 70%" was not critical as it is proved by the figures 85% and 95%, respectively, in the dependent claims;

- it is part of general technical knowledge that any rotating machine acts like a fan sucking gas through it; if in practice with the known impact mills it was found that too much nitrogen was sucked through the mill, it was obvious to provide some regulation means to avoid this; moreover, document (3) clearly suggests the use of such regulation means downstream of the mill in order to avoid excessive gas flow through the mill.

The Respondents essentially pointed out that the available prior art does not suggest the idea of removing at least 70% of the material before it completes one circuit of the mill, which, in combination with the process step of pre-cooling the material in order to embrittle it before it enters the mill, saves a considerable amount of expensive nitrogen; the fact that the apparatus known from document (1) could possibly be run according to the method claimed in present Claim 1 does not mean, in the absence of any instruction so to run it, that this method is rendered obvious by this state of the art.

VI. Independent Claims 1 and 6 as they stand read as follows:

1. A method of cryogenically grinding material, which method comprises the steps of advancing the material to be ground from a feeding point towards an impact mill having an inlet and an outlet, embrittling said material by direct contact with a stream of cold nitrogen a major portion of which is travelling away from said impact mill in countercurrent flow to said material; introducing the embrittled material through the inlet of said impact mill together with a minor portion of said stream of cold nitrogen and transporting the embrittled material around said impact mill, characterized in that said method further comprises removing at least 70% of the embrittled material which enters the mill through said outlet before

it completes one circuit of the mill; controlling the flow of nitrogen from said mill at a position downstream of said outlet so that only a minor portion of said nitrogen passes through said impact mill; screening the material leaving said impact mill and cryogenically regrinding oversize particles.

6. Apparatus for cryogenically grinding material which apparatus comprises means (23') in which, in use, material coming from a feeding point (22') is embrittled by direct contact with cold nitrogen, an impact mill (24') having an inlet (31') to receive said material when embrittled and an outlet (27'), and means (29') for screening material leaving said impact mill (24') so that particles of the required size pass through said screening means, characterized in that the outlet (27') of said impact mill permits, in use, at least 70% of the embrittled material entering said impact mill (24') to leave said impact mill before it completes one circuit of the mill, means (37) are provided downstream of said outlet (27') to control, in use, the flow of nitrogen through said impact mill (24'); and means are provided for transferring oversize particles from said screen for further cryogenic grinding.

VII. In the Oral Proceedings the parties were informed that, as announced in the official communication accompanying the summons, late filed document US-A-4 073 443 is disregarded by the Board pursuant to Article 114(2) EPC, since the examination under Article 114(1) EPC has yielded the result that it is not relevant. Consequently, there will be no further substantiation of this matter.

Reasons for the Decision

1. The appeal complies with Articles 106 to 108 and Rules 1(1) and 64 EPC and is, therefore, admissible.

2. Concerning formal requirements, the Board has no objections to Claims 1 and 6.

2.1 Those claims are covered, in substance, by the contents of original Claims 1 and 4 and Claims 6 and 9, respectively, together with the statement as to the function of valve 37 on page 5, lines 32 to 34 of the original description, and thus are considered to meet the requirement of Article 123(2).

2.2 The amendments made during the opposition proceedings and appeal proceedings apparently help to define more clearly the matter for which protection is sought (Article 84) without extending the protection conferred (Article 123(3)). This could possibly be doubtful regarding the replacement of "restrict" in Claim 6 by "control". However, since the word "control" has been used in granted Claim 1 in the same context, no undue broadening of Claim 6 arises from the corresponding feature of the apparatus designed for carrying out this method.

2.3 Furthermore, both independent claims are considered to be correctly delimited against the closest prior art, which appears to be reflected, for example, by Figure 1 of the patent-in-suit.

Contrary to the Appellants' opinion expressed in their Statement of Grounds, page 2, last paragraph and page 3, paragraph 1, it is clear from the specification of the patent-in-suit that with the embodiment of Figure 1, a

certain restriction of the flow of gaseous nitrogen entering the hammermill via inlet 12 is achieved by the effect of the screen 7, which inhibits the free escape of the gas. A major portion of the nitrogen introduced into the conveyor section for embrittling the material will therefore be forced to flow in a countercurrent direction through the material contained in the feed hopper, thus fulfilling the wording of the preamble (features (a) to (d) according to the list established by the Opposition Division).

The document GB-A-1 397 793 cited in the search report also discloses a method and an apparatus according to the preamble of Claims 1 and 6 (see Figure 1 and page 2, line 118 to page 3, line 25). It follows from the expression "trickle" on page 2, line 126 that only a minor portion of nitrogen is fed into the mill, whereas the larger portion apparently leaves the feed hopper in a countercurrent flow.

3. Concerning patentability it results immediately from the comparison of the subject-matter of Claims 1 and 6, respectively, with the disclosure of each of the documents of the available prior art, that none of these documents discloses a method or an apparatus comprising all the features specified in those claims. Consequently, the subject-matter of Claims 1 and 6 is novel pursuant to Article 54 EPC. Since this has never been disputed, no further discussion of this matter is considered to be necessary.

4. What was disputed during the opposition proceedings and appeal proceedings is the existence of an inventive step. In this respect the following is to be observed:

4.1 Although there is no express statement of the problem to be solved by the method of Claim 1 and by the apparatus of Claim 6, it follows from the whole contents of the patent description (cf. in particular the examples indicated on column 4, lines 40 to 61) that the invention aims at reducing the nitrogen consumption per unit of material to be treated.

4.2 The conception of this problem certainly is not based on an inventive activity, since it is the normal attitude of any practitioner to lower operation costs wherever possible.

4.3 Having regard to the solution as claimed in both independent claims the examination by the Board yields the result that none of the documents discloses feature (e), i.e. the method step of removing at least 70% of the embrittled material entering the mill through the outlet before it completes one circuit of the mill.

4.4 Particularly, document (1) relied on in the first place by the Appellants when contesting inventive step, is totally silent about the number of circuits the material to be ground performs in the mill until it is discharged via the outlet gap between the two plates. Feature (e) obviously also cannot be derived from the statement on the second page of (1), according to which the comminuting operation may lead to any desired degree of fineness of the ground product, and also the fact that according to this known method there is a sifting device and a recycling means for oversize particles arranged subsequently to the impact mill, does not positively suggest the discharge of at least 70% of the material before the completion of one only circuit through the mill. Document (2), even if combined with document (1) does not give any further suggestion in this respect.

Possibly, as admitted by the Respondents, the apparatus known from document (1) could be theoretically used according to the method of Claim 1. This does, however, in the Board's view, in the absence of any positive teaching in this respect, not affect the question of inventive step. For this reason, the finding of the Opposition Division that features (b) and (e) of Claim 1 are not compatible when transferred to the apparatus of document (1), which finding was disputed by the Appellants, needs not be discussed any further.

4.5 The Board does not accept the Appellants' argumentation according to which the person skilled in the art would arrive at the idea of removing most of the material from the mill before it completes one circuit merely by normal and logical considerations and the application of general technical knowledge, without the exercise of any inventive skill. This argumentation appears to be based on the assumption that the skilled person aiming at reducing the nitrogen consumption did not in practice have any other choice than to go the way proposed by the method of Claim 1. However, starting from a prior art apparatus as shown in Figure 1 of the patent-in-suit it would also have been possible to try to save nitrogen by an exact control of the nitrogen flow in response to the signals of temperature sensors and by a re-circulation of cooling gas in a closed system, both measures being suggested by document (1). In any case, the Appellants failed to provide any evidence such as documents, general technical literature or text books showing that in the art of cryogenically grinding or in a similar technical context there was any knowledge or suggestion pointing in the direction of the solution as claimed.

Regarding the available prior art, it is, on the contrary, to be stated that it teaches away from this solution in the sense that it suggests the use of a screen covering the outlet of the mill and thus requiring the repeated circulation of at least the major part of the material in the mill until it is ground to a degree fine enough to pass the screen (see document (3) and GB-A-1 397 793), or the prior art recommends the feeding of cold nitrogen directly into the mill, which also points to a longer stay of the material in the mill, because otherwise this coolant could not have the intended cooling effect (see document (1)). In this context, it is to be noted that with the method of the invention it is absolutely necessary to cool the material to such an extent before it enters the mill that it is fully embrittled, as indicated by features (b) and (c) of Claim 1.

4.6 Since, as shown above, feature (e) of Claim 1 and the respective feature of Claim 6 are not obvious having regard to the available prior art including general technical knowledge and routine of the person skilled in the art, the method of Claim 1 and also the apparatus of Claim 6 in their entirety involve an inventive step pursuant to Article 56 EPC (cf. decision T 113/82 of the same Board, OJ 1/84, 10 ff).

4.7 It is therefore of no importance that some of the features defined in the characterising portion of Claim 1 (and also Claim 6) are known in the prior art, such as screening of material which leaves the impact mill (feature (g)) and regrinding oversize particles (feature (h)), which features are disclosed in document (1).

Concerning feature (f), i.e. controlling the flow of nitrogen at a position downstream of the outlet so that only a minor portion of the nitrogen passes through the

mill, it is true that a valve construction, which would allow such a control of the flow of nitrogen, is disclosed in document (3). On the other hand, there is no clear disclosure that the control is actually carried out in this manner. Different teachings can be derived in this context from column 3, lines 36 to 57 of this document, saying on the one hand (lines 36 to 42) that the developing cooling gas is sucked by ventilator 10 "wholly or partly" through the material in the hopper, whereas, on the other hand, it follows from column 3, lines 47 to 57 that the gas flow through the mill can be regulated by element 19 in such a manner that the amount of gas which develops by vaporization of liquid coolant in the equipment may be completely drawn through the mill. It is doubtful whether the skilled person would get a clear suggestion to control the flows of nitrogen in the manner defined by features (b) and (f) of Claim 1 from this ambiguous disclosure. However, for the reason set out under point 4.6 above no further substantiation of this matter is necessary.

5. Summing up, the Board comes to the conclusion that the subject-matter of independent Claims 1 and 6 involves an inventive step and is patentable over the available prior art. The patent must, therefore, be maintained on the basis of these claims.

6. Claims 2 to 5 and 7 to 15 concern particular embodiments of the method according to Claim 1 and of the apparatus according to Claim 6, respectively, and are likewise allowable under Rule 29(3) EPC.

7. The description has been adapted to the wording of the claims and meets the requirements of Rule 27 EPC. Some clerical errors have been corrected and it is now clear from the description that solely the embodiment of Figure 3 shows the invention as claimed.

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 Claims 1 to 15 and the description handed over during the Oral Proceedings, together with the drawings as granted.

The Registrar: The Chairman:

S. Fabiani P. Delbecque