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Bezeichnung der Erfindung: Method and plant for the evaporation of a liquid solution thereby using mechanical compression.
Title of invention:
Titre de l'invention :

Klassifikation / Classification / Classement : BOID 1/28, BOID 1/26, A23C 1/12

ENTSCHEIDUNG / DECISION
vom / of / du 23 April 1987

Anmelder / Applicant / Demandeur : STORK FRIESLAND B.V.

~~Patentinhaber / Proprietor of the patent / Titulaire du brevet :~~

~~Einsprechender / Opponent / Opposant :~~

Stichwort / Headword / Référence :

EPÜ / EPC / CBE Articles 52(1), 56

Kennwort / Keyword / Mot clé : "Inventive step (no)"

Leitsatz / Headnote / Sommaire

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Case Number : T 138/85

D E C I S I O N
of the Technical Board of Appeal
of 23 April 1987

Appellant : STORK FRIESLAND B.V.
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Decision under appeal : **Decision of Examining Division 031 of the European Patent Office dated 24 October 1984 refusing European patent application No. 81 200 282.2 pursuant to Article 97(1) EPC**

Composition of the Board :

Chairman : K. Lederer
Members : J. Roscoe
O. Bossung

Summary of Facts and Submissions

I. European patent application No. 81 200 282.2, filed on 13 March 1981 (publication No. 0 036 235), was refused by decision of Examining Division 031 of the European Patent Office, dispatched 9 January 1985. This decision was based on Claim 1 submitted in the oral proceedings held on 24 October 1984 and Claims 2 to 5 as originally filed.

II. The reason given for the refusal was that the step from the teaching of a pamphlet dated April 1977 by P.R. Laguilharre and J. Ciboit "L'évaporation à compression mécanique dans les industries alimentaires", which was distributed at a Symposium in Versailles (France) (hereafter referred to as doc. (1)) to the subject-matter of the application, did not constitute a patentable invention in the sense of Article 56 EPC since the problem to be solved was already solved by the prior art.

This pamphlet had been drawn to the attention of the Examining Division in observations presented by a third party pursuant to Article 115 EPC.

III. On 7 March 1985, the Appellants lodged an appeal against the decision and paid the appeal fee. The Statement of Grounds was received on 7 May 1985 and was accompanied by a replacement set of claims, numbered 1 to 5, differing only in minor respects from the claims on which the refusal was based.

IV. With a response to one of two communications from the rapporteur expressing serious doubts as to the patentability of the claimed subject-matter, the appellants filed an undated prospectus of the firm

Niro Atomiser, hereafter doc. (2), which was said to disclose the state of the art from which their invention had been developed.

V. At the oral proceedings held on 23 April 1987, the appellants stated that doc. (2) had, in fact, not been published until after the priority date claimed, but that essentially the same state of the art was disclosed in the bulletin entitled "Fallstrom-Eindampf-Anlagen" dated 1968 (hereafter doc. (3)) enclosed with their letter dated 16 April 1987. They drew particular attention to page 9 of this bulletin.

VI. The appellants request that the decision under appeal be set aside and a patent granted either on the basis of a first set of claims numbered 1 to 5 submitted during the oral proceedings (main request), or on the basis of a second set of claims, numbered 1 and 2, also submitted during those proceedings (auxiliary request), in each case with an adapted description and drawings.

VII. Claims 1 and 5, the only independent claims of the first set (main request) reads as follows:

"1. Method of increasing the dry content of milk or of a liquid milk product in a multi-stage evaporating plant, whereby the latent heat of the vapour of a liquid solution released from a previous stage (B_1) is used in a subsequent stage (B_2) having a higher boiling point of the liquid solution, so as to successively increase the dry substance contents of said liquid solution by means of evaporation and recompressing heating vapour in order to have the vapour regain its initial temperature and pressure,
characterised in that, the evaporators connected in series for the passage of the product, are split up into a

plurality of groups (C, B, A), whereby the outgoing released vapour of each group after mechanical recompression is fed to the first stage of each group, the incoming and outgoing vapour per group are respectively connected in parallel with the outlet (41) and inlet (40) lines of the mechanical compressor (42).

5. Plant for the evaporation of milk or of a liquid milk product, while using the method as claimed in any one of Claims 1-4, comprising a plurality of evaporating stages (C, B and A), each consisting of an evaporator (37, 38, 39) and a drop separator (21, 23), lines and pumps for conveying the liquid solution through the plant, lines for the treatment vapour and a mechanical compressor, as well as lines 47, 50 for the discharge of condensate, characterised in that, the liquid solution passes through the evaporating stages in series, said totality of stages being split up into a plurality of groups, comprising a decreasing number of evaporating stages, while the treatment vapour being supplied and discharged per group, is connected in parallel with the outlet and inlet lines (41, 40) of the mechanical compressor (42), the supply for the milk or of a milk product being led to the first evaporating stage of the group comprising the greatest number of evaporating stages."

VIII. Claim 1 of the second set of claims (auxiliary request) reads as follows:

"1. Method of increasing the dry content of milk or of a liquid milk product in a multi-stage evaporating plant, whereby the latent heat of the vapour of a liquid solution released from a previous stage (B_1) is used in a subsequent stage (B_2) having a higher boiling point of the liquid solution, so as to successively increase the dry substance contents of said liquid solution by means of

evaporation in order to have the vapour regain its initial temperature and pressure, characterised in that, the evaporators connected in series for the passage of the product, are split up into a plurality of groups (C, B, A) each group - as seen in the direction of the product flow - comprising a decreasing number of evaporators, and the last group consists of one evaporator whereby the outgoing released vapour of each group after mechanical recompression is fed to the first stage of each group, the incoming and outgoing vapour per group are respectively connected in parallel with the outlet (41) and inlet (40) lines of the mechanical compressor (42), the liquid solution being supplied to the group having the greatest number of evaporators and is subsequently passed through the groups having a steadily decreasing number of evaporators."

It corresponds therefore in substance to Claim 4 of the first set when appendant to Claim 3. Claim 2 of the second set is, in substance, the same as Claim 5 of the first set.

IX. Both in their written submissions and at the oral proceedings the appellants argued essentially as follows.

The already recognised general problem to which the claimed method and plant afforded an effective solution was, that in certain prior art methods in which a multistage plant for increasing the dry content of milk is operated, as set out in the preamble of Claim 1, when using a single stage compressor for recompressing the heating vapour, the rise in pressure and temperature produced was so limited that the evaporator heating surfaces had to be enlarged to compensate for the low temperature gradient across them. The resulting reduction

in the liquid load in the pipes of the later evaporator stage(s), in which the product had a higher dry-material content, could lead to dry boiling and incrustation, thus causing a reduction in the already lower heat transfer coefficient in these stages.

Hitherto this general problem had been successfully tackled either by using a multi-stage compressor to obtain a higher temperature difference between the heating fluid in the first and last stages, or by splitting the pipes of an evaporator stage into a number of passes connected in series, for product flow, thereby increasing the liquid load, as in the arrangement shown on page 9 of doc. (3). These techniques, however, had the drawback of requiring additional equipment with an attendant rise in cost.

The more specific problem of providing an alternative solution to the general problem which did not suffer from these drawbacks was solved according to the invention by the expedient of dividing the series-connected evaporators into a plurality of groups and directing the outgoing vapour from the groups in parallel to the inlet of a mechanical compressor and supplying the vapour output of the compressor to heat the first evaporator of each group. In this way, for a given compressor and number of stages, the temperature gradient available across the heat transfer surface of the evaporators could be increased, thus avoiding the need for the larger evaporator heating surface in the later stages which had necessitated the use of passes.

Doc. (1) was essentially concerned with reducing the energy needed to operate evaporators and in no way suggested that the arrangement described on page 13 with reference to Figure 8, on which the decision to refuse was founded, provided a solution to even the general problem

addressed by the invention; indeed it made no reference to this problem. The arrangement in question was simply presented as an alternative to another arrangement, which employed passes and was thus subject to the drawbacks of the earlier solution, without any indication being given that it had any advantage over the latter arrangement.

This document was therefore of no relevance to the issue of inventive step. That the skilled man had not found in it a solution to the more specific problem was evidenced by the fact that doc. (2), though published five years after doc. (1), still proposed the method disclosed in doc. (3) published in 1968.

Doc. (1) related in any case to a lower temperature process unsuitable for increasing the dry content of milk or liquid milk products to which the claims were now limited.

Reasons for the Decision

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

2. An examination of docs. (1) and (3), the documents mentioned in the search report, and GB-A-1 119 462, which was drawn to the attention of the Examining Division in observations presented by a third party pursuant to Article 115 EPC, reveals that none of them discloses a method having the combination of all the features set out in Claim 1 of either request or plant combining all the features set out in Claim 5 of the main or the equivalent Claim 2 of the auxiliary request. Therefore the subject matter claimed in these claims and hence that claimed in the remaining, appendant, claims of both requests is novel (Article 54 EPC). The

novelty of this subject matter never having been challenged, the Board deems it unnecessary to further justify this conclusion here.

3. It remains therefore to be examined whether the subject-matter of the independent claims of the main and auxiliary requests involve an inventive step.

3.1 Following a careful study of the two Claims 1 and the prior art documents mentioned above the Board finds that the prior art method which comes closest to that claimed is the one described on pages 12 to 13, with reference to Figure 8, of doc. (1) in the here underlined version disclosed in the passage at lines 23-25 of page 13 which reads "Comme précédemment.....en tête du faisceau finisseur (12) alimenté pour son chauffage, soit en vapeur d'échappement du premier effet, soit en vapeur du fluide frigorigène comprimé."

3.2 Contrary to the appellant's assertion it is evident that this method is intended for increasing the dry content of milk (see caption "lait" to the right of the Figure and page 3 lines 25-26). It is performed in a multi-stage evaporation plant (6, 9, 12) whereby the latent heat of the vapour of a liquid solution (milk) released from a previous stage (6) is used in a subsequent stage (9) having a higher boiling point of the liquid solution (milk of increased dry substance content) so as to successively increase the dry substance content of the milk by means of evaporation. The evaporators (6, 9 and 12) are all connected in series for the passage of the product (milk) and are split into a plurality (two) of groups, the first of which in the direction of product flow consisting of two evaporators (6, 9) and the second (and final) group consisting of one (12), as in Fig. 4 of the application in suit.

Furthermore the first evaporator of each group is heated by fluid from the same source (pump 5) and thus at the same temperature, and the vapour from the last stage of each group is fed to a common output, leading to refrigerant evaporator (14).

3.3 Therefore the difference between the method of Claim 1 of both requests and this prior method can reside only in the following requirements:

(a) that the heating vapour is recompressed in order to have the vapour regain its initial temperature and pressure and

(b) that the outgoing released vapour of each group after mechanical recompression is fed to the first stage of each group, and the incoming and outgoing vapour per group are respectively connected in parallel with the output and inlet lines of the mechanical compressor.

3.4 Requirement (a) in the light of the description and the rest of the claim, can only mean that vapour after being used for heating one stage is recompressed for use in heating an earlier stage.

3.5 These requirements are exclusively concerned with the handling of vapour released from the various groups of evaporators and with the nature of the incoming vapour, which is understood in the light of the description to mean that used to heat the first evaporator of each group.

In the mentod known from document (1) the latent heat of the vapour output from the last stage of both groups, which flows from a common chamber (10) to an evaporator (14), is used in the latter to vaporise refrigerant fluid ("fluide

frigorigène"). This fluid, after compression to a saturated vapour temperature above that in the first stage (6) of the first group of evaporators, is used to heat that stage as Figure 8 shows and to heat the first (and only) evaporator stage 12 of the second group.

3.6 The Board, though recognising that doc. (1) makes no explicit reference to the problems of dry boiling and incrustation nor points to respective advantages of the two systems described with reference to Fig. 8 cannot follow the appellants view that this renders it irrelevant to the issue of inventive step.

In examining for the presence of inventive step the Board follows its normal practise of first deciding what is the closest prior art. This may or may not correspond to that from which the applicant developed his invention. In reaching a decision on this issue it is necessary to compare the combination of technical features of the subject matter, in this case method, of the claim under consideration with that of the various prior art methods, as has been done above, without regard to the reasons which motivated the designers of the respective methods to combine the features.

It is only after the closest prior art has been identified in this way that the problem to be solved is determined. This is done objectively by comparing the results achieved by the subject matter claimed with those achieved by that prior art. In the Boards view it is entirely legitimate to assume that the same combination of features always produces the same result even when this is not explicitly stated, unless it can be shown that additional features cause the effect of the combination to be modified.

In the present case, as indicated above, the Board considers the above discussed method disclosed in doc. (1) to be the closest prior art, because of the relatively highest degree of similarity of its steps to those of the method of Claim 1 of both requests.

From the facts set out above it emerges that the sole difference between this closest prior art method and that claimed in the method of Claim 1 is that in the former the latent heat of the released vapour emerging from each evaporator group is transferred in a heat exchanger (14) to a refrigerant fluid which is then compressed and fed back directly to the first evaporator of each group whereas in the latter it is the released vapour itself which is compressed and fed back together with its latent heat.

3.7 In the application itself it is recognised that it is the application across the different groups of evaporators, and specifically of the later groups, of the full temperature difference provided by the pump, see page 2, lines 2-19; page 10, lines 10-14 (which is also, of course, a feature of the closest prior art method) which is responsible for the improvements referred to in the application, and not the use of direct heat pumping, since this was also used in the prior method described with reference to Figure 2 of the application, which lacks the improvement.

The advantages of such direct heat pumping are indeed not mentioned in the application.

3.8 On the other hand, the appellant has himself stated before the Opposition Division that the use of refrigerant fluids such as FREON might not be allowed by certain authorities in milk-evaporation plant due to the danger of

contamination of the milk, and it is apparent that in a direct heat pump such fluids are not required so that contamination is avoided. Therefore, on the available information the problem in relation to the above-mentioned closest prior art is to be seen as how to modify that method to avoid the risk of contamination.

3.9 No contribution to inventive step can be seen (a) in appreciating this risk of contamination, even if the authorities imposed no restrictions on account of it, since the properties of the refrigerant fluids in widespread use are well known, nor (b) in recognising that the problem could be circumvented by avoiding their use. Doc. (1) itself shows a way in which this can be done. It discusses, at page 3, last paragraph and page 4, first paragraph, the possibility of using in milk-evaporating plant both indirect heat pumps (as in Figure 8) and direct heat pumps. It indicates that the latter are more efficient but can only be used for relatively high evaporation temperatures. The use of such a pump in which the vapour output of a single-stage milk evaporator is mechanically compressed and then fed back to heat the stage, and which can be seen to use no fluid other than water, is described at pages 10 and 11 with reference to Figure 7.

3.10 In view of this the Board concludes that it would be obvious for the skilled man faced with the problem of the contamination risk associated with the use of conventional refrigerant fluids to replace the indirect heat pump of the Figure 8 prior art by such a direct heat pump and thus arrive at the subject-matter of Claim 1 of both requests.

3.11 The subject-matter of Claim 1 of both the main and the auxiliary request, therefore, lacks an inventive step as required by Article 56 EPC. Therefore, neither of these

can be allowed having regard to Article 52(1) EPC, so that both the main and the auxiliary request have to be refused for this reason alone.

4. For the same reasons as given above under paragraphs 3.1 to 3.10 the plant as defined by independent Claim 5 of the main request and independent Claim 2 of the auxiliary request lacks inventive step.

Order

For these reasons, it is decided that:

the appeal is dismissed.

The Registrar: The Chairman:

Rückerl Lederer