BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

A		B		C	X

File No.: T 0265/90 - 3.2.2

Application No.: 84 850 100.3

Publication No.: 0 124 496

Classification: D21F 11/04

Title of invention: Manufacturing of Kraft paper

D E C I S I O N
of 3 August 1993

Applicant:

Proprietor of the patent: KORSNÄS AB

Opponents: 01: Holmens Bruk AB/Bäckhammars bruk AB/STORA Kopparbergs Bergslags AB
02: Valmet-Ahlström Inc.
03: Zellstoff-und Papierfabrik Frantschach

Headword:

EPC: Art. 56

Keyword: "Inventive step (yes); additional effect; combination of features"

Headnote
Catchwords

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0265/90 - 3.2.2

D E C I S I O N
of the Technical Board of Appeal 3.2.2
of 3 August 1993

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Decision under appeal: **Decision of the Opposition Division of the European Patent Office dated 8 February 1990 revoking European patent No. 0 124 496 pursuant to Article 102(1) EPC.**

Composition of the Board:

Chairman: G. Szabo
Members: M. Noel
J. Van Moer

Summary of Facts and Submissions

I. European patent No. 0 124 496 was granted on 28 October 1987 on the basis of European patent application No. 84 850 100.3.

II. In consequence of three oppositions filed by the Respondents, the Opposition Division decided to revoke the patent on 8 February 1990 on the grounds of inadmissible extension of the protection, in contravention of Article 123(3) EPC, and of lack of inventive step of the claimed subject-matter with respect to the prior art documents:

(1) AT-B-367 351, in combination with other evidence, in particular

(4) "Tidnings - och Kraftpapper - Process och maskineri:" by Gunnar Gavelin, Sveriges Skogsindustriförbund, July 1975, page 43 (english translation),

(6) "The influence of the sheet formation Method on the Properties of Multi-Ply Paper and Board" by Albrecht Meinecke, presented at Eucepa 1979, XVIII International Conference, London, May 1979, and

Deposition of Mr Olle Lind, dated 4 September 1989.

III. The Appellant (Proprietor of the patent) lodged an appeal against this decision on 2 April 1990, paying the appeal fee on the same date. In support of the Statement of Grounds filed on the 1 June 1990, two sets of amended Claims 1 to 5 (alternatives I and II) were submitted.

IV. Claim 1 of the first alternative, reads as follows (in the first line, "sack" was added to "kraft paper", during the oral proceeding):
"Process for manufacturing a sack kraft paper on a paper machine comprising a wire section, a press section and a drying section, wherein a paper web formed in the wire section is subjected to creping or micro-creping and drying by a combined cylinder drying and free drying in order to obtain a stretch at break of at least 5% in the cross direction and of at least 3% in the machine direction, characterized in that the web is formed on a multi-wire machine in two or more layers which are couched together in the wire section of the machine."

V. Oral proceedings took place on 3 August 1993 in the absence of the Respondent 2 (Opponent 2). The following submissions were made by the parties to the proceedings.

(i) The Appellant argued substantially that the invention related to a process for manufacturing of sack kraft paper by combining three process steps, known *per se*, into a new inventive process. The combination of using a two-wire or a multi-wire section, creping or micro-creping and free drying constituted a new paper making concept. Since nothing but a small effect could have been expected from this combination, by a skilled person, it could not be regarded to be close at hand to combine said three process steps in order to obtain a sack paper having surprisingly outstanding strength properties, especially high tensile energy absorption (TEA) values, in comparison with the best kraft paper known at the time of the filing of the priority application.

(ii) The Respondents' statements were as follows:

As for the Respondent 1 (Opponent 1) all steps of the alleged invention were well-known as being part of the general technical knowledge of the person skilled in the art. In particular, according to the deposition of Mr Olle Lind, a paper machine, having the reference number 13, was equipped with a two endless-wire forming section at the time the application was filed and was commonly used to produce a cable paper which is also a kind of kraft paper. Consequently, no inventive step could be recognised by combining the different known steps to increase further the strength properties of a kraft paper since each individual step provided its own effect and the total result did not go beyond what could be reasonably expected.

As for the Respondent 3 (Opponent 3) all steps of the claimed process were known from the process disclosed in document (1). Although this prior art dealt more particularly with the production of absorbent and bulky sanitary paper, the process disclosed therein could be used for manufacturing kraft paper as well. Otherwise its teaching could also be complemented by that of document (4), dealing with the production of sack kraft paper in combination with the additional information given in document (6).

VI. The Appellant requests that the decision under appeal be set aside and that the patent be maintained on the basis of the claims 1 to 5 as filed in the first alternative on 2 April 1990, with an amendment in the first line of Claim 1, referring to "sack kraft paper"; description and drawings as granted.

The Respondents request that the appeal be dismissed.

Reasons for the Decision

1. The appeal is admissible.

2. *Formal aspects*

2.1 The subject-matter of Claim 1 is fairly supported by the application as originally filed, in particular from page 1 to page 5, second paragraph of the description. The requirements of Article 123(2) EPC are thus fulfilled.

2.2 As to the requirements of Article 123(3) EPC, the expression "multi-wire machine" was reintroduced in Claim 1 in accordance with the terminology used either in the version as filed or as granted. Therefore, the previous objection of the Opposition Division regarding the omission of said expression, has been removed.

Wordings such as (in the order of appearance) "sack kraft paper", "a press section", "paper web formed in the wire section", "stretch at break of at least 3%" (instead of 2.5%), have been added to Claim 1 with respect to the version as granted. All these amendments correspond to a restriction of the protection and, as such, are allowable under Article 123(3) EPC. Specifically "sack kraft paper" limits the scope to the

use of a kraft paper as defined in the patent (cf. page 1, lines 1-7 and 12-14), i.e a kraft paper normally suited for sack production with improved strength properties, especially in the cross direction.

Other terms such as "optimal glazing" and "the web is shrunk" have been omitted from Claim 1 as granted, however without causing a prohibited extension of the protection, since the former term was optional and the latter appeared as the necessary result of the free drying operation in any case (cf. patent, page 3, lines 11 to 12).

3. *Closest prior art*

The closest prior art can be seen in the combination of the features stated in the pre-characterising portion of Claim 1 which, according to the Appellant, reflects the best previous generally known process for manufacturing kraft paper, that is a process giving a paper having the best strength values. On the other hand, document (1) was considered by the Opposition Division, as the closest prior art, which was also maintained by the Respondent 3 at the oral proceedings.

Document (1) describes, with reference to Figure 1, a process for producing soft, bulky and absorbent paper sheets suitable for use in tissue, towelling and sanitary products. The paper web is formed at first by superposing two fibrous layers on a multi-wire machine 3,4; then it is subjected successively to pre-drying by means of hot air, blow-through dryer 45, pressing by a pressure roll 41, final drying on a Yankee dryer 50 and to optional creping by means of a doctor blade 52 or micro-creping in a Clupak machine.

At the oral proceedings the Respondent 3 alleged that practically all features of Claim 1 were known from the document (1) as it discloses a paper having a basis weight in the range between 8 and 65 g/m^2, which are values suitable for a kraft paper; further, similar steps as in the process according to the patent, were to be found in the known process, namely a creping or micro-creping operation and a combination of cylinder drying (Yankee drum 50) with free drying (hot air dryer 45).

However, this line of argument cannot be followed by the Board since document (1) refers essentially to a process for manufacturing a sanitary paper having mechanical properties far removed from those required in the patent for making a sack kraft paper, with the consequence that the sanitary paper would obviously be unsuitable as packaging paper for producing for instance 50kg weight fertilizer or cement sacks.

Although the grammages referred to in document (1) and in the patent are slightly overlapping (8-65 g/m^2 versus 60-150 g/m^2, respectively), all measures are taken in the patent for obtaining a kraft sack paper having high tensile energy absorbtion (TEA) and stretch at break values. Against that, increasing the paper strength is not the main object of document (1), as it is explained on page 7, lines 44-48.

Further it is mentioned in this document (cf. page 9, lines 28-32) that micro-creping may have an adverse effect on the overall tensile strength of the paper sheets, which is clearly contrary to the requirements of the patented process. Thus, the limitation to "sack kraft paper" in the preamble of the claim in suit already appears to be contrary to the idea of considering document (1) as the closest prior art.

Furthermore, in document (1), creping or micro-creping takes place after drying, whereas in the patent creping is performed in the press section after couching the layers or micro-creping is performed in a Clupak-aggregate after couching and pressing (c. page 3, lines 19-22). Since in the patent process the creping operation always takes place before drying, the process steps are clearly not performed either in the same order nor for the same purpose in document (1) and in the patent.

Last of all, in document (1) pre-drying of the composite web 27 by hot air dryer 45 is not similar to free drying in the sense of the patent, according to which the web is supported by a hot air stream so that it is able to shrink freely during drying (c. patent, page 2, lines 21-23). In other words, the web floats on a thin film of air where drying takes place without transverse stresses. Contrary to that, in document (1), the layered paper web is thermally predried without disturbing its relationship to the supporting drying/imprinting fabric 37, i.e the contact must be maintained once established (c. page 8, lines 34-37 and 43-46), so that drying takes place under strain.

For all these reasons the Board is convinced that the state of the art closest to the subject-matter of Claim 1 is not document (1) but the combination of features known and admitted by the Appellant i.e the patentee himself.

4. *Novelty*

Other documents also being considered, Document (6) informs about the influence of the sheet formation method on the properties of multi-ply paper and board. The conclusion of the investigation is that maximum strength values with a given furnish are obtained by multi-ply sheet formation. The reason for this is that the increase in strength of a multi-ply sheet is associated with a higher sheet consistency, which is chiefly substantiated by the improvement of formation of the low-basis-weight individual ply. The sheet forming section used for the tests comprises a Duoformer K equipped with two separated wires installed on a fourdrinier machine (cf. Figure 5) for the production of two-ply packaging paper. In another embodiment, a multi-ply fourdrinier machine operating for the production of board was equipped with a Yankee dryer, that is a cylinder drying device.

However, there is no provision in the process described in this document of the remaining steps referred to in the claimed process, such as creping or micro-creping and free-drying. Also the peculiar production of sack kraft paper of high strength quality is not concerned by this document. Consequently, the document (6) teaches no more than what was already considered as known by the Appellant, that a positive effect on the tensile energy absorption could be achieved when the paper was produced in two layers instead of in one layer in a paper machine (c. patent, page 2, lines 51-52).

The document (4) refers to a process machinery for producing sack kraft paper according to which, in view of the large volumes of water which are needed to be drained on the forming area of the paper machine due to the unusually low pulp consistency in the headbox, the

paper machine is equipped with a double wire. It is generally known that the drainage capacity of the forming section determines the forming consistency and thereby the paper quality; because the fibres of the sack paper stock are long and have a strong tendency to flocculate, a low consistency headbox is necessary; the lower the consistency the better the sheet paper strength, in particular in the cross direction of the machine.

However, the process described in document (4) is confined to improving the drainage efficiency in the forming section. Increasing the strength properties of the paper is not specifically sought nor intended. Further, this document is silent about any additional creping or drying operation.

Since in none of the documents revealed in the proceedings are all the essential steps of the claimed process known in combination, that is in the following order:

- forming the multi-layer web on a multi-wire machine,
- pressing the web in addition to creping or micro-creping,
- drying the web by a combined cylinder drying and free drying,

the subject-matter of Claim 1 must be regarded as novel over the prior art according to Article 54(2) EPC.

5. *Problem and solution*

With respect to the known process comprising the steps recited in the preamble of Claim 1 for manufacturing the best marketed sack kraft paper currently known, the objective technical problem underlying the present patent was therefore to improve significantly the strength properties of the paper, in particular the tensile energy absorption (TEA) and stretch at break characteristics.

The solution to this problem is given by the characterising features of Claim 1. These features refer actually to the first step of the process, with respect to the forming section.

However, in the Board's view, characteristics of the solution cannot be limited to the first step alone. Rather it should be regarded in the simultaneous consideration and combination of all steps of the process listed in point 4 above, as will be more explained later in more detail. With this view in mind, Claim 1 might have been worded in a one-part-form as well.

6. *Inventive step*

6.1 The skilled person who already knows how to produce a sack kraft paper, having improved strength properties, according to the process steps stated in the preamble of Claim 1, also knows that a positive effect on the paper strength can be achieved when the paper is formed in two or more layers couched together in the wire section of a multi-wire machine. This fact was not questioned by the Appellant who rather put forward that the basis of the present invention resided in the combination of the above mentioned three process steps, each known *per se*,

so as to obtain a sack kraft paper having outstanding strength properties.

The Appellant's view was supported by the results set forth in tables 1 and 2 of the patent specification, supplemented by additional evidence (tables 3 and 4) provided during the opposition proceedings. The first instance decided not to consider this evidence as its incorporation to the description was inadmissible as new mater under Article 123(2) EEC. However, it is clear that, as explained by the Appellant in the Statement of Grounds for appeal, tables 3 and 4 were filed as enclosures with the reply of 16 April 1989 to the notices of opposition. They were not intended to be added to the description, but only filed as additional evidence for the purpose of illustrating the invention, in particular to show the superior strength properties of a paper obtained by the process claimed. In the Board's view, this evidence can greatly assist in a better and complete understanding of the invention and, consequently, it must be taken into consideration.

6.2 A correct assessment of inventive step of the solution thus requires a detailed analysis of tables 1 to 4. At first, it should be reminded that, as stated in the patent (c. page 2, lines 8 to 14) the strength of a paper sack is correlated to the tensile energy absorbtion (TEA), that is the total amount of work per unit of area which is required for a piece of paper to be stretched to rupture (stretch at break). A kraft sack paper should consequently show high values for tensile energy absorption, which is set out in tables 1 to 4 by the tensile energy absorption index, counted as the average value in the machine and cross directions, divided by the grammage.

6.3 The results given in table 1 refer to laboratory tests. They show the noticeable improvement that can be expected on the strength when the drying operation is performed freely, i.e the sheets are allowed to shrink freely, without hindrance. For example, the TEA index increases from 2400 to 3260 mJ/g (+36%) for a one-layer sheet and from 2420 to 3080 mJ/g (+27%) for a two-layer sheet.

However, the same table shows that no improvement of the strength could be expected when the sheet was made of two layers instead of one layer, both sheets being freely dried between blotters, since the T.E.A. index decreased from 3260 to 3080 mJ/g (-5.50%). Such a disappointing result should normally have deterred the skilled person from continuing its investigations by turning from the experimental to the industrial stage for the production of kraft paper, even if he was generally aware that multi-layer forming could have a positive but limited influence on the strength, as taught in Documents (6) or (4).

6.4 The results given in table 2 show, surprisingly, a substantial increase of the strength when the paper is produced in commercial scale on a production machine comprising two-layer forming and free drying. Other factors being equal, the TEA index changes, in fact, from 1.85 to 1.25 J/g (+48%) when the layer is produced from two layers instead of one layer, which is perfectly in contradiction with the laboratory tests of table 1. For the Board, to persist in an attempt apparently doomed to failure, represents a first sign in favour of the inventive step of the solution, since the modification was certainly not obvious to try.

6.5 What is more, the present invention is not confined to the favourable preceding results since the patented

process resides in the combination of the three essential steps listed in point 4 above. Therefore, by providing the preceding steps of two-layer forming and free drying with an additional micro-creping operation, preferably performed between pressing and free drying, a noticeable increase of the paper strength can still be obtained, as illustrated in table 3.

With respect to the results set out in table 2, those indicated in table 3 show that the TEA index still increases from 2.6 to 3.3 J/g (+27%) when micro-creping is added for producing a paper that has been already obtained from combined two-layer forming and free drying. Indeed, the positive effect of creping or micro-creping on the strength of paper, was known from the skilled person (c. patent, page 1, lines 15 to 16). What was not predictable, however, was the importance of the influence of micro-creping on the combination of the previous steps. In the process used either according to documents (4) or (6) or in relation to the paper machine No. 13 (PM13), referred to in the Deposition of Mr Olle Lind, creping or micro-creping is never considered. Thus, the statement made by the Respondent 1 at the oral proceedings that PM13 could be equipped at request with a doctor blade, e.g similar to that used in document (1), is not founded and results from an *ex-post-facto* analysis, the more since this machine itself was not intended for the production of sack kraft paper.

6.6 The favourable assumption of the Board regarding the inventive step of the process according to the patent, is confirmed by the results indicated in table 4, as set out below.

In table 4, paper quality B represents the best paper made according to the conventional method set in the preamble of Claim 1. The corresponding sack is made of

two plies of paper B, each obtained by a one-layer forming process. Instead, paper quality C is made, according to the invention, directly from two layers couched together in the wire forming section of the multi-wire machine, the sack being made of one ply. It results clearly from the reading of table 4 that the tensile energy absorption of the sack obtained from paper C with only one ply (460 J/m^2) is greater than that of the sack made of two plies of conventional paper B (2 x 205 = 410 J/m^2). The bonus effect on the strength (+12%) in favour of paper C, can be interpreted as being attributable to the positive influence of the sheet forming on the following steps of the process. In other words, the three steps of the process taken as a whole, form a combination of features in the sense that their interrelation provide a multiplier, i.e. synergistic effect on the expected increase of the paper strength. This is regarded by the Board as an additional indication in favour of patentability.

Furthermore, taking into account that the grammage of the sack made of paper C (140g/m^2) is much less than the total grammage of the sack B (190g/m^2), the patented process appears advantageously as the possibility to use a smaller amount of paper for making paper sack of better strength, which is really outstanding.

6.7 Since the values emphasised in tables 1 to 4 were not challenged by the Respondents and since no evidence to the contrary was presented either, the Board takes the view that the combination of the process steps, in the sequence set out in Claim 1, was not obvious, having regard to the state of the art. Therefore, Claim 1 involves an inventive step within the meaning of Article 56 EPC. Consequently, Claims 2 to 5 which depend on Claim 1 are also acceptable.

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 the documents listed in section VI above.

The Registrar:

S. Fabiani

The Chairman:

G. Szabo