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D E C I S I O N
of 1 December 2005

Case Number: T 0895/01 - 3.3.09

Application Number: 94303958.6

Publication Number: 0627306

IPC: B32B 29/00

Language of the proceedings: EN

Title of invention:

Enhanced crush strength construction multi-grade paperboard tubes

Patentee:

SONOCO PRODUCTS COMPANY

Opponents:

- 01 Corenso United Oy Ltd
02 Sonoco Alcore GmbH
03 CORENSO-ELFES GmbH & Co. KG
04 Erich Müller GmbH & Co. KG
05 Paul & Co. GmbH & Co. KG

Headword:

-

Relevant legal provisions:

EPC Art. 56

Keyword:

"Novelty (yes)"
"Inventive step (yes)"

Decisions cited:

-

Catchword:

-



Case Number: T 0895/01 - 3.3.09

D E C I S I O N
of the Technical Board of Appeal 3.3.09
of 1 December 2005

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Decision under appeal: Decision of the Opposition Division of the
European Patent Office orally announced on
24 April 2001 and posted 25 May 2001 revoking
European patent No. 0627306 pursuant to
Article 102(1) EPC.

Composition of the Board:

Chairman: P. Kitzmantel
Members: W. Ehrenreich
M. B. Tardo-Dino

Summary of Facts and Submissions

I. Mention of the grant of European Patent No. 0 627 306 in respect of European patent application 94 303 958.6 in the name of *Sonoco Products Company*, filed on 2 June 1994 and claiming the priority US 71485 of 4 June 1993, was announced on 14 October 1998. The patent, entitled "*Enhanced crush strength construction multi-grade paperboard tubes*" was granted with fifteen claims, product Claim 1 and process Claim 12 reading as follows:

"1. A multi-grade paperboard tube of enhanced flat crush strength construction comprising:
a cylindrical bodywall formed from a plurality of structural paperboard plies and being defined in radial cross section by at least one centrally located paperboard ply disposed between at least one radially inwardly located structural paperboard ply and at least one radially outwardly located structural paperboard ply;
wherein the centrally located paperboard ply is formed from a higher density paperboard having a density that is at least 3% greater than density of the paperboard forming each of the inwardly and outwardly located structural paperboard plies to thereby enhance the flat crush strength of the multi-grade paperboard tube."

"12. A process for forming a multi-grade spirally wound paperboard tube of enhanced flat crush strength comprising:

applying adhesive to a first group of paperboard plies comprising one or more continuous paperboard plies having a first predetermined density and spirally

winding the first group of paperboard plies around a stationary mandrel in overlapping relation; applying adhesive to a plurality of paperboard plies having a density of at least 3% higher than the first predetermined density and spirally winding said plurality of higher density continuous paperboard plies in overlapping relation on top of said first group of paperboard plies; and applying adhesive to a third group of paperboard plies comprising one or more continuous paperboard plies having substantially the same density as said first predetermined density and spirally winding said third group of paperboard plies in overlapping relation on top of said plurality of higher density paperboard plies to thereby form a multi-grade spirally wound paperboard tube comprising a plurality of plies formed from said first group of continuous paperboard plies, said plurality of higher density paperboard plies and said third group of paperboard plies."

Claims 2 to 11 were dependent on Claim 1 and Claims 13 to 15 were dependent, either directly or indirectly, on Claim 12.

II. Notices of opposition requesting revocation of the patent in its entirety were filed by

Corenso United OY Ltd - Opponent I - on 13 July 1999;

Johann Nelsbach GmbH, now Sonoco-Alcore GmbH - Opponent II - on 12 July 1999;

Elfes GmbH, now Corenso-Elfes GmbH & Co. KG - Opponent III - on 13 July 1999;

Erich Müller GmbH & Co. KG - Opponent IV - on 14 July 1999; and

Paul & Co., Inh. K. Kunert und Söhne GmbH & Co., now Paul & Co. GmbH & Co. KG - Opponent V - on 14 July 1999.

Under the opposition grounds according to Article 100(a) EPC, all opponents submitted that the claimed subject-matter lacked novelty and was not based on an inventive step.

Opponent I based its submissions on the following document:

D1 EP-A 0 516 488

All Opponents alleged prior public use and presented, in support of their submissions, several documents and offered witnesses. *Inter alia*, the following evidence was submitted by the Opponent V:

D2 Werkauftrag Nr. 63121 concerning the delivery of 420 paperboard tubes with Material Nr. 715347 to the company Novacel on 20 October 1992 and an invoice dated 21 October 1992 listing *inter alia* the paperboard tubes with the above Material Nr. 715347.

With respect to D2, the Opponent V argued in its notice of opposition that the structural plies specified in the "Werkauftrag" (reading from top to bottom) as "1B Soustre", "4B RT3", "2B RT 3", "2B Soustre", "2B Soustre", "3B Soustre", "3B Soustre", "1B Soustre"

corresponded to the following arrangement of the structural plies in the tube (moving from the inside to the outside): 1LD-6HD-11LD (where LD = low density ply with an average density of 0.609 g/cm^3 and HD = high density ply with an average density of 0.723 g/cm^3).

Furthermore, the Opponent V raised objections under Article 100(b) EPC.

III. With its decision orally announced on 24 April 2001 and issued in writing on 25 May 2001 the Opposition Division revoked the patent. The decision was based on a new main request and an auxiliary request, both filed during the oral proceedings and each consisting of product Claims 1 to 13 and process Claims 14 to 16. The wording of Claim 1 of the main request was as follows:

"1. A multi-grade paperboard tube of enhanced flat crush strength construction comprising:
a cylindrical body wall formed from a plurality of structural paperboard plies of relatively low density and a plurality of structural paperboard plies of relatively high density, the higher density plies comprising from 30% to 70% of the plies of the body wall and being formed of paperboard having a density that is at least 3% greater than density of the paperboard forming the lower density plies, and wherein the lower density plies are located in the body wall such that at least one-third of the lower density plies are located radially inwardly of the higher density plies, and at least one-third of the lower density plies are located radially outwardly of the higher density plies, whereby the higher density plies are

generally radially centrally located in the body wall thereof to thereby enhance flat crush strength of the multi-grade paperboard tube."

Claim 1 of the auxiliary request corresponded to Claim 1 of the main request save that the feature "at least 3% greater" concerning the difference in the density between the high density and the low density plies had been amended to read "at least 5% greater".

IV. In the decision, the Opposition Division held that the subject-matter of the claims according to the main request and the auxiliary request lacked an inventive step with regard to D1 in combination with the prior public use alleged by Opponent V.

In particular, the Opposition Division reasoned that the paperboard tubes according to the claims represented an obvious implementation of the teaching of D1, and the reference to the improved flat crush strength in the claims could not be regarded as contributing to an inventive step because this property was inherent to the tubes according to D1.

Furthermore, in the Opposition Division's opinion, Opponent V had convincingly shown that paperboard tubes with the sequence of structural plies 1LD-6HD-11LD had been delivered to Novacel on 20 October 1992, which thus represented citable prior art. These tubes must have a flat crush resistance which is not significantly lower than that of tubes with the construction 6HD-12LD or 4HD-6HD-8LD according to Figure 4 of the patent specification. Since at the priority date of the patent in suit there was nothing which would have specifically discouraged the skilled person from increasing the

number of inside LD plies from "1" according to the established prior use to at least one-third of the total number of LD plies, the subject-matter of the claims could not be considered as a purposive selection from the general teaching of D1.

V. On 3 August 2001 the Patent Proprietor (Appellant) lodged an appeal against the decision of the Opposition Division and paid the prescribed fee on the same day. The Statement of the Grounds of Appeal was filed on 3 October 2001 and was accompanied by two sets of claims corresponding to a new main and an auxiliary request.

The essential amendment in the claims vis à vis the requests underlying the appealed decision was that the minimum number of the structural plies had been raised to up to ten.

Furthermore, an affidavit of Terry D. Gerhardt, PhD, together with, *inter alia*, a Figure B and a Figure C was submitted. Figure B depicted two graphs comparing the flat crush strength data of Figure 6 of the patent specification with model predictions, and Figure C presented corrected experimental flat crush strength data for tube constructions according to Figure 6 of the patent specification.

VI. Several counterstatements were filed by the Respondents/Opponents I, III, IV and V. Of the alleged prior public uses, only the one put forward by Opponent V was referred to.

With respect to the features "at least one third" and "generally radially centrally located" in Claim 1 of

both requests, the Respondent/Opponent III raised objections under Articles 84 and 123(3) EPC.

With the letters dated 12 and 25 October 2005 Respondent/Opponent II withdrew its opposition.

VII. In response to the Opponents' submissions, the Appellant filed a new main request and seven auxiliary requests with a letter dated 4 August 2004. By letter dated 1 November 2005, in response to the Board's communication dated 7 September 2005 raising *inter alia* objections under Article 123(2) EPC, all these requests were replaced by an amended main request, consisting of product Claims 1 to 7 and process Claims 8 to 10, and fifteen new auxiliary requests.

During the oral proceedings held on 1 December 2005 the Appellant filed a further amended Claim 1 of the main request which reads as follows:

"1. A multi-grade paperboard tube of enhanced flat crush strength construction comprising:
a cylindrical bodywall formed from at least ten structural paperboard plies and being defined in radial cross-section by
a plurality of centrally located structural paperboard plies disposed between
at least one radially inwardly located structural paperboard ply and
at least one radially outwardly located structural paperboard ply; wherein
the plurality of centrally located structural paperboard plies are formed from a higher density paperboard having a density that is at least 3% greater

than the density of the paperboard forming each of the inwardly and outwardly located structural paperboard plies to thereby enhance the flat crush strength of the multi-grade paperboard tube, and between 50% and 70% of the structural paperboard plies are formed of the higher density paperboard plies."

With regard to the amended Claim 1 of the main request, the Respondents no longer maintained their objections as to lack of novelty vis à vis D1 and the alleged prior public use. In particular it was appreciated that the 1LD-6HD-11LD structure of the alleged prior public use of Opponent V did not fall within the tube construction as defined in the amended Claim 1.

However, the Respondent/Opponent V raised objections under Article 123(2) EPC.

VIII. The Appellant denied that the evidence D2 provided by the Opponent V was suitable to prove, in line with the standards of the case law of the Boards of Appeal, that the 1LD-6HD-11LD tube was made available to the public and represented state of the art.

The Appellant's arguments with regard to the issue of inventive step submitted in writing and at the oral proceedings may be summarized as follows:

Document D1, which was citable prior art, addressed a completely different problem, namely the control of the outside diameter of multi-ply paperboard tubes with the aim of arriving at paperboard tubes with uniform outside diameter. According to Figure 1, this aim was achieved by reducing the thickness and thereby

increasing the density of one of the structural plies of a three-ply tube by passing the ply through a ply presser. Even in case of multi-ply tubes, it was unlikely that more than one ply was compressed because this was normally sufficient to achieve the desired diameter adjustment and because there was therefore no need to subject further plies to an additional, unnecessary and costly ply pressing step.

In contrast thereto, the teaching of the patent addressed multigrade paperboard tubes of enhanced flat crush strength construction wherein cheaper plies of relatively low density (LD) and more expensive plies of higher density (HD) were assembled in a specific arrangement, achieving thereby a flat crush strength close to that of a tube constructed only from HD plies but at considerably reduced costs.

Even if the 1LD-6HD-11LD tubes of Opponent V represented prior art, there was no teaching associated with this tube construction. The skilled person, being aware of this tube structure had therefore no motivation to raise the number of HD plies to 50% and to shift them to the center of the tube in order to arrive at tube constructions with enhanced flat crush strength values as shown in Figure 5 of the patent specification (data marked with the hollow triangle) and the revised Figure C attached to the affidavit of Dr Gerhardt.

IX. The Respondents provided the following written and oral arguments with respect to the issue of inventive step:

Multi-ply tubes were known in the prior art. For instance, tubes with 20 or more plies were mentioned in

column 1, lines 26 to 29, of D1. Tubes with mixed HD and LD plies were also known and the 1LD-6HD-11LD structure of Opponent V, which was made available to the public, could be considered representative of such tubes and constituted the closest prior art.

Furthermore, it was common general knowledge of the skilled person that the crush resistance of multi-ply tubes could be influenced by varying the position and/or the density of the plies.

Therefore, a skilled person starting from the 1LD-6HD-11LD tubes would apply this knowledge and vary the position and the number of the LD/HD plies. No inventive effort could therefore be seen in increasing the number of HD plies of the 1LD-6HD-11LD structure from 33% to 50% or more and thereby to arrive at the invention. All the more so as the data in Figure 6 of the patent specification demonstrated that a tube with a 12HD-6LD structure, outside the scope of the invention, had better flat crush strength properties than the 3LD-12HD-3LD, 4LD-12HD-2LD and 5LD-12HD-1LD structures according to the claimed invention. Moreover, the correctness of the revised data in Figure C of Dr Gerhardt's affidavit, showing improved flat crush strength values, was questionable.

Hence, the position and number of the LD and HD plies in the tubes according to the claims did not provide an improvement in flat crush resistance and therefore constituted an arbitrary and non-inventive selection.

- X. The Appellant requested that the decision under appeal be set aside and that the patent be maintained on the

basis of the new Claim 1 of the main request as filed during the oral proceedings and Claims 2 to 10 as submitted with the letter dated 1 November 2005, or alternatively on the basis of one of the 15 auxiliary requests filed with the letter dated 1 November 2005.

XI. The Respondents requested that the appeal be dismissed.

Reasons for the Decision

1. The appeal is admissible.

2. The issues of clarity (Article 84 EPC), extension of the protection conferred (Article 123(3) EPC) and novelty (Article 54 EPC) were no longer in dispute. The objections of sufficiency of disclosure (Article 83 EPC), raised by the Opponent V in the first instance opposition proceedings, were not raised into the appeal proceedings.
The Board is satisfied that the subject-matter claimed by the main request meets the requirements stipulated in the above mentioned Articles.

3. As will be shown below, a tube with the 1LD-6HD-11LD ply construction according to the alleged prior public use cannot suggest the claimed invention, either alone or in combination with the citation D1. Without taking a decision on the issue of the alleged prior use, the Board will start from the assumption that it had been established.

4. *Article 123(2) EPC*

In the oral proceedings, the Respondent/Opponent V argued that the range "50 to 70%" for the number of HD plies was not originally disclosed, contrary to Article 123(2). In column 10, lines 54 to 58 of the A-publication, the value "50%" was only separately disclosed but not in conjunction with the upper limit of "70%".

The Board cannot share the Respondent's position. In lines 55/56 of the above passage, the range "between about 30 and about 70%" is clearly disclosed and in the subsequent half sentence it is pointed out that "the contribution of these plies to tube strength is most apparent when at least about 50% of the plies are higher density plies". It is therefore immediately apparent to a skilled person that the range "50 to 70%" is particularly preferred.

Moreover, it is established case law that the combination of the limiting values of a broader and a narrower quantitative range is admissible under Article 123(2) (see for instance T 2/81; OJ 10/1982, pages 394 to 402, in particular the headnote 2. and reasons, point 3).

5. *Inventive step*

5.1 The subject-matter of the patent in suit

The patent concerns a multi grade paperboard tube comprising a cylindrical bodywall made of a number of helically wound structural paperboard plies. According to column 3, lines 10 to 14, of the patent specification, the construction of the tube is such

that the flat crush strength is increased and the number of the more expensive, higher density paperboard plies is minimised.

According to Claim 1 of the main request, the tube construction comprises the following essential features:

- (a) the bodywall is formed of at least ten structural paperboard plies in radial cross section;
- (b) the at least ten structural paperboard plies are structured and positioned in the bodywall such that:
 - (i) 50 to 70% of the plies have a density that is at least 3% greater than the remaining plies and are centrally located within the bodywall;
 - (ii) at least one of the remaining plies is radially inwardly located and
 - (iii) at least one of the remaining plies is radially outwardly located
 - (iv) thus assuring that one or more of the higher density structural plies (i) covers the center line of the cylindrical body wall.

The graph in Figure 5 of the patent specification shows that the flat crush strength values for paperboard tubes made of 9 higher density (HD) and 9 lower density (LD) plies depend to a considerable extent on the position of the plies relative to each other. The following can be derived from the Figure:

- All tubes with mixed HD/LD plies have a higher flat crush strength than tubes made of only LD plies, and

a lower flat crush strength than tubes made of only HD plies;

- tubes according to the claimed invention (marked with the hollow triangle) with 9 centrally located HD plies and 9 LD plies distributed at the inward and the outward positions have a higher flat crush strength than
 - (i) tubes with 9 centrally located LD plies and 9 HD plies distributed at the inward and the outward positions (solid triangle) or
 - (ii) tubes with 9 inwardly located HD plies and 9 outwardly located LD plies (solid circle to the left) or
 - (iii) tubes with 9 inwardly located LD plies and 9 outwardly located HD plies (solid square to the right).

The same applies when considering the revised experimental data depicted in Figure C attached to the affidavit of Dr Gerhardt, which data correct the data of Figure 6 according to the patent specification. According to Figure C, tubes made of 12 HD plies and 6 LD plies have a higher flat crush strength in a ply arrangement 1LD-12HD-5LD, 2LD-12HD-4LD, 3LD-12HD-3LD or 4LD-12HD-2LD (moving from the inside to the outside) according to the invention, than tubes outside the scope of the invention with either a 12HD-6LD construction or ply arrangements marked in Figure 6 with the solid triangle and the solid square.

To the extent that the Respondents contest the correctness of the data in Figure C, the Board points out that the onus is on the Respondents to disprove this evidence, which they have failed to do.

5.2 The closest prior art

The paperboard tubes with the composition 1LD-6HD-11LD according to the prior public use alleged by the Respondent/Opponent V are the structurally closest prior art. In this construction, the proportion of the HD plies is 33% (based on the total number of the structural plies) and the HD plies do not comprise the center line of the body wall.

5.2.1 Problem and solution

The tubes according to Claim 1 of the main request differ from the 1LD-6HD-11LD tubes according to the above prior art in that the proportion of the HD plies is 50 to 70%, such that the HD plies straddle the center of the bodywall.

The above experimental evidence shows that - at a given number of HD and LD plies in a multi-ply/multigrade paperboard tube - the flat crush strength of the tube depends to a considerable extent on the position of the plies relative to each other within the body wall, the best performance being obtained by the use of only HD plies, which by their nature are more expensive than LD plies.

The problem underlying the claimed invention vis-à-vis this prior art is to provide multi-ply paperboard tubes characterised by an optimum balance of flat crush strength and costs.

This problem is solved by a tube with the above mentioned features (a) and (b)/(i)/ii)/(iii) according to Claim 1 of the main request.

5.2.2 Obviousness

In the Board's judgment, a skilled person starting from the 1LD-6HD-11LD structure of the tube of Respondent/Opponent V, would not arrive at the claimed tube in an obvious manner.

In the absence of any publicly available description and/or characterization of its properties there is no teaching associated with the 1LD-6HD-11LD structure which would motivate a skilled person to increase the numbers of HD plies, in the sense of the instructions of Claim 1, in order to solve the above problem.

Although the Board can agree with the Respondents' position that it was common knowledge to increase flat crush strength by increasing the number of HD plies relative to the LD plies, this criterion alone is not considered decisive. As is clearly shown by the Appellant's data in Figures 5 and C, the optimum flat crush strength for a given number of HD/LD plies also strongly depends on the relative position of the HD and the LD plies.

When considering the 1LD-6HD-11LD structure, the skilled person has several possible ways of raising the percentage of the HD plies:

- either by removing (a) the single inwardly located LD ply or (b) one or more of the outwardly located LD plies;

- or by adding further HD plies, either (c) at the inside, (d) the center or (e) at the outside of the body wall.

No information, however, is available as to which of these variants (a) to (e) would lead to an optimized balance of crush stability and costs. Therefore, the 1LD-6HD-11LD tube does not render the claimed tube obvious.

This position is not different when the above closest prior art is combined with the disclosure of the citation D1. As pointed out by the Appellant (see point VIII above), D1 refers to a completely different technical problem, namely the manufacture of multi-ply tubes with a controlled uniform outside diameter by compressing at least one ply and thereby reducing its thickness and increasing its density (D1, Claim 1 and column 4, lines 31 to 36).

As far as D1 suggests the location of the compressed ply at the interior of the bodywall (column 4, lines 36 to 39), this is only to prevent the ply returning to its original thickness as a result of exposure to ambient humidity (column 4, lines 39 to 42) and not for the purpose of increasing flat crush strength.

It is therefore not evident to the Board how the teaching of D1 could motivate the skilled person to amend the 1LD-6HD-11LD structure in order to arrive at tubes with the body wall construction as claimed in Claim 1 of the main request.

The same conclusion follows if D1 itself is taken as the starting point for the assessment of inventive step, because, given the entirely different objective of D1,

namely the achievement of a predetermined, controlled outer diameter, the skilled person does not get any clue from it as to how to obtain a beneficial balance of crush strength and costs; there is even less hint in D1 at the claimed solution of the patent in suit.

5.3 Conclusion

In the circumstances, the tube claimed in Claim 1 and dependent Claims 2 to 7 of the main request involves an inventive step.

The same applies to the process according to the independent process Claim 8 and dependent Claims 9 and 10 because the process steps defined in Claim 8 lead to paperboard tubes falling within the scope of Claim 1.

It is therefore not necessary to discuss the auxiliary requests.

As far as the necessary consequential adaptation of the description is concerned, account should be taken of the facts that Figures 2 and 4 do not fall within the claims of the main request and that Figure 6 was pointed out by the Appellant/Patentee to comprise false data.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the Opposition Division with the order to maintain the patent on the basis of
 - Claim 1 as filed during the oral proceedings
 - Claims 2 to 10 of the main request as submitted with the letter dated 1 November 2005 andafter any necessary consequential amendment of the description and the drawings.

The Registrar:

The Chairman:

G. Röhn

P. Kitzmantel