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D E C I S I O N
of 14 September 2004

Case Number: T 0417/02 - 3.2.1

Application Number: 94926999.7

Publication Number: 0720516

IPC: B21B 1/22

Language of the proceedings: EN

Title of invention:
Aluminium sheet with rough surface

Patentee:
ALCAN INTERNATIONAL LIMITED

Opponent:
Hydro Aluminium Deutschland GmbH

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step - main request - (no)"
"Non-admittance of the first auxiliary request filed during oral proceedings"
"Inventive step - further auxiliary requests (no)"

Decisions cited:
-

Catchword:
-



Case Number: T 0417/02 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 14 September 2004

Appellant: Hydro Aluminium Deutschland GmbH
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Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office posted
15 March 2002 concerning maintenance of
European patent No. 0720516 in amended form.

Composition of the Board:

Chairman: S. Crane
Members: Y. A. F. Lemblé
H. Preglau

Summary of Facts and Submissions

- I. The appeals of both the patent proprietors and the opponents are directed against the interlocutory decision of the Opposition Division dated 15 March 2002 according to which, account being taken of the amendments made by the patent proprietors during the opposition proceedings, the subject-matter of independent claims 1 and 4 according to the fourth auxiliary request was found to meet the requirements of the EPC.
- II. The opposition Division held that the subject-matter of the granted claims and of the claims according to the first to third auxiliary requests did not meet the requirements of the EPC, in particular that of inventive step (Article 100(a) EPC) having regard to the following prior art documents:
- D1: Translation of an article by H. Sakaki et al. in the Journal of Japan Institute of Light Metals, Keikin-zoku 39 (1989), H.6 (344), pages 460-465
- D2: DE-A-28 32 580
- III. During oral proceedings held 14 September 2004 the patent proprietors requested that the decision to maintain the patent in amended form be set aside and, as a main request, that the patent be maintained as granted, or in the alternative on the basis of the first auxiliary request presented during the oral proceedings, or of the fourth or fifth auxiliary requests filed with letter of 12 August 2004. The new first auxiliary request was based on the second

auxiliary request filed with letter dated 12 August 2004 in which the aspect ratio of at least 1.3 in claims 1 and 4 was replaced by an aspect ratio of at least 5. The claims of the fifth auxiliary request correspond to those approved by the Opposition Division. The auxiliary requests 1, 2 and 3 filed with letter dated 12 August 2004 were withdrawn.

The opponents requested that the decision to maintain the patent in amended form be set aside and that the patent be revoked in its entirety.

IV. The respective independent claims according to the requests of the patent proprietors read as follows:

Main request

"1. Rolled aluminium sheet having a surface that is uniformly rough by virtue of: a rippled topography comprising ridges and troughs extending transverse to the rolling direction and having an aspect ratio of at least 1.3 and an average spacing between adjacent ridges of 5 - 200 μm ; and a pitted structure comprising pits having an average diameter of 1 - 20 μm and an aspect ratio of not more than 1.5."

"5. A method of making a sheet having a roughened surface, starting from a ribbon of aluminium, by the steps of:-

- a) Pack rolling the ribbon to provide a pack of two or more sheets and separating the pack into individual sheets each having a matt surface that faced another sheet of the pack during rolling, and
- b) Graining the said matt surface of the sheet."

"6. A method of making a lithographic plate support, starting from a ribbon of aluminium, by the steps of:-
a) Pack rolling the ribbon to provide a pack of two or more sheets and separating the pack into individual sheets each having a matt surface that faced another sheet of the pack during rolling, and
b) Graining the said matt surface of the sheet to an extent sufficient to enable a layer of an organic material to be firmly bonded to the grained surface."

First auxiliary request

"1. A lithographic plate support comprising a pack rolled aluminium sheet having a surface that is uniformly rough by virtue of: a rippled topography comprising ridges and troughs extending transverse to the rolling direction and having an aspect ratio of at least 5 and an average spacing between adjacent ridges of 5 - 200 μm ; and a pitted structure comprising pits having an average diameter of 1 - 20 μm and an aspect ratio of not more than 1.5, wherein the roughness of the rippled topography is sufficient to make the surface water-retentive, and the roughness of the pitted structure is sufficient to permit a layer of an organic material to become firmly bonded to the surface."

"4. A method of making a lithographic plate support, starting from a ribbon of aluminium, by the steps of:
a) Pack rolling the ribbon to provide a pack of two or more sheets and separating the pack into individual sheets each having a matt surface that faced another sheet of the pack during rolling, wherein the matt

surface has the appearance of a rippled topography comprising ridges and troughs extending transverse to the rolling direction and having an aspect ratio of at least 5 and an average spacing between adjacent ridges of 5 to 200 μm , and

b) Graining the said matt surface of the sheet to an extent sufficient to enable a layer of an organic material to be firmly bonded to the grained surface."

Fourth auxiliary request

"1. A lithographic plate support comprising a pack rolled aluminium sheet having a surface that is uniformly rough by virtue of: a rippled topography comprising ridges and troughs extending transverse to the rolling direction and having an aspect ratio of at least 1.3 and an average spacing between adjacent ridges of 5 - 200 μm ; and a pitted structure comprising pits having an average diameter of 1 - 20 μm and an aspect ratio of not more than 1.5, wherein the roughness of the rippled topography is sufficient to make the surface water-retentive, and the roughness of the pitted structure is sufficient to permit a layer of an organic material to become firmly bonded to the surface, and wherein the thickness of the sheet is between 0.15 and 0.51 mm."

"4. A method of making a lithographic plate support, starting from a ribbon of aluminium, by the steps of:
a) Pack rolling the ribbon to provide a pack of two or more sheets and separating the pack into individual sheets each having a matt surface that faced another sheet of the pack during rolling, and

b) Graining the said matt surface of the sheet to an extent sufficient to enable a layer of an organic material to be firmly bonded to the grained surface, wherein the thickness of the sheet is between 0.15 and 0.51 mm."

Fifth auxiliary request

"1. A lithographic plate support comprising a pack rolled aluminium sheet having a surface that is uniformly rough by virtue of: a rippled topography comprising ridges and troughs extending transverse to the rolling direction and having an aspect ratio of at least 1.3 and an average spacing between adjacent ridges of 5 - 200 μm ; and a pitted structure comprising pits having an average diameter of 1 - 20 μm and an aspect ratio of not more than 1.5, wherein the roughness of the rippled topography is sufficient to make the surface water-retentive, and the roughness of the pitted structure is sufficient to permit a layer of an organic material to become firmly bonded to the surface, and wherein the thickness of the sheet is between 0.15 and 0.51 mm and wherein the sheet is recovery annealed on commencing pack rolling."

"4. A method of making a lithographic plate support, starting from a recovery annealed ribbon of aluminium, by the steps of:

a) Pack rolling the ribbon to provide a pack of two or more sheets and separating the pack into individual sheets each having a matt surface that faced another sheet of the pack during rolling, and

b) Graining the said matt surface of the sheet to an extent sufficient to enable a layer of an organic material to be firmly bonded to the grained surface, wherein the thickness of the sheet is between 0.15 and 0.51 mm."

V. The submission of the patent proprietors can be summarized as follows:

Main request

Although D2, which disclosed a lithographic plate support comprising an aluminium sheet obtained by pack rolling, was to be considered as the closest prior art to the subject-matter of claim 1 of the main request, it did not disclose the claimed rippled topography. The Opposition Division was not correct in holding that the claimed topography derived implicitly from the pack-rolling process. The ridges and troughs extending transverse to the rolling direction and having an aspect ratio of at least 1.3 implied that the claimed surface was highly anisotropic. The surface of the pack-rolled aluminium sheet of D2 was, on the contrary, clearly mentioned as isotropic (see page 4, last paragraph, page 7, lines 2 to 3 of D2). The unusual pack rolling conditions disclosed in the examples 1 and 2 of D2 explained this deviation from the typical topography of pack-rolled sheets. It must therefore be concluded that D2 neither disclosed the rippled topography, nor the pitted structure of claim 1. Furthermore, starting from the packed rolled sheet according to document D2, there was no way for the skilled person to approach the problem of enhancing the

adhesion of the organic material, since he was taught in D2 that he should not perform, on the just roughened surface, any other process than storage ageing for a period of at least three months in order for a stable oxide layer to be formed on it (see page 6, second paragraph; page 7, lines 7 to 11).

The subject-matter of claim 1 and of claim 5 was also not obvious in the light of a combination of D2 with D1. Although D1 mentioned the possibility of combining chemical, mechanical and electrolytic graining and despite the fact that not less than nine different methods of graining were disclosed, there was not the slightest hint in this document that pack rolling might be used as a roughening process. In fact, a thorough analysis of D1 (see especially table 7) showed that the multi-grain sample C resulted from the superimposition of a coarse crater grain (wave length 10 μm) obtained by an electrolytic roughening process with a finer honeycomb grain (wave length 3 μm) also obtained by an electrochemical roughening process. Thus, D1 only taught the combination of two electrolytic graining processes. Moreover, there was no clear disclosure in D1 of a pitted structure comprising pits having an average diameter of 1 - 20 μm and an aspect ratio of not more than 1.5. Since none of the documents D1 or D2 disclosed the claimed rippled structure or the claimed pit structure, a hypothetical combination of D1 with D2 could not disclose those either. Besides, the opponents had not demonstrated that the skilled person would inevitably combined D1 with D2.

First auxiliary request

The substitution in the granted claims of the "aspect ratio of at least 1.3" by the more restrictive formulation that the aspect ratio should be of "at least 5" in claims 1 and 4 of this request was disclosed in page 4, line 36 of the application as originally filed. This specific topography could not be derived from the available prior art documents D1 and D2 and involved an inventive step.

Fourth auxiliary request

The additional feature referring to the thickness of the sheet (between 0.15 and 0.51 mm) found its basis in page 1, lines 12 to 13 of the application as originally filed. When compared to the thickness range cited in D2, the claimed range was narrow and the overlap was also narrow. The claimed range represented therefore a new and non-obvious selection over the available prior art.

Fifth auxiliary request

The further addition of the feature that the sheet was recovery annealed on commencing pack rolling found its basis in page 11, lines 23 of the application as originally filed. The annealing treatment disclosed in D2 (12 hours at 450°) was a soft annealing in which recrystallisation of the sheet took place. Recovery annealing meant that recrystallisation had not occurred and led to a stronger sheet.

VI. The opponents argued essentially in the following way:

Main request

D2 was the closest prior art. The skilled person learned from D1 that the combination of a coarse graining with an additional finer graining provided for a lithographic aluminium substrate which combined good water receptive properties with a firm adhesion of the lipophilic organic coating. The application of this teaching to the pack-rolled sheet of D2 led to the subject-matter of the granted claims 1 and 5 which therefore lacked inventive step in the light of the disclosures D1 and D2.

First auxiliary request

To direct the subject-matter of the claims to a minimal particular value of the aspect ratio ("at least 5") raised a new unexpected issue on which the opponents could not have been prepared. The passage cited by the patent proprietors could not serve as a clear basis for the proposed amendment. Moreover, the manner the skilled person might arrive at the now claimed topography was not clearly disclosed in the patent. This request should therefore not be admitted into the proceedings.

Fourth and fifth auxiliary requests

The features added in the independent claims according to these requests were known per se or were obvious from the content of D2. The subject-matter of these request was therefore obvious to a person skilled in the art in the light of a combination of D1 with D2.

Reasons for the Decision

1. *Main request*

The Board notes that the objection that granted claim 1 lacked novelty over D1 was not maintained. As already observed by the Opposition Division, the method of making an aluminium sheet having a roughened surface in accordance with the teaching of D1 does not comprise the step of pack rolling. Consequently, the aluminium sheet of D1 cannot show the rippled topography linked to this manufacturing step and mentioned in the first part of granted claim 1.

For the purpose of assessing inventive step, the parties agreed that the nearest prior art is to be seen in D2 which discloses a method of making a lithographic plate support by pack rolling a ribbon of aluminium. An aluminium sheets resulting from such pack rolling has a matt surface on the side that faced another sheet of the pack during rolling (see especially claim 1 and example 1 on page 6). As mentioned in paragraph [0014] of the patent, the finish of the mat surface of a pack-rolled aluminium sheet, when examined microscopically, has the appearance of a rippled topography comprising ridges and troughs, the major axis of which being transverse to the rolling direction. The aspect ratio of these ridges and troughs (i.e. the ratio of their length to their width) is typically in the range 1.5 to 4 and the average spacing between adjacent peaks measured in the rolling direction is typically in the range of 5 - 200 μm .

In the examination procedure the patent proprietors conceded that the aluminium sheet made according to D2 might have the claimed rippled topography (see letter of 27 October 1997). Before the Board, they contended for the first time in their letter of 12 August 2004 that the surface of the pack-rolled aluminium sheet of D2 did not exhibit the claimed topography, emphasising its anisotropic nature in contrast to the surface roughness of the sheet of D2 which was qualified as being isotropic.

The Board was unable to follow this new line of argumentation. The "isotropic" statement made in D2 must be placed within its context which is that of a comparison with conventional brush roughening and rolling methods. For example in conventionally rolled aluminium sheet, the metallurgical structure and the surface topography on the rolled side are strongly aligned in the rolling direction, leading to a highly directional, i.e. anisotropic, roughness structure. In a pack rolling process, the aluminium in the micro range of the metal contact surfaces is allowed to flow in other directions than the sole rolling direction. The topography of such a pack rolled aluminium sheet is therefore characterised by a distribution of the roughness which is of comparatively greater uniformity. In other words, the reference to the "isotropic" characteristics of the surface in D2 relate to its roughness measured in different directions rather than to the geometric form of the individual features which lead to this roughness, as suggested by the patent proprietors. This view is confirmed by paragraph [0037] of the patent which explicitly mentions that a pack rolled lithographic sheet presents a matt surface which

has a high degree of uniformity in both the rolling and the transverse directions (page 6, lines 6 to 9). The Board also notes that column 3, lines 17 to 19 of the patent stipulates that for carrying out the invention "it has not been found necessary to use unusual pack rolling conditions". The Board is unable to recognise any unusual pack-rolling conditions in D2. It may be true that the scale and nature of the ripples can be modified by the choice of the starting material and can depend to some extent on the rolling conditions employed, however, account being taken of the very broad range of the claimed parameters defining the topography and having regard to the prior art description of the topography of pack-rolled aluminium sheets (see e.g. the literature mentioned in the patent: R. Akeret, Aluminium, Vol. 68, 1992, 319-321), the Board comes to the conclusion that the sheet of D2 must have the claimed rippled structure.

Consequently, the following features of granted claim 1 must be considered to be known from D2: a lithographic pack-rolled aluminium sheet having a surface that is uniformly rough by virtue of a rippled topography comprising ridges and troughs extending transverse to the rolling direction and having an aspect ratio of at least 1.3 and an average spacing between adjacent ridges of 5-200 μm .

As mentioned in paragraph [0006] of the patent, experience showed that pack rolled sheets, when used as lithographic plate supports, although presenting good printing properties due to their superior water retention characteristics (see EP-A-0 115 678 cited in the patent), are not satisfactory under the durability

aspect because the organic material which is applied on the mat surface to form a lipophilic image area does not bond well and rapidly flakes off, rendering this type of lithographic plate support not adapted for long print runs. There is, thus, a need for improving the service life of this type of sheets.

Document D1, which is a scientific paper dealing with the structure of roughened surfaces of aluminium lithographic sheets, will draw the attention of the skilled person in search of a way of satisfying this need. In this document, a comparison is made between three different samples A, B and C of aluminium sheets to be used as lithographic plate support. According to this document, the roughened surface of these samples are described in terms of peaks and valleys forming a more or less finely waved profile. A distinction is made between sample A whose roughness is defined by a coarse profile presenting a distance between the peaks in the range of 10 to 30 μm (wave length 10 μm) and sample B defined by a profile in the range of 1 to 10 μm (wave length 3 μm). Sample A is mentioned in Figure 7 as having a crater grain and sample B as having a honeycomb grain. As can be deduced from table 1, such crater grain and honeycomb grain appear to be obtained by electrolytic roughening.

D1 also discloses the concept of a "multi-grain" sample C which may be obtained by combining chemical, mechanical and/or electrolytic roughening (page 11, lines 1 to 4) and juxtaposes the coarse profile of sample A with the finer profile of sample B (see table 3). All of the samples also have a superimposed very fine profile in the range of 0.01 and 0.07 μm

(microwave length 0.02 μm) which apparently results from anodisation of the sheets.

Service life, dirt contamination and the water retention capability of the samples were compared. Regarding the service life, sample A is mentioned as not achieving the requirement of durability because the lipophilic image flaked off in long print runs; samples B and C show a high service life and the honeycomb structure is found to be a good basis for a firmly bonded organic layer (page 11, last paragraph to page 12, end of first paragraph; Figure 5). As can be derived from the point 5.3 in combination with Figure 7 of D1, sample B is inferior under the aspect water retention capability while the larger grain of the coarse profile of samples A and C has good water receptive properties. D1 thus comes to the finding that the overall best results are obtained with the "multi-grain" sample C (middle of page 14) which combines the advantages of sample A (water retention) and B (service life).

On the basis of this teaching, the Board considers that it would have been obvious for a person skilled in the development of lithographic supports and aiming at improving the service life of the known lithographic pack-rolled sheets of the type shown in D2, to superimpose the finer honeycomb profile obtained by an electrochemical roughening process of the type disclosed by sample B of D1 on the rippled profile of D2 for the purpose of promoting bonding of the organic coating. In so doing, he would come to the subject-matter of the granted claims 1 and 5. The common dimensional range shared by the larger grain profile of

sample A (10-30 μm) and the rippled structure of a pack-rolled sheet (5-200 μm) as well as the analogy in their properties (good water receptive capacity, weak as a basis for a firm bonding) would be apparent to the skilled person and be an incentive to the superimposition of the finer honeycomb profile on such a rippled structure. As disclosed in paragraph [0016] of the patent and confirmed by the dimensional data and the drawings of D1, the honeycomb profile obtained by electrochemical roughening typically leads to a pitted structure comprising pits having an average diameter of 1 to 20 μm and an aspect ratio of less than 1.5 e.g. about 1.0.

The Board does not share the view of the patent proprietors that there was not the slightest hint to combine pack rolling as a mechanical roughening process with the other roughening processes mentioned in D1. This argument overlooks the fact that D2 explicitly mentions pack rolling as an advantageous alternative to brush graining which is also mentioned D1 (D2: page 4, second to third paragraphs).

The Board was not convinced either by the argument relating to the formation of the oxide layer by storage ageing. It is well known that the formation of the oxide layer, e.g. by storage ageing, anodisation, or any other means, is the last step in the process of making an aluminium lithographic sheet (see D1) and does not prevent the skilled person from contemplating a bimodal roughening.

It follows from the above that the subject-matter of the granted claims 1 and 5 does not involve an inventive step.

2. *First auxiliary request*

During oral proceedings the patent proprietors withdrew their then existing first, second and third auxiliary requests and submitted a new first auxiliary request taking the second auxiliary request filed with letter dated 12 August 2004 and replacing the "aspect ratio of at least 1.3" in claims 1 and 4 by an "aspect ratio of at least 5".

According to established case law, the Boards of Appeal have discretion to admit any amendment to a party's case made at a late stage in the proceedings. In the circumstances of the present case, the Board judged it not proper to admit the first auxiliary request in the proceedings.

Considering the extent to which the opponents could have expected this request as a possible route for maintenance of the patent, it is apparent that the proposed amendments were not readily foreseeable and their examination would require a review of all the disclosures referring to the topography of pack rolled aluminium sheets. Hence, they represented a new issue which could not be expected to be dealt with at this stage of the proceedings.

Moreover, concerning the question whether the passage cited by the patent proprietors could serve as an adequate basis for the proposed amendment, the Board

takes the view that there is no direct and unambiguous disclosure in the originally filed application documents of ridges and troughs having an aspect ratio of at least 5 with the exclusion of ridges and troughs having an aspect ratio of less than 5.

3. *Fourth auxiliary request*

The claimed range of thickness of the sheet (0.15 to 0.51 mm) is to be compared with a range of 0.08 to 0.22 mm mentioned in claim 1 of D2. Since there is a substantial overlap between the two ranges, the Board is unable to recognise in the additional feature of this request anything of inventive significance.

4. *Fifth auxiliary request*

If D2 is examined under the aspect of the annealing treatment, it discloses two extremes. In the first example, the annealing treatment is a soft annealing (12 hours at 450°) before pack-rolling. In the second example, the aluminium sheet is pack-rolled without any annealing treatment. For the purpose of preventing too narrow an interpretation of a disclosure, it is not unusual in patent application documents to cite extreme examples. In the Board's judgement, the skilled person should be free to determine the amount of annealing between these two examples in order to influence in a manner well known per se the mechanical properties of the final product. There is also nothing in the additional feature, which, when combined with the other features of the claims, would lead to any special or surprising effect.

The subject-matter of claim 1 according to the fourth and fifth auxiliary requests therefore also does not involve an inventive step.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:

The Chairman:

A. Vottner

S. Crane