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Datasheet for the decision of 10 October 2006

Case Number: T 0579/04 - 3.2.02

Application Number: 97941934.8

Publication Number: 0917594

IPC: C22C 38/06

Language of the proceedings: EN

Title of invention:
Steel, method for its manufacture, its use and product made from steel

Patentee:
Corus Staal BV

Opponents:
USINOR
ThyssenKrupp Steel AG

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
-

Decisions cited:
-

Catchword:
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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0579/04 **-** 3.2.02

D E C I S I O N
of the Technical Board of Appeal 3.2.02
of 10 October 2006

Appellant: (Patent Proprietor)
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 25 February 2004 revoking European patent No. 0917594 pursuant to Article 102(1) EPC.**

Composition of the Board:

Chairman: T. Kriner
Members: R. Ries
E. Dufrasne

Summary of Facts and Submissions

I. Oppositions were filed against European patent No. 0 917 594 as a whole and were based on Article 100(a) EPC, (lack of novelty and inventive step).

The opposition division held that the subject matter of claim 1 of the main, first and third auxiliary requests then on file lacked novelty with respect to the disclosure of either document

D1: EP-A-0 360 955 or

D7: DE-C-3 020 883 (& US-A-4 397 699) or

D9: EP-B-0 171 197.

The claims according to the second auxiliary request on file were held not to satisfy the requirements of Article 123(3) EPC. The decision to revoke the patent was dispatched on 25 February 2004.

II. The appellant (patent proprietor) lodged an appeal against this decision. The appeal was received on 29 April 2004 and the fee for appeal was paid on the same date. The statement setting out the grounds of appeal was received on 6 July 2004 and included in the annex two amended sets of claims (main request: claims 1 to 12; auxiliary request: claims 1 to 13).

III. Enclosed with its reply to the appellant's statement, the respondent II (opponent II) referred to document

D8: K. Maruoka et al.: "C.A.P.L. for tinplate. Production of can-making steel using continuous annealing" Steel Times International, May 1992, pages 48 to 52

which, in its view, represented the closest prior art and in combination with the technical disclosure of document D9 led in an obvious manner to the subject matter claimed in the patent.

IV. Oral proceedings before the board took place on 10 October 2006, at the end of which the following requests forming the basis of the decision were submitted:

The appellant (patent proprietor) requested that
- the decision under appeal be set aside and
- the patent be maintained on the basis of the main request or, in the alternative,
- of the auxiliary request,

both requests filed with letter dated 6 July 2004.

The respondents (opponents I and II) requested that the appeal be dismissed.

V. Independent claim 1 of the main request reads a follows:

"1. Method of manufacturing pre-spin-necked cans from a steel strip or sheet having a thickness of less than 0,35 mm wherein the steel has a chemical composition:

Element	Min*	Max*
C		40
Mn	140	250

P		20
S		20
Si		30
N ppm		30
Al**		50
B ppm	5	50
Cu		40
Sn		10
Cr		40
Ni		40
Mo		10

* in 0,001 %wt. unless otherwise stated

** acid soluble

balance Fe and inevitable impurities, wherein 0,4 ≤ B/N ≤ 1,2, wherein the grain size in edge region of the strip Gs-edge and the grain size in a centre region of the strip Gs-centre differ less than 0,5 ASTM units comprising the stages:

- hot-rolling comprising finish-rolling at a finish-rolling temperature selected above Ar_3-10°C and coiling at a coiling temperature selected below 700°C;
- pickling;
- cold-rolling;
- continuous annealing, and optionally further cold rolling, preferably with a reduction of at least 0.6 %;
- taking blanks from centre, edge and in between regions of the strip;
- drawing the blanks into cups;
- wall ironing, trimming and pre-spin-necking the cups into pre-spin-necked cans."

Claim 1 of the first auxiliary request reads as follows:

"1. Use of steel in the form of cold reduced, annealed and optionally further cold reduced sheet or strip having a thickness of less than 0,35 mm wherein the steel has a chemical composition:

Element	Min*	Max*
C		40
Mn	140	250
P		20
S		20
Si		30
N ppm		30
Al**		50
B ppm	5	50
Cu		40
Sn		10
Cr		40
Ni		40
Mo		10

* in 0,001 %wt. unless otherwise stated
** acid soluble

balance Fe and inevitable impurities, wherein 0,4 ≤ B/N ≤ 1,2, wherein the grain size in edge region of the strip Gs-edge and the grain size in a centre region of the strip Gs-centre differ less than 0,5 ASTM units, in can manufacture wherein the sheet or strip is cut into blanks from different portions taken from the centre, edge and in between regions of the strip or sheet and the blanks are drawn into cups which cups are wall ironed, trimmed and pre-spin-necked into cans each

having a neck of smallest diameter PSPD and an out-turned flange having a maximum diameter PSED, for reducing the spread in PSED and PSPD and for lowering PSED."

VI. The appellant argued as follows:

Document D8 was the only document which addressed the production of two-piece deep-drawn wall ironed (DWI) steel cans. Hence, this document qualified as closest prior art. However, D8 neither disclosed a specific steel grade nor a process for producing DWI cans. The passage on page 51, right hand column, second paragraph dealing with "Soft grades for tinplate from aluminium-killed steel" was concerned with tinplate for producing three piece cans rather than DWI cans. So did the reference(6) to document D9 which related to a process for producing tinplate that was highly resistant to "fluting" or "buckling". In DWI can production as claimed in the patent, "fluting" or "buckling" did not occur in view of the nature of D&I (drawn and ironed) process. In addition, boron was an important element in the patent that was to be added in relation to the nitrogen content, contrary to the steel grade described in document D9 where boron was merely an optional component.
Hence, a skilled person would not take into account the disclosure of document D9 when looking for a steel grade and process suitable for producing DWI cans.

Document D7 related to a process for producing cold rolled Al-killed steel strip for deep drawing by continuous annealing. The thickness of the steel strip was about 0.8 mm and the strip was provided for

manufacturing press-formed automobile forms rather than DWI cans. The type of steel strip and the field of application referred to in this document differed largely from those of the patent. Hence, no incentive was given to the skilled practitioner to turn to D9 or D7 when producing DWI can stock material referred to in D8.

Claim 1 of the auxiliary request was directed to the second unknown use of a known steel grade (e.g. from D9 or D7) for producing DWI cans. None of the prior art documents disclosed that the known steel grade could be used for this application.

The subject matter set out in claim 1 of the main and the auxiliary requests, therefore, involved an inventive step.

VII. The arguments of the respondents can be summarized as follows:

The claimed subject matter was obvious from the combined teaching of documents D8 and D9.

Reasons for the Decision

1. The appeal is admissible.

2. *The patent at issue*

The patent at issue is concerned with the manufacture of pre-spin-necked, two-piece deep-drawn and wall-ironed (DWI) cans from a continuously annealed highly

formable steel sheet having a thickness of less than 0.35 mm. In the continuously annealed and optionally further cold reduced condition, the specified steel strip displays better uniform (isotropic) mechanical properties which make it possible to obtain lower reject rates (spoilage) and to make the cans lighter. The degree of isotropy is expressed by the difference of the grain size of less than 0.5 ASTM in the centre region and the edge regions of the steel strip.

3. *The closest prior art; problem and solution*

3.1 Among the citations, document D8 specifically deals with the production of DWI cans and thus qualifies as closest prior art. As set out herein, DWI steel cans are made from 0.24 mm thick, bake-hardenable (BH) tin plate which is produced in a continuous annealing and processing line (CAPL) (cf. D8, page 52, middle column, paragraph: "Product development by CAPL"; Figure 3, page 50, first column, first paragraph). As shown in Figure 1 and page 50: "Layout of Yawata No. 2 CAPL" of this document, the CAPL also includes the steps of pickling and cold rolling before continuous annealing and further cold rolling the steel sheet.

Considered as a whole, the teaching of document D8 is, however, not restricted to DWI cans but relates to the production of can-making steel strip (tinplate or blackplate) in general, using continuous annealing in a CAPL. It is mentioned in D8 on page 48, right hand column; paragraph "Spread of CAPL for tinplate" that tinplate (or blackplate) must provide uniform mechanical properties, good flatness and few surface defects and can be used for manufacturing two-piece DWI

and three-piece cans. Detailed metallurgical aspects to be considered when producing soft grades of tin plate from Al-killed steel in a CAPL are given in D8 on page 51, right hand column. Document D8 does not explicitly teach a particular steel grade and the process parameters to adhere to when hot rolling and coiling the steel sheet so that it exhibits almost homogeneous properties and thus could be successfully formed into DWI cans. However, the passage on page 51 comprises a specific reference(6) to European patent No. 0 171 197 (document D9) which is concerned with a continuous annealing process for tinplate.

3.2 Starting from this prior art, the problem underlying the patent at issue thus is seen in finding further corresponding technical information to fill this gap, i.e. in finding a suitable steel grade and treatment for the production of DWI cans. Following the indication given in document D8, the skilled person would in his search for further technical information be immediately guided to turn to document D9 which relates to a process for producing soft blackplate with a T-3 temper or less. This strip can be subjected to a surface treatment such as tin-plating and is suitable for can production (cf. D9, page 3, lines 5 and 6, 39 to 45). The Al-killed steel grade disclosed in D9 for producing blackplate comprises (by weight): 0.01 to 0.08% C, 0.02% or less P and 0.05 to 0.6% Mn. The addition of boron is recommended for effectively fixing nitrogen and if added, the B/N ratio should fall within the range of 0.5 to 1.0 which meets the proviso of $0.4 \leq B/N \leq 1.2$ claimed in the patent. After heating to a temperature ranging from 950 to 1240°C, the steel is hot rolled and then coiled at a temperature in the

range of 620 to 710°C. The hot rolled steel strip is then cold rolled at a reduction rate of ≥ 80% to obtain the gauge of blackplate of ≤ 0.45 mm (cf. D9, page 4 line 59 to page 5, line 47).
Particular reference is made to the steel alloy of example 9 given in Table 1 of D9 which components satisfy the compositional requirements of the claimed steel, in particular including a B/N ratio of 0.88. The temperatures for hot rolling and coiling displayed in example 9 likewise meet the hot rolling and coiling conditions set out in claim 1 of the patent at issue. The steps of cold rolling (to a thickness of 0.35 mm), continuous annealing and optionally further cold rolling are mentioned for example in document D9, page 6, lines 16 to 26. Document D9 thus discloses an appropriate steel grade and a process for producing continuous annealed soft steel strip suitable for manufacturing cans which complies with the corresponding features set out in claim 1 of the patent.

Document D9 fails to disclose the additional process steps featuring in claim 1 of the main request comprising:
"- taking blanks form the centre, edge and in between regions of the strip;
- drawing the blanks into cups
- wall ironing, trimming and pre-spin necking the cups into pre-spin necked cans".

At the oral proceedings, it was, however, undisputed by the appellant that the additional process steps in claim 1 merely described the standard method that was typically applied for producing DWI cans. Therefore,

these steps are implicitly disclosed in document D8 and do not comprise inventive subject matter.

It is therefore concluded that the method set out in claim 1 of the main request is obvious to a person skilled in the art from the combined technical teaching given in documents D8 and D9.

3.3 The appellant argued that D9 essentially aimed at improving the "fluting" resistance of blackplate so that no "buckling" of the surface into polygonal lines occurs during bending (cf. D9, page 3, lines 10 and 39 to 45; 61 to 63; page 4, line 8 to 10). "Fluting" or "buckling" did, however, not occur in DWI can production but was associated with bending the steel sheet. Thus, document D9 related to the manufacture of three-piece cans.

3.4 A special reason, however, as to why the reference given in document D8 to document D9 should be confined exclusively to the production of three-piece can and therefore should be disregarded by a skilled person, is not discernable. It is not disputed that one object of document D9 is reducing "fluting" or "buckling" of the steel sheets, but another object of D9 resides in producing soft blackplate for surface treatment by continuously annealing without the need for decarburizing the steel by vacuum degassing or the addition of expensive elements such as Ti, Nb etc (cf. D9, page 4, lines 1 to 4). Nothing is found in this document for implying that the disclosed blackplate is totally unsuitable as a stock material for producing DWI cans, all the more so since the hardness of 52.5 HR(30T) of example 9 of D9 is in the T-2 range

indicating that the steel sheet is even softer than the Al-killed T-3 steel grades referred to in D8, page 51, right hand column, second paragraph. In addition, document D9 also mentions the beneficial effect of B and the necessity to adhere to a B/N ratio to obtain excellent deep formability, a property which likewise plays an important role in DWI can production.

The fact that at the filing date of document D9 (1985) DWI steel can production was unknown in the art and therefore could not have been taken into account - as mentioned by the appellant - has no bearing on the matter since for assessing the issue of inventive step, it is what was known to the person skilled in the art at the priority date of the patent in issue which has to be considered.

4. In addition thereto, the subject matter of claim 1 of the main request also results by combining the technical teaching given in documents D8 and D7 (DE-C-3 020 883 & US-A-4397 699) which is amply discussed in document D9 on page 4, lines 14 to 21.

As mentioned in D8, page 52, paragraph "Product development by CAPL", DWI cans are made of bake-hardenable (BH) tinplate which is soft and formable in the DWI forming stage and which after forming acquires adequate strength during the paint baking step. The tinplate thus makes use of the bake-hardening effect like automotive steel strip. The skilled reader is therefore referred to document D7 (also referred to in document D9) which discloses cold rolled continuous annealed soft steel strips which are i.a. used in the manufacture of cold press-formed automotive parts. The

boron-containing ultra-low carbon Al-killed steel sheet, comprises ≤ 0.06% C, ≤ 0.40% Mn, 0.005-0.05% Al_{sol}, ≤ 0.004% N, 0.0005 to 0.0020% B with B/N = 0.8 to 1.0%, balance Fe and residual impurities and provides excellent deep-drawability and stretchability. As an example, steel sheet D given in Table 1 (0.022% C, 0.025% Si, 0.22% Mn, 0.013% P, 0.011% S, 0.0010% N, 0.0008% B, B/N=0.80 balance Fe) has been hot rolled at a finishing hot-rolling temperature of 895°C, coiled at 635°C, followed by pickling, further cold rolling to 0.8 mm, continuous annealing and further cold rolling at a reduction rate of 1% (cf. Sample 1 and page 4, lines 40 to 50). Sample D exhibits a r-value of 1.63 (cf. D7, Table II) which is above the minimum value of 1.3 required in the patent in issue. Further ultra-low carbon steel sheets satisfying the steel composition and process parameters set out in claim 1 of the patent and are given in D7, Table III, samples H, J, K. As D7 also mentions on page 4, last line to page 5, line 2, the steel sheets may be surface-coated e.g. with tin and exhibit excellent deep-drawability. For the production of DWI cans, it was, therefore, close at hand to use the technology disclosed in D7 and to further reduce the thickness of the ultra-soft steel sheet down to 0.35 mm or 0.24 mm as mentioned in document D8 and to provide an optimum stock material for DWI can production.

The subject matter of claim 1 of the main request therefore also does not involve an inventive step with respect to the technical teaching given in documents D8 and D7.

5. *Auxiliary request:*

The same reasoning applies to claim 1 of the auxiliary request which is directed to the use of the soft cold rolled and continuously annealed steel sheet or strip already known from documents D9 or D7, for producing DWI cans as disclosed in D8. Since claim 1 of the auxiliary request defines in other terms the same subject matter as does claim 1 of the main request (a fact not disputed by the appellant at the oral proceedings), claim 1 of the auxiliary request is also not allowable for lack of inventive step having regard to the teaching of document D8 in combination with either document D9 or D7.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

V. Commare T. K. H. Kriner