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**Datasheet for the decision  
of 11 March 2008**

**Case Number:** T 0792/06 - 3.2.06

**Application Number:** 93911048.2

**Publication Number:** 0594828

**IPC:** B21B 1/04

**Language of the proceedings:** EN

**Title of invention:**

Method and apparatus for intermediate thickness slab caster  
and inline hot strip and plate line

**Patentee:**

SMS Demag Tippins LLC

**Opponents:**

VOEST ALPINE Industrieanlagen Ges.m.b.H.  
DANIELI & C.

**Headword:**

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**Relevant legal provisions:**

EPC Art. 123(2), 123(3), 56  
EPC R. 43(1)

**Relevant legal provisions (EPC 1973):**

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**Keyword:**

"Amendments - added subject-matter (no)"  
"Amendments - scope of protection not affected by form of  
claim"  
"Inventive step (yes)"

**Decisions cited:**

T 1087/01, T 0191/89, T 0583/93

**Catchword:**

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Case Number: T 0792/06 - 3.2.06

**D E C I S I O N**  
of the Technical Board of Appeal 3.2.06  
of 11 March 2008

**Appellant:**  
(Patent Proprietor)

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**Decision under appeal:** Decision of the Opposition Division of the European Patent Office posted 20 March 2006 revoking European patent No. 0594828 pursuant to Article 102(1) EPC.

**Composition of the Board:**

**Chairman:** P. Alting Van Geusau  
**Members:** G. Pricolo  
K. Garnett

## Summary of Facts and Submissions

- I. The appeal is from the decision of the Opposition Division posted on 20 March 2006 revoking European patent No. 0 594 828, granted in respect of European patent application No. 93 911 048.2.
- II. In a first decision of 24 July 2001 the Opposition Division revoked the patent on the grounds that granted claim 1 (main request) contained added subject-matter; as for the claims according to the auxiliary requests A to H, these likewise contained added subject-matter.
- In the subsequent appeal T 1087/01 lodged by the patent proprietor, Board 3.2.01 held that claim 1 according to auxiliary request C satisfied the requirements of Article 123(2) EPC. It decided to set the decision aside and to remit the case to the department of first instance for further prosecution.
- III. In its further decision of 20 March 2006, which is the subject of the present appeal proceedings, the Opposition division revoked the patent, holding that the subject-matter of claim 1 according to the main request, which corresponded to claim 1 according to the previous auxiliary request C, and of claim 1 according to auxiliary requests 1 to 11, did not involve an inventive step in the light of:

D2 : EP-A-0 320 846; and

either

D4 : Hitachi Review, vol. 39 (1990) August, No. 4,  
"Hitachi Mini Hot Strip Mill", by T. Kimura et al.,  
pages 195-200;

or

D6 : Iron and Steel Engineer, January 1984, "Southern  
Cross builds stainless mill for half the cost",  
pages 73 and 74.

- IV. The appellant (patent proprietor) lodged an appeal on 29 May 2006. Payment of the appeal fee was recorded on the same day. With the statement setting out the grounds of appeal, received at the EPO on 31 July 2006, the appellant requested that the decision under appeal be set aside and the patent be maintained on the basis of the main request or one of the auxiliary requests considered by the Opposition Division, together with the reimbursement of the appeal fee in view of a substantial procedural violation.
- V. In an annex to the summons for oral proceedings pursuant to Article 11(1) of the Rules of Procedure of the boards of appeal, the Board expressed the preliminary opinion that that the Opposition Division did not commit the alleged substantial procedural violation, and that document D2 represented an appropriate starting point for the assessment of inventive step. Although in the proceedings before the department of first instance it was undisputed that D2 disclosed a method having all the features of the preamble of claim 1, it appeared that, as submitted by the appellant, this was not correct because D2 did not

disclose all the features of the preamble of claim 1 in combination.

VI. Oral proceedings, at the end of which the decision of this Board was announced, took place on 11 March 2008.

During the oral proceedings the appellant withdrew its previous main and auxiliary requests and its request for reimbursement of the appeal fee, and filed a new request for maintenance of the patent in amended form. It requested that the decision under appeal be set aside and that the patent be maintained on the basis of claim 1 as filed during the oral proceedings and claims 2 to 8 as granted.

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

VII. Claim 1 under consideration reads as follows:

"1. A method of making coiled plate, sheet in coil form or discrete plate comprising the steps of:

- a) continuously casting a strand having a thickness between 89 mm and 140 mm (3.5 inches to 5.5 inches);
- b) shearing said strand into a slab (44, 46) of predetermined length;
- c) feeding the slab (44, 46) into an inline heating furnace (42);
- d) extracting said slab (44, 46) onto a continuous processing line including a hot reversing mill (56) having a coiler furnace (58, 60) on each of an upstream side and downstream side thereof;
- e) flat passing said slab (44, 46) back and forth through said mill (56) to form an intermediate product of a thickness sufficient for coiling of about 25 mm (1

inch) or less after three or four flat passes through the mill;

f) coiling said intermediate product in one of said upstream or downstream coiler furnaces (58, 60);

g) passing said coiled intermediate product back and forth through said mill (56) to reduce said coiled intermediate product to second intermediate product of further reduced thickness, said intermediate product being collected in and fed out of each of said coiler furnaces (58, 60) on each pass through the mill (56);

h) further rolling said second intermediate product to reduce it to an end product of desired thickness, and

i) finishing said end product into one of coiled plate, discrete plate or sheet in coil form,

wherein said further rolling of said second intermediate product into said end product is performed by passing said second intermediate product back and forth between said coiler furnaces (58, 60) of said hot reversing mill."

VIII. The arguments of the appellant in support of its request can be summarized as follows:

The amendment made to claim 1 over claim 1 according to auxiliary request C allowed by the previous decision T 1087/01, consisted in replacing the expression "characterized in that" by "wherein". This was a mere formal amendment that did not change the substance of the claim. The description was amended to reflect the restrictions introduced in claim 1. Accordingly the amendments made met the requirements of Articles 123(2) and (3) EPC.

The method of claim 1 differed from the method known from D2 in that the thickness of the cast strand was selected to be in the range of 89 to 140 mm, the thickness of the slab was reduced to about 25 mm or less after three or four flat passes through the mill, and the further rolling of the second intermediate product into the end product was performed by passing said second intermediate product back and forth between the coiler furnaces of the hot reversing mill. These distinguishing features led to a process which was balanced, i.e. one in which the rate at which the metal could be cast essentially corresponded to the rate at which the slabs could be rolled and the product could be finished. The combination of the distinguishing features further allowed the optimization of the rolling process in terms of thermal and electrical energy requirements. D6 disclosed a mill arrangement capable of converting stainless steel slabs up to 180 mm thick into 3 mm hot bands. It clearly related to a method in which thick slabs were used rather than slabs of intermediate thickness in the claimed range of 89 to 140 mm. D6 was completely silent about the type of caster with which the mill arrangement was combined and did not address the problem of balancing the casting and rolling rates. Also D4 was concerned with rolling thick slabs, of about 200 mm thickness, and did not address this problem. Moreover, D4 disclosed that dispensing with the finishing mill in a line comprising a roughing mill and a finishing mill, and using a single reversing mill for both roughing and finishing, resulted in not only a smaller arrangement but also in a much lower annual production. In view of this disadvantage the skilled person would not consider removing the finishing mill in the arrangement of D2.



IX. Respondent II took an objection under Article 123(3) EPC in relation to the amendment of claim 1 by which the two-part form formulation was changed to a one-part form. It also objected to the amendments of pages 2 and 5 of the description pursuant to Article 123(2) EPC. The amendment of page 5 was also objected by respondent I.

Respondent II further submitted that the claimed thickness range of 89 to 140 mm was known from D2 because the latter related in general to rolling of slabs having a thickness ranging between 80 and 220 mm. D2 also disclosed flat-passing the slab through the mill until a thickness of about 25 mm was reached. Respondent I submitted that even if these features were regarded as distinguishing features, they would not support inventive step. The range of 89 to 140 mm was an arbitrary selection within the range of 80 to 220 mm disclosed by D2. 25 mm was a usual thickness value for the coiling of a product and three or four passes were usually necessary to reach a thickness of 25 mm when starting from a slab having a thickness between 89 and 140 mm.

Both respondents submitted that, on the one hand, it was not clear what was meant by a balanced process and, on the other, that the method according to claim 1 was not necessarily balanced. In fact, the patent in suit was not restricted to a method in which the cast slabs were continuously rolled inline, but also contemplated a method in which slabs were removed from the inline processing and stored in a storage area. In any case, D4 already disclosed a balanced process. D4 disclosed

that the finishing mill could be dispensed with in order to save costs and space. The skilled person would regard it as obvious to implement this teaching of D4 in the method known from D2, thereby arriving at the subject-matter of claim 1 without the exercise of inventive activity. In addition D6 also disclosed converting the second intermediate product into an end product by passing the intermediate product back and forth between the coiler furnaces of a hot reversing mill. Finally, D2 itself also disclosed, in connection with the embodiment of Fig. 6, that a single reversing mill could be used for executing the final finish rolling.

### **Reasons for the Decision**

1. The appeal is admissible.
2. *Amendments*
  - 2.1 The amendment to claim 1 made by the appellant during the oral proceedings before this Board only consists of replacing the expression "characterized in that" by "wherein" in claim 1 according to auxiliary request C, which claim was considered to satisfy the requirements of Article 123(2) EPC in the previous decision T 1087/01 taken by Board 3.2.1 concerning the patent in suit.

This amendment does not have any effect on the claimed combination of features but only modifies the form of the claim (one-part form instead of the two-part form). The claimed subject-matter remaining unchanged, the amendment is not objectionable under Article 123(2) EPC.

2.2 Respondent II submitted that this amendment had the effect of modifying the scope of protection and as such was contrary to the requirements of Article 123(3) EPC. When assessing the scope of protection attached to a claim drafted in the two-part form, a national Court would give much weight to the features defined in the characterising part. By drafting the claim in the one-part form, a national Court might possibly give more weight to the other features which were previously in the preamble of claim 1.

In the Board's view there is no support in the EPC for this objection. According to established and constant case law of the Boards of Appeal (see e.g. T 191/89, point 3; T 583/93, point 4.1), the form of the claim has no impact on the scope of protection. In fact, by specifying that the claims shall define the matter for which protection is sought in terms of *the technical features of the invention*, and that, when a claim is drafted in the two-part form, the matter for which protection is sought is defined by *the combination of the technical features* recited in the characterising portion and the technical features defined in the preamble, Rule 43(1) EPC (taken in combination with Article 84 EPC) makes it clear that irrespective of the form of the claim, it is the combination of features of a claim taken as a whole which defines the scope of protection.

2.3 The amendments made to the description do not introduce subject-matter extending beyond the content of the application as filed.

The amendment of page 2, lines 6 and 12, consists in deleting, from the description of the prior art's method known from D2, the features according to which the strand has a thickness between 89 mm and 140 mm and the intermediate product undergoes at least three flat passes through the mill. Apart from the fact that these features are effectively not known from D2 (as is explained below), their deletion cannot have the effect of introducing subject-matter extending beyond the application as filed, because they are simply removed from a context relating to the prior art. Moreover, on the same page (page 2, lines 29 and 30) it is stated that in the prior art the range for the thickness of the strand is 80 to 220 mm and that the intermediate product undergoes a number of flat passes. These references correspond to the explicit disclosure of D2 and thus give an objective description thereof.

On page, 3, lines 46 and 52, the expression "3 flat passes" is amended to read "3 or 4 flat passes". Similarly, on page 5, line 53, the expression "three passes" is replaced by "three or four passes". As these expressions apply in the general context of the invention, and not in relation to a specific embodiment thereof, and, as found in previous decision T 1087/01 (points 1.1.4 to 1.1.6 and 1.4), three or four flat passes are disclosed in the general context of the invention in the application as filed, these amendments also do not contravene Article 123(2) EPC.

Finally, page 3 is amended to recite that the objects of the invention are achieved "in a method as defined in claim 1", thus bringing the description into conformity with the wording of the amended claim.

2.4 Therefore, the amendments made satisfy the requirements of Articles 123(2) and (3) EPC.

3. *Novelty*

Novelty was not in dispute and therefore it is not necessary to consider the matter in detail. The Board agrees with the reasoning set out in the decision of the Opposition Division (see point 4) on this point.

4. *Inventive step*

4.1 The problems underlying the patent in suit are to provide an improved method for making plate by integrating an intermediate thickness slab caster with a hot reversing mill, to adopt a system which balances the rate of the caster to the rate of the rolling mill, to adopt a system using less thermal and electrical energy, and further to adopt an automated system with small capital investment, reasonable floor space requirements, reasonably powered rolling equipment and low operating costs (see page 3, lines 16 to 23).

4.2 Document D2, which is acknowledged in the patent in suit (see page 2, line 20), discloses, in connection with the embodiment of Fig. 5, a method which undisputedly represents the closest prior art. The method according to this embodiment is indeed the most similar to the method claimed because it comprises the use of a hot reversing mill having a coiler furnace on each of an upstream side and downstream side thereof for rolling a cast slab.

Using the wording of claim 1 of the patent in suit, this known method is a method of making coiled plate, sheet in coil form or discrete plates comprising the steps of:

- a) continuously casting a strand (5 in Fig. 1; note that the parts of the apparatus on the left side of the rolling mills are the same for all embodiments);
- b) shearing said strand into a slab (7) of predetermined length (at 6 in Fig. 1);
- c) feeding the slab into an inline heating furnace (14 in Fig. 1);
- d) extracting said slab (7) onto a continuous processing line including a hot reversing mill (see Fig. 5) having a coiler furnace (71,72) on each of an upstream side and downstream side thereof;
- e) flat passing said slab (7) back and forth through said mill to form an intermediate product of a thickness sufficient for coiling (see col. 12, lines 11 to 16);
- f) coiling said intermediate product in one of said upstream or downstream coiler furnaces (see col. 12, lines 14 to 16);
- g) passing said coiled intermediate product back and forth through said mill to reduce said coiled intermediate product to second intermediate product of further reduced thickness (see col. 12, lines 16 to 26), said intermediate product being collected in and fed out of each of said coiler furnaces on each pass through the mill;
- h) further rolling said second intermediate product to reduce it to an end product of desired thickness (see col. 12, lines 24 to 26 to 32), and
- i) finishing said end product into sheet in coil form (30) (note that "finishing" here should not be read as

a finishing rolling operation, the end thickness having been reached in the "further rolling step". According to the patent in suit, "finishing" is e.g. descaling, shearing and piling, see page 6, lines 4,5).

D2 discloses that the usual thickness range of the slab is generally between 80 and 220 mm (see col. 3, lines 1,2). It also discloses that the first embodiment (Figs. 1 to 3) is suitable for thicknesses of 80 mm, or thicknesses greater than 80 mm such as 120 mm (see col. 10, lines 39 to 46 and col. 11, lines 2 to 7), and that the second embodiment is suitable for use where the slab has a thickness greater than 80 mm, e.g. 110 to 220 mm (col. 11, lines 22 to 25). As regards the third embodiment of Fig. 5, D2 only mentions that a slab "having a large initial thickness is repeatedly rolled" (col. 12, lines 11, 12). Accordingly, D2 does not disclose, in combination with the above-mentioned features disclosed in connection with the embodiment according to Fig. 5, the feature of claim 1 according to which the strand (i.e. the initial slab) has a thickness between 89 mm and 140 mm. Furthermore, D2 discloses in combination with the embodiment of Fig. 5 that the material thickness is reduced to "30 mm or so" by flat passing the slab back and forth through the mill (see previous decision T 1087/01, point 1.1.4: "flat pass" means a rolling pass starting from an uncoiled slab and ending coiled or uncoiled). D2 does not disclose in connection with the embodiment of Fig. 5 how many flat passes are performed. Accordingly D2 does not disclose, in combination with the above-mentioned features, the feature of claim 1 according to which a thickness sufficient for coiling, of about 25 mm or less, is reached after three or four flat passes through the mill. Finally, it is undisputed that

D2 does not disclose that the further rolling of the second intermediate product into the end product is performed by passing the second intermediate product back and forth between the coiler furnaces of the hot reversing mill. Indeed in the embodiment of Fig. 5 a finish rolling mill (28) is provided following the hot reversing mill (35) to finish roll the material into the final product (see col. 12, lines 24 to 32).

- 4.3 The respondents submitted that the general disclosure in D2 that the thickness of the slab material to be processed usually ranged between 80 and 220 mm applied to all embodiments, in particular to the embodiment of Fig. 5, and that the claimed range of 89 to 140 mm could not be regarded as novel.

The Board accepts that D2 generally relates to processing of slabs having a thickness in the range of 80 to 220 mm. However, it cannot be inferred from the disclosure of D2 that the embodiments disclosed are all equally suited for any thickness value within the range of 80 to 220 mm. As pointed out by the appellant during the oral proceedings, hot strip mills are normally not designed for such a wide range of slab thicknesses (see also the abstract of D4), but only for a limited range of thicknesses (in particular depending on whether a small thickness, an intermediate thickness or a large thickness slab caster is integrated with the hot strip mill). And indeed the embodiment of Fig. 4 of D2 is acknowledged as being suitable for thicknesses greater than 80 mm, e.g. 110 to 220 mm (see col. 11, lines 22 to 25). For the embodiment of Fig. 5, D2 discloses that a "slab having a large initial thickness is repeatedly rolled by the rough rolling mill" (see col. 12,



lines 11, 12). Accordingly, D2 suggests that the embodiment of Fig. 5 is intended for rolling slabs having a thickness close to 220 mm. There is therefore no clear and unambiguous disclosure that the embodiment of Fig. 5 is intended for rolling slabs having a thickness in the claimed range of 89 to 140 mm.

4.4 It was also pointed out by the respondents that D2 specifically disclosed the value of 25 mm as a thickness of the intermediate product sufficient for coiling. However, this value is disclosed in connection with the first embodiment of Figs. 1 to 3 (see col. 9, line 39) and only the value of 30 mm (see col. 12, line 13) is disclosed for the embodiment of Fig. 5. Furthermore, there is no clear and unambiguous disclosure of the number of flat passes which should be performed with the embodiment of Fig. 5 in order to reach this thickness. In fact, if the slab has a thickness of about 220 mm, then more than four flat passes would be necessary (see e.g. table 1 of D4 showing the number of flat passes for reducing the thickness of a slab from 200 to 25 mm). The argument of respondent I according to which if the thickness of the slab is in the claimed range of 89 to 140 mm, then necessarily three or four flat passes are needed to achieve a thickness of 25 mm, fails because it starts from the incorrect assumption that D2 discloses that a slab having a thickness within the range of 89 to 140 mm is used in the embodiment of Fig. 5.

4.5 In summary, the subject-matter of claim 1 is distinguished from the method according to the embodiment of Fig. 5 of D2 essentially in that the strand, and thus the initial slab, has a thickness

between 89 and 140 mm, the number of flat passes is three or four and enables a thickness of about 25 mm to be achieved, and a single hot reversing mill is used for processing the slab from its initial thickness to the final thickness of the end product.

The Board agrees with the respondents that the features of claim 1 do not necessary provide a method which balances the rate of the caster to the rate of the rolling mill. Claim 1 indeed covers a method in which the slabs can be removed from the inline processing and stored in a slab collection and storage area (see page 5, lines 28, 29). Accordingly, the rate of the caster might substantially differ from the rate of the rolling mill.

However, the respondents failed to show that the distinguishing features did not interact with each other to reduce the consumption of thermal and electrical energy. In particular, as set out in the patent in suit (see page 3, lines 29 to 40), the slab is thick enough so that, as compared to a thin slab, it loses much less heat and requires a lesser input of energy, and at the same time, as compared to a thick slab, it is adapted for being reduced to a thickness sufficient for coiling (about 25 mm or less) in only 3 or 4 flat passes by the hot reversing mill (during which the slab only has its residual heat as it is not previously heated by the coiler furnaces).

Finally, it is not disputed that the use of a hot reversing mill for reducing the thickness of the material from the initial slab thickness to the desired

end product thickness allows space to be saved and costs to be reduced.

Accordingly, the objective technical problem solved by the method according to claim 1 can be considered to be the reduction of the consumption of thermal and electrical energy and at the same time a reduction of the space and costs requirements.

4.6 D2 itself does not suggest the claimed solution to this problem. Respondent I referred to the embodiment of Fig. 6, in which a roughing mill (35, 36) is followed by a reversible finish rolling mill having reversible take-up devices (80, 81) on its inlet and outlet sides capable of coiling and uncoiling the material (see col. 12, line 57 ff.). Although the embodiment of Fig. 6 might suggest the replacement of the finish rolling mill (28) in the embodiment of Fig. 5 by a reversible finish rolling mill, there is no indication in D2 suggesting that the roughing mill (35) in the embodiment of Fig. 5 be dispensed with, thus providing a single hot reversing mill for processing the slab from its initial thickness to the final thickness of the end product. In fact the whole disclosure of D2 is concerned with the provision of a rough rolling mill in combination with a finish rolling mill (see in particular the independent claims 1, 6, 10, 12 and 13).

D4 relates to hot rolling of slabs having a thickness of about 200 mm down to a strip approximately 2 mm thick (see page 198) and specifically teaches away from using thin slabs, i.e. slabs having a thickness of 50 to 80 mm (see pages 195, 196). In the embodiment of Fig. 8A, D4 discloses a reversing mill for both

roughing and finishing, which should be used if one desires a small facility (see page 199, left column, 4<sup>th</sup> par.; see Fig. 8: capacity of 0.3 Mt/year). Even assuming that this embodiment might suggest to the skilled person that the finish rolling mill (28) in the method disclosed by D2 in connection with Fig. 5 be dispensed with, still there is no indication in D4 suggesting the use of a slab having a thickness in the claimed range of 89 to 140 mm and at the same time the provision of three or four flat passes, for reducing the consumption of thermal and electrical energy. An indication in this direction cannot be found in D6 either. This document, although relating to a method in which a single stand reversing mill combining roughing and finishing operations is used, generally relates to rolling of slabs "up to 7 in" (179 mm) "thick into 3 mm hot band" (see page 73, right-hand column) and thus gives no specific hints to start from slabs having a thickness of 89 to 140 mm and to adopt three or four flat passes.

- 4.7 In view of the above, the Board comes to the conclusion that the subject-matter of claim 1 under consideration involves an inventive step over the cited prior art. This finding differs from the conclusion of the Opposition Division. However, the said decision relied largely on an interpretation of D2 which was not contested during the proceedings before the Opposition Division, according to which D2 disclosed a method comprising all the features of the preamble of claim 1. As explained above, this interpretation is not correct.

5. Therefore, the patent documents in accordance with the sole request of appellant form a suitable basis for maintenance of the patent in amended form.

## **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:
  - (a) Claim 1 as filed during the oral proceedings and claims 2 to 8 as granted;
  - (b) Pages 2, 3 and 5 of the amended description as filed during the oral proceedings and pages 4, and 6 to 15, of the description as granted;
  - (c) Figures 1 to 5 as granted.

The Registrar:

The Chairman:

M. Patin

P. Alting van Geusau