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**Datasheet for the decision
of 9 October 2015**

Case Number: T 2581/11 - 3.2.03

Application Number: 02760588.0

Publication Number: 1527829

IPC: B21B45/02

Language of the proceedings: EN

Title of invention:

COOLING DEVICE, MANUFACTURING METHOD, AND MANUFACTURING LINE
FOR HOT ROLLED STEEL BAND

Patent Proprietor:

JFE Steel Corporation

Opponent:

SMS group GmbH

Headword:

Relevant legal provisions:

EPC Art. 123(2), 123(3), 83

Keyword:

Amendments - added subject-matter (no)
Sufficiency of disclosure - (no)

Decisions cited:

Catchword:



**Beschwerdekammern
Boards of Appeal
Chambres de recours**

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Case Number: T 2581/11 - 3.2.03

D E C I S I O N
of Technical Board of Appeal 3.2.03
of 9 October 2015

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Decision under appeal: **Interlocutory decision of the Opposition
Division of the European Patent Office posted on
18 October 2011 concerning maintenance of the
European Patent No. 1527829 in amended form.**

Composition of the Board:

Chairman G. Ashley
Members: C. Donnelly
E. Kossonakou

Summary of Facts and Submissions

- I. The appeal lies from the intermediate decision of the opposition division to maintain the European patent in amended form.

The opponent (hereinafter: the "appellant") filed an appeal against this decision in due form and time.

- II. The Board informed the parties of its provisional opinion in a communication dated 8 September 2015 pursuant to Articles 15(1) and 17(2) of the Rules of Procedure of the Boards of Appeal (RPBA). In particular, the board drew the parties attention to the fact that the appellant's submissions presented under Article 123(2) also raised issues under Articles 83 and 84 EPC.

- III. Oral proceedings before the board were held on 9 October 2015. At the end of the debate the parties confirmed the following requests:

The appellant requested that the decision under appeal be set aside and that European Patent No. 1527829 be revoked.

The respondent requested that the appeal be dismissed (main request), alternatively that the patent be maintained on the basis of the claims of one of the auxiliary requests 1 to 4 filed with letter dated 9 September 2015.

- IV. The appellant referred to the following feature analysis of the preamble of claim 1 in the version the

opposition division considered could be maintained
(main request):

1. A cooling apparatus for hot rolled steel strip comprising:
2. top surface cooling means (4b) to be provided above a hot rolled steel strip (9),
3. transferred with transfer rollers (7) after hot rolling to cool the top surface of the hot rolled steel strip (9); and
4. bottom surface cooling means (4a) to be provided below the hot rolled steel strip (9) to cool the bottom surface of the hot rolled steel strip (9),
5. each of the top surface cooling means (4b) and the bottom surface cooling means (4a) comprising:
a protective member (10a, 10b) disposed close to the surface of the hot rolled steel strip (9), having at least one cooling water passage hole (11),
5a defining a path for draining cooling water;
6. at least one cooling water header (12a, 12b) opposing the hot rolled steel strip (9) separated by the protective member (10a, 10b); and
7. cooling water jetting nozzles (15) protruding from the cooling water header (12a, 12b) and adapted to jet cooling water approximately vertically toward the surface of the hot rolled steel strip (9) through the cooling water passage hole(s) (11),
wherein the tips (16) of the cooling water jetting nozzles (15) are disposed farther from the hot rolled steel strip (9) than the surface, opposing the hot rolled steel strip (9), of the protective member (10a, 10b).

The Board will also refer to this numbering.

V. *Auxiliary requests 1 to 4 filed with letter of 9 September 2015, and auxiliary request 5 submitted during the oral proceedings.*

Claim 1 according to auxiliary request 1 comprises an amendment to the final feature (7), specifying "such that the cooling water passage hole(s) (11) function(s) as jetting hole(s) of cooling water and as drain hole(s) of jetted cooling water".

In claim 1 according to auxiliary request 2, feature 6 is amended to define the additional requirement "such that a space is formed between the protective member (10a, 10b) and the cooling water header (12a, 12b) for draining cooling water drained through the cooling water passage hole(s) into that space"

Claim 1 according to auxiliary request 3 comprises the amendments made in auxiliary requests 1 and 2 plus the feature:

"wherein the cooling water jetting nozzles (15) are laminar nozzles having cylindrical cooling water jetting outlets to produce a cylindrical laminar flow of the jetted cooling water"

Claim 1 of auxiliary request 4 is as for auxiliary request 3, but with the additional feature:

"wherein the protective member (10a, 10b) is a flat plate having a thickness of 5mm or more"

Claim 1 of auxiliary request 5 is a combination of claim 1 of the main request and claim 3 as granted.

The arguments of the parties relevant to the decision can be summarised as follows:

VI. *Appellant's case*

a) *Main request*

Added subject-matter, Article 123(2), (3) EPC

Feature 5a: "defining a path for draining cooling water", introduced into claim 1 during the opposition proceedings, was not originally disclosed. In particular, it is not clear from the passage in paragraph [0043] of the patent, which describes three possible "paths", in which direction the water flows through the cooling water passage holes 11. The specification of only one of these paths in the claim constitutes an intermediate generalisation. Further, this passage only refers to the bottom cooling means and cannot be the basis for the disclosure of feature 5a with respect to the top cooling means.

In paragraph [0050], referring to the top side of the strip, it is stated that: "Therefore, the cooling water that is not drained from the space between the steel strip 9 and the protective members 10b flows into the space between the protective members 10b and the cooling water headers 12b from below the protective members 10b through the cooling water passage holes 11." However, it is also not clear from this passage whether water flows out on the opposite side of the strip.

Furthermore, the term "path" cannot be used in connection with the top side arrangement since it was not used in the relevant part of the original description in this context.

Sufficiency of disclosure, Article 83 EPC

It is questionable whether feature 5a can be realised in practice, since the cooling water jetting nozzles are placed in the water passage holes 11; the alleged drainage water must therefore somehow get past the much stronger flow coming out of the nozzles.

Moreover, this feature applies to both the top and bottom cooling means, and it is clear that the way by which cooling water drains from the bottom cooling means must differ from the way it does from the top cooling means. In the case of the bottom cooling means it could be accepted that, through the action of gravity, a certain amount of water might work its way back through the water passage holes 11.

However, this will not occur in the case of the top cooling means where gravity actually works against any flow up and back through the water passage holes. The patent provides no explanation as to how water can actually flow upwards and back out of the cooling water passage holes in the upper protective member.

The respondent's explanation, shown in Appendix A filed with its letter of 16 July 2012 and Annex 2, submitted during the oral proceedings, as to how this is achieved, is not credible since it depicts an ideal stationary situation. However, this is not the case; the steel strip is moving at speed and is at an extremely high temperature such that a large amount of

the cooling water is immediately vaporised, causing a great amount of turbulence which would disrupt the creation of any "virtual walls" between the nozzles, as had been suggested by the respondent. No dimensions are indicated in the diagrams shown in Appendix A and Annex 2. Moreover, the patent application provides no detailed information on how the water jet nozzles and the water passage holes must be dimensioned such that a drainage effect is obtained with the top cooling means. Hence, the skilled person is not given the necessary information to carry out the invention.

b) Auxiliary requests, Admissibility, Article 83 EPC

None of the auxiliary requests should be admitted since they are all late filed, particularly auxiliary request 5, which was only submitted during the oral proceedings. In any case none of these requests overcome the problems identified under Article 83 EPC, since all comprise feature 5a. The additional features introduced do nothing to alter the fundamental objections already raised.

VII. Respondent's case

a) Main request

Added subject-matter, Article 123(2), (3) EPC

As reasoned by the opposition division in its decision (see paragraph 5.1), feature 5a is disclosed, for both the top and bottom cooling means, at col. 8, lines 9 to 11 of the published application.

Further, support can be found at col. 11, lines 3 to 13 of the published application. This passage defines

three possible paths for draining the cooling water jetted from the cooling water jetting nozzles 15. The cooling water passage holes are defined in sub-item (iii) as forming one of these paths. The above cited passage relates to the bottom surface cooling means 4a. The effect of the arrangement of the tips of the cooling water jetting nozzles inside the cooling water passage holes is further explained in col. 12, lines 32 to 35:

"In the bottom surface cooling means, the cooling water jetted to the steel strip 9 flows down due to gravity through the cooling water passage holes 11 in the protective members 10a."

At col. 12, lines 35 to 43 of the published application the draining function with respect to the top cooling means is explained:

"On the other hand, in the top surface cooling means, the majority of the jetted cooling water is drained from both edges in the width direction. Therefore, the cooling water that is not drained from the space between the steel strip 9 and the protective members 10b flows into the space between the protective members 10b and the cooling water headers 12b from below the protective members 10b *through the cooling water passage holes 11.*"

The effects of this arrangement for the top and bottom cooling are described at col. 12, lines 43 to 49 and col. 11, lines 18 to 41. Thus, for the top surface cooling means:

"Consequently, the tips 16 of the cooling water jetting nozzles 15 are preferably disposed inside the cooling

water passage holes 11 so that the flow of the cooling water jetted from the cooling water jetting nozzles 15 is not affected by the drained water flowing toward both edges in the width direction in the space above the protective members 10b."

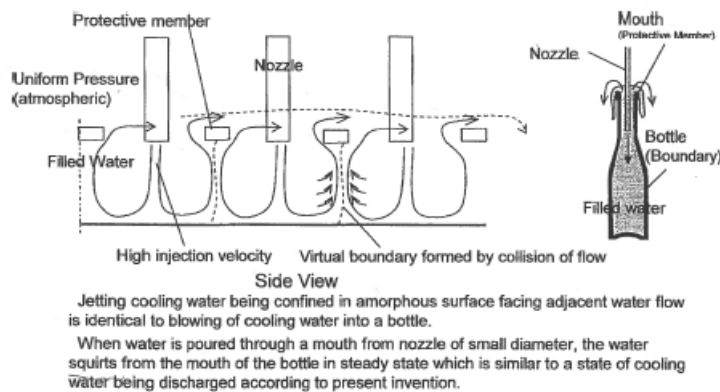
Thus, the feature of each of the top surface cooling means and the bottom surface cooling means having at least one cooling water passage hole defining a path for draining cooling water is disclosed in the application as originally filed.

Sufficiency of disclosure, Article 83 EPC

The invention is also disclosed in a manner sufficiently clear and complete for it to be carried out by the skilled person. Firstly, the act of "draining" is not limited to the flow of liquid under gravity. Appendix A, filed with letter of 16 July 2012, and Annex 2, filed during the oral proceedings and which is reproduced below, show how cooling water jetted from the nozzles strikes the strip to be cooled and is then recirculated upwards and back through the water passage holes. This flow pattern is created by the water jet impinging on the strip, spreading outwardly and then upwardly as it comes into contact with water spreading out from an adjacent nozzle. This collision of cooling water between the adjacent nozzles creates a series of "virtual walls" defining distinct cells of recirculating water in the manner of a series of bottles. The water that has flowed back up through the water passage holes then drains out of the space between the protective members and the cooling water headers.

Figure 8A of the patent shows a typical layout of the nozzle array in slit shaped water passage holes, and the example given at col. 13, line 38 to col. 14, line 52 of the application, provides all the necessary dimensions. It would not be an undue burden for the skilled person to dimension an arrangement in which the recirculation patterns shown in Appendix A and Annex 2 are obtained for the top cooling means and successful drainage in a vertical direction through the water passage holes is obtained.

Annex 2



b) *Auxiliary requests, Admissibility, Article 83 EPC*

All the auxiliary requests should be admitted. Auxiliary requests 1 to 4 were filed in response to the board's preliminary opinion, and auxiliary request 5 was submitted as a result of the discussions concerning Article 83 EPC during the oral proceedings.

The additional features specified in each of the auxiliary requests further clarify how the cooling means should be constructed.

Reasons for the Decision

1. *Main request, claim 1: Added subject-matter, Extent of protection, Articles 123(2) and (3) EPC*

1.1 The subject-matter of claim 1 in the version which the opposition division considered could be maintained differs from that of claim 1 as granted by the introduction of feature 5a, which further specifies the water passage hole(s) as "defining a path for draining cooling water".

1.2 The board agrees with the opposition division (see paragraph 5.1 of the contested decision) that this is directly and unambiguously disclosed, for both the top and bottom cooling means, at col. 8, lines 9 to 11 of the published application where it is stated that:

"The cooling water passage holes in the protective members function not only as jetting holes of cooling water and but (sic) as drain holes of jetted cooling water".

1.3 Further, support can be found for water passage holes of the bottom cooling means to function as drain holes at col. 11, lines 3 to 13 of the published application. This passage defines three possible paths for draining the cooling water jetted from the cooling water jetting nozzles 15. The cooling water passage holes are defined in sub-item (iii) as forming one of these paths. The effect of the arrangement of the tips of the cooling

water jetting nozzles inside the cooling water passage holes is further explained in col. 12, lines 32 to 35:

"In the bottom surface cooling means, the cooling water jetted to the steel strip 9 flows down due to gravity through the cooling water passage holes 11 in the protective members 10a."

- 1.4 Additional support for the draining function with respect to the top cooling means is given at col. 12, lines 35 to 43 of the published application where it is explained that:

"On the other hand, in the top surface cooling means, the majority of the jetted cooling water is drained from both edges in the width direction. Therefore, the cooling water that is not drained from the space between the steel strip 9 and the protective members 10b flows into the space between the protective members 10b and the cooling water headers 12b from below the protective members 10b *through the cooling water passage holes 11.*" (Emphasis added).

- 1.5 The appellant has argued that Article 123(2) is infringed since it is not possible to take just one of the drainage paths in isolation out of the three paths specified in the passage at col. 11, lines 3 to 13 of the application as published, since this would result in an intermediate generalisation. However, the board agrees with the opposition division that it would be self-evident to the skilled person that water will also drain along the two other paths, namely:

(i) towards both edges in the width direction of the space between the protective members 10a and the steel strip 9; and

(ii) into the space between the protective members 10a and the transfer rollers 7.

Hence, the requirements of Article 123(2) EPC are met.

1.6 *Article 123(3) EPC*

Since feature 5a imposes a further requirement on the characteristics of the water passage holes it also narrows the scope of the claim. Hence, the requirements of Article 123(3) EPC are also fulfilled.

2. *Main request, claim 1: Sufficiency of disclosure, Article 83 EPC*

2.1 Although it is originally disclosed that each of the top and bottom protective member has at least one cooling water passage hole defining a path for draining water, the board considers that, in the case of the top cooling means at least, the patent application does not disclose this characteristic in a manner sufficiently clear and complete for it to be carried out by the skilled person.

2.2 It is evident that the way in which water drains from the top cooling means will differ from the way it does from bottom cooling means, since water jetted from the top cooling means, cannot "drain" back up through the cooling water passage holes by the action of gravity as it can in the bottom cooling means. In this respect, the board agrees with the respondent that the term "draining" should not be limited to flowing under gravity, but rather to meaning any flow whereby cooling water is removed away from the strip after impinging upon it.

Therefore, in the case of the top cooling means, there must be a particular arrangement which allows or causes the jetted water not only to flow back up through the water passage holes in the opposite direction to that of the water leaving the nozzles, but which also prevents water that has flown back up from then draining back down through the water passage holes.

- 2.3 With reference to Appendix A and Annex 2 the respondent has explained how recirculation of the cooling water could be achieved through the creation of a series of "virtual walls" of standing water surrounding each of the outlet nozzles.

Firstly, it must be noted that no such explanation appears in the application and that it does not apply in the case of a single nozzle, which is nevertheless comprised in the subject-matter of claim 1.

Secondly, the board considers it would not be immediately obvious to a skilled person that a stable series of recirculating flow-paths could be created, as envisaged by the respondent, since the strip is at an extremely high temperature and moving at high speed (e. g. 850°C and 700 mpm - see paragraph [0055] of the published patent). As explained by the appellant, a large amount of turbulence is created by the movement of the strip and the generation of steam, which would work against the creation of stable recirculation cells, as was argued by the appellant.

- 2.4 Moreover, even if the skilled person accepted that such a phenomenon is plausible, he would be aware that in the field of fluid dynamics the creation of particular flow patterns is extremely sensitive to small changes in system parameters. Hence, it would be apparent that

the flows shown in Appendix A and Annex 2 would only occur for certain ranges of parameters relating to the cooling water flow rate and the configuration of the cooling means; of particular relevance are the relative dimensions of the jetting nozzles to the water passage holes.

- 2.5 The application itself indicates in several places that the area dimension of the cooling water passage holes should be determined, but fails at any point to say how this is done. For example, with respect to the top cooling means, col. 12, lines 22 to 26 merely states that "The area dimension of the cooling water passage holes 11 of the protective members 10b is also determined in view of the number and position of the guide rollers 14 and the space between the guide rollers 14 and the steel strip 9".

At col. 8, lines 42 to 47 a general statement is made to the effect that "The orifices of the slit shaped cooling water passage holes 11 are preferably as large as possible to drain jetted cooling water, but larger orifices cause collision of the leading end of the steel strip 9 with the slit edge resulting in seizing and damage". However, any precise indication as to what dimensions the slits should have is not given. The only plan view of a nozzle layout is illustrated in figure 8A of the application, which refers to the bottom cooling means. It is not possible to deduce any dimensions from this figure.

- 2.6 The single example of the invention given in the application at column 14, lines 23 to 52 with reference to figure 13 specifies constructional details of the top surface cooling means. In this embodiment, cooling water jetting nozzles with a diameter of 5mm are

described as being placed in an array with a pitch of 30mm in both the width and the longitudinal directions. However, no dimensions are given for the area of the cooling water passage holes, nor even what shape these should be. Paragraph [0028] of the application, suggests various alternatives such as a flat plate having slits, a group of bars disposed in parallel, a grid or an expanded metal (see figures 7A to 7D).

2.7 In conclusion, the requirements of Article 83 EPC are not met since the patent application does not disclose how the relative dimensions of the cooling water passage hole(s) and the water jetting nozzles in the top cooling means should be determined in a manner sufficiently clear and complete for the skilled person to construct an arrangement in which the cooling water passage hole(s) define a path for draining cooling water.

3. *Auxiliary requests 1 to 4*

The subject-matter of claim 1 of all these requests still comprises feature 5a. The additional features introduced into claim 1 of these requests do not help overcome the fundamental objection concerning the water passage hole(s) of the top cooling means defining a drain path raised against the main request.

In conclusion, the same arguments apply and the requirements of Article 83 EPC are not met.

4. *Auxiliary request 5*

Auxiliary request 5 filed during the oral proceedings also comprises feature 5a. Hence, prima facie it does

not meet the requirements for sufficiency of disclosure under Article 83 EPC. Consequently, it was not admitted into the proceedings.

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:



P. Martorana

G. Ashley

Decision electronically authenticated