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**Datasheet for the decision
of 18 November 2021**

Case Number: T 1205/15 - 3.2.03

Application Number: 05822734.9

Publication Number: 1908535

IPC: B21B45/02

Language of the proceedings: EN

Title of invention:

COOLING DEVICE FOR THICK STEEL PLATE

Patent Proprietor:

Nippon Steel & Sumitomo Metal Corporation

Opponent:

SMS group GmbH

Headword:

Relevant legal provisions:

EPC Art. 100(a), 56
RPBA Art. 13
RPBA 2020 Art. 25(3)

Keyword:

Inventive step - (yes)

Late-filed document - admitted (yes)

Decisions cited:

Catchword:



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Case Number: T 1205/15 - 3.2.03

D E C I S I O N
of Technical Board of Appeal 3.2.03
of 18 November 2021

Appellant: SMS group GmbH
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted on 14 April 2015 rejecting the opposition filed against European patent No. 1908535 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman C. Herberhold
Members: R. Baltanás y Jorge
E. Kossonakou

Summary of Facts and Submissions

- I. European patent No. 1 908 535 relates to a "*cooling device for thick steel plate*".
- II. An opposition which was based on Article 100(b) EPC and Article 100(a) EPC together with Articles 54 and 56 EPC was filed against the patent.
- III. The appeal lies from the decision of the opposition division to reject the opposition.

The opponent (hereinafter: "appellant") filed an appeal against the above-mentioned decision.

- IV. Requests

The appellant requested that the decision under appeal be set aside and the patent be revoked.

The respondent (patent proprietor) requested that the appeal be dismissed.

- V. The Board informed the parties of its preliminary opinion on the case in a communication annexed to the summons dated 25 September 2019.

- VI. Claim 1 as granted, including the numbering of its features as adopted by the parties, reads as follows:

- a) *A cooling apparatus of thick-gauge steel plate*
- b) *having a plurality of pairs of constraining rolls (5₁, 5₂), each comprising a top roll (5a) and*

bottom roll (5b), constraining and conveying hot rolled thick-gauge steel plate (6),

- c)** *and a plurality of spray nozzles (7, 8) spraying water on the top and bottom surfaces of the thick-gauge steel plate conveyed between the adjoining pairs of constraining rolls (5₁, 5₂) before and after each other in the conveyance direction,*
- d)** *said plurality of spray nozzles being arranged in such way that:*
 - d1)** *the sum of the areas of the impact surfaces of the water sprays (7a) from the top surface side spray nozzles (7) on a spray impact part at the surface of the thick-gauge steel plate (6) is in the range of 4 to 90% of the surface area of the steel plate defined by the width (w) of the steel plate and the closest distance (La) of the roll outer circumferences of the pairs of constraining rolls (5a),*
 - d2)** *the sum of the areas of the impact surfaces of the water sprays (8a) from the bottom surface side spray nozzles (8) on a spray impact part at the surface of the thick-gauge steel plate (6) is in the range of 4 to 100% of the surface area of the steel plate defined by the width (w) of the steel plate and the closest distance (La) of the roll outer circumferences of the pairs of constraining rolls (5b), and*
 - d3)** *the impact surfaces of the water sprays from the spray nozzles (7₁, 7₂, 7₃, 7₄,) adjoining each other at the top surface in the conveyance direction with the top surface of the thick-gauge steel plate (6) do not directly interfere,*
- e)** *said cooling apparatus of thick-gauge steel plate characterized in that,*

- e2)** *when projecting the water sprays (7a, 8a) from the spray nozzles (7, 8) adjoining each other in the conveyance direction from the conveyance direction on a vertical surface perpendicular to the conveyance direction of the thick-gauge steel sheet (6), the impact surfaces of the water sprays adjoining each other in the conveyance direction overlap by about 10 to 70% of the area of the impact surfaces in the width direction of the surface of the thick-gauge steel plate (6),*
- e1)** *wherein said spray impact part is defined as a part where the impact pressure of water spray is 2 KPa or more.*

Dependent claims 2 to 4 concern preferred embodiments of the cooling apparatus of claim 1.

VII. State of the art

The following documents have been cited, both in the grounds of appeal and during the opposition proceedings, and are relevant to this decision:

- E2: JP 2004 34109 A
E2a: German translation of E2
E5: DE 1 508 432
E8: JP 2004 001082
E8a: English translation of E8

VIII. Other submissions

The respondent included the following figure in its letter of 15 January 2020:

Fig. A: Drawing based on Figures 2 and 6 of E2

IX. The appellant's arguments can be summarised as follows:

Admittance of Fig. A

Fig. A should not be taken into consideration by the Board since it was not apparent that it corresponded to information disclosed in E2 or to a combination of its Figures 2 and 6, but instead appeared to be a photo-montage.

Inventive step

The claimed invention was obvious when starting from document E8 and combining it with the teaching of either E2 or E5.

Claim 1 differed from E8 only in feature e2) (see point VI above).

The skilled person trying to put into practice the cooling apparatus of E8 would take into consideration document E2, since it likewise aimed at achieving uniform cooling. E2 disclosed that a minimum impact pressure of 4.9 KPa must be ensured in order to break through the water pool above the steel plate (see paragraphs [0021] to [0024]), and that the nozzles were to be arranged in a pattern forming equilateral triangles defined by the spray areas (see Figures 2 and 3 and section c) of paragraph [0022]). Even if the circles of Figure 2 did not correspond to the precise spray areas, the claimed range of feature e2) was so broad that the resulting device would still fall within the claimed overlap. Fig. A merely confirmed the presence of an overlap in the sense of feature e2) in E2.

The skilled person starting from E8 would also consider E5, since the same technical effects concerning evaporation of cooling water and formation of a water pool on the plate occurred in the cooling of non-ferrous metallic plates disclosed in E5. The requirements of the process were the same, even if the working temperatures differed. E5 disclosed the arrangement of nozzles such that an overlap as in feature e2) was provided, given the broad range claimed (see Figures 1 and 2, region 46).

- X. The respondent's arguments can be summarised as follows:

Admittance of Fig. A

Fig. A was not a new prior art document, but a mere graphical representation of the information contained in Figures 2 and 6 of E2, which had been superposed. Thus it should be admitted, since it formed part of an earlier argument explaining the content of E2.

Inventive step

Document E8 did not disclose features d1), d2), d3), e1) and e2).

Feature e2) must be understood as defining an overlap of the impact surfaces of the water sprays at impact parts where the impact pressure of water spray was 2 KPa or more, as in features d1) and d2). Any ambiguity in this respect must be attributed to a translation error.

Feature e2) was clear in that the overlap to be considered was that of the impact surfaces of the water sprays adjoining each other in the conveyance direction, as also shown in Figure 4 of the patent.

Document E2 merely disclosed a high impact pressure directly below the nozzles (see e.g. claim 1), but not in an overlap zone of water sprays adjoining each other in the conveyance direction. The pressure distribution represented in Figure 6 showed that the pressure in the immediate vicinity of the vertical projection of the nozzles was lower than 2 KPa. Given that the nozzles were at a substantial distance from each other (see Figure 2), no overlap as defined in feature e2) could be observed, as illustrated by Fig. A. The honeycomb pattern shown in Figure 3 did not represent the water sprays but was created by the water flow on the sheet when applying the high-impact-pressure jet on the pooled water directly below the nozzle (see Figure 3, and paragraphs [0021] and [0022]). The corresponding spray pattern of each nozzle itself was narrow, as shown in Figure 6, there thus being no overlap in the sense of feature e2). Therefore the skilled person would not arrive at the claimed invention even by combining the teaching of E2 with E8.

E5 would not have been considered by the skilled person when improving a cooling apparatus for cooling thick-gauge steel plates as in E8, given the different field of application. E5 only concerned non-ferrous materials with a temperature and heat capacity very different from that of steel plates. These different physical characteristics resulted in different requirements, as shown by the low flows used, which hinted at low impact pressures (see last paragraph of page 14). Moreover, Figures 1 and 2 of E5 were merely of a schematic nature

(see page 9, third paragraph), which did not allow any conclusions to be drawn about any overlap of adjoining sprays, in particular in connection with the claimed impact pressures above 2 KPa.

Reasons for the Decision

1. Admittance of Fig. A - Article 13 RPBA 2007

The Board agrees with the respondent that Fig. A - filed in reply to the preliminary opinion of the Board - is essentially an overlap of Figures 2 and 6 of E2. Even if some reference lines and a translation of Japanese terms have been added in Fig. A with respect to Figures 2 and 6 of E2, this does not result in new information which goes beyond what could be argued when interpreting E2 on its own.

Fig. A thus merely renders clearer the explanation of an argument that had been provided earlier in written form on the basis of Figures 2 and 6 and their description, and does not represent any new piece of prior art.

The Board thus sees no reason to hold Fig. A inadmissible under Article 13 RPBA 2007, which is to be applied according to Article 25(3) RPBA 2020, since the communication containing the preliminary opinion of the Board was sent before 1 January 2020.

2. Inventive step

2.1 Closest prior art - E8

It is common ground among the parties that document E8 can be regarded as the closest prior art.

The Board agrees that E8 represents a suitable starting point for assessing inventive step, since it concerns a cooling apparatus of thick-gauge steel plates comprising constraining rolls, and spray nozzles, arranged above and below the steel plate, as in claim 1.

2.2 Differentiating feature

The Board further agrees with the parties that at least feature e2) is not disclosed in E8.

Feature e2) defines that "when projecting the water sprays from the spray nozzles adjoining each other in the conveyance direction from the conveyance direction on a vertical surface perpendicular to the conveyance direction of the thick-gauge steel sheet, the impact surfaces of the water sprays adjoining each other in the conveyance direction overlap by about 10 to 70% of the area of the impact surfaces in the width direction of the surface of the thick-gauge steel plate".

2.3 Interpretation of feature e2)

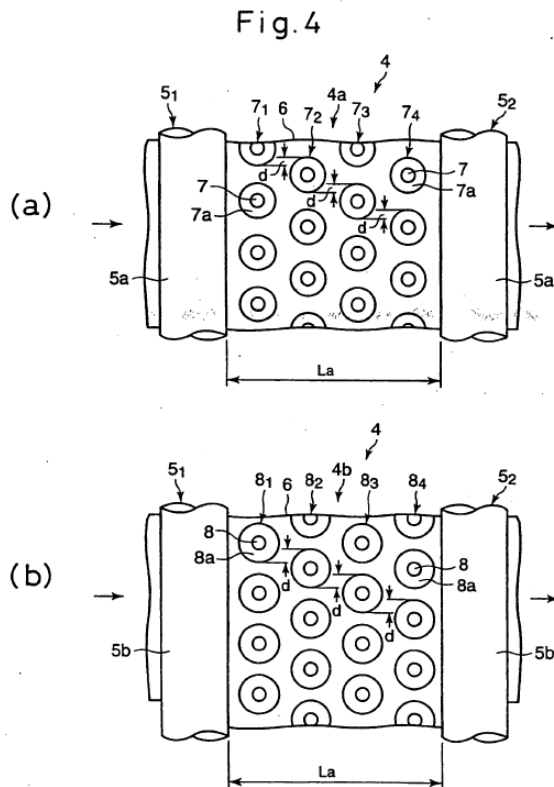
2.3.1 The Board agrees with the respondent that the "overlap" in feature e2) must be interpreted as referring to the overlap of the water impact surfaces (which uncontestedly are to be understood as the surfaces where the impact pressure of the water spray is 2 KPa

or more) created by adjoining spray nozzles in the conveyance direction, i.e. by nozzles consecutively arranged in the conveyance direction.

- 2.3.2 This is the only possible way of interpreting feature e2), both from a literal point of view such that it makes technical sense and also taking into account the description.

The feature in a first part defines the **nozzles** which are to be considered: "*when projecting the water sprays from the spray nozzles **adjoining each other in the conveyance direction***" (emphasis added). Then, in a second part, it defines the **water sprays** which are to be considered for defining the overlap, which correspond to the nozzles previously defined: "*the impact surfaces of the water sprays **adjoining each other in the conveyance direction***" (emphasis added).

- 2.3.3 Even if the skilled person was in doubt about the meaning of the claimed overlap when reading the features "*when projecting the water sprays ... from the conveyance direction on a vertical surface perpendicular to the conveyance direction of the thick-gauge steel sheet*", they would find a consistent explanation in the patent specification, in particular in Figure 4 (reproduced below), where the claimed overlap between impact surfaces of adjoining water sprays is represented as "d" and the conveyance direction is indicated by arrows on the left and right sides of the device.



2.4 Technical effect and objective technical problem

The technical effect of differentiating feature e2) is that the whole width of the steel plate in a direction perpendicular to the conveyance direction is impacted by at least one water spray.

The objective technical problem provided by the appellant (achieving uniform cooling) thus seems to be correct. The respondent has not contested this.

2.5 Combination with E2

2.5.1 The appellant argued that E2 would be consulted by the skilled person, since it addresses the same technical problem in the same technical field (see E2a, paragraph [0023]).

2.5.2 E2 proposes solving the problem posed by providing openings (4) in a plate (3) which can create an impact pressure of at least 4.9 KPa at a position directly below the openings (4) (see paragraph [0023] and claim 1 of E2a). By creating such a pressure it is ensured that the fresh water flowing from each opening (4) circulates along the steel plate and in contact with it, creating a honeycomb pattern by the interference of the water flows coming from neighbouring openings (4) (see Figure 3 and point c) of paragraph [0022] of E2a).

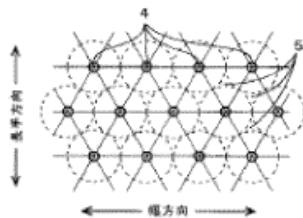
In order to ensure such an impact pressure directly below the openings (4), E2 teaches that a certain length (L) of the opening (4) has to be provided to avoid a non-laminar flow of the water spray, such that the thick water pool above the steel plate can be broken through (see Figure 4 and paragraphs [0026] to [0030] of E2a). Figure 4b shows the narrow water spray pattern produced by the openings (4) of the resulting device providing the intended advantage in E2. This confirms that the dotted circles in Figure 2 do not correspond to the spray pattern produced by the openings (4), but rather show the outward flow of the cooling water on the plate, see last sentence of paragraph [0006] of E2a.

2.5.3 However, even if the skilled person considered implementing the openings (4) of E2 in the device of E8, the resulting cooling apparatus would not exhibit feature e2), since the narrow water spray impact surfaces produced by the openings (4) would not produce an overlap in the sense of feature e2). This can be ascertained from E2, Figure 4b (showing the narrow diameter of the impact surface, which is quite close to that of the opening (4)) in combination with Figure 6

(indirectly disclosing where the impact of the water spray from two neighbouring openings (4) actually takes place) and with Figures 2 and 3 (disclosing the distance between openings (4) and their position with respect to the conveying direction). This is exactly what the respondent had illustrated in Fig. A.

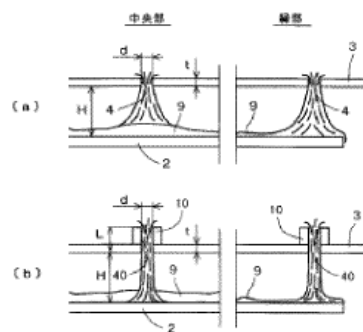
Figures 2, 4 and 6 of **E2a** are reproduced below for convenience.

[Figur 2]



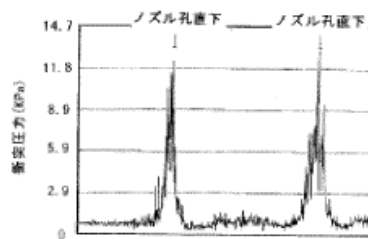
Y-Achse: Längenrichtung, X-Achse: Breitenrichtung

[Figur 4]



Links: Zentrum; rechts: Randteil

[Figur 6]



Y-Achse: Aufpralldruck (kPa), oben: direkt unter der Düsenöffnung (2x)

2.5.4 In view of the above, it has to be concluded that the impact surfaces of the water sprays adjoining each other in the conveyance direction do not overlap when projected in the conveyance direction on a vertical surface perpendicular to the conveyance direction. Thus combining E8 with the teaching of E2 does not render feature e2) obvious.

2.6 Combination with E5

2.6.1 The Board shares the view of the respondent that the skilled person wishing to increase uniformity of cooling in the cooling apparatus for thick-gauge steel plates of E8 would not consider document E5, which deals with materials of a different nature using other apparatuses.

2.6.2 E5 concerns exclusively the cooling of non-ferrous metallic materials (see page 1, last paragraph). Such non-ferrous metallic materials have different starting temperatures and heat capacities from steel, and the features of the cooling process are also different, given the specific requirements of the final product in each case. Moreover, the apparatus of E5 cannot be considered as an analogous apparatus to that of E8 from a constructional point of view: no double pair of constraining rolls can be ascertained (see Figures 1, 8 and 9), those rolls producing the typical water pool in the device of E8. Since no water pool is present in E5, the skilled person would be aware of the different nature and underlying principles of the two cooling devices.

2.6.3 The skilled person would thus not consider E5 as being relevant to the technical field of cooling a thick-gauge steel plate in a device such as that of E8, in particular in view of reaching more uniform cooling in a cooling apparatus having pooled water - a situation which is not present in the D5 device.

2.6.4 Even if they did, the schematic nature of the figures of E5 would not allow the skilled person to draw any conclusion about an overlap of the water sprays in the sense of claim 1 (see Figure 2 and corresponding

description in the penultimate paragraph of page 9), not to mention that no advantage or effect linked to such an overlap which might motivate the skilled person to try a combination of the features allegedly disclosed is disclosed in E5.

2.6.5 For these reasons, the subject-matter of feature e2) is not rendered obvious by a combination of E8 with E5.

3. Conclusion

None of the proposed combinations of documents renders the subject-matter of claim 1 obvious.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



C. Spira

C. Herberhold

Decision electronically authenticated