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**Datasheet for the decision
of 25 July 2024**

Case Number: T 0507/22 - 3.2.03

Application Number: 14762821.8

Publication Number: 2974810

IPC: B22D7/00, B22D9/00, B22D11/128,
B22D11/041, B22D11/115,
B22D11/12, B22D11/14

Language of the proceedings: EN

Title of invention:
CASTING EQUIPMENT AND CASTING METHOD USING SAME

Patent Proprietor:
Posco

Opponent:
DANIELI & C.
OFFICINE MECCANICHE SpA

Headword:

Relevant legal provisions:
EPC Art. 54, 84, 83, 123(2), 56

Keyword:

Novelty - main request (no) - auxiliary request (yes)
Claims - clarity - auxiliary request (no) - clarity after
amendment (yes)
Sufficiency of disclosure - (yes)
Amendments - extension beyond the content of the application
as filed (no)
Inventive step - (yes) - non-obvious solution

Decisions cited:

T 0962/98, T 1920/06, G 0003/14

Catchword:



Beschwerdekammern

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Case Number: T 0507/22 - 3.2.03

D E C I S I O N
of Technical Board of Appeal 3.2.03
of 25 July 2024

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Decision under appeal: **Interlocutory decision of the Opposition
Division of the European Patent Office posted on
13 December 2021 concerning maintenance of the
European Patent No. 2974810 in amended form.**

Composition of the Board:

Chairman C. Herberhold
Members: B. Miller
D. Prietzel-Funk

Summary of Facts and Submissions

- I. European patent No. 2 974 810 B1 ("the patent") relates to casting equipment and a casting method using the same for producing a thick steel slab.
- II. An opposition against the patent was filed on the grounds of Article 100(b) and (c) EPC and Article 100(a) EPC together with Articles 54 and 56 EPC.

In its interlocutory decision the opposition division decided that

- the grounds for opposition under Article 100(b) and (c) EPC did not prejudice maintenance of the patent as granted
 - the subject-matter of claim 11 as granted did not meet the requirements of Article 54 EPC
 - the subject-matter of claim 10 of the first auxiliary request did not meet the requirements of Article 54 EPC
 - the subject-matter of claim 11 of the second auxiliary request did not meet the requirements of Article 84 EPC
 - the third auxiliary request submitted by letter dated 13 August 2021 as the sixth auxiliary request and renumbered during the oral proceedings before the opposition division met the requirements of the EPC.
- III. The interlocutory decision of the opposition division was appealed by both parties. As the patent proprietor and the opponent are both appellants and respondents in the appeal proceedings, for the sake of simplicity the

Board will continue to refer to the parties as the patent proprietor and the opponent.

- IV. The patent proprietor requested that the decision under appeal be set aside and that the patent be maintained as granted (main request).

Alternatively, it requested that the patent be maintained in amended form on the basis of

- the first or second auxiliary request as recited in the contested decision of the opposition division;
- the third to seventh auxiliary request as filed in the first-instance opposition proceedings. The numbering of the requests corresponds to the numbering introduced during the oral proceedings before the opposition division (see Section IX on page 2 of the contested decision).

It further requested that late-filed documents D8 and D9 not be admitted into the proceedings.

The opponent requested that the decision under appeal be set aside and the patent revoked. It further requested that late-filed documents D8 and D9 be admitted into the proceedings.

- V. Cited evidence

- (a) The following documents already submitted during the opposition proceedings are of particular importance for the appeal proceedings:

D1: KR 10-2011-0074153
D1a: machine translation of D1
D4: US 3,620,285
D6: KR 10-2012-0074370

D6a: machine translation of D6

(b) With the statement setting out the grounds of appeal, the opponent submitted the following further documents for the first time:

D8: JP 3630328 B1

D8a machine translation of D8

D9: US 7,735,544 B2

VI. Wording of the claims of the various requests at issue in this decision

(a) Main request (claims as granted)

Claim 1 including feature numbering as used by the parties reads:

F1.0 A casting installation (1) comprising
F1.1 a casting unit (1a) comprising an accommodation unit (100) configured to accommodate molten steel and solidify the molten steel,
F1.2 a drawing machine (200) configured to draw a slab downward from the accommodation unit (100), and
F1.3 a guide roll (170) configured to guide the slab, which is drawn from the accommodation unit (100) and solidified, to a lower side,
F1.4 the casting unit (1a) configured to cast the molten steel into the slab; and
F1.5 a solidification unit (1b) separated from the casting unit (1a) and disposed to be spaced apart from a side surface of the casting unit (1a),

- F1.6 the solidification unit (1b) receiving the slab cast in the casting unit (1a) to induce the solidification,
- F1.7 wherein the solidification unit (1b) comprising:
- F1.8 a support unit (500) disposed on at least any one place of sides of the slab to support the slab; and
- F1.9 a first quality controller (600) provided on an outside of the slab to induce solidification of the slab.

Claim 11 including feature numbering as used by the parties reads:

- F11.0 A casting method comprising:
- F11.1 providing molten steel to prepare casting;
- F11.2 casting the molten steel in a casting unit (1a) allowing a passage through which the molten steel passes to be opened or closed;
- F11.3 transferring a slab produced through the casting to a solidification unit (1b) that is separated from the casting unit (1a) and disposed to be spaced apart from a side surface of the casting unit (1a); and
- F11.4 transferring the slab, of which solidification is completed in the solidification unit (1b), to a post-process,
- F11.5 wherein the casting of the molten steel is repeated in the casting unit (1a) after transferring the slab to the solidification unit (1b).

(b) First auxiliary request

Claim 10 is identical to claim 11 as granted.

The wording of amended claim 1 is not relevant to the present decision.

(c) Second auxiliary request

Claim 1 is identical to claim 1 as granted.

Claim 11 is based on claim 11 as granted wherein the following feature F11.3a has been added between features F11.3 and F11.4:

F11.3a completing solidification of the slab and preventing pre-solidification of an upper portion of the slab to reduce formation of pipe through a first quality controller (600) that is provided in the solidification unit (1b); and

(d) Third auxiliary request (filed as the sixth auxiliary request during the opposition proceedings)

Claim 1 is based on claim 1 as granted wherein the following feature has been added:

F1.10 wherein the first quality controller (600) comprises:
a first stirrer (620) disposed in proximity to an outside of the slab and able to elevate in a longitudinal direction of the slab;
a second stirrer (640) provided spaced apart below the first stirrer (620) and able to

elevate in the longitudinal direction of the slab; and
a first heater (660) installed so as to be able to move forward and backward in a region directly above the slab and configured to heat an upper portion of the slab.

Claim 10 is based on claim 11 as granted wherein the following feature F11.3c has been added between features F11.3 and F11.4:

F11.3c completing solidification of the slab and preventing pre-solidification of an upper portion of the slab to reduce formation of pipe through a first quality controller (600) that is provided in the solidification unit (1b) and comprises:
a first stirrer (620) that is disposed in proximity to an outside of the slab and spaced apart at a predetermined distance from the slab, and that is configured to elevate in a longitudinal direction of the slab,
a second stirrer (640) that is provided spaced apart at a predetermined distance below the first stirrer (620) and configured to elevate in the longitudinal direction of the slab, and
a first heater (660) configured to heat an upper portion of the slab;
wherein unsolidified molten steel in the slab is stirred by the first stirrer (620), and by the second stirrer (640), and an upper portion of the slab in an outside of the slab is heated by the first heater (660), and...

The further auxiliary requests on file are not relevant to the present decision.

VII. The opponent and the patent proprietor supplemented their arguments with letters dated 13 June 2024 and 24 June 2024 respectively in preparation for the oral proceedings before the Board.

VIII. Oral proceedings were held on 25 July 2024.

At the end of the oral proceedings both parties maintained their requests as submitted in writing.

IX. The patent proprietor's arguments, as far as they are relevant to this decision, can be summarised as follows.

(a) Admittance of D8 and D9

The third auxiliary request had been filed on 13 August 2021 (filed as the sixth auxiliary request at the time) within the deadline for written submissions in first instance, and thus two months in advance of the oral proceedings before the department of first instance.

The claims in accordance with the third auxiliary request were not significantly altered compared with the granted claims. Claim 1 of the third auxiliary request was a combination of granted claims 1 and 2. The technical content of method claim 10 of the third auxiliary request reflected that of apparatus claim 1 of that request. A combination of features of claims as granted did not justify the need for a fresh prior-art search. The opponent had not identified in specific terms a new "interpretation or consideration" by the opposition division in the contested decision. Further,

the opponent had not explained how D8 and D9 addressed the alleged new "interpretation or consideration".

(b) Main request - novelty

Claim 11 defined in feature F11.3 that the solidification unit is "separated from the casting unit" and "disposed to be spaced apart from a side surface of the casting unit". Therefore it was clear to a person skilled in the art that the drawing device, which supported the slab in the casting unit, and the support unit, which supported the slab in the solidification unit, had to be separated/spaced apart from each other as well.

The casting process of D4 was based on a conceptually different approach ("container concept"), which did not show a distinct structural separation of a casting unit and a solidification unit as required by claim 11 ("slab concept"). The support units of D4 functioned as part of the casting unit during casting and as part of the solidification unit after casting.

Since the support units formed part of both the casting unit and the solidification unit, D4 failed to disclose *"a solidification unit that is separated from the casting unit and disposed to be spaced apart from a side surface of the casting unit"* in the sense of feature F11.3. Indeed, the word "transfer" in this feature required the slab to be taken out of the container, which was not the case in D4.

Consequently, D4 did not disclose that *"casting of the molten steel is repeated in the casting unit after transferring the slab to the solidification unit"* in the sense of feature F11.5.

(c) First auxiliary request - novelty

Claim 10 of the first auxiliary request was identical to that of claim 11 in accordance with the main request. The same reasons regarding novelty as outlined above for the main request applied to the subject-matter of claim 10 of the first auxiliary request.

(d) Second auxiliary request - clarity

Although amended claim 11 defined the desired result or function of *"completing solidification of the slab and preventing pre-solidification of an upper portion of the slab to reduce formation of pipe"*, claim 11 also defined the required means to achieve this result, namely through a first quality controller. The expression "first quality controller" was clear to a person skilled in the art of steel casting. Moreover, the person skilled in the art could consult the description of the patent in case of doubt about the meaning of the expression.

(e) Third auxiliary request - clarity

Amended claim 10 of the third auxiliary request was defined by further structural features to obtain the result: a first and a second stirrer in combination with a heater. The claim was thus in accordance with the requirements of Article 84 EPC.

The expressions "in proximity to", "spaced apart at a predetermined distance" and "in the longitudinal direction of the slab" introduced into claim 10 had been present in the same context in claims 1 and 2 as granted and were clear to the skilled person.

(f) Third auxiliary request - amendments

The amendments to the claims were based on the teaching of the application as originally filed, in particular on paragraphs [0012], [0015], [0039], [0043], [0062], [0063], [0065] and Figure 1 of the application.

(g) Third auxiliary request - sufficiency of disclosure

The opponent did not provide any arguments substantiated by verifiable facts as to why the skilled person was unable to reproduce a casting installation as illustrated by Figure 1. The function of the first quality controller was described in paragraphs [0055] to [0057] of the patent.

(h) Third auxiliary request - inventive step

Starting from D1, the skilled person was not motivated to consult D4 to improve the efficiency of the casting installation, since D4 disclosed a conceptually completely different approach for the casting apparatus and casting method from D1. These conceptual differences rendered a combination of D1 with D4 technically unfeasible.

Starting from D4, the skilled person had no motivation to install a heater and stirrers in the water spray area or directly on the moving support unit. This lacking motivation was not derivable from common general knowledge, D1 or D6 either.

Even if the skilled person starting from D4 considered D1 or D6, which disclosed a casting installation comprising heating elements and electromagnetic stirring means, it was not obvious to use this

equipment in the casting installation of D4, since it was technically not sensible or feasible to install a heater and stirrers in the water spray area or directly on the moving support unit of D4.

X. The opponent's arguments can be summarised as follows.

(a) Admittance of D8 and D9

The filing of D8 and D9 during the appeal proceedings was justified, since the opponent had been surprised during the first-instance proceedings that the opposition division considered the claims presented during the oral proceedings to be compliant with the requirements of the EPC. Moreover, both documents were *prima facie* highly relevant for assessing inventive step since they provided critical insights into the principles of semi-solid metal processing.

(b) Main request - novelty

D4 disclosed a casting process wherein molten steel was pulled down from the mold into the support unit. When the casting of the molten metal was complete, the cast slab moved together with the support unit from under the mold (the casting unit) toward a zone with a water spray area for further solidification (the solidification unit), which was spaced apart from the casting unit. Thus D4 disclosed a casting method in accordance with features F11.0 to F11.2 and F11.4.

Claim 11 defined the casting unit and the solidification unit by their functions. Claim 11 did not exclude that a support unit moved together with the slab and became part of a solidification unit and that

a further support unit was used for casting the next slab as in the method of D4.

Since the solidification according to D4 took place in an area next to the casting unit, the method of D4 complied with feature F11.3.

D4 disclosed that successive slabs were cast and moved aside for cooling. Therefore feature F11.5 was also complied with by D4.

(c) First auxiliary request - novelty

Claim 10 of the first auxiliary request was identical to that of granted claim 11 in accordance with the main request. The same reasons as outlined above with regard to novelty of the main request therefore applied to the subject-matter of claim 10 of the first auxiliary request.

(d) Second auxiliary request - clarity

The expression "first quality controller" in amended claim 11 was not clear to a person skilled in the art of steel casting. Claim 11 did not define what was meant by the expression "first quality controller" in the context of the associated desired result (*"completing solidification of the slab and preventing pre-solidification of an upper portion of the slab to reduce formation of pipe"*).

(e) Third auxiliary request - clarity

Like claim 11 of the second auxiliary request, claim 10 of the third auxiliary request was defined by the result to be achieved ("first quality controller").

Moreover, the expressions "in proximity to", "spaced apart at a predetermined distance" and "in the longitudinal direction of the slab" introduced into claim 10 had no well-defined meaning.

(f) Third auxiliary request - amendments

The following amendments in claim 1 extended beyond the teaching of the application:

- omission of cooling nozzle and vibrator in relation to the guide roll
- guide roll configured to guide the slab **to a lower side**
- omission of the second quality controller
- accommodation unit configured **to ... solidify molten steel**
- deletion of "defining a passage through which molten steel passes"
- solidification unit **being separated from the casting unit**
- solidification unit **... to induce the solidification**
- deletion of "disposed spaced apart from the casting unit"

Moreover, the amendments to claim 10 extended beyond the teaching of the application, since the third and fourth stirrers of the second quality controller had been omitted.

(g) Third auxiliary request - sufficiency of disclosure

The skilled person was unable to rework the invention, since the patent did not disclose features that would allow the first quality controller to induce solidification of the slab. Moreover, the skilled

person did not know how to interpret the expression "disposed to be spaced apart from a side surface of the casting unit" and thus was unable to rework the invention.

(h) Third auxiliary request - inventive step

Starting from D4, the objective technical problem to be solved by claim 10 could be formulated as how to provide a casting method which improved the quality of the cast steel.

It fell within the customary practice of the skilled person to supplement the casting installation of D4 with a conventional heater and stirrers such as also disclosed in D1 or D6 to improve the quality of the cast steel. Moreover, the skilled person faced no technical difficulties when installing a heater and stirrers in the water spray area of the casting installation of D4 or directly on the moving support units of D4.

The same argument applied with regard to claim 1.

Starting from D1, D4 motivated the skilled person to improve the productivity and efficiency of the casting installation of D1 by separating the casting unit and the solidification unit.

Reasons for the Decision

1. Admittance of D8 and D9

- 1.1 D8 and D9 were submitted for the first time in appeal proceedings with the statement setting out the grounds of appeal. They are used by the opponent for new objections of lack of inventive step starting from D1 and D4.

According to Article 12(4) and (6) RPBA, documents D8 and D9 and the objections based thereon may be admitted at the Board's discretion.

- 1.2 When exercising its discretion, the Board assesses whether a piece of evidence or objection should have been submitted already in the opposition proceedings and whether the evidence or objection in question can be considered an appropriate and immediate reaction to new developments at a late stage of the opposition proceedings.

- 1.3 The opponent explains that it was surprised by the opposition division's finding that the claims in accordance with the third auxiliary request met the requirements of the EPC.

However, the fact that objections were not found to be convincing is not a justification for filing a completely new line of attack based on new evidence in appeal in order to force a different conclusion.

In the annex to the summons to attend oral proceedings, the opposition division had already expressed its view

that it was not convinced by all the arguments and objections presented by the opponent.

It would thus indeed have been required of the opponent to submit all necessary further documents and appropriately substantiated additional objections already in the opposition proceedings.

- 1.4 The outcome of the opposition proceedings does not provide justification for filing D8 and D9 only in the appeal proceedings either.

The claims in accordance with the third auxiliary request were submitted on 13 August 2021, within the deadline for written submissions and two months before the oral proceedings during the opposition proceedings, in the form of the sixth auxiliary request. Hence the opponent was made aware of the features on which the patent proprietor intended to rely in defence of its patent well before the oral proceedings in opposition proceedings.

Moreover, the amendments to the independent claims are based in principle on the combination of features as defined in claims 1 and 2 as granted. Hence the amendments as such cannot come as a surprise to an opponent.

The further general statement of the opponent that the opposition division in its contested decision had adopted a new "interpretation or consideration" of D1 and D4 is unfounded since the opponent has not identified any new interpretation or consideration. Moreover, the opponent has not explained how D8 and D9 addressed the alleged "new interpretation or consideration".

- 1.5 Furthermore, the Board may consider the *prima facie* relevance of documents when exercising its discretion.

D8 relates to an extrusion process and thus to a completely different manufacturing concept from D1. Hence D8 would not be considered by the skilled person for modifying the casting apparatus of D1.

The opponent refers to the general statement on page 11, penultimate full paragraph of D8a concerning the transfer of a metal slurry from a first sleeve 21 to a second sleeve 22. However, no reason and no specific pointer in D8/D8a has been identified by the opponent as to why and how this teaching concerning a metal slurry and sleeves in D8/D8a in the context of an extrusion process would provide a motivation for the skilled person to modify the casting installation of D1. D8/D8a fails to disclose any structural elements that could be equated with components of the claimed solidification unit. Moreover, the sleeves 21, 22 disclosed in D8/D8a do not comprise a first and a second stirrer and a heater as required by claims 1 and 10 of the third auxiliary request. D8/D8a is thus not *prima facie* relevant to the present case.

D9 relates to a continuous strand casting apparatus and method. Although in D9 a metal slurry is handled and transferred, D9 relates to a fundamentally different concept for a casting installation and would not be considered for modifying the slab casting apparatus of D4.

In a continuous strand casting apparatus such as that disclosed in D9, differentiation between the casting

unit and solidification unit is problematic, if not impossible, since the solidification occurs continuously along the casting line.

Moreover, it is completely unclear why and how the elements of the continuous casting apparatus of D9 would be implemented in the casting installation of D4 comprising moving support units.

D9 is thus not *prima facie* relevant to the present case.

1.6 In view of the above, pursuant to Article 12(4) and (6) RPBA, second paragraph, the Board decided not to admit documents D8 and D9 and the new objections based thereon into the appeal proceedings.

2. Main request - novelty over D4

By reference to Figure 6, D4 discloses a casting installation and method wherein a slab is cast into a support unit which functions as a container.

During the casting process of D4, the support unit constitutes an essential part of the casting unit, since the molten steel is pulled down from the mold into the support unit (see col. 5, lines 27-30 of D4).

When the casting of the molten metal is complete, the slab has not yet cooled internally to a condition where it is self-supporting. Therefore the cast slab is moved together with the support unit from an area under the mold (the casting unit) toward a zone with a water spray area for further solidification (the solidification unit), which is spaced apart from the

casting unit (see col. 5, lines 31-36 and Figure 6 of D4).

In view of the above, it is undisputed that D4 discloses a casting method in accordance with features F11.0 to F11.2 and F11.4.

The patent proprietor argues that the subject-matter of claim 11 differs from the method of D4 by features F11.3 and F11.5 because of the "change of function" of the support unit when moving from the casting unit to the solidification unit. Contrary to the "container concept" disclosed in D4, the method of claim 11 addressed a "slab concept" and thus a completely different manufacturing concept.

The Board is not convinced by these arguments.

In line with the patent proprietor's argument (see paragraphs [0036] - [0039] of the statement setting out the grounds of appeal), the support unit of D4 is a structural entity that forms part of the casting unit during the casting process and changes its function to that of a solidification unit after the casting process.

The patent as a whole addresses a different manufacturing concept, as stated by the patent proprietor. However, the assessment of novelty is based on the wording of claim 11.

Claim 11 defines the casting unit and the solidification unit by their functions. It does not define a support unit. More particularly, claim 11 does not exclude that, upon transferring the slab from the casting unit to the solidification unit, a support unit

moves together with the slab from the casting unit and becomes part of a solidification unit and that a further support unit is used for casting the next slab as in the method of D4. There is no requirement in the claim for the slab to be separated from its support unit. Hence the features of claim 11 do not exclude the so-called "container concept" disclosed by D4.

Since the solidification takes place in an area next to the casting unit, the method of D4 complies with feature F11.3 (*"transferring a slab produced through the casting to a solidification unit (1b) that is separated from the casting unit (1a) and disposed to be spaced apart from a side surface of the casting unit (1a)"*).

D4 further discloses that successive slabs are cast and moved aside for cooling (see col. 5, lines 36-39 of D4 and Figures 5 and 6).

Therefore feature F11.5 (*"wherein the casting of the molten steel is repeated in the casting unit (1a) after transferring the slab to the solidification unit (1b)"*) is also disclosed by D4.

In view of the above, the Board concludes that the subject-matter of claim 11 lacks novelty over D4. It follows that the ground for opposition pursuant to Article 100(a) EPC in combination with Article 54 EPC prejudices maintenance of the patent as granted.

3. First auxiliary request - Article 54 EPC

Claim 10 is identical to claim 11 of the main request. Hence the same arguments as for the main request apply.

Claim 10 therefore lacks novelty for the same reasons as claim 11 as granted.

The first auxiliary request is therefore not allowable.

4. Second auxiliary request - Article 84 EPC

4.1 Claim 11 has been amended by introducing the following feature from the description:

"completing solidification of the slab and preventing pre-solidification of an upper portion of the slab to reduce formation of pipe through a first quality controller that is provided in the solidification unit (1b)".

4.2 This feature defines a result to be achieved (*"completing solidification of the slab and preventing pre-solidification of an upper portion of the slab to reduce formation of pipe"*). According to claim 11, this result is achieved through a first quality controller which is, however, not defined at all by further structural features. The patent proprietor has not demonstrated, and the Board is also not aware, that the expression "first quality controller" has a well-defined and commonly accepted meaning in the art.

4.3 According to established case law (see Case Law of the Boards of Appeal, 10th edition, 2022 ["Case Law"], Chapter II.A.3.4), characterisation of claimed subject-matter by a result to be achieved may only be allowed as long as the person skilled in the art knows, without exceeding their normal skills and knowledge, what they have to do in order to obtain said result.

4.4 Since claim 11 does not define what is meant by the expression "first quality controller", and in particular due to this vague expression does not clearly define the technical features required to reach the desired result, the scope of protection is unclearly defined, contrary to the requirements of Article 84 EPC.

The second auxiliary request is therefore not allowable.

5. Third auxiliary request - Article 84 EPC

5.1 The opponent states that claim 10 is likewise formulated by the result to be achieved, similarly to claim 11 of the second auxiliary request.

5.2 However, claim 10 has been adapted to the wording of claim 1, and the corresponding features of claims 1 and 2 as granted have been incorporated into the wording of claim 10.

As a consequence, claim 10 is not defined by the desired result only, but also by the structural features which allow the result to be obtained: a first and a second stirrer in combination with a heater.

Hence the expression "first quality controller" and the associated desired result are clear in the context of claim 10 of the third auxiliary request.

5.3 The opponent also objects to the lack of clarity of the expressions "in proximity to", "spaced apart at a predetermined distance" and "in the longitudinal direction of the slab" introduced into claim 10, but

does not provide any arguments as to why the reasoning of the opposition division is wrong.

These expressions may be broad and relative, but they are not unclear. The Board sees no reason to deviate from the finding in point 10.3 of the contested decision *"that the skilled person, reading claim 10, understands that:*

- for a first stirrer that is disposed "in proximity to" an outside of the slab, the distance between the the [sic] first stirrer and the outside of the slab depends on the output power of the magnetic field of the first stirrer;*
- "spaced apart at a predetermined distance" means that the distance between should not remain the same during movement of the objects that are spaced apart;*
- the longitudinal direction of the slab is the casting direction."*

- 5.4 The question of whether it is allowed, in view of the principles developed in G3/14, to discuss the clarity of those expressions in amended method claim 10 which are present in product claims 1 and 2 as granted at all, can thus remain unanswered.
- 5.5 In summary, the Board concludes that the subject-matter of claim 10 meets the requirements of Article 84 EPC.
6. Third auxiliary request - Article 123(2) EPC
- 6.1 Claim 1 is based on claim 1 as filed (in line with both parties' submissions, reference is made to the English translation of the application as published in Korean: WO-A-2014/142597, "the application") with the following amendments (~~omission~~ and **addition** highlighted by the Board):

A casting installation **(1)** comprising:
a casting unit **(1a)** ~~defining a passage through which molten steel passes and~~ **comprising**
an accommodation unit (100) configured to accommodate molten steel and solidify the molten steel,
a drawing machine (200) configured to draw a slab downward from the accommodation unit (100), and
a guide roll (170) configured to guide the slab, which is drawn from the accommodation unit (100) and solidified, to a lower side,
the casting unit (1a) configured to cast ~~for casting~~ the molten steel into a **the slab;** and
a solidification unit **(1b)** **separated from the casting unit (1a) and disposed to be spaced apart from a side surface of the casting unit (1a), the solidification unit (1b) receiving the slab cast in the casting unit (1a) to induce the solidification,**
wherein the solidification unit (1b) comprising:
a support unit **(500)** ~~disposed spaced apart from the casting unit and receiving the slab from the casting unit and~~ disposed on at least any one place of sides of the slab to support the slab; and
a first quality controller **(600)** provided on an outside of the slab to induce solidification of the slab
wherein the first quality controller (600) comprises:
a first stirrer (620) disposed in proximity to an outside of the slab and able to elevate in a longitudinal direction of the slab;
a second stirrer (640) provided spaced apart below the first stirrer (620) and able to elevate in the longitudinal direction of the slab; and
a first heater (660) installed so as to be able to move forward and backward in a region directly above the slab and configured to heat an upper portion of the slab.

6.2 The opponent argues that the following amendments in claim 1 extend beyond the teaching of the application:

- 1) omission of cooling nozzle and vibrator in relation to the guide roll
- 2) guide roll configured to guide the slab **to a lower side**
- 3) omission of the second quality controller
- 4) accommodation unit configured **to ... solidify molten steel**
- 5) deletion of "defining a passage through which molten steel passes"
- 6) solidification unit **being separated from the casting unit**
- 7) solidification unit **... to induce the solidification**
- 8) deletion of "disposed spaced apart from the casting unit"

None of these objections is convincing.

6.2.1 omission of cooling nozzle and vibrator in relation to the guide roll

The application discloses in paragraph [0043] that *"there may be provided a guide roll 170 guiding a slab having an initial shell to the outside of the mold 160 through the mold 160, a cooling nozzle (not shown) cooling the slab guided from the guide roll 170, and a vibrator (not shown) transmitting vibration to the mold 160 so that the slab inside the mold is easily drawn to the outside of the mold 160."*

The application as filed discloses in this paragraph that the guide roll is an optional element of the casting installation. Even if the paragraph is considered as a whole, the optional guide roll, cooling nozzle and vibrator do not have an inextricable functional or structural linkage. The omission of any of these listed optional elements from a casting installation does not require a structural or functional modification of the other elements.

Although all three elements contribute to facilitating slab extraction, they do this independently of each other, and not in an interdependent or functionally linked manner.

In line with the case law T 962/98 and T 1920/06 cited by the opponent, it is permissible to amend a claim by adding a feature disclosed in the description which has no functional or structural relationship with other features disclosed in the same context.

It follows that the isolated addition of guide rolls as disclosed in paragraph [0043] of the application is an allowable intermediate generalisation and meets the requirement of Article 123(2) EPC.

6.2.2 guide roll configured to guide the slab to a lower side

It is evident from Figure 1 and it is further explicitly explained in paragraph [0015] of the application that molten steel is drawn downwards to a lower portion.

Hence the amendment of claim 1 that the guide rolls guide the slab **to a lower side** does not extend beyond the technical teaching of the application.

6.2.3 omission of the second quality controller

Paragraph [0012] of the application discloses that the casting installation comprises a first quality controller. The casting unit may include *inter alia* a second quality controller as disclosed in paragraph [0015]. Hence the application leaves no doubt that the second quality controller is an optional feature.

This teaching is confirmed by paragraph [0103] of the application, where it is described that the second quality controller may further improve the efficiency of the process, since it avoids the requirement of transferring the last slab to the solidification unit.

Since the application therefore directly and unambiguously discloses that the second quality controller is only an optional feature, its omission from the wording of claim 1 does not extend beyond the technical teaching of the application.

6.2.4 accommodation unit configured to ... solidify molten steel

Paragraph [0015] of the application discloses that the accommodation unit accommodates the molten steel and that the drawing machine draws the slab from the accommodation unit. Hence the accommodation unit has to be configured to solidify the molten metal in order to enable the drawing of the slab. This teaching provided by paragraph [0015] is confirmed by Figure 1 and paragraphs [0039] and [0043] of the application.

The addition of the feature "an accommodation unit (100) configured to accommodate molten steel and solidify the molten steel" therefore does not extend beyond the teaching of the application.

6.2.5 deletion of "defining a passage through which molten steel passes"

Claim 1 requires that the drawing machine draw the slab from the accommodation unit. For the skilled person it is immediately apparent that the casting unit defines "a passage through which molten steel passes". In the absence of a passage, a slab could not be drawn by the drawing machine.

Hence the deletion of a superfluous and redundant feature ("defining a passage through which molten steel passes") does not extend the technical teaching of the application.

6.2.6 solidification unit being separated from the casting unit

It is undisputed that no literal disclosure for the amended wording "a solidification unit (1b) separated from the casting unit (1a)" in claim 1 can be found in the application. However, when the solidification unit is disposed to be spaced apart from a side surface of the casting unit, it necessarily follows that the solidification unit is separated from the casting unit.

Hence the addition of the expression "separated from the casting unit" to claim 1 does not extend the technical teaching of the application.

6.2.7 solidification unit ... to induce the solidification

The term "solidification unit" as such already teaches that this unit is suitable for at least inducing solidification.

6.2.8 deletion of "disposed spaced apart from the casting unit"

Claim 1 specifies that the entire solidification unit is disposed to be spaced from a side surface of the casting unit and that the support unit is included in the solidification unit. It follows that the support unit is disposed spaced apart from the casting unit, in line with the teaching of the application.

Hence the deletion of a superfluous and redundant feature (support unit "disposed spaced apart from the casting unit") does not extend the technical teaching of the application.

6.3 Claim 10 is based on claim 11 as granted and has been amended in accordance with amended claim 1 by specifying that unsolidified molten steel in the slab is stirred by the first stirrer (620) and by the second stirrer (640), and that an upper portion of the slab in an outside of the slab is heated by the first heater (660) in line with the disclosure in paragraphs [0062], [0063] and [0065] of the application.

6.3.1 The opponent argues that the amendments to claim 10 extend beyond the teaching of the application, since the third and fourth stirrers of the second quality controller have been omitted.

This argument is not convincing.

6.3.2 As argued above, the application describes that the second quality controller (comprising the third and fourth stirrers) is an optional feature. Hence the omission of the third and fourth stirrers from the wording of claim 1 does not extend the technical teaching of claim 10.

The further added feature "wherein unsolidified molten steel in the slab is stirred by the first stirrer (620), and by the second stirrer (640) and an upper portion of the slab in an outside of the slab is heated by the first heater (660)" is directly and unambiguously derivable from paragraphs [0062], [0063] and [0065] of the application, which disclose the functionality of the first quality controller.

The functionality of the first quality controller is not functionally linked to the further features disclosed in these paragraphs.

Hence the addition of the phrase "*wherein unsolidified molten steel in the slab is stirred by the first stirrer (620), and by the second stirrer (640) and an upper portion of the slab in an outside of the slab is heated by the first heater (660)*" does not extend the technical teaching of the application.

6.4 In view of the above, the Board concludes that the amendments to the third auxiliary request meet the requirements of Article 123(2) EPC.

7. Third auxiliary request - Article 83 EPC

7.1 In order to establish insufficiency of disclosure, the burden of proof is upon an opponent to establish on the

balance of probabilities that a skilled reader of the patent, using their common general knowledge, would be unable to carry out the invention.

According to Article 83 EPC and established case law of the Boards of Appeal, the patent specification as a whole, and not a claim as such, must convey a reproducible teaching for the skilled person (Case Law, Chapter II.C.3.1).

Moreover, a successful objection of insufficiency of disclosure presupposes that there are serious doubts, substantiated by verifiable facts (Case Law, Chapter II.C.9.). The mere fact that a claim is broad or comprises unspecific expressions such as a "first quality controller" is not a reason to assume that the patent does not meet the requirement of sufficiency of disclosure.

7.2 The opponent argues that the patent does not disclose features that would allow the first quality controller to induce solidification of the slab.

However, apart from this statement the opponent does not provide any arguments substantiated by verifiable facts why the skilled person cannot rework a casting installation as defined in claim 1.

Even if the skilled person does not know what is meant by the expression "first quality controller" in claim 1 they will find the required information already in claim 1 (*a first stirrer (620) disposed in proximity to an outside of the slab and able to elevate in a longitudinal direction of the slab; a second stirrer (640) provided spaced apart below the first stirrer*

(620) and able to elevate in the longitudinal direction of the slab; and
a first heater (660) installed so as to be able to move forward and backward in a region directly above the slab and configured to heat an upper portion of the slab). Moreover, the invention is illustrated by Figure 1 and the functionality of the first quality controller is described in paragraphs [0055] to [0057] of the patent.

Hence no reason exists to conclude that the skilled person would have any problems in reworking the invention of the patent due to the use of the expression "first quality controller" in claim 1.

7.3 The opponent further argues that the skilled person cannot rework the invention, since they do not know how to interpret the expression "disposed to be spaced apart from a side surface of the casting unit".

This mere statement is not convincing since the argument relates to the clarity of the wording of claim 1 and not to sufficiency.

Even if the skilled person were unsure what was meant by the expression "disposed to be spaced apart from a side surface of the casting unit" in claim 1, this uncertainty would clearly be resolved, for example when taking into account the accompanying figures of the patent.

7.4 In summary, the Board concludes that the invention as defined in the claims of the third auxiliary request meets the requirements of Article 83 EPC.

8. Third auxiliary request - inventive step starting from D1

8.1 D1 (paragraph bridging pages 1 and 2 of the machine translation; Figures 3 and 4) discloses a vertical casting apparatus for producing a large ingot with a fixed cooling mold, a separating unit and a rotary conveying unit capable of automatically separating and transporting a solidified cast steel from a base.

8.2 According to the opponent, either the supporting part (130) in Figures 3 and 4 of D1 or the tilting device (154) can be regarded as the solidification unit according to claim 1.

This argument is not convincing, since neither the supporting part (130) in Figures 3 and 4 of D1 nor the tilting device (154) can be regarded as the solidification unit.

8.3 Regarding the attack based on the supporting part (130), the opponent refers in particular to Figure 4 of D1 and argues that

- the casting unit is formed by the magnetic field stirrer (229) together with the mold (110) and the guide rolls
- the solidification unit is formed by the magnetic field stirrer (220) together with the supporting part (130) and optionally the tilting part (154).

However, the supporting part (130) is an essential part of the casting unit, since the support is needed during the casting, see third paragraph on page 2 of D1a: "*A supporting part 130 for supporting the casting S to be pulled down to the lower side of the cooling mold 110.*"

Moreover, the supporting part is not spaced apart from a side of the casting unit.

Hence the supporting part (130) of D1 corresponds to the drawing machine according to claim 1.

8.4 Furthermore, the tilting device (154) cannot be considered as the solidification unit as defined in claim 1 either, since it is used when solidification has been obtained by the solidification unit 170, see page 4, first complete paragraph of D1a:
"The solidification unit 170 is a means for cooling the cast steel S that has been firstly cooled in the cooling mold 110."

and page 4, last paragraph of D1a:

"The separating unit 140 separates the solidified sintered body S from the surface plate 132 by pushing the solidified body S by applying a force from one side."

8.5 Therefore the subject-matter of claims 1 and 10 differs from the casting installation and casting method of D1 in that

- the solidification unit is separated from the casting unit and disposed to be spaced apart from a side surface of the casting unit and
- the solidification unit comprises a first and a second stirrer and a heater.

8.6 The objective technical problem to be solved by claims 1 and 10 can be formulated as how to improve the productivity and efficiency of a slab manufacturing process, in line with the opponent's line of argument.

8.7 According to the opponent, D4 would motivate the skilled person to improve the productivity and

efficiency of a casting installation of D1 by separating the casting unit and the solidification unit.

This argument by the opponent is not convincing.

- 8.8 D4 takes a conceptually completely different approach for the casting apparatus and method from D1. These conceptual differences render a combination of D1 with D4 technically unfeasible. Hence, starting from D1, the skilled person has no motivation to consult D4 to improve the efficiency of the casting installation.

Even if a skilled person were to consult D4, it is not evident, and the opponent has not explained, why and how the working principle of D4 (moving support unit) can be combined with the casting installation of D1.

Moreover, neither D1 nor D4 provides an incentive for the skilled person to use a first quality controller that is provided in the solidification unit and comprises a first and second stirrer and a heater as defined in claims 1 and 10, since neither of documents D1 and D4 discloses a corresponding solidification unit.

- 8.9 Starting from D1, the subject-matter of claims 1 and 10 is therefore not obvious even when taking into account D4.

9. Third auxiliary request - inventive step starting from D4
- 9.1 Claim 10
 - 9.1.1 As discussed in point 2 above, D4 discloses a method of casting wherein metal is cast in a support unit. The support unit functions as a container and moves from the casting area to the water spray area (solidification unit) and finally to the service area, see Figures 5 and 6 of D4.
 - 9.1.2 The subject-matter of claim 10 differs from the casting method of D4 at least in that the solidification unit comprises a first and a second stirrer and a heater.
 - 9.1.3 The objective technical problem to be solved by claim 10 can be formulated as how to provide a casting method which improves the quality of the cast steel.
 - 9.1.4 The opponent argued that it fell within the customary practice of the skilled person to supplement the casting installation of D4 with a conventional heater and stirrers such as also disclosed in D1 or D6 to improve the quality of the cast steel. Moreover, the skilled person faced no technical difficulties when installing a heater and stirrers in the water spray area of the casting installation of D4 or directly on the moving support units of D4.

This argument is not convincing.
 - 9.1.5 No pointer or motivation to install a heater and stirrers in the water spray area or directly on the moving support unit can be derived from D4. Although the skilled person is aware of the fact that heaters

and stirrers for metal slurries exist, the common general knowledge does not provide any motivation to modify the casting installation of D4 in order to enable a method of casting as defined in claim 10.

This lacking motivation and incentive is not provided by D1 or D6 either, since they address different casting concepts and do not disclose a separate solidification unit comprising a heater and stirrers.

Even if the skilled person starting from D4 were to consider heaters and stirrers as disclosed in D1 (see D1a: last paragraph on page 1) or D6 (see D6a: paragraph [0035] and [0038]), no motivation to modify the casting installation of D4 is provided by either D1 or D6.

Moreover, contrary to the view of the opponent, it is technically not sensible or feasible to modify the casting installation by installing a heater and stirrers in the water spray area or directly on the moving support unit of D4. Installing a heater in the water spray area, which is intended to cool the cast ingot (hence has the opposite function to a heater), does not present itself as a straightforward routine modification for the skilled person. Moreover, stirrers and a heater installed in the water spray area of D4 would not be efficient in heating and stirring the cast metal in the moving support unit of D4, since the support unit would shield the cast metal contained therein from a heater and stirrers installed in the water spray area.

On the other hand, it is not technically easily feasible to install a heater and stirrers directly on the moving support unit of D4, since it is debatable

how the required energy would be supplied to the heater and stirrers while the support unit moves through the water spray installation of D4 (see Figure 5 of D4).

The opponent's arguments are thus based on hindsight and do not provide a reason to deviate from the finding in point 11.2 of the contested decision.

9.2 Claim 1

9.2.1 The support unit of the casting unit is defined in claim 1 of the third auxiliary request by the term "drawing machine". The support unit in the solidification unit is defined by the term "support unit". As a consequence, the support unit (drawing machine) in the casting unit according to claim 1 is to be considered as being distinct from the support unit in the solidification unit.

This is not the case in the casting installation of D4, since in D4 the support unit in its function as a container is moving from the casting unit to the water spray area (solidifying unit) and then to the service area, see Figures 5 and 6 of D4.

9.2.2 The subject-matter of claim 1 differs from the installation in D4 at least in that

- the solidification unit comprises a support unit
- the solidification unit comprises a first and a second stirrer and a heater.

9.2.3 As set out above in relation to the method according to claim 10, starting from D4 it is not obvious to install a heater and stirrers in the water spray area or directly on the moving support unit of D4.

Hence for this reason alone the subject-matter of claim 1 is not obvious starting from D4.

- 9.3 In view of the above, the Board concludes that the subject-matter of claims 1 and 10 is not obvious when starting from D4 and when further taking into account common general knowledge, D1 or D6.

The subject-matter of the third auxiliary request therefore meets the requirements of Article 56 EPC.

10. In summary, it can be concluded that neither appeal is successful.

Order

For these reasons it is decided that:

The appeals are dismissed.

The Registrar:

The Chairman:



D. Grundner

C. Herberhold

Decision electronically authenticated