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Language of the proceedings: EN

Title of invention:

HOT PRESS FORMED PARTS HAVING EXCELLENT POWDERING RESISTANCE DURING HOT PRESS FORMING, AND METHOD FOR MANUFACTURING SAME

Patent Proprietor:

POSCO

Opponent:

ArcelorMittal

Headword:

HOT PRESS FORMED PARTS/POSCO

Relevant legal provisions:

EPC Art. 123(2), 84
RPBA 2020 Art. 13(2)

Keyword:
Amendments - allowable (no)
Claims - clarity (no)
Amendment after summons - exceptional circumstances (no)

Decisions cited:
G 0003/14, T 1800/21, T 1857/19

Catchword:

Europäisches Patentamt
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Beschwerdekammern

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Case Number: T 1440/23 - 3.3.05

D E C I S I O N
of Technical Board of Appeal 3.3.05
of 27 May 2025

Appellant 1: (Patent Proprietor)	POSCO (Goedong-dong) 6261, Donghaean-ro Nam-gu Pohang-si, Gyeongsangbuk-do 790-300 (KR)
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Appellant 2: (Opponent)	ArcelorMittal 24-26, Boulevard d'Avranches 1160 Luxembourg (LU)
Representative:	Lavoix 2, place d'Estienne d'Orves 75441 Paris Cedex 09 (FR)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 27 June 2023 concerning maintenance of the European Patent No. 3239336 in amended form.**

Composition of the Board:

Chairwoman	S. Besselmann
Members:	J. Roider
	P. Guntz

Summary of Facts and Submissions

I. The appeals by the patent proprietor (appellant 1) and the opponent (appellant 2) lie from the opposition division's interlocutory decision to maintain the European patent EP 3 239 336 B1 on the basis of auxiliary request 3.

II. The following documents, cited by the patent proprietor after receiving the board's preliminary opinion, are relevant for the decision:

D9 ISO 1463, Third edition, 2003-03-01
D10 ISO 2064, Third edition, 1996-10-01

III. Claim 1 of the main request (patent as granted), auxiliary requests 1 to 20 and auxiliary request 84 reads (feature numbers in the left-hand column):

F1.0 A Hot Press Forming, also known as HPF, part

F1.1 wherein a hot-dip plated layer comprising Al is formed on the surface of a base steel sheet,

F1.2.1 wherein the base steel sheet comprises C: 0.18% to 0.25%, Si: 0.1% to 1.0%, Mn: 0.9% to 1.5%, P: 0.03% or less, S: 0.01% or less, Al: 0.01% to 0.05%, Cr: 0.05% to 0.5%, Ti: 0.01% to 0.05%, B: 0.001% to 0.005%, N: 0.009% or less,

F1.2.2 the base steel sheet further optionally comprising Mo + W: 0.001% to 0.5%; at least one of Nb, Zr, and V: within a range of 0.001% to 0.4% (as the sum); Cu + Ni: within a range of 0.005% to 2.0% and at least one of Sb, Sn, and Bi: 0.03% or less, and a balance of Fe and other impurities by wt%;

F1.3 the hot-dip plated layer consists of a soft diffusion layer and a hard alloyed layer;

F1.4 a thickness ratio of the alloyed layer/diffusion layer in the hot-dip plated layer satisfies 1.5 to 3.0;

F1.5 in the alloyed layer, a tau phase exists at area% within a range of 10% to 30%; and

F1.6 the tau phase is comprised of Si of 10% or greater and Cr of 0.2% or greater by wt% thereof.

IV. Claim 1 of auxiliary requests 21 to 41 and auxiliary request 85 contains the following further feature at the end of the claim:

F1.7 wherein the alloyed layer has a thickness of 35 µm or less.

V. Claim 1 of auxiliary requests 42 to 62 and auxiliary request 86 contains the following further feature at the end of the claim:

F1.8 wherein the tau phase is prepared by comprising Si: 10% to 12%, Mn+Cr: 1.3% to 2.0% and a balance of Fe and Al by wt% thereof.

VI. Claim 1 of auxiliary requests 63 to 83 and auxiliary request 87 contains the features F1.7 and F1.8 at the end of the claim.

VII. Claim 1 of auxiliary request 88 reads:

F5.0 A method of manufacturing an HPF part, which comprises:

F5.1 a process of preparing a hot dip aluminum plated steel sheet wherein a hot dip aluminum plated layer is formed on the surface of a base steel sheet

F5.2.1 comprising C: 0.18% to 0.25%, Si: 0.1% to 1.0%, Mn: 0.9% to 1.5%, P: 0.03% or less, S: 0.01% or less, Al: 0.01% to 0.05%, Cr: 0.05% to 0.5%, Ti: 0.01% to 0.05%, B: 0.001% to 0.005%, N: 0.009% or less,

F5.2.2 the base steel sheet further optionally comprising Mo + W: 0.001% to 0.5%; at least one of Nb, Zr, and V: within a range of 0.001% to 0.4% (as the sum); Cu + Ni: within a range of 0.005% to 2.0% and at least one of Sb, Sn, and Bi: 0.03% or less, a balance of Fe and other impurities by wt%;

F5.3 a process of cooling the plated steel sheet at an average cooling speed of 15°C/s or faster after the hot dip aluminum plating until the plated layer is solidified;

F5.4 a process of heating the hot dip aluminum plated steel sheet at a temperature of 880°C to 930°C followed by being maintained to alloy a hot dip aluminum plated layer of the surface thereof; and

F5.5 a process of hot forming the alloyed hot dip aluminum plated steel sheet and being quenched at a temperature range of 300°C or lower at the same time to manufacture an HPF part,

F5.6 wherein the alloyed hot dip aluminum plated layer consists of a soft diffusion layer and a hard alloyed layer; in the alloyed layer, a tau phase exists at area% within a range of 10% to 30%; and the tau phase is prepared by comprising Si of 10% or greater and Cr of 0.2% or greater by wt% thereof;

F5.7 wherein the hot dip aluminum plated steel sheet is prepared by a process of heating the steel sheet at a temperature of 550°C to 850°C followed by being maintained at 640°C to 680°C, and then immersing the steel sheet in a hot dip aluminum plating bath prepared by comprising Si: 9% to 11%, Fe: 3% or less, and a balance of Al and other inevitable impurities by wt% for hot dip aluminum plating.

VIII. Claim 1 of auxiliary request 89 is identical to claim 1 of auxiliary request 88 except for feature F5.2.2, which reads (addition underlined):

F5.2.2 the base steel sheet further optionally comprising Mo + W: 0.001 % to 0.5%; at least one of Nb, Zr, and V: within a range of 0.001 % to 0.4% (as the sum); Cu + Ni: within a range of 0.005% to 2.0% and at least one of Sb, Sn, and Bi: 0.03% or less, a balance of Fe and other impurities by wt%, wherein the thickness of the plated layer formed by the hot dip aluminum plating is within 25 μm to 35 μm;

IX. The key arguments of appellant 1 (patent proprietor) can be summarised as follows.

Article 100(c) EPC/Article 123(2) EPC

The patent in suit did not extend beyond the application as originally filed because the feature "*having an excellent powdering resistance during hot*

press forming" was ensured by the remaining features of the claim.

Article 84 EPC
The amendments were clear. In particular, the thickness of a layer could be measured and the skilled person would only consider the maximum thickness.

Article 13(2) RPBA
In view of the unexpected development, auxiliary requests 88 and 89 should be admitted into the proceedings.

X. The key arguments of appellant 2 (opponent) can be summarised as follows.

Article 100(c) EPC/Article 123(2) EPC
Deleting the feature "*having an excellent powdering resistance during hot press forming*" extended the claimed subject-matter because the patent application as originally filed disclosed that further measures were necessary to ensure this feature.

Article 84 EPC
The thickness of the claimed layer could not be measured, and the measure to be determined was undefined.

Article 13(2) RPBA
There were no exceptional circumstances which could justify admitting auxiliary requests 88 and 89.

XI. Substantive requests

(a) Appellant 1 (patent proprietor) requested that the decision under appeal be set aside and the

opposition be rejected, i.e. that the patent be maintained as granted; or in the alternative that the patent be maintained on the basis of auxiliary request 1 or 2 resubmitted together with the statement of grounds of appeal; or in the alternative that the opponent's appeal be dismissed, i.e. that the patent be maintained on the basis of auxiliary request 3 held allowable in the impugned decision; or in the alternative that the patent be maintained on the basis of one of auxiliary requests 4 to 87 resubmitted together with the reply to the opponent's appeal; or in the alternative that the patent be maintained on the basis of one of auxiliary requests 88 or 89 filed during the oral proceedings before the board.

(b) Appellant 2 (opponent) requested that the decision under appeal be set aside and the patent be revoked.

Reasons for the Decision

1. Main request, claim 1, amendments, Article 100(c) EPC with Article 123(2) EPC

In this section, the references apply to the application as originally filed unless stated otherwise.

Claim 1 of the main request differs from claim 1 as originally filed, *inter alia*, in that it does not contain the feature "*an HPF part having excellent powdering resistance during hot press forming*" in feature F1.1.

The opponent is challenging this deletion, among other things.

The impugned decision is correct in that "excellent" is a relative term for which the limits cannot be clearly established. However, its meaning cannot be completely ignored.

By omitting the requirement that the HPF part must have excellent powdering resistance, the subject-matter of claim 1 of the main request encompasses an HPF part not having excellent powdering resistance unless the remaining features of claim 1 of the main request compensate for this deletion.

This is not apparent. Therefore, the requirements of Article 123(2) EPC are not met.

The disclosure on page 3, first paragraph, already links optimising the thickness of the alloyed layer, the (area) percentage of the tau phase and its composition to the powdering resistance (i.e. the problem whereby the plated layer is detached from a plated object), as acknowledged by the patent proprietor in its reply to the opponent's appeal, margin reference [21]. This passage thus suggests optimising three different aspects. The passage on page 10, lines 3-5 likewise links minimising detachment of the plated layer during hot press forming to the thickness of the alloyed layer being within 35 µm, among other things.
Therefore, these disclosures support the conclusion that achieving excellent powdering resistance also depends on the thickness of the alloyed layer.

Furthermore, the description as originally filed

(page 22, line 23 to page 23, line 6) states that excellent powdering resistance is not necessarily achieved when the thickness of the plated layer exceeds 35 µm.

The fact that page 22, line 23 to page 23, line 6 relates to the plating and not to the final HPF part does not change the fact that the powdering resistance is not achieved at a certain thickness of the plated layer and above. The consequence of limiting the thickness of the plated layer is that the thickness of the resulting alloyed layer is also limited.

It therefore needs to be determined whether claim 1 as granted includes the cases in which the thickness of the alloyed layer exceeds 35 µm. As outlined above, it is apparent from the description that in such cases the excellent powdering resistance is not achieved.

It is clear that claim 1 does not expressly specify the thickness of the alloyed layer.

The patent proprietor held that this feature was implicit, arguing that a thickness of 35 µm or less of the alloyed layer was a direct result of the remaining features of claim 1 of the main request, particularly features F1.4 to F1.6.
In its view, providing features F1.5 and F1.6 made it impossible to exceed an alloyed layer thickness of 35 µm while simultaneously achieving feature F1.4. This was because the tau phase was formed early in the process. Features F1.5 (tau phase area percentage) and F1.6 (tau phase composition) ensured that the tau phase controlled the diffusion of the alloying components. This led to the formation of the alloyed layer and the diffusion layer, which had to satisfy the thickness

ratio required by feature F1.4.
As the parameters that defined the tau phase were limited, the ratio in feature F1.4 could not be achieved if the alloyed layer was thicker than 35 µm. This could be seen in comparative examples 1 and 2. Therefore, controlling the tau phase parameters did not only allow the alloyed layer thickness to be controlled, but – in conjunction with feature F1.4 – it also limited said thickness as an inevitable consequence. Page 18, lines 2-9 and page 9, line 21 to page 10, line 5 of the description as originally filed therefore had to be read against that background.

However, it is not shown by the examples, nor is it convincing, that the thickness of the alloyed layer is merely a consequence of the other features of claim 1.

Page 18, lines 2-9 of the description as originally filed reads (underlining added by the board):

"Further, in the present disclosure, the tau phase may preferably be prepared by comprising Si of 10% or greater and Cr of 0.2% or greater (remaining ingredients are Al and Fe) by wt% thereof. By controlling the ingredients of the tau phase as described above, it is possible to control thickness of the alloyed layer having brittleness to be 35 µm or less and also the area percentage of the tau phase can be controlled. Thus, the HPF part having excellent powdering resistance during hot press forming can be provided."

This paragraph discloses that by controlling the ingredients of the tau phase, it is possible to control, *inter alia*, the thickness of the alloyed layer to 35 µm or less. It does not disclose that no other

conditions need to be met. While it is a necessary condition, nothing suggests that it is also a sufficient condition. This is also consistent with page 3 of the description, which discloses (first paragraph) optimising the thickness of the alloyed layer, a percentage of a tau phase and the composition of the plated layer.
The disclosure on page 9, line 21 to page 10, line 5 also suggests that if the tau phase has a certain composition it can be distributed so that the thickness of the alloyed layer is within 35 µm.
There is nothing to suggest that the thickness of the alloyed layer was the consequence of optimising the other parameters.

Moreover, the examples cannot show that the different thicknesses of the alloyed layers in the examples and the comparative examples are due to the different tau phase parameters as alleged by the patent proprietor. Contrary to the patent proprietor's statement, all the examples have different process conditions. In particular, according to page 26, last full paragraph, comparative examples 1 and 2 were cooled at a speed below the minimum cooling speed of 15°C/s. However, the cooling speed has a major influence on the alloying process and the formation of the tau phase (page 21, lines 10-15).
As can be seen in the penultimate column of Table 1, comparative examples 1 and 2 have a thin diffusion layer. However, the skilled person knows that diffusion is governed, *inter alia*, by temperature, time and concentration gradients. In the comparative examples, the heating temperature was below that of inventive example 2, which used the maximum heating temperature of 930°C (page 23, lines 15-18), and the heating time could also have been prolonged. Overall, a number of

plating parameters are available to the skilled person, which they may vary independently, including the bath composition, the dipped layer thickness, the cooling step and the heating time and temperature. Only a few such variations are examined in the examples, so they cannot lead to the universal conclusion that it would be *impossible* to obtain an alloyed layer thickness in excess of 35 µm within the constraints of features F1.4 to F1.6 as claimed. It is clear that the examples in the patent in suit have not been designed to maximise the alloyed layer thickness, the consistent teaching in the patent in suit being that a low thickness is desired.

Even if it were accepted that there is a qualitative connection between the thickness ratio in feature F1.4 and the alloyed layer thickness, this does not lead to the conclusion that the latter would not exceed the specific value of 35 µm, which the application as originally filed emphasises as being essential for excellent powdering resistance.

The examples therefore cannot show that features F1.4 to F1.6 *inevitably* lead to an alloyed layer thickness of 35 µm or less.

Since the feature "*an HPF part having excellent powdering resistance during hot press forming*" was deleted, it is incumbent on the patent proprietor to show that this is allowable.

However, the patent proprietor could not convincingly show that the remaining features in claim 1 compensated for that deletion.

The requirements of Article 123(2) EPC are not met.

2. Auxiliary request 21, claim 1, clarity, Article 84 EPC

Claim 1 of auxiliary request 21 additionally contains feature F1.7, which reads "*wherein the alloyed layer has a thickness of 35 µm or less*".

This feature originates from claim 1 of the application as originally filed. The claims as granted (main request) do not contain this feature.

The opponent argued that the thickness of the alloyed layer differed depending on the measurement method, although this was not indicated in the claims. Furthermore, the parameter to be used for the alloyed layer thickness, i.e. the average, the maximum, the minimum, etc., was not specified.

The patent proprietor referred to G 3/14, according to which an unclear feature may not be objected to under Article 84 EPC if it was already present in the claims of the patent as granted. Since the thickness ratio was contained in claim 1 as granted and this ratio required the thickness of the alloyed layer to be measured, the alleged lack of clarity was already contained in claim 1 as granted.

2.1 Examination of claim 1 under Article 84 EPC (G 3/14)

It is evident that the thickness of the alloyed layer is not defined in any of the dependent claims. Consequently, the contested feature was not included in the claims as granted. Therefore, the disputed feature is not precluded from examination under Article 84 EPC (see G 3/14, Reasons, point 80).

According to G 3/14, a patent may be examined for compliance with the requirements of Article 84 EPC only when, and then only to the extent that the amendment introduces non-compliance with Article 84 EPC.

The decision serves to protect the claims of a granted patent from being examined under Article 84 EPC but does not conceal the deficiency in order to allow it to be extended to other features which would otherwise be objected to for introducing a lack of clarity.

Even if the thickness ratio were unclear, which could be considered equivalent or at least similar to the alleged lack of clarity of the alloyed layer thickness, it would still not be legitimate to extend that lack of clarity to the alloyed layer thickness because a (dimensionless) thickness ratio is not the same as a thickness measured in µm.

Therefore, the feature added to claim 1 may be examined under Article 84 EPC.

2.2 Clarity of the added feature, Article 84 EPC

2.2.1 The opponent argued that according to D10, paragraph 4.2, the number of measurements to be made within a reference area should be agreed. However, neither claim 1 nor the patent in suit defined this number to the effect that the measurement method defined in D10 lacked a piece of essential information. Moreover, claim 1 did not define the thickness parameter to which the feature applied (e.g. minimum thickness, average thickness, maximum thickness). Figure 1 of the patent in suit showed a significant variation in the surface of the alloyed layer across

the portion examined. It could not be assumed that the number of measurements made within an area of reference or the kind of thickness parameter to be considered was not decisive for the result.

The patent proprietor argued that standard measuring methods were available to the skilled person, as evidenced by D9 and D10, which constituted common general knowledge. The skilled person knew how to select a representative number of measurement points. Moreover, the text "or less" in the claim implied that the required thickness parameter was the maximum thickness. This was also evident from the fact that the powdering resistance was not observed above a thickness of 35 µm.

Even if it is accepted in the patent proprietor's favour that, in combination with common general knowledge, D9 and D10 provide the skilled person with the information to correctly establish a thickness measurement for the alloyed layer, the feature lacks clarity.

The term "or less" applies to a range with an upper limit of 35 µm. This is equivalent to a range of [0]-35 µm. It does not restrict or imply anything with regard to the nature of the thickness parameter to be used (i.e. minimum, average or maximum).
It is also not apparent that claim 1 referred to the maximum thickness of the alloyed layer since powdering resistance was not observed above a thickness of 35 µm. The thickness characterises the alloyed layer. It is neither evident nor derivable from the patent in suit that isolated points of the alloyed layer where some peaks exceed the maximum thickness of 35 µm had a decisive impact on the powdering resistance.

Furthermore, as the opponent emphasised, D10 discloses (last paragraph of page iii) that in some coatings such as hot-dipped coatings, the coating specification may call for compliance with a minimum local thickness or an average local thickness or both.
Although the alloyed layer must be distinguished from the plated layer, as argued by the patent proprietor, the plated layer according to claim 1 is made by hot-dip coating. It would therefore appear that in the absence of any definition in the patent in suit, D10 would lead the skilled person to the minimum local thickness, the average local thickness or both.

Therefore, as the opponent correctly observed, the thickness parameter that must be within the range of 35 µm or less could be the minimum thickness, the average thickness or the maximum thickness.

Figure 1 of the patent in suit shows a variation in the surface of the alloyed layer that far exceeds 10% of its thickness. The alloyed layer thickness of comparative examples 1 and 2 is only 1 µm and 2 µm above the upper limit for the thickness of the alloyed layer, which is 35 µm.

Therefore, it is crucial for the skilled person to know which thickness parameter to consider so that they can establish whether they are working within or outside the claimed range.

The feature added to the subject-matter of claim 1 does not meet the requirements of Article 84 EPC.

3. Auxiliary requests 1 to 20 and 22 to 87 also contain the above-mentioned deficiency of the main request

(Article 123(2) EPC) or the deficiency of auxiliary request 21 (Article 84 EPC). The patent proprietor acknowledged that the same respective considerations applied.

4. Admission of auxiliary requests 88 and 89, Article 13(2) RPBA

These requests were submitted during the oral proceedings. They represent an amendment to the patent proprietor's case. The admittance of these requests is at the board's discretion under Article 13(2) RPBA.

The patent proprietor argued that, much to its surprise, the board considered amendment F1.7 not to comply with Article 84 EPC. With reference to T 1857/19, the proposed amendments simply involved deleting a category, i.e. all the product claims. Had the product claim been allowed, it would have been necessary to discuss the method claims, so no additional burden arose.

A board agreeing with the other party's arguments does not amount to exceptional circumstances; this may happen and has to be expected in any *inter partes* proceedings.

Assuming, in the patent proprietor's favour, that exceptional circumstances arose, the criteria of Article 13(1) RPBA can also be taken into consideration when deciding on Article 13(2) RPBA (Case Law of the Boards of Appeal of the EPO, 10th edition, 2022, V.A. 4.5.1, last two paragraphs).

These criteria concern the state of the proceedings, the suitability of the amendment to resolve the pending

issues and whether the amendment is detrimental to procedural economy and does not give rise to new objections.

As apparent from the communication under Article 15(1) RPBA (point 1.1.1(a), relating to the thickness of the plated layer when exceeding 35 µm), the considerations regarding claim 1 of the main request under Article 123(2) EPC are similarly relevant to the absence of the feature whereby the "*thickness of the plated layer formed by the hot dip aluminium plating is within 25 µm to 35 µm*" in method claim 1 of auxiliary request 88.

As stated in the communication under Article 15(1) RPBA (penultimate paragraph of point 3.5, relating to the clarity of the thickness of the plated layer), the considerations regarding claim 1 of auxiliary request 21 under Article 84 EPC are similarly relevant to the "*thickness of the plated layer formed by the hot dip aluminium plating*" in method claim 1 of auxiliary request 89.

The opponent also raised further objections which are not *prima facie* without merit. In particular, it argued that the definition of the thickness of the plated layer did not automatically lead to a limitation of the thickness of the alloyed layer.

In the case forming the basis of the decision cited by the patent proprietor (T 1857/19) in reply to the communication under Article 15(1) RPBA, the board raised an objection under Article 123(2) EPC for the first time at the proceedings.

This is not the case here. The objection under

Article 123(2) EPC had already been discussed in the decision under appeal (point 3.3.1) and raised in the opponent's reply to the patent proprietor's appeal (page 4). The lack of clarity had already been raised in the proceedings before the opposition division in the letter of 17 May 2023 (page 24) and repeated in the opponent's statement of grounds of appeal (page 72).

The situation in T 1857/19 is therefore not applicable to the case in hand (T 1857/19, point 1.1).

This case also differs from T 1800/21 (points 3.4.7 and 3.4.8) because, as summarised above, the deletion does not overcome all the remaining objections, and the amendments present in claim 1 of each of auxiliary requests 88 and 89 give rise to new objections.

Therefore, auxiliary requests 88 and 89 are not considered and 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 Chairwoman:

C. Vodz S. Besselmann

Decision electronically authenticated