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Datasheet for the decision of 10 July 2025

Case Number:	T 0939/23 - 3.2.03
Application Number:	16848998.7
Publication Number:	3354359
IPC:	B21B1/22, B21B27/02, C23C2/06, C23C2/12, C25D3/22
Language of the proceedings:	EN

Title of invention:
METHOD FOR MANUFACTURING PLATED STEEL SHEET HAVING EXCELLENT CLARITY OF IMAGE AFTER COATING

Patent Proprietor:
Posco

Opponent:
ArcelorMittal

Headword:

Relevant legal provisions:
RPBA 2020 Art. 15a(2), 12(4)
EPC Art. 100(c), 100(b), 100(a), 54, 56

Keyword:

Oral proceedings by videoconference
Oral proceedings - request for oral proceedings to be held by videoconference(refused)
Amendments - added subject-matter (no)
Amendment to case
Sufficiency of disclosure - enabling disclosure (yes) - relationship between Article 83 and Article 84
Novelty - (yes)
Inventive step - (yes)

Decisions cited:

G 0003/14, G 0001/21, T 0175/97, T 1051/09, T 0821/19, T 0746/22, T 1440/23

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

Boards of Appeal

Chambres de recours

Boards of Appeal of the
European Patent Office
Richard-Reitzner-Allee 8
85540 Haar
GERMANY
Tel. +49 (0)89 2399-0

Case Number: T 0939/23 - 3.2.03

D E C I S I O N
of Technical Board of Appeal 3.2.03
of 10 July 2025

Appellant: (Opponent)	ArcelorMittal 24-26, Boulevard d'Avranches 1160 Luxembourg (LU)
Representative:	Lavoix 2, place d'Estienne d'Orves 75441 Paris Cedex 09 (FR)
Respondent: (Patent Proprietor)	Posco (Goedong-dong) 6261 Donghaean-ro Nam-gu Pohang-si, Gyeongsangbuk-do 37859 (KR)
Representative:	Meissner Bolte Partnerschaft mbB Patentanwälte Rechtsanwälte Postfach 86 06 24 81633 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 31 March 2023 rejecting the opposition filed against European patent No. 3354359 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	C. Herberhold
Members:	B. Goers
	N. Obrovski

Summary of Facts and Submissions

I. European patent No. 3 354 359 relates to a method of manufacturing a plated steel sheet having excellent image clarity after coating including the steps of cold rolling, plating and temper rolling.

II. The appeal is against the opposition division's decision to reject the opposition, which was based on the grounds for opposition under Article 100(a) EPC in conjunction with Articles 54 and 56 EPC, as well as those under Article 100(b) and (c) EPC and of.

III. The opponent ("appellant") requested that the decision under appeal be set aside and that the patent be revoked.

The patent proprietor ("respondent") requested that the appeal be dismissed, or, as an auxiliary measure, that the patent be maintained in amended form according to one of auxiliary requests 1 to 4, which had initially been filed with the reply to the notice of opposition and were then resubmitted with the reply to the statement of grounds of appeal.

IV. Documents relevant to this decision

D1: "Measurement of the waviness characteristic value Wsa (1-5) cold rolled metallic flat products", test specification (Stahl-Eisen-Prüfblätter SEP) 1941), published in May 2012

D2: "Tata adds 100th new product to its portfolio", press communication, allegedly published 3 February 2015

D3: "Serica™ - tightly controlled low surface

waviness", brochure, "Copyright 2014"

D4: "Serica^{R} - tightly controlled low surface waviness", brochure, "Copyright 2016"

D5: "Premium paint appearance - Serica^{R}: hot-dip galvanised surface finish for exposed automotive panels", broschure, "Copyright 2015"

D6: "Premium paint appearance - Serica^{R}: hot-dip galvanised surface finish for exposed automotive panels, brochure, "Copyright 2017"

D7: "Premium paint appearance: Serica^{R}; the hot-dip galvanized surface finish for exposed automotive panels", article in International Paint & Coating Magazine, published July/August 2015

D8: "Surface aspects", screen copy of a "Serica" product provided by the patent proprietor Serica with a letter dated 24 July 2019

D9: "Tata Steel - 108th Annual Report", excerpt, allegedly published in 2015

D10: J. Simão, D.K. Aspinwall, "Hard chromium plating of EDT mill work rolls", Journal of Materials Processing Technology 92-93 (1999), pages 281-287

D11: EP 739 253 B1

D12: H. Hoffmann et al., "Handbuch Umformen", Munich: Carl Hanser Verlag, 2012, excerpts

D13: JP 2008-214681 A

D13a: Machine translation of D13 provided by the EPO

D14: US 2015/0209848 A1

D15: "Characterising the surface waviness of hot dip galvanised steel sheets for optical high-quality paintability (Carsteel)", European Commission Report "EUR 23854", published 2009

D16: WO 2014/135999 A1

D17: WO 2015/114405 A1

D18: "Hot-Dip Galvanized Sheet Steel with Excellent Press Formability and Surface Quality for the Automotive Panels", Kawasaki Steel Technical

Report No. 48, March 2003

D21: M. Vermeulen et al., "Form removal aspects on the waviness parameters for steel sheet in automotive application", Tagungsband, XIV. International Colloquium on Surfaces, 2017, pages 11 to 20

D22: J. Guo et al., "Analysis of factors influencing the steel sheet surface waviness in cold rolling process," IOP Conference Series: Materials Science and Engineering 770, 2020

V. Claim wording relevant to this decision

Method claim 1 of the main request (patent as granted) reads as follows (with feature numbering added in "[]"):

Claim 1:

"[1] *A method of manufacturing a plated steel sheet having excellent image clarity after coating, comprising:*

[2] *providing a cold rolled steel sheet by cold rolling;*

[3] *plating the cold rolled steel sheet to manufacture a plated steel sheet;*

[4] *and temper rolling the plated steel sheet by inserting the plated steel sheet into a temper rolling mill,*

[5] *wherein a long-wavelength waviness (Wsa1-5) of a final stand rolling roll is 0.4 μm or less (not including 0) during the cold rolling,*

[6] *wherein the plating of the cold rolled steel sheet is performed to allow a plating amount on a single surface to be 45 g/m2 or greater,*

[7] *wherein, in the temper rolling the plated steel sheet, a roll having a long-wavelength waviness (Wsa1-5) of 0.4 μm or less (not including 0) is used,*

[8] *wherein the cold rolled steel sheet has a long-wavelength waviness (Wsa1-5) of 0.2 µm or less (not including 0)*".

Method claim 2 of the main request reads as follows.

"*The method of claim 1, wherein the plated steel sheet is provided as one of a hot-dip galvanized steel sheet, a hot-dip aluminized steel sheet, an aluminum alloy plated steel sheet, an electro-galvanized steel sheet, an alloy electrogalvanized steel sheet, and a hot-dip galvannealed steel sheet.*"

VI. The appellant's arguments, where relevant to the present decision, can be summarised as follows.

(a) Format of the oral proceedings

Oral proceedings should be conducted as a videoconference. Such proceedings would be suitable for the present case and would be more cost efficient and more environmentally friendly. Mixed-mode oral proceedings were not justified since this format compromised the principle of equal treatment of the parties as it allowed the party present to react in a more direct manner than the party participating remotely. Moreover, the appellant's reasoned request for oral proceedings as a videoconference had been made much earlier than the respondent's unreasoned request for in-person oral proceedings. The appellant's request should thus bear more weight. Oral proceedings in mixed-mode format were acceptable as an auxiliary measure.

(b) Article 100 (c) EPC

The subject-matter of claim 1 extended beyond that of the application as filed. Dependent claims 2 to 4 as originally filed were not a suitable basis since they referred exclusively to claim 1. The combination of features introduced an unallowable intermediate generalisation. The specification of the roll force (with reference to the common general knowledge in D15) of a a temper-rolling mill "of the related art" and the specification of the plated steel sheet long-wavelength waviness as being 0.28 microns or less after temper rolling as defined in paragraphs [0043] to [0045] (the paragraph numbers refer to the application documents as originally filed, not the A1 publication, which has different paragraph numbers from paragraph [0020] onwards) were unallowably omitted from feature [7].

(c) Article 100 (b) EPC

The patent did not disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art. The requirement to be obtained according to feature [1] was ill defined and the invention was not workable over the whole subject-matter claimed (both in terms of the steel and plating materials to be used and the whole range of the parameters defined) when applying the criteria in decision T 1051/09 and in view of the examples in Table 1 and the examples HX220YD+Z and HX180BD+Z in Figure 2 of the patent.

(d) Admittance of D21 and D22

D21 and D22 should be admitted. The documents were evidence of common general knowledge relating to the

comparability of waviness parameters and only supported the arguments already on file.

(e) Novelty

The subject-matter of claim 1 was not novel over D13, D16, D17 or the steel product "Serica" as described in D2 to D9. The values of the waviness parameters disclosed in D13, D16 and D17 were systematically higher than the corresponding waviness Wsa1-5 as used in the patent, which was evident from D15, D21 and D22. In addition, there was a direct correlation between the roughness of the rolls and their waviness, as well as between the waviness of the rolls and the resulting waviness of the steel sheet and vice versa; this was apparent from D10 and D15. Therefore, in view of the data disclosed in D13, D16, D17 and the steel product "Serica", the features of claim 1 that were not explicitly disclosed here were at least implicitly disclosed.

(f) Inventive step

The subject-matter of claim 1 did not involve an inventive step starting from D13, D16, D17 and or the steel product "Serica" in view of the teachings of any of D10 to D15. D16 disclosed a product with no orange peel defect, and in Example 2, Test 15, the waviness of the steel sheet in the different processing steps corresponded at least qualitatively to those in the examples of the patent. The distinguishing roll waviness features were arbitrary and did not have an effect over the whole scope of claim 1. In addition, the skilled person knew the relationship between the roughness and waviness of the rolls and a respective

adaptation was obvious from any of D10 to D15. The same observation applied to the further starting points.

VII. The respondent's arguments, where relevant to the present decision, can be summarised as follows.

(a) Format of the oral proceedings

The oral proceedings should be conducted as an in-person hearing or, in the alternative, in mixed-mode format.

(b) Article 100 (c) EPC

The subject-matter of claim 1 was not unallowably extended. Feature [7] had a basis in claims 1 and 4 as originally filed. All three process steps in claim 1 as originally filed were further specified by features [6] to [8], independently of each other either, in the original claims and in the corresponding parts of the original description.

(c) Article 100 (b) EPC

The patent disclosed the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art. In all of the comparative examples, one of the claimed requirements was not met. The appellant failed to demonstrate that steel grades or plating materials other than those used in the examples were not feasible.

(d) Admittance of D21 and D22

No exceptional circumstances in support of the admittance of D21 and D22 were present. Thus these documents should not be admitted.

(e) Novelty

The subject-matter of claim 1 was novel over each of D13, D16, D17 and the steel product Serica. In particular, there was no generally applicable correlation between the different waviness parameters disclosed in the patent, D13, D16 and D17 and thus it was not possible to conclude that the waviness values disclosed in these documents fell within the ranges defined by features [5], [7] and [8]. Moreover, no commonly applicable correlation between the surface roughness of the rolls and their waviness existed. With regard to the Serica product, no details of the method of production were disclosed; in particular, no details were disclosed about the cold-rolling step.

(f) Inventive step

The discussion of inventive step had to be restricted to a single closest prior-art document (D16), in accordance with a "well-established line" of case law. Moreover, the subject-matter of claim 1 involved an inventive step in view of all of the starting points D13, D16, D17 and the steel product "Serica", even when taking into account the teachings of D10 to D15.

Reasons for the Decision

1. Format of the oral proceedings

The appellant's request for oral proceedings to be held solely by videoconference was rejected. Oral proceedings were held in mixed-mode format (Article 15a(2) RPBA) in accordance with the auxiliary request of both the appellant and the respondent, for the following reasons.

1.1 The Board had summoned the parties to oral proceedings in person with a notification dated 23 January 2025. With a letter dated 6 February 2025 the appellant requested that the oral proceedings be held by videoconference.

In response to an inquiry by the Board, the respondent stated in a letter dated 16 June 2025 that its preference was for the oral proceedings to be held in person as summoned, or alternatively in a hybrid manner.

In its response to a further inquiry by the Board, the appellant requested in a letter dated 17 July 2025 that the oral proceedings be conducted as a videoconference, or alternatively that they be held in mixed-mode format.

1.2 Deciding on the format of the oral proceedings is at the discretion of the Board (Article 15a RPBA). This includes the possibility of holding oral proceedings in a mixed-mode format (Article 15a(2) RPBA).

1.3 The appellant argued that oral proceedings by videoconference were more cost-effective and more environmentally friendly, and that it had communicated its preference as to the format of the oral proceedings earlier than the respondent and had provided a more detailed reasoning. The appellant also argued that holding oral proceedings in a mixed-mode format ("hybrid form") was not appropriate since it compromised the principle of equal treatment of the parties; in particular, as a remote participant in mixed-mode oral proceedings the appellant would not be able to present its case in the same manner as the respondent attending in person.

Even though the appellant considered it beneficial for both parties to participated in the same format, it also explicitly declared that it would prefer a hybrid format over attending in person (see its letter dated 17 June 2025, last paragraph).

1.4 As to the criteria to be taken into account in the Board's discretionary decision on the format of the oral proceedings, the present Board considers offering the respective party the opportunity to be heard in the oral proceedings format of their choice the leading criterion in the present case. This is particularly true in view of the other criteria referred to by the appellant, such as costs, the environmental impact, the level of detail of a party's reasoning for its preference of format, and differences as to when the requests were made.

1.5 By holding the oral proceedings in hybrid form, each of the parties had the opportunity to attend in the format of their choice. This choice was made in full awareness of the particularities of the case, the other party's

choice, and the further implications of this choice, such as the interaction being more or less direct, the associated cost and the environmental impact. Indeed, the parties could also have chosen to take part in the format chosen by the respective other party, i.e. the appellant was free to attend in person and the respondent could have joined the proceedings remotely by videoconference. By adhering to each party's respective requests and preferences, the principle of equal treatment was respected, and any potential differences in how the parties presented their case in the oral proceedings results of their own deliberate choices.

1.6 The Board further notes that a party does not have the right to impose on another party the format in which they are to be heard.

1.7 Furthermore, while the Enlarged Board took the view in its decision G 1/21 that communication by videoconference cannot yet be put on the same level as communication in person (G 1/21, Reasons 38 and 39), the Enlarged Board also concluded (Reasons 40) that it does not follow therefrom that the right to be heard or the right to fair proceedings cannot be respected when oral proceedings are held by videoconference. This conclusion is applicable *mutatis mutandis* to a situation where one of the parties participates remotely in mixed-mode oral proceedings.

1.8 In view of the above considerations, the Board decided to hold the oral proceedings in a mixed-mode format (see the communication of the Registry, 25 June 2025). At the oral proceedings before the Board, the appellant did not indicate that communicating by videoconference

in mixed-mode format had in the case in hand had any adverse effect on it.

2. Main request - added subject-matter

With regard to the ground for opposition under Article 100(c) EPC, the appellant has raised a number of objections relating to an unallowable extension of subject-matter.

The respondent requested that some of the appellant's arguments (see arguments (a) and (c) in point 2.2.1 below) not be admitted into the appeal proceedings under Article 12(4) RPBA since had been presented for the first time in the appeal proceedings.

However, even when taking into account all of the appellant's arguments, the ground for opposition under Article 100(c) EPC does not prejudice the maintenance of the patent. For this reason, the question whether or not the allegedly late-filed arguments of the appellant should be admitted can be left undecided.

The following references pertain to the paragraph numbering in the originally filed documents.

2.1 The gold standard (see G 2/10, Reasons 4.3) is the underlying principle to be applied, i.e. what is to be decided is whether as a result of the combination of features [1] to [8] the skilled person is presented with new technical information (see G 2/10, Reasons 4.5.1).

Claim 1 as originally filed includes features [1] to [5]. Features [6], [7] and [8] were disclosed, *inter*

alia, in dependent claims 2, 3 and 4 as originally filed; however, these were not disclosed in combination since claims 2 to 4 refer exclusively to claim 1. The claims alone thus cannot establish a sufficient basis for the present claim 1. The mere fact that the respective subject-matter defined by dependent claims 2 to 4 relates to details of different process steps, all of which are already defined in claim 1, does not, as such, establish that features [1] to [8] are disclosed in combination. As concluded in the decision under appeal, the basis in the application as filed therefore has to be established on the basis of the application documents as a whole.

This is in line with the approach applied in decision T 895/18, Reasons 3.1.3: "[T]his [the choice to use "USA style" claim drafting] was a deliberate choice of the appellant (then applicant) and there is no legal basis in the EPC for applying different requirements, or in particular for applying differently the requirements of Article 123(2) EPC, according to that choice"; "[i]n any case it must be examined whether the combinations of features present in the amended claims are directly and unambiguously derivable from the whole of the application as originally filed".

Nevertheless, each of the dependent claims (in particular claim 4) forms an originally disclosed feature combination. Whether or not the combination with the further features (i.e. the features of the other dependent claims) added with respect to this originally disclosed feature combination (i.e. features [6] and [8] in the case of claim 4 as originally filed) is originally disclosed needs then to be examined with respect to the original disclosure as a whole.

2.2 Feature [7]

2.2.1 The appellant argued that the long-wavelength waviness of the roll in the temper-rolling step defined by feature [7] was only originally disclosed in paragraphs [0043] to [0045] in combination with the following features that have been unallowably omitted from the present claim 1:

(a) A temper-rolling mill "of the related art"
(b) A roll force of 150 tons or more
(c) A final plated steel sheet long-wavelength waviness of 0.28 microns as defined in paragraph [0044]

However, this is not persuasive.

2.2.2 A combination of features [1] to [5] and [7] has a basis in the claims as originally filed, in particular in claim 4 as originally filed, which is directly dependent on claim 1.

The original claim 1 defines a process with the steps of cold rolling, plating and temper rolling. The most generic definition of the temper-rolling step in the patent specification is found in claim 4 as originally filed. This claim explicitly refers to and further defines "the method of claim 1". Features [1] to [5] and [7] of the original claims 1 and 4 are thus originally disclosed in combination and claim 4 as filed discloses a method including temper rolling the plated steel sheet with a roll having a long-wavelength waviness (Wsa1-5) of 0.4 microns or less, without the particular details of features (a) to (c) above. In other words, the combination of features [1] to [5] and [7] may be a generalisation over the disclosure in paragraphs [0043] to [0045]. This generalisation is,

however, originally disclosed in dependent claim 4 as filed. In view of this explicit disclosure, it is irrelevant that all of the embodiments in Table 1 use a temper-rolling roll force of 150 tons, and that a Wsa1-5 value is given under "Evaluation of Image Clarity" in Table 1.

Thus, an unallowable omission of features (a) to (c) is not manifest for this combination.

2.3 Features [6] and [8]

Since the combination of the features of claims 1 and 4 as originally filed establishes a basis for the combination of features [1] to [5] and [7], it is now necessary to discuss whether or not these features were disclosed in combination with features [6] and [8].

Feature [6] defines further characteristics of the plating step and feature [8] defines further characteristics of the cold-rolling step of the originally filed claim 1. In this context, the following parts of the description are of particular relevance.

Paragraph [0038] defines that "plating may be performed so that an amount of plating on a surface thereof may be 45 g/m^2 or greater". Paragraph [0030] defines that "the cold rolled steel sheet [...] may be provided, while the cold rolled steel sheet having a long-wavelength waviness (Wsal-5) of 0.2 μm or less", and paragraph [0033] defines features [5] and [8] of the cold-rolling step in combination.

According to paragraphs [0038] and [0039] the effect after coating of excellent image clarity (which is

already defined in claim 1 as originally filed by feature [1]) can be achieved if the plating amount is at least 45 g/m^2 in the plating step (feature [6]). The requirement in feature [6] is present to prevent surface defects (such as the orange peel effect), even where the cold-rolled steel sheet has the desired long-wavelength waviness (Wsa 1-5), i.e. the waviness of of 0.2 microns or less disclosed in paragraph [0030] and defined in feature [8].

Paragraphs [0030], [0031], [0032] and [0034] likewise disclose that excellent image clarity without surface defects such as the orange peel defect can be achieved after coating (even after plating and without a process after plating) if the cold-rolled steel sheets have a long-wavelength waviness of of 0.2 microns or less after cold rolling (paragraph [0031]).

Features [6] and [8] are thus each disclosed in the description as being preferred embodiments of the invention, without any functional link being established to parameters of the further steps disclosed in paragraphs [0043] to [0045] (and in particular without any link to any of steps (a) to (c) above). As discussed above, there is already a basis for a generalisation of the details given in paragraphs [0043] to [0045] in claim 4 as originally filed.

3. Main request - sufficiency of disclosure

In the appellant's view, the patent did not disclose the invention, i.e. a method to produce a plated steel sheet having "excellent image clarity after coating" as defined by claim 1, in a manner sufficiently clear and complete for it to be carried out by a person skilled

in the art. It argued with reference to the case underlying decision T 1051/09 that the invention was not disclosed in the patent in such a manner that it was fit for generalisation beyond the specific examples disclosed, i.e. it was not workable over the whole scope claimed. The appellant based its objection on the following arguments.

(a) It was not established that the invention was workable over the whole scope of steel grades. In fact, it was only shown to be workable for the steel grade "DX56D+Z" (Figure 2). Figure 2 also showed a steel grade "HX220YD+Z", which fell within the Wsa1-5 range according to feature [5] but did not obtain the "excellent image clarity" of feature [1].

(b) It was not shown in the patent that the plating amount defined in feature [6] was sufficient for all plating materials. In the patent, this was only shown for a hot-dip zinc coating (see paragraph [0059]: "galvanizing bath").

(c) The parameter end value of 0.4 microns in feature [5] also encompassed (in view of its precision, i.e. the last significant figure being the decimal place directly after the decimal point and according to well known rounding rules) values up to 0.44 microns for the final-stand rolling roll. Thus, Comparative Examples 3 and 5 disclosed values (0.42 microns) falling within the claimed range without resulting in the range of Wsa1-5 of the cold-rolled steel sheet in accordance with feature [8].

As this discussion hinges on the understanding of the intended "excellent image clarity after coating", this must be discussed first.

It is noted that decision T 1051/09 - which was cited by the appellant - does indeed deal with the question of sufficiency of disclosure of a claimed process which "is defined in a functional manner, i.e. by its outcome", and whether the claimed process is disclosed in such a manner that it is "fit for generalisation beyond the specific examples disclosed" (see Reasons 2). However, the considerations set out therein (Reasons 2 to 2.8) state that such a question is to be decided on a case-by-case basis. In the case at hand the Board came to the following conclusion.

3.1 Feature [1] of claim 1 defines that the plated steel sheet obtained by the claimed method should exhibit "excellent image clarity after coating". Apart from the argument that it was not sufficiently disclosed how to obtain this outcome over the whole scope of claim 1, the appellant considered this requirement to be an ill-defined parameter. It is therefore first to be assessed how this parameter is to be construed and what impact it has on the claimed subject-matter.

3.1.1 According to established case law (see Case Law of the Boards of Appeal, 11th edition, 2025, II.C.3.3), a technical effect is to be taken into account in assessing enablement if it is explicitly claimed. In the case at hand, the "excellent image clarity" is a feature of the product to be obtained by the claimed method, i.e. the question to be answered is whether the method is sufficiently disclosed such that the excellent image clarity of the plated steel sheet after it has been coated by a subsequent coating step (which is not defined in the claim) can be obtained.

3.1.2 The feature "excellent image clarity" is not further defined in claim 1 by qualitative criteria, nor is it defined by quantifiable criteria. The term "excellent" is thus merely a relative definition (a fact not objectionable for a granted claim, see G 3/14). Nevertheless, this restriction limits the claim to processes achieving this product property, as was also argued by the opponent with reference to decision T 1440/23 (see Reasons 1).

According to paragraph [0014], the problem relating to image clarity is generally described as a "form profile" of a base layer remaining in a plating layer and appearing even after painting. As explained in paragraph [0024], the image clarity to be achieved after coating depends not only on the long-wavelength waviness of the plated steel sheet, but also on a combination of the long-wavelength waviness of the cold rolled steel sheet, [and] the plating material. The aforementioned critical parameters for improving image clarity after coating, namely the waviness of the cold-rolled steel sheet (see feature [8]) and the plating amount (see feature [6]), are defined in claim 1, with feature [7] further limiting the long-wavelength waviness of the temper-rolling roll. The claimed excellent image quality can thus be considered an implicit consequence of the claimed process steps.

This is confirmed by the experimental evidence in Table 1: all of the comparative examples exhibiting the "occurrence" of a "defect" have either below the minimum plating amount defined in feature [6] or are above the maximum cold-rolled sheet long-wavelength waviness Wsa1-5 of 0.2 microns, whereas in the examples fulfilling the claimed process conditions, no defect could be observed.

In these experiments, the presence of a defect was determined "with the naked eye" (paragraph [0060]).

The patent thus discloses a process which, according to the experimental data in Table 1, results consistently in a plated steel sheet having "excellent image quality" in the sense that no occurrence of a defect (such as the orange peel effect) was observed. This is in accordance with further passages in the description, which link the desired "excellent image clarity after coating" to the absence of a "surface defect, such as an orange peel defect" (see, for example, paragraphs [0018], [0022] and [0027]).

It is true that the patent elaborates on further criteria to determine the excellent image clarity. In paragraph [0052], it is suggested that the image clarity be determined in terms of "DOI by BYK-Gardner". However, such a DOI value is used neither in Figure 2 nor in Table 1.

Furthermore, the diagram in Figure 2 shows a correlation between the Wsa1-5 waviness after coating with a two-coat painting system (x-coordinate; this value is **not** being given for the examples in Table 1) and the plated sheet waviness after processing (5% deformation; this value is essentially given in Table 1), further illustrating regions in this diagram in which an orange peel defect is observed or not observed.

According to paragraph [0055] the long-wavelength waviness may be measured after 5% of the plated sheet is processed, thereby evaluating image clarity.

However, while documented in Table 1, this parameter is not defined in claim 1.

Therefore, no unambiguous concept is used in the patent to quantify the "image clarity", let alone "excellent" image clarity, and in particular no such quantifiable concept is defined in claim 1. Rather, the claim defines (among other parameters) the manufacturing process by giving the waviness of the cold-rolled steel sheet itself, the control of which improves - together with the other claimed process requirements - the image clarity after coating (paragraph [0025], last sentence; see also Figure 1 illustrating the underlying effect).

In view of the broad disclosure of how to evaluate image quality (including inspection by the naked eye), the definition thereof in feature 1 is to be interpreted broadly. The experimental data in Table 1 are sufficient evidence that the claimed process results in a plated steel sheet having excellent image clarity after coating, as defined in feature 1.

3.2 Objections (a) (steel grades) and (b) (plating materials)

3.2.1 According to established case law, a successful objection of insufficient disclosure presupposes that there are serious doubts, substantiated by verifiable facts (see Case Law of the Boards of Appeal, 10th ed., 2022, II.C.9).

As also concluded in the decision under appeal the appellant failed to provide any verifiable facts in terms of evidence demonstrating that the claimed process was not workable for different steel qualities or plating materials.

Instead, the appellant used data given in Figure 2 of the patent as evidence for insufficient disclosure. Yet this is not persuasive, for the following reasons.

3.2.2 As pointed out by the respondent, the data underlying Figure 2 do not refer to the examples listed in Table 1 of the patent (indeed, even the number of data points does not match). It is thus not directly and unambiguously disclosed that the experiments in Figure 2 were performed in accordance with the requirements of claim 1.

3.2.3 According to paragraphs [0052] and [0053] of the patent, Figure 2 is intended to provide support for a further development of a quantitative parameter for the image quality (namely using the Wsa1-5 value after forming), which is different from the DOI value by BYK-Gardner. Neither of these two quantitative parameters were, however, used in claim 1 to define image clarity. There is no reason to read into claim 1 these quantitative parameters as the decisive criterion in view of the alternative evaluation of image clarity by the naked eye, which is also disclosed. Whether or not the correlation between the two parameters in Figure 2 has been determined by an inappropriate regression is thus not decisive.

3.2.4 The data point for the example using a HX220YD+Z grade steel (referred to by the appellant in support of its arguments) is not suitable evidence that the invention is not workable for steel grades other than DX56D+Z, for the following reasons.

Figure 2 defines two regions:

- a first region indicated with "no orange peel defect" at Wsa1-5 values before coating (y-axis: deformed 5%, without painting) of 0.35 microns or smaller and long-wavelength waviness values after coating (i.e. painted with two-coat painting on the x-axis) of 5 microns or smaller
- a second region indicated with "orange peel defect occurrence" at Wsa1-5 values before coating of 0.35 microns and long-wavelength waviness values after coating of above 5 microns.

The data point for HX220YD+Z is in neither of the two regions, and thus not in the region associated with orange peel defect occurrence. For this reason alone, it cannot raise doubts on sufficiency of disclosure. Furthermore, the lowest Wsa1-5 value after forming at which the occurrence of a defect was recorded is 0.37 microns according to Table 1, i.e. well above the respective Wsa1-5 value for HX220YD+Z in Figure 2.

3.2.5 Example HX180BD+Z is in the second region ("with orange peel defect occurrence") of Figure 2, but this example cannot cast doubt on the invention either. Its Wsa1-5 waviness value (x-axis of Figure 2) is about 0.35 microns, i.e well above the Wsa1-5 value after forming given for the inventive examples in Table 1 (the highest value of an inventive embodiment is 0.32 microns, see Inventive Example 11 for steel grade 15).

The data points in Figure 2 referred to by the appellant thus cannot cast doubt on the experimental evidence given in Table 1 for the claimed process being capable of producing a plated steel sheet with excellent image clarity, i.e. without occurrence of defects observable with the naked eye.

3.2.6 The claimed parameters in claim 1 relate to the physical processing steps to be used in cold rolling and temper rolling, which then result in the claimed excellent image clarity. Therefore, the workability with other steel grades and different platings is, *prima facie*, convincing and it was not shown by the appellant that undue burden is necessary to put the invention into practice with other steel grades, for example. Without any evidence to the contrary, the appellant's objections cannot be considered to be substantiated by verifiable facts.

3.3 (c) Comparative Examples 3 and 5

3.3.1 It is well established in science that the extent to which a measurement is significant should be indicated by means of the decimal places given. This principle is usually also applied when determining the precision of claimed end points of a parameter (see, for example, T 821/19, Reasons 2.3.2, with reference to T 175/97).

3.3.2 Although in the patent the experimental values of the parameters are determined with a precision of two decimal digits (see Table 1), the respondent has chosen to define the parameters in claim 1 only with the precision of one decimal digit. In the description, too, these ranges are disclosed with the precision of one decimal place. In the case at hand, there is no indication in the claims or the description that for the **claimed** end values a different precision was intended than that defined here by means of one decimal digit. Applying the aforementioned rounding convention, the Board thus agrees with the appellant and the decision under appeal that the defined boundary of 0.2 microns for Wsa1-5 of the cold-rolled steel sheet

or of 0.4 microns or less for Wsa1-5 of the temper-rolling roll waviness, for example, also encompasses values of 0.24/0.44 microns, respectively.

Therefore, in Comparative Examples 3 and 5, the Wsa1-5 value of 0.42 microns for the final-stand roll (feature [5]) is still within of the scope of the claim, while the resulting Wsa1-5 value (0.26 microns) of the cold rolled sheet (feature [8]) is outside the scope of the claim.

However, this does not result in a lack of sufficient disclosure. Contrary to the appellant's understanding, the subject-matter of claim 1 is not to be construed in such a way that for any final-stand roll waviness of 0.4 microns or less (feature [5]), a cold rolled sheet having a waviness of 0.2 microns or less (feature [8]) has to be obtainable. Instead, the claim requires that both conditions [5] and [8] are fulfilled at the same time, i.e. the waviness of the cold-rolled steel sheet has to be 0.2 microns or less (not including 0, see feature [8]), and in addition the final-stand rolling roll has to have a waviness of 0.4 microns or less (not including 0). Comparative Examples 3 and 5 thus do not fall under the definition of the invention in claim 1 and the occurrence of a surface defect in these examples does not result in a lack of sufficiency of disclosure.

In addition, the patent encompasses a teaching as to how the waviness of the cold-rolled steel sheet falling under the definition of claim 1 can be achieved, since from the examples it is clear what needs to be done to get the parameter of feature [8] into the claimed range: the waviness of the roll is to be further

reduced (see the waviness of the final-stand rolling roll for the inventive examples shown in Table 1).

Indeed, since the required result of the cold rolling process step is already defined in claim 1, it is not apparent why the waviness of the cold-rolling roll is critical to the method. The definition of both the cold-rolling roll waviness (feature [5]) and the resulting waviness of the cold rolled steel sheet (feature [8]) thus might to a certain extent be redundant for the definition of the process. However, this is not a problem of sufficiency of disclosure but (if at all) an issue of clarity, which is not to be examined in opposition appeal proceedings for granted claims.

3.4 To conclude, none of the objections raised by the appellant can raise doubts as to the sufficiency of disclosure of the patent.

4. Main request - novelty

The appellant raised novelty objections in view of of D13, D16, D17 and the product series "Serica" as described in D2 to D9. D21 and D22 were submitted by the appellant in support of these objections.

None of these objections is persuasive, however.

4.2 Admittance of D21 and D22

The appellant submitted documents D21 and D22 (both published after the priority date of the patent) with its reply to the Board's communication under Article 15(1) RPBA. The respondent requested that these

documents not be admitted as no exceptional circumstances were present.

4.2.1 D21 and D22 are considered to be relevant background documents as far as they contribute to the understanding of the comparability of different waviness parameters, a discussion partly triggered by point 4.4.4 of the Board's communication under Article 15(1) RPBA. Their filing is thus considered a legitimate reaction to points raised in the Board's communication, i.e. it is justified by exceptional circumstances.

The Board thus decided to take these documents into account.

4.3 Novelty objection based on D13

4.3.1 D13 discloses the temper rolling of a 50g/m^2 nickel-plated steel sheet (see D13a, paragraphs [0015], [0028] and [0037]). A cold-rolled steel sheet is used as a precursor (D13a, paragraph [0028]). According to D13, the waviness Wca of the steel sheet is 0.25 microns after cold rolling (D13a, paragraph [0028]). Reference was also made to Example 9 in Table 2, in which the Wca is 0.2 microns.

D13 does not explicitly disclose a Wsa1-5 value of 0.2 microns or less for the cold-rolled sheet (feature [8]); nor does it disclose the waviness of the cold-rolling roll or the temper roll (features [5] and [7]).

4.3.2 The appellant considers features [5], [7] and [8] to be at least implicitly disclosed in D13. The appellant argued that the value of the waviness parameter Wca

disclosed in D13 was systematically higher than the corresponding claimed Wsa1-5 value when determined for the same sheet or roll. This was shown, for example, in D15, Figure 98. The Wsa1-5 value of the cold rolled sheet (Wca=0.25 microns) therefore had to be 0.24 microns or lower, thus falling within the claimed range of 0.2 microns or less (feature [8]) when applying the aforementioned rounding convention. It was further implicit that the corresponding rolls had corresponding waviness values since otherwise the disclosed sheet's waviness was not achievable.

These arguments are not convincing, however.

4.3.3 It was undisputed that the Wca value (obtained by Gaussian filtering using cut-off values of 0.8 to 8.0 mm, see, for example, D15, page 111) does not correspond to the claimed Wsa1-5 value (obtained by filtering using cut-off values of 1-5 mm, see the patent, paragraphs [0026] and [0028], or D1, Figure 1).

Figure 98 of D15 shows a comparison between values of different waviness parameters after different band pass filtering (here, Wca corresponds to "Wa(0.8-8)" and Wsa1-5 corresponds to "Wa(1-5)"). The respondent argued that "also cases in which Wsa(1-5) > Wca were conceivable when long wavelengths waviness dominates", yet did not provide any evidence or examples.

The allegation that the value of Wsa1-5 is systematically below the value of Wca is valid under certain conditions. For example, in the event of dominating long wavelengths (as an example we assume a dominating range of 6 to 8 mm), the corresponding change in Z-values (see D1, Figure 2) would not be taken into account by Wsa1-5 (as wavelengths above 5 mm

are cut off), but it would be taken into account by the Wca parameter (which includes wavelengths of 0.8 to 8 mm and thus also the exemplary 6 to 8 mm wavelengths). As the waviness parameter essentially adds up the differences between Z-values and the mean (see D1, point 3.12), in this case Wca is greater than Wsa1-5. On the other hand, for dominating wavelengths within the cut-off region of both parameters (e.g. 2 to 5 mm) both values can be substantially equal.

4.3.4 Features [5] and [8]

Even if the appellant's allegation that the Wsa value of the cold-rolled steel sheet corresponded to the waviness of the cold rolling roll and has Wsa1-5 < Wca < 0.25 microns were convincing, Wsa1-5 has not been shown to be below 0.2 microns (or below 0.24 microns when applying the rounding convention) for the cold rolled steel sheet long-wavelength waviness (feature [8]). There is no generally applicable correlation available showing that the resulting value has in any case to be at least 0.24 microns or lower. While Figure 98 of D15 gives a correlation of the Wa1-8 value and the Wa1-5 value with the Wa1-10 value, each of these correlations comes with a variance, which has to be taken into account when approximating the Wa1-5 value via the Wa1-10 value. Indeed the values for Wa1-8 and Wa1-5 can be very close, with their standard deviations overlapping (see for example Figure 97, sample 7 or 31). Even if a Wsa1-5 value is smaller, this does not necessarily result, after rounding, in a value in the claimed range (the respondent exemplified this by a Wca/Wsa1-5 ratio of 0.254/0.246). There is thus no implicit disclosure of a Wsa1-5 value of 0.244 or less in D13.

Since the resulting waviness of the steel sheet defined by feature [8] is not established, there cannot be a clear and unambiguous disclosure in D13 of a cold-rolling roll waviness in accordance with feature [5], either.

4.3.5 Feature [7]

Assuming that it is correct that the value of Wsa1-5 is at least not above the Wca value, the arithmetic condition defined by feature [7] is fulfilled (paragraph [0028] discloses a Wca of 0.34 microns for the temper-rolled steel sheet, thus implying a Wsa1-5 of 0.34 microns or less). According to paragraph [0054] and Figure 2 of the patent, a value of 0.35 microns or less (of the sheet after processing) may be used as an indication of excellent image clarity after coating; however, as discussed above, the waviness of the temper-rolled steel sheet is not defined in claim 1.

Contrary to the appellant's view, the conclusion that because the patent describes the waviness of the temper-rolling roll according to feature [7] as a necessary prerequisite to achieve a low value of the waviness of the temper-rolled steel sheet, the conclusion that the waviness of the temper-rolling roll in accordance with feature [7] was also implicitly disclosed in D13 is not persuasive. According to paragraph [0006] of D13, "the manufacturing method [...] does not require special roll roughness and roll management **in temper rolling**"(emphasis added).

Moreover, the results in the patent show that there is no direct correlation between the achieved steel sheet waviness and the waviness of the temper-rolling roll (the latter being constantly at Wsa1-5 = 0.3 microns at

the same roll force, while the resulting Wsa1-5 values of the steel sheet after temper rolling vary between 0.17 and 0.46 microns. Thus, no implicit disclosure of feature [7] can be derived from D13, either.

4.3.6 To conclude, features [5], [7] and [8] are not directly and unambiguously disclosed in D13.

4.4 Novelty objection based on D16

4.4.1 D16 discloses in Example 2, test ("essai") 15 (see pages 10 and 11 and Table II), a method of forming a plated steel sheet including the steps of cold rolling and hot-dip galvanisation followed by temper rolling ("skin-pass"). In addition, a subsequent processing step (deformation of 3.5%) is performed. In Test 15, a cold-rolling roll with a low roughness is used, i.e. a roll with a surface texture which is not obtained by electron discharge texturing (EDT). For this test, the resulting values of the Wa0.8 waviness parameter for the steel sheet are 0.15 microns (after cold rolling), 0.35 microns (after temper rolling) and 0.34 microns (after deformation). The amount of zinc added during plating in Example 2 falls within the range of feature [6] (a layer thickness of 6.5 microns corresponds to an amount of 46.4 g/m^2 for a zinc density of 7.14 g/cm^3). The waviness of the cold-rolling roll and the temper roll are not disclosed in D16.

4.4.2 The parameter Wa0.8 used in D16 to characterise the waviness is different from the parameter Wsa1-5 used in the patent. D16 thus at least does not explicitly disclose the Wsa1-5 values defined by features [5], [7] and [8]. However, in the appellant's view, these values are implicitly disclosed.

The appellant provided the following arguments to demonstrate that features [5], [7] and [8] were disclosed in D16.

(a) For the same steel sheet, the value of the Wsa1-5 parameter was systematically lower than the value of the Wa0.8 parameter disclosed in D16.
(b) The disclosed waviness of the resulting steel sheet strongly correlated to the waviness of the rolls, the latter thereby being implicitly disclosed.
(c) The disclosed roughness of the rolls also correlated with the waviness of the rolls, the latter thus being implicitly disclosed also for this reason.

These arguments are not persuasive for the following reasons.

4.4.3 Relationship between Wa0.8 and Wsa1-5

The parameter Wa0.8 used in D16 does not correspond to either of Wsa1-5 or Wca as defined in the patent (paragraphs [0026] and [0028]). Instead, it is calculated by a method removing the form contribution by approximation with an at least 5 degree polynomial, while removing the roughness contribution using a Gaussian filter (cut-off 0.8 mm) (see D16, page 9, lines 29 to 34, or D21, chapter 3.2).

The appellant argued that a Wsa1-5 value (Wa(1-5) in D15, Figure 98) was always smaller than the corresponding Wca value ("Wa(0.8-8)" in D15). This was confirmed by D21, right-hand part of Figure 11 and by the results provided in D22, Figure 5. Consequently,

the Wsa1-5 value used in the claim was always below the Wa0.8 values given in D16.

This is not persuasive. While for the mere Gaussian filter approach (Wsa1-5) the complete waviness in the filter range contributes to the calculation of the waviness, this is different for the polynomial approach, in which form components are "disregarded" by subtracting a polynomial fit. In this procedure the evaluated waviness depends on the quality of the fit to the measurement data. Furthermore, the wavelength spectrum taken into account depends on the degree of the polynomials used (for which D16 only gives the lower limit of 5, see D16, page 9, line 32, "polynome de degré **au moins** 5"). The conclusion of the appellant that the Wsa1-5 value is always and inevitably lower than the Wa0.8 value is thus not persuasive. D22 does not provide such a general teaching either. In Figure 5, a specific example is shown (in which form removal was performed by 5th order polynomial regression, see point 2.2.2), in which context it is stated that "[t]he waviness characteristic values of Wa0.8 is higher than Wsa1-5 [for this example]". The same is true for Figure 11 of D21, which merely shows the qualities of various waviness parameters in which the polynomial fit (P5 specifying again a 5th order polynomial regression) can be close to the theoretical reference value of the particular Carsteel gauge profile.

It thus cannot be concluded from the data in Table II of D16 that Example 2, Test 15 that the waviness of the resulting steel sheet after cold rolling inevitably falls within the range defined by feature [8].

In addition, the waviness values of the rolls according to features [5] and [7] are not disclosed in D16, either.

4.4.4 Waviness of the rolls not derivable from the waviness of the steel sheet

The waviness of the cold-rolling and temper rolling rolls (features [5] and [7]) is not mentioned in D16. For this reason alone- D16 does not anticipate the novelty of the patent.

The appellant held the view that the waviness Wsa1-5, though defined differently, was in any case smaller than the Wa0.8 values disclosed in D16. In addition, the rolls had to have waviness values which correspond to the waviness of the steel sheet. At least for the "smooth" cold-rolling roll, which has an average roughness of below 0.5 microns (page 3, lines 16 to 19, and Table II), this was further confirmed by the correlation in Figure 8 of D10.

Even if it were established that the Wsa1-5 values of the steel sheet according to feature [8] and of the unprocessed and processed skin-passed steel sheet defined in paragraph [0054] of the patent were disclosed in D16, it still would have to be discussed whether this also implies corresponding Wsa1-5 values of the rolls (features [5] and [7]) (see in this respect D15, Figure 21, for example, according to which the resulting waviness of the steel sheet for a given roll also depends on other parameters such as the roll force.

4.4.5 Waviness of the rolls not derivable from the surface roughness of the rolls

With respect to the alleged correlation between the waviness of a cold-rolling roll with its surface roughness, such a relationship is not present for the examples of the patent (see Table 1, columns 2 and 3). While in all of the examples the final-stand cold rolling-roll always has the same roughness of 2.1 microns, its waviness varies for the examples of the invention between 0.18 and 0.42 microns.

With regard to the appellant's reference to D10, Figure 8, this does not constitute evidence of common general knowledge. Rather, it is merely a single scientific report and Figure 8 describes a correlation for a roll having a surface texture processed by a specific method, which is EDT, while the cold-rolling roll in Example 2, Test 15, of D16 is explicitly not an EDT-treated roll but a "smooth" roll having a surface roughness of 0.5 microns (see D16, page 10, lines 20 to 22: "cylindres de travail dits **lisses** dont les surfaces de travail présentent une rugosité Ra2.5 de 0,5 µm"). Therefore, the correlation of D10, Figure 8, is not applicable to the example of D16 in question. Furthermore, the temper-rolling rolls in Example 2, Test 15 are not obtained by EDT but by electron beam treatment (EBT, page 11, lines 5 to 8).

Therefore, the conclusion in the decision under appeal that the correlation of waviness and roughness in Figure 8 of D10 is not applicable to determining the waviness of the cold-rolling roll and the temper-rolling roll disclosed in D16 on the basis of the disclosed roughness values is correct.

4.4.6 To conclude, features [5] to [8] are not directly and unambiguously disclosed in D16.

4.5 Novelty objection based on D17

The novelty objection based on D17 is not convincing either. In the statement setting out the grounds of appeal, reference was only made to the analogue content ("contenu analogue") of D16 and to an alleged correlation of roughness and waviness according to Figure 8 of D10. This is not convincing for the reason alone that D17 relies on a different definition of the waviness (see page 1, lines 17 to 20) compared with that applied in D16. Moreover, the objection was only based on general references to generic statements on page 3 of D17.

It was thus not explained where in D17 the features of claim 1 are disclosed. The novelty objection is therefore already not sufficiently substantiated, let alone convincing.

4.6 Steel product series "Serica"

4.6.1 In light of documents D2, D3, D7 and D9, it is persuasive that on the priority date of the patent a hot-dip galvanized (i.e. zinc-plated) steel sheet product series, "Serica", was commercially available, which thus constitutes prior art under Article 54(2) EPC.

Post-published documents D4 to D6 and D8 disclose that at least some of the Serica steel sheet products which were plated with plating amounts above 45 g/m^2 (see D4, page 1: "Surface aspects") had a final product Wsa1-5 waviness of 0.35 microns or lower after (5%) processing (see, for example, D6, Image 5). This value corresponds to a value mentioned in paragraphs [0054] and [0055] of

the patent as one possible indication of the desired surface quality.

4.6.2 However, it is not established whether such properties were also present for Serica products available before the priority date. Since "Serica" is a trade name, the mere reference to the product name cannot establish with certainty that a Serica steel sheet before the priority date had the same properties as disclosed in the post-published documents such as, for example, D5 or D6. The burden of proof that such a Serica steel sheet was produced before the priority date lies with the appellant, which did not submit evidence in support of this alleged fact.

4.6.3 In addition, while claim 1 defines a method, documents D2 to D9 do not fully disclose the process steps applied to produce the steel sheets of the Serica series to obtain the described surface quality. In particular, no information is provided on the cold-rolling step. Moreover, the waviness of the steel sheet after cold rolling according to feature [8] is not disclosed here. Document D7 (and also D5 and D6, see page 2 thereof) merely explains that "Tata Steel implemented modifications to the steel manufacturing process - e.g. in the chemical composition and specific adaptation of the skin pass rolling". Whether this includes the application of rolling rolls in accordance with features [5] and [7] is not apparent from any of documents D2 to D9.

5. Main request - inventive step

The appellant raised objections relating to a lack of inventive step in view of:

- D16 in combination with any of D10 to D15
- D13 in combination with any of D10 to D15
- D17 in combination with any of D10 to D15
- the Serica product in view of the teachings of any of D10 to D15

5.1 The respondent argued that according to a "well-known line of case law" only one prior art is to be considered as the closest prior art.

However, the Board does not agree with the respondent's allegation that there is "usually only one closest prior art". If the skilled person had a choice of several workable routes which might lead to the invention, the rationale of the problem-solution approach requires that the invention be assessed relative to all these possible routes (see Case Law of the Boards of Appeal, 10th ed., 2022, I.D.3.1, sixth paragraph). In the case at hand, there is no justification for restricting the inventive-step discussion to only one starting point in view of the differences in the disclosures (see novelty discussion), and the respondent did not provide convincing arguments in that respect either.

5.2 D16 as the starting point

5.2.1 The most promising starting point in D16 is Example 2, Test 15. The resulting steel sheet exhibits a surface waviness which is associated, as in the patent, with the absence of an orange peel effect (see page 1, lines 26 to 29: "peau d'orange"), i.e. excellent image clarity after coating ("peinture").

As discussed above (see point 4.4), this example does not disclose features [5], [7] and [8], i.e. the claimed waviness of the rolls, as well as the waviness of the steel sheet after cold rolling.

5.2.2 According to D16, excellent image clarity is achieved by providing a plated and skin-passed steel sheet having a certain waviness after processing. According to Example 2, Test 15 (see table 2) it is important to achieve a certain waviness after each processing step, which corresponds in the case of Example 2, Test 15 (at least qualitatively, as the waviness is a differently defined parameter compared with the patent) with the achieved values in the examples of the patent. However, in D16, the means to achieve the waviness values in all all of processing steps is the selection of rolls having a low surface roughness, i.e. being smooth (page 11, lines 14 to 16: "l'utilisation du laminage **lisse** permet de réduire l'ondulation Wa0.8 que ce soit à l'issue du laminage à froid, du skin-pass ou de l'etape de mise en forme", emphasis added). As established previously (see point 4.4.5), there is no direct correlation between the surface roughness and the waviness of the rolls for the smooth rolls used in Example 15.

Therefore, the objective technical problem is to provide an alternative process for manufacturing a plated steel sheet with excellent image clarity after coating.

5.2.3 The appellant argued that this technical problem was not convincing since the effect was not achieved over the whole scope claimed. In the absence of a correlation between the waviness of the temper-rolling roll and the resulting waviness of the final steel

sheet the claimed effect was not achieved. Therefore, with reference to T 746/22, the appellant further held that the features relating to the waviness of the rolling rolls are arbitrary features which cannot be taken into account for formulating the objective technical problem.

This is not convincing, however. The effect defined by feature [1] of claim 1 excludes methods which do not achieve the property of excellent image clarity. The data in Table 1 of the patent show that this effect is achieved, at least with respect to defects such as the orange peel effect, which are recognisable with the naked eye. The fact that the result is defined in a relative definition and that the waviness of the temper-rolled steel sheet is related to this effect but not defined in claim 1 is a deficiency related to Article 84 EPC which is not applicable here. This does not call into question the fact that excellent image clarity is achieved.

The appellant further argued with reference to Figure 21 of D15 that the waviness of the steel sheet could vary with the roll force. Since the roll force was not defined in the claim, there was no technical effect present over the whole scope of the claim, as roll-force values were encompassed that were incapable of imparting the required waviness on the steel sheet.

However, the choice of an appropriate rolling force for a roll of given waviness to impart the waviness to the steel sheet is well within the capabilities of the skilled person. Subject-matter where the roll force is insufficient to impart the roll's waviness to the steel sheet would not be chosen by the skilled person and

would not be considered part of the claimed subject-matter.

5.2.4 D16 in combination with the common general knowledge

D16 in combination with common general knowledge does not lead to the invention. D16 only teaches adjusting the roughness of the cold-rolling roll to a low value (Test 15 of Example 2: below 0.5 microns). With respect to the temper rolls a roughness of 5 microns is defined (Example 2, page 11, second paragraph). The waviness of the rolls is not addressed in D16. Furthermore, as discussed above (see point 4.4.5), there is no direct correlation between surface roughness and waviness that would prompt the skilled person to select rolls having the claimed waviness in accordance with features [5] and [7].

5.2.5 D16 in combination with D10

D10 refers solely to the adaptation of the waviness of a tandem or temper mill roll of the plated steel sheet using EDT. It not apparent why this reference would prompt the skilled person to replace the smooth cold-rolling roll of Example 2, Test 15 (which is not textured by EDT), with a roll in accordance with feature [5].

5.2.6 D16 in combination with D11

D11 discloses imparting a certain roughness on the steel sheet either by cold rolling or temper rolling (paragraph [0009]). This is done in order to improve the adhesion of coatings (see paragraph [0071]). D11 is silent on imparting a certain waviness and therefore

also on respectively adapted cold-rolling and temper rolls.

Therefore, D11 does not teach the distinguishing features and does not contain a pointer towards the solution of the technical problem, either.

5.2.7 D16 in combination with D12

D12 also only suggests adjusting the surface roughness (point 3.1.2.6.6.4) in the cold-rolling and temper-rolling ("Dressieren") steps. It is not apparent whether the steel is plated in between (see also Figure 1 of D11, according to which plating is only optional). Moreover, as far as the surface preparation (by EDT) of a rolling roll is suggested here, this is only for the temper-rolling roll. No details are given.

5.2.8 D16 in combination with D13

D13 only discusses adapting the waviness of the cold-rolling roll before plating to a value of 0.25 microns. D13 discloses neither the Wsa1-5 value of the cold-rolling roll and the temper roll, and the value of 0.25 microns of the cold-rolled sheet is not within the range defined by feature [8] (see discussion on the accuracy of values in point 3.3.1 above).

Even if the teaching for the cold rolling step were to be considered, it is not apparent why the skilled person would also adapt the temper-roll waviness in addition (see D13a, paragraph [0008]: "to provide a simple manufacturing method which does not require special roll roughness and roll management in temper rolling").

5.2.9 D16 in combination with D14

D14 discloses only adapting the waviness of the temper-rolling roll (paragraphs [0063] and [0064]) in order to improve the "visual appearance" (here, the arithmetic mean Wsa is defined). Therefore, it is not apparent why the skilled person should also adapt the waviness of the cold rolling roll in view of this teaching.

5.2.10 D16 in combination with D15

D15 merely confirms the common general knowledge that the roughness and the waviness of the particular rolling rolls (EDT-rolls, as in D10) are somehow related (see page 40, point 2.3.3.2.1). D15 also mentions a waviness parameter very similar to the one used in D16 (here, "WcP5-0.8", see the overview in the table on page 111).

However, as discussed above, D16, Example 15 uses "smooth rolls", i.e. rolls not treated by EDT. Thus, for the same reasons as those discussed with respect to D10, there is no pointer in D15 to adapt the waviness of these smooth rolls (or to suggest that their waviness may fall within the range claimed).

D15 thus does not render the distinguishing features obvious to the skilled person.

5.3 D13 as the starting point

Contrary to the appellant's analysis of D13, feature [8] is also a distinguishing feature (see point 4.3 above). As previously mentioned, D13 discourages the skilled person from adjusting the temper-roll

surface properties, including its waviness (see D13a, paragraph [0008]).

5.4 D17 as the starting point

Given that the appellant did not properly establish the common and distinguishing features over the disclosure of D17 in its novelty objection, the objection relating to a lack of inventive step is equally unconvincing. The mere reference to the same arguments as those concerning D16 cannot rectify this deficiency.

5.5 The Serica product as the starting point

Even when starting from the Serica product under the assumption that it was pre-published, none of the cited references D10 to D15 discloses all of distinguishing features [5], [7] and [8] (see also points 5.2.5 to 5.2.10), and, in particular, none of them disclose the features of the cold-rolling step, a step which is not addressed in the Serica documents. The inventive step attack based on this starting point is thus not convincing either.

6. Since none of the appellant's objections is convincing the appeal is not successful.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

C. Spira C. Herberhold

Decision electronically authenticated