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**Datasheet for the decision  
of 9 March 2017**

**Case Number:** T 1102/13 - 3.2.03

**Application Number:** 06841463.0

**Publication Number:** 1974101

**IPC:** E02D5/04

**Language of the proceedings:** EN

**Title of invention:**

SHEET PILE IN DOUBLE-T FORM

**Patent Proprietor:**

ArcelorMittal Commercial RPS S.à r.l.

**Opponents:**

Peiner Träger GmbH  
ThyssenKrupp Bautechnik GmbH

**Headword:**

**Relevant legal provisions:**

EPC Art. 100(a), 56, 114(2)  
RPBA Art. 12(4)

**Keyword:**

Ground for opposition under Article 100(a) EPC withdrawn in  
opposition proceedings - not admitted in the appeal  
proceedings

Late-filed documents

Inventive step - (yes)

Non-attendance at oral proceedings

**Decisions cited:**

G 0010/91, G 0004/95

**Catchword:**



**Beschwerdekammern  
Boards of Appeal  
Chambres de recours**

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Case Number: T 1102/13 - 3.2.03

**D E C I S I O N  
of Technical Board of Appeal 3.2.03  
of 9 March 2017**

**Appellant 1:** Peiner Träger GmbH  
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**Decision under appeal:** **Decision of the Opposition Division of the  
European Patent Office posted on 11 March 2013  
rejecting the opposition filed against European**

patent No. 1974101 pursuant to Article 101(2)  
EPC.

**Composition of the Board:**

<b>Chairman</b>	G. Ashley
<b>Members:</b>	V. Bouyssy
	D. Prietzel-Funk

## **Summary of Facts and Submissions**

- I. European patent No 1 974 101 (in the following: "the patent") concerns a sheet pile in double-T form which has a V-shaped groove for coupling to a connection profile.
- II. The patent as a whole was opposed by opponents 1 and 2 on two grounds of Article 100(a) EPC (lack of novelty and lack of inventive step).
- III. The opposition division decided to reject the oppositions.
- IV. This decision was appealed by both opponents (here appellants 1 and 2).
- V. With the summons to oral proceedings, the Board sent a communication pursuant to Article 15(1) of the Rules of Procedure of the Boards of Appeal (RPBA) indicating its preliminary opinion of the case.
- VI. Oral proceedings before the Board were held on 9 March 2017, for the course of which reference is made to the minutes. As announced by letter of 9 January 2017, duly summoned appellant 2 was not present at the oral proceedings. Despite being duly summoned, appellant 1 failed to appear.
- VII. Requests

The appellants requested in writing that the decision under appeal be set aside and the patent be revoked.

The patent proprietor (here respondent) requested that the appeals be dismissed (main request), alternatively,

that the patent be maintained in amended form on the basis of one of the sets of claims filed as auxiliary requests 1 and 2 with letter of 27 November 2013.

VIII. Claims of the patent proprietor's main request (claims as granted)

Independent product claim 1 is directed to the following subject-matter (the feature breakdown was relied on in the decision under appeal and used by all parties):

- 1.1) Steel sheet pile in double-T form, comprising
  - 1.2) a web and
  - 1.3) two flanges,
    - 1.3.1) wherein each flange has an inner side facing the web, an outer side facing away from the web, and two longitudinal edges; and
    - 1.3.2) a coupling means for a connection profile is provided along at least one longitudinal edge of at least one flange end,
- characterized in that
- 1.4) the coupling means is formed by a milled groove,
    - 1.4.1) which extends in the outer side of the flange along the at least one longitudinal edge and
    - 1.4.2) has a substantially V-shaped cross section
    - 1.4.3) with an opening width (b) lying within the range  $(0.5 \cdot e) \leq b \leq (1.5 \cdot e)$  and
    - 1.4.4) with a depth (t) lying within the range  $10 \text{ mm} \leq t \leq (0.5 \cdot e)$ ,
  - 1.5) where (e) is the thickness of the flange in the direct vicinity of the groove.

Independent method claim 15 is directed to the following subject-matter:

- 15.1) Method for producing a sheet pile in accordance with any one of the preceding claims comprising the steps of:
  - 15.2) hot-rolling a double T-profile
  - 15.3) comprising a web and two flanges, wherein each flange has an inner side facing the web, an outer side facing away from the web, and two longitudinal edges;
- characterized by
- 15.4) incorporating by a milling operation, subsequently to said hot-rolling step, a groove into the outer side of at least one of said two flanges, along at least one of said longitudinal edges,
  - 15.5) said groove having a substantially V-shaped cross section with an opening width (b) lying within the range  $(0.5 \cdot e) \leq b \leq (1.5 \cdot e)$  and a depth (t) lying within the range  $10 \text{ mm} \leq t \leq (0.5 \cdot e)$ , where (e) is the thickness of the flange in the direct vicinity of the groove.

IX. Cited evidence

In the statements setting out the grounds of appeal, and in the reply to them, the parties relied, among others, on the following documents which were filed in the opposition proceedings and are cited in the decision under appeal:

- E1: WO 2005/038148 A1
- E2: DE 10339957 B3
- E3: DE 613 210 C
- E5: US 2,018,625 A

- E7: DE 10 2007 015 455 A1
- E12: European Standard DIN EN 10248-2, "Warmgewalzte Spundbohlen aus unlegierten Stählen - Teil 2: Grenzabmaße und Formtoleranzen", 1995
- E13: Extract from catalogue "Peiner Stahlspundwände - Peiner Stahlpfähle", PREUSSAG STAHL AG, with imprint "12.94", pages 7, 8 and 18
- E17: Baer, O., "Stählerne Kastenspundbohlen: Untersuchungen über ihre technische und wirtschaftliche Eignung", TH Braunschweig, Peine, 1953
- E18: DE 42 05 455 C1
- E19: DE 197 17 200 A1
- E20: EP 0 790 093 A1
- E21: WO 2007/137747 A1
- E27: Extract from catalogue "Steel Sheet Piling - General catalogue - Edition 2003", ProfilARBED S.A., pages 46a and 47a
- E28: Braun, H. et al., "Fachkunde Metall", Verlag Europa-Lehrmittel, 52nd edition, 1996, pages 166 to 171

In the statement setting out the grounds of appeal, appellant 1 submitted and referred to the following document for the first time:

E30: DE 659 442 C

In addition, appellant 1 reiterated its request made at the hearing before the opposition proceedings to hear Mr Ingolf Ehms as technical expert to provide evidence of the general knowledge of the skilled person.

X. The arguments of the parties, insofar as relevant for the present decision, can be summarised as follows:



(a) Consideration of E7, E19 to E21, E27, E28 and E30  
in the proceedings

Appellants' case:

The opposition division decided not to admit any of documents E7, E19 to E21, E27 and E28 into the proceedings. However, these documents must be taken into consideration when assessing inventive step because they document common general knowledge in the relevant field of sheet piles, in particular the fact that milling is a well-known manufacturing process, the absence of any technical prejudice against milling, the fact that a V-shaped groove is easily milled, and the fact that so-called RZD, RZU and RH connection profiles were well-known in the art. E30 also documents that it is common general knowledge that, after hot-rolling sheet piles, the flash or excess metal can be trimmed off by milling.

(b) Request to hear Mr Ehms in the appeal proceedings

Appellant 1's case:

The opposition division decided not to admit any oral submission from Mr Ingo Ehms because appellant 1 had failed to indicate, in advance of the oral proceedings, Mr Ehms' professional function and qualification to speak. The appellant now submits that Mr Ehms is head of the department Patents & Licensing at Salzgitter Mannesmann Forschung GmbH, Duisburg. It is requested that he be heard as technical expert to provide evidence of common general knowledge in the relevant field of sheet piles.

Respondent's case:

The opposition division correctly decided not to admit any oral submission by Mr Ehms. In addition it is not comprehensible why he could not submit a written statement instead of making oral submissions.

(c) Main request - Novelty

Appellant 1's case:

The subject-matter of claim 1 is anticipated by the steel sheet pile disclosed in E1.

Respondent's case:

The appellants had expressly withdrawn the ground of lack of novelty during the oral proceedings before the opposition division, so that it constitutes a fresh ground of opposition in the appeal proceedings. Since the patent proprietor does not approve the discussion of this ground, it cannot be considered in the appeal proceedings, pursuant to G 10/91.

(d) Main request - Inventive step

Appellant 1's case:

The subject-matter of claim 1 is rendered obvious by the common general knowledge in the field of sheet piles. The skilled person, who starts from a steel sheet pile in double-T form with bare flanges and seeks to provide a flange end with means for coupling to a connection profile of the RZ type, as marketed by the respondent (see E27), knows two alternative solutions: either working a coupling groove into the flange end (see e.g. E1, E3, E13) or forming a wedge-shaped

coupling bead on the flange end (see e.g. E1, E2, E18). He would choose the first alternative because it is less complicated and expensive. E3 teaches that it is common practice to mill coupling grooves in flange ends. E30 confirms that, following rolling of sheet piles, milling is standard operation, in particular to trim off the flash or excess metal. Moreover, it is common practice to weld the connection profile to the flange end, after it has been connected to it (E1, E18), and milled surfaces are known to be well suited for welding. In light of this, the skilled person would consider milling a coupling groove in the flange end, as required by feature (1.4). When doing so, he would inevitably mill a symmetric V-shaped groove, as shown in E1 (figure 4), as this would further reduce costs and effort while easing welding with the connection profile.

The width and depth of the V-shaped groove are dictated by the geometry of the profile RZ to be coupled to the groove. In particular, the profile RZD 16 (see E27, page 46a) has a clamp-shaped lock part with an inwardly curved strip which is suitable for overlapping the outer flank of the V-shaped groove of a sheet pile on a height of at least 4 mm, as required by European standard EN 10248 (see E12, table 15, form 4), and at most 15.6 mm, while the flange end of the sheet pile may not exceed a thickness ( $e_{\max}$ ) of 36.19 mm. Hence, the maximum possible depth of the V-shaped groove is  $t_{\max} = 15.6$  mm, which lies between 10 mm and  $(1.5 \cdot e_{\max})$ , as required by feature (1.4.4). From figure 4 of E1 it is clear that, in the coupled condition, the inwardly curved strip of the profile RZD 16 makes an angle of approximately  $45^\circ$  with the outer side of the sheet pile flange. Therefore, the symmetric V-shaped groove is approximately an isosceles right triangle and  $b=2 \cdot t$ .

Hence, the maximum possible width of the V-shaped groove is  $b_{\max} = 31.2$  mm, which is comprised between  $(1.5 \cdot e_{\max})$  and  $(2 \cdot e_{\max})$ , as required by feature (1.4.3). These two dimensional requirements are still satisfied if some play is foreseen between the curved strip of the profile RZD 16 and the outer flank of the V-shaped groove, or if the angle for the curved strip (i.e.  $45^\circ$ ) has a tolerance of  $\pm 5^\circ$ . Thus, given the geometry of the profile RZD 16 and the minimum locking overlap required by European standard EN 10248, the skilled person would inevitably arrive at features (1.4.3) and (1.4.4).

Alternatively, should the skilled person start from E3, he would also arrive at the subject-matter of claim 1 in an obvious manner. E3 discloses features (1) to (1.3.2) of claim 1. Contrary to the opposition division's view, figure 1 of E3 discloses also that the coupling means is formed by a V-shaped groove as required by features (1.4) to (1.4.2). The subject-matter of claim 1 thus differs from E3 only by the features that the groove is formed by milling (feature (1.4)) and that its width and depth meet the requirements of features (1.4.3) and (1.4.4). The step of milling the groove is rendered obvious by the teaching of E3 that it is known to hot-roll steel sheet piles in double-T form and subsequently mill coupling grooves in the flange ends (see page 1, lines 52 to 57 of E3). As shown above, the groove width and depth as defined in features (1.4.3) and (1.4.4) are dictated by the geometry of the connection profile RZ 16 which is to be coupled to the V-shaped groove.

As a further alternative, should the skilled person start from E1, the subject-matter of claim 1 would also lack an inventive step. As ruled by the opposition

division, claim 1 differs from E1 only by the feature that the groove is formed by milling (feature (1.4)) and by feature (1.4.3). As explained above, the first distinguishing feature is a standard manufacturing option for the skilled person. In fact, E1 discloses that a coupling groove can be rolled or milled in the flange end of a sheet pile (page 2, line 10). In addition, the groove shown in figures 3 and 6 of E1 comprises sharp edges and the skilled person knows that such a groove can be formed only by machining, in particular by milling. Finally, as shown above, feature (1.4.3) is dictated by the geometry of the profile RZD 16.

The same arguments apply, *mutatis mutandis*, to the subject-matter of method claim 15.

Appellant 2's case:

The opposition division held that the subject-matter of claim 1 differs from E1 by the feature that the groove is formed by milling (feature (1.4)) and by the groove width defined by feature (1.4.3). However, feature (1.4.3) cannot distinguish the claimed sheet pile from that disclosed in E1, for the following reasons. It is stated on page 7, lines 6 and 7 of E1 that the thickness  $e^*$  of the flange in the direct vicinity of the groove is 1.5 to 4.0 times, preferably 2 times, larger than the thickness  $e$  of the flange at the bottom of the groove. In figure 4 of E1, the groove flanks make an angle of approximately  $45^\circ$  with the flange surface and thus the groove is approximately an isosceles right triangle. When  $(1.5 \cdot e) \leq e^* \leq (2 \cdot e)$ , it is then inevitable that the groove width  $b$  is such that  $(2/3 \cdot e^*) \leq b \leq (e^*)$ . This takes away the novelty of the range  $(0.5 \cdot e^*) \leq b \leq (1.5 \cdot e^*)$  defined in feature

(1.4.3). Thus, claim 1 differs from E1 only in that the coupling groove is formed by milling.

This distinguishing feature is only one out of a limited number of obvious well-known alternatives, which the skilled person would apply to form the groove in the flange. In fact, it follows from the application as filed that the groove can be rolled or milled into the flange of the sheet pile and that, when the sheet pile is produced by hot-rolling, the machining steps of milling, planing and grinding are equally valid alternatives to form the groove in the completed sheet pile. This is confirmed by document E3 (page 1, lines 52 to 57): it describes sheet piles in double-T form having mutually engaging coupling grooves and projections in the flange ends, which are produced by milling or planing. E5 also suggests forming the coupling groove by machining the sheet pile (column 1, lines 11 to 16). Post-published document E7 proves that, before the priority date of the patent, there was the idea of milling the coupling groove and no prejudice existed against it.

In conclusion, the subject-matter of claim 1 lacks an inventive step.

The same arguments apply, *mutatis mutandis*, to the subject-matter of method claim 15.

Respondent's case:

Contrary to the appellants' view, E1 does not disclose a coupling means formed by a narrow V-shaped groove incorporated in the outer face of the flange by a milling operation, after hot-rolling of the double-T steel pile. Rather E1 only discloses a coupling means

formed by a wedge-shaped bead 20 protruding from the outer face of the flange end 21. The wedge-shaped bead is produced when hot-rolling the sheet pile and is later trimmed to the desired height by using a cutting torch (figure 6 of E1). The grooves shown in figures 3 and 4 of E1 are by-products of the reinforcement of the central part of the flange with an extra material thickness 24; they do not constitute coupling grooves in the sense of the claim. E1 is silent as regards the groove width and it does not mention any specific value for the angle of the groove flanks. An angle of 45° cannot be scaled from the schematic drawings in figures 3 and 4 of E1 since no exact dimensions can be derived from such drawings. Thus, the sheet pile defined in claim 1 differs from that disclosed in E1 by all the features recited in the characterising portion of claim 1.

These distinguishing features are closely interrelated and have the effect that coupling means warranting a reliable coupling are provided in a easy, cost-efficient and precise manner. In particular, milling produces uniform coupling grooves along the whole length of the flange, with small dimensional and shape tolerances. Since the groove is V-shaped and relatively narrow, it is easy and simple to mill it into the hot-rolled sheet pile. Vice versa, the groove being a milled V-shaped groove, has small manufacturing tolerances and may be very narrow.

The technical problem to be solved can thus be formulated as how to produce improved coupling means in a simple, economic and precise manner.

The claimed solution is not rendered obvious by the cited prior art and common general knowledge.

E3 and E5 would not motivate the skilled person to mill a coupling groove into the flange end instead of hot-rolling a wedge-shaped bead on the flange end, as taught in E1. In fact, E3 teaches away from milling a coupling groove because it states that it is a complicated and very expensive operation to form interlocking grooves or protrusions in flange ends by milling (page 1, lines 52 to 57). E5 teaches only that "generally in the prior art, ... metallic pilings have been provided with complicated designs of interlocking terminal edges which, due to their design, either were formed by very difficult rolling operations or by machining" (column 1, lines 11 to 16 of E5).

Contrary to appellant 1's view, the claimed geometry of the coupling groove is not a direct consequence of the shape of the connection profile RZ, let alone that of the profile RZD 16. In fact, the profile RZ has originally been designed to be pushed over a flange end with its wedge-shaped bead, a positive connection being produced between the flange end and connection profile (see E1 figure 1; E27). It is neither disclosed nor suggested in the cited prior art that a positive connection be produced between the inwardly curved strip of the profile RZ and a narrow groove in the flange outer side, as in the claimed invention (see drawings).

Finally, as evidenced by post-published document E7, even if the groove of E1 were milled, it would not be necessarily be milled to a narrow V-shape as required in claim 1. In particular, in figure 1b of E7, the groove 16 is wide and its shape does not match that of the inwardly curved strip of the connection profile 18.



The claimed subject-matter thus involves an inventive step when starting from E1.

The same arguments apply if the skilled person were to start from E3, alternatively from a sheet pile with bare flanges, as argued by appellant 1. In particular, like E1, E3 discloses a coupling means formed by a wedge-shaped bead protruding from the outer face of the flange end (figure 1), and it fails to disclose a coupling means formed by a groove in the flange end.

### **Reasons for the Decision**

1. Consideration of E7, E19 to E21, E27, E28 and E30 in the proceedings
  - 1.1 Document E7
    - 1.1.1 In the opposition proceedings, the opposition division decided not to admit E7 into the proceedings because it was published after the application date of the patent (see point 18.2.1 of the contested decision).
    - 1.1.2 However, since this document was submitted in due time, namely with the notice of opposition of appellant 1, the opposition division had no discretion to disregard it (Article 114(2) EPC). Therefore, this document was part of the proceedings from the start and must be taken into consideration, notwithstanding its relevance.
  - 1.2 Documents E19 to E21, E27 and E28
    - 1.2.1 The opposition division decided not to admit late-filed E19 to E21, E27 and E28 into the proceedings, using its discretionary power under Article 114(2) EPC.

- 1.2.2 It is not the function of the Board to review all the facts and circumstances of the case as if it were in the place of the opposition division, in order to decide whether or not it would have exercised such discretion in the same way. Rather, the Board must confine its review as to whether the opposition division has exercised its discretion according to the wrong principles, without taking into account the right principles, or in an unreasonable way.
- 1.2.3 The opposition division decided to not admit E19 to E21 since they were prima facie not relevant (see point 18.2.3 of the contested decision). Hence, it appears that the opposition division has correctly exercised its discretionary power under Article 114(2) EPC. In the appeal proceedings, appellant 1 did not challenge the non-admission of these documents, and the Board cannot find any reason why the teachings of these documents would be particularly relevant for the outcome of the present case. Consequently, the Board decided not to take E19 to E21 into further consideration (Article 12(4) RPBA).
- 1.2.4 Appellant 1 filed E27 and E28 in response to the preliminary opinion of the opposition division that neither features (1.4) and (1.4.2) nor features (1.4.3) to (1.5) of claim 1 are disclosed in the cited prior art, as expressed in the annex to the summons to oral proceedings. E28 documents common general knowledge relating to the milling of metal products. E27 provides detailed information on the dimensions of known HZ King Piles and RZD connection profiles as mentioned in paragraphs 3, 25 and 32 and shown in figures 3, 4 and 6 of the patent specification. The opposition division decided not to admit these documents because their

content was not contested by the respondent. In doing so, the opposition division has exercised its discretionary power under Article 114(2) EPC in an unreasonable way and thus incorrectly. These documents also appeared to be relevant for the outcome of the present case. For these reasons the Board decided to take them into consideration.

- 1.3 The Board sees no reason to disregard document E30, which was filed in reaction to the evaluation of inventive step in the contested decision. Thus, E30 is also taken into consideration in the proceedings (Article 12(4) RPBA).
  
2. Request to hear Mr Ehms in the appeal proceedings
  
- 2.1 In the statement setting out the appeal grounds, appellant 1 requested to hear Mr Ehms as a technical expert to provide evidence of the general knowledge of the skilled person in the technical field of sheet piles.
  
- 2.2 In its communication pursuant to Article 15(1) RPBA the Board addressed this request as follows (point 7 of the communication):
  
- 2.3 "The Board intends to use its own technical expertise to decide the issue of whether the subject-matter shows an inventive step, using the general knowledge of the skilled person. Therefore, it is not considered necessary to hear Mr Ehms as an expert witness (Article 117(1) (e) EPC)."
  
- 2.4 The communication went on to say, "of course, appellant 1 may request the Board to allow Mr Ehms to make submissions during the oral proceedings as an

accompanying person, in line with the criteria set out in decision G 4/95. Such oral submissions cannot be made as a matter of right, but only with the permission of and at the discretion of the Board (G 4/95, point 9 of reasons)."

2.5 In response, appellant 1 neither commented nor disputed this preliminary, non-binding opinion, and the Board saw no reason to depart from it. Hence, the Board decided not to hear Mr Ehms as an expert.

3. Admissibility of the ground of lack of novelty

3.1 In its statement setting out the appeal grounds and in its submission dated 26 February 2014, appellant 1 contended that the subject-matter of claim 1 lacks novelty over E1.

3.2 In the opposition proceedings lack of novelty was raised and substantiated only in the notice of opposition of appellant 2. It follows from the decision under appeal and the minutes of the oral proceedings before the opposition division that the appellants eventually acknowledged that the claimed subject-matter is novel (see point 20.1 of the reasons; points 29 and 30 of the minutes). The appellants did not contest the correctness of the minutes.

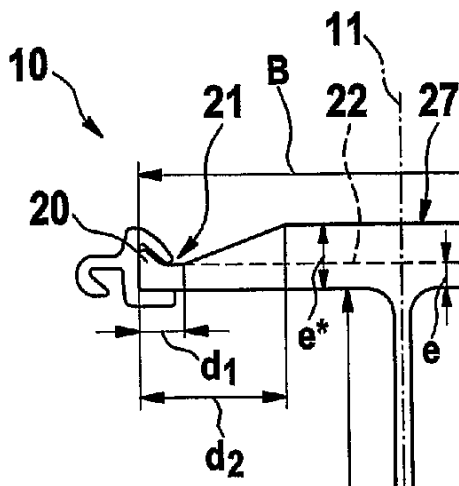
3.3 The ground of lack of novelty is thus a fresh ground for opposition which cannot be considered in the appeal proceedings, without the approval of the respondent as patent proprietor (see G 10/91, OJ EPO 1993, 420). Since this was not given, the issue of novelty has not been considered.

4. Main request - Inventive step

- 4.1 The appellants and the respondent agree that the steel sheet pile in double-T form disclosed in E1 is an appropriate starting point for assessing inventive step. The Board shares this view.
- 4.2 The parties dispute whether the sheet pile of E1 discloses the following features in the characterising portion of claim 1, namely:
- 1.4) the coupling means is formed by a milled groove,
    - 1.4.1) which extends in the outer side of the flange along the at least one longitudinal edge and
    - 1.4.2) has a substantially V-shaped cross section
    - 1.4.3) with an opening width (b) lying within the range  $(0.5 \cdot e) \leq b \leq (1.5 \cdot e)$  and
    - 1.4.4) with a depth (t) lying within the range  $10 \text{ mm} \leq t \leq (0.5 \cdot e)$ ,
  - 1.5) where (e) is the thickness of the flange in the direct vicinity of the groove.
- 4.3 Milled V-shaped coupling groove
- 4.3.1 Figure 1 of E1 shows how the sheet pile 10 in double-T form is coupled, at the flange end 21, with a connection profile of the RZD type (see the detail reproduced below taken from figure 1). The flange end 21 comprises a wedge-like coupling bead 20 which closely fits in a recess of the profile. The latter comprises an inwardly curved strip which engages a relatively wide groove, which is delimited by the bead 20 and an adjacent sloping flank (extending from a point at a distance d1 from the flange edge and ending at a point at a distance d2 for it). This wide groove extends in the outer side of the flange along the

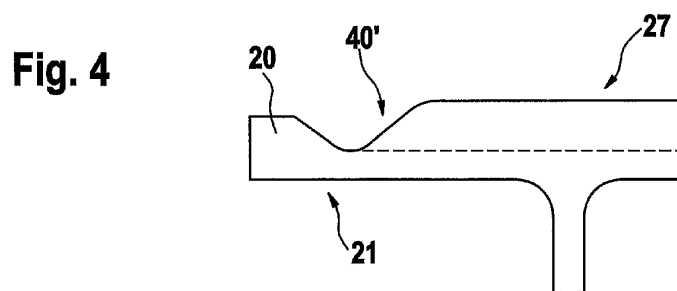
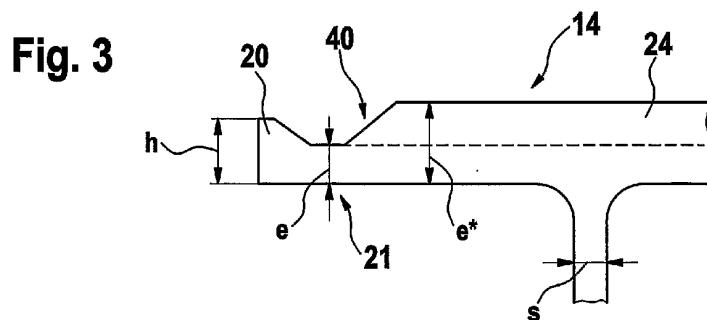
longitudinal edge. It forms a coupling groove in the broad sense of disputed features (1.4) and (1.4.1).

**Fig. 1**



4.3.2 The understanding that the bead 20 and the sloping flank delimit a groove is confirmed by the fact that, when describing figure 6 which shows how wedge-like bead 20 is trimmed to the desired height using a cutting torch, E1 expressly refers to the groove 40 and its width b (see page 8, lines 10 to 12, "la largeur b de la gorge 40").

4.3.3 Figures 3 and 4, which are reproduced below, show a preferred embodiment of the flange end of figure 1. In these drawings, the bead 20 and the adjacent sloping flank 40 resp. 40' together delimit a relatively narrow groove, which is adapted to be engaged by the inwardly curved strip of the connection profile RZD, as shown in figure 1. From a combined consideration of figures 1, 3 and 4, it is apparent that the narrow grooves of figures 3 and 4 provide a closer fit to the inwardly curved strip of the profile RZD than the wide groove of figure 1.



4.3.4 It is clearly apparent that the narrow groove shown in either figure 3 or figure 4 has a substantially V-shaped cross section, as required by feature (1.4.2).

4.3.5 It cannot be derived from E1 that the coupling groove in figure 1, 3 or 4 is "milled", as required by feature (1.4) of claim 1. This feature attempts to define the groove by referring to the method by which it is produced. The step of milling the groove inevitably leads to discernible surface properties for the finished groove.

4.4 Groove depth

4.4.1 In figures 1 and 3, reference signs e and e\* are used to indicate the thickness of the flange end 21 at the bottom of the groove and in the immediate vicinity of the groove, respectively. It is stated on page 7, lines 6 and 7, with reference to figure 1, that e\* is approximately twice e, but that the ratio e\*/e can vary between 1.5 and 4.0. For the specific ratio 2, the

depth of the groove ( $t=e^*-e$ ) equals  $(0.5 \cdot e^*)$  and this anticipates the range defined in feature (1.4.4) of claim 1. For higher thickness ratios, the groove depth is greater than required.

4.4.2 It is apparent that, in the embodiment of figure 3, the thickness  $e^*$  is approximately twice the thickness  $e$ , as taught on page 7, line 6, while figure 4 shows a higher ratio. Thus, feature (1.4.4) is disclosed in figure 3, but not in figure 4.

#### 4.5 Groove width

4.5.1 It cannot be derived from E1 that, in figure 1, 3 or 4, the coupling groove has a width within the range of  $(0.5 \cdot e^*)$  to  $(1.5 \cdot e^*)$ , where  $e^*$  is the thickness of the flange in the direct vicinity of the groove.

4.5.2 As regards the groove width, E1 teaches only that it must be such that, while trimming the bead 20, the flame of the cutting torch cannot burn the sloping flank (page 8, lines 10 to 13 together with figure 6).

4.5.3 It is apparent that, in figure 1, the coupling groove is much wider than required by feature (1.4.3). At first glance, in figures 3 and 4, the groove width might lie in the required range. However, this is not corroborated by any teaching in the text of E1 and these schematic representations are not to scale, hence the groove width cannot be measured directly off these drawings. For the same reason, it cannot be derived from figure 4 that both groove flanks are arranged at an angle of about  $45^\circ$  relative to the flank side, to conclude that the groove is approximately an isosceles right triangle, as argued by appellant 2.



- 4.6 The Board thus comes to the conclusion that, among the different embodiments disclosed in E1, the sheet pile shown in figure 3 is the most promising and relevant starting point and that the subject-matter of claim 1 differs from it only in that
- the coupling groove is milled, i.e. it has been formed by milling (see feature (1.4)), and
  - its opening width (b) lies within the range  $(0.5 \cdot e) \leq b \leq (1.5 \cdot e)$ , where (e) is the thickness of the flange in the direct vicinity of the groove. (see feature (1.4.3)).
- 4.7 The first distinguishing feature has the effect that the coupling groove is formed in a easy, cost-efficient and precise manner, whereby milled surfaces are particularly suited for additionally welding the connection profile onto the flange end, after they have been coupled. The second distinguishing feature has the effect that, compared to E1, an even closer fit is achieved for the inwardly curved strip of the connection profile, whereby the additional weld seam can be made thinner. The two distinguishing features are interrelated: a narrow groove is easier and cheaper to mill than a wide groove; a milled narrow groove is advantageous for welding; the groove can be milled within close tolerances and this is advantageous for a close fit.
- 4.8 Starting from E1, the technical problem objectively solved by the two distinguishing features can thus be formulated as how to improve the coupling means, while allowing simple and economical production.
- 4.9 The claimed solution to this problem is not part of common general knowledge of the skilled person and is

neither disclosed nor suggested in the cited prior art documents.

4.10 Using common general knowledge, the skilled person would readily recognise that, instead of forming the coupling groove shown in figure 3 of E1 by rolling the bead 20, it could be produced by machining the outer side of the flange end, and he would consider using milling, a common form of machining, depending on practical constraints such as cost, accuracy and productivity (see e.g. E28). In fact, E1 already discloses that machining is a known alternative to rolling to form a coupling groove in the flange end of a sheet pile (page 2, line 10, "une rainure laminée ou usinée"). In addition, E3 discloses that it is possible, albeit relatively complicated and expensive, to form coupling grooves and projections in the flange ends of a sheet pile by machining, in particular by milling (page 1, lines 52 to 57). Contrary to the respondent's view, this disclosure of E3 does not teach away from milling coupling grooves in general: when read in context, it simply means that it can be complicated and expensive to mill wide coupling grooves as shown in figure 1 of E3.

4.11 However, when milling the coupling groove of figure 3, the skilled person would not necessarily arrive at a groove having the narrow width required by feature (1.4.3). Contrary to appellant 1's view, this additional feature does not inevitably result from the geometry of the connection profile RZ, let alone that of the connection profile RZD 16. In particular, the skilled person is not provided with a clear motivation to shape the coupling groove so that it matches the shape of the inwardly curved strip of a profile RZ. This is confirmed for instance by figure 1b in post-

published document E7, which shows that the inwardly curved strip of the connection profile 18, whose clamp-shaped lock part is similar to that of a profile RZD, engages the milled coupling groove 16 of the flange end, but without matching shapes. In fact, all of the cited prior art documents suggest to provide matching shapes only for the wedge-shaped bead of the flange end and the corresponding recess of the profile RZD (see E1 figure 1; E27).

- 4.12 In conclusion, when starting from E1, the subject-matter of claim 1 involves an inventive step.
- 4.13 The same conclusion would be reached if the skilled person were to start from the sheet pile disclosed in E3, alternatively a steel sheet pile in double-T form with bare flanges, because such sheet piles are less promising starting points than E1 for a development leading to the claimed invention, at least for the following reasons.
- 4.14 Figure 1 of E3 discloses a sheet pile according to the preamble of claim 1. However, it fails to disclose that at least one flange end comprises a coupling groove as required by features (1.4) to (1.5), which is configured to be engaged by a connection profile. Instead, in figure 1 of E3, the end of each flange (a) comprises a coupling means formed by a wedge-shaped bead (b), which engages a recess of the connection profile (c). In any event, even though the two opposite beads (b) of each flange (a) delimit a wide groove extending across the flange, it is not substantially V-shaped, as required by feature (1.4.2). Further, it cannot be derived from E3 that the width and depth of this wide groove meet the requirements of features (1.4.3) and (1.4.4). Thus, E3 requires more structural

and functional modifications than E1 to arrive at the claimed invention.

- 4.15 A steel sheet pile in double-T form with bare flanges does not comprise any coupling means for a connection profile and thus it does not comprise any of features (1.3.2) to (1.5) of claim 1. This renders even less likely for a skilled person starting from it to arrive at the claimed solution.
- 4.16 In conclusion, the subject-matter of claim 1 involves an inventive step in accordance with Article 56 EPC.
5. The above reasoning applies also to the subject-matter of method claim 15.
6. In conclusion, the Board shares the opposition division's view that the opposition ground of lack of inventive step does not prejudice the maintenance of the patent unamended.
7. In light of this conclusion there is no need to consider the auxiliary requests of the respondent.
8. Non-attendance of appellant 1 at oral proceedings
- 8.1 Appellant 1 chose not to inform the Board that it would not attend the oral proceedings. It was thus left to the Board on the day of the oral proceedings to make its own enquiries as to whether appellant 1 had simply been delayed or whether it actually had no intention of appearing.
- 8.2 The Board points in this respect to Article 6 of the Code of Conduct of Members of the EPO as well as to the Case Law of the Boards of Appeal, 8th edition, 2016,

Chapter III.C.3.3, where the obligation to give notice of not attending oral proceedings is outlined.

**Order**

**For these reasons it is decided that:**

The appeals are dismissed.

The Registrar:

The Chairman:



N. Schneider

G. Ashley

Decision electronically authenticated