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D E C I S I O N
of 26 October 2005

Case Number: T 0797/03 - 3.2.03

Application Number: 96302426.0

Publication Number: 0741207

IPC: E02D 5/04

Language of the proceedings: EN

Title of invention:

Improvements in and relating to steel piling

Patentee:

Corus UK Limited

Opponent:

ProfilARBED S.A.

Headword:

-

Relevant legal provisions:

EPC Art. 100(a), 52(1), 56

Keyword:

"Inventive step - no"

Decisions cited:

-

Catchword:

-



Case Number: T 0797/03 - 3.2.03

D E C I S I O N
of the Technical Board of Appeal 3.2.03
of 26 October 2005

Appellant:
(Opponent)

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(Proprietor of the patent)

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Representative:

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Decision under appeal:

Decision of the Opposition Division of the
European Patent Office posted 23 June 2003
rejecting the opposition filed against European
patent No. 0741207 pursuant to Article 102(2)
EPC.

Composition of the Board:

Chairman: U. Krause
Members: J. Kollar
K. Garnett

Summary of Facts and Submissions

- I. The grant of European patent 0741207, which concerns a steel piling sheet, was opposed by the present appellant on the grounds that the subject-matter of claims 1 and 10 does not involve an inventive step (Article 100(a), 52(1) and 56 EPC).

The opposition division concluded that the claimed subject-matter was inventive and consequently rejected the opposition.

- II. Independent claim 1 of the granted patent reads as follows:

"1. A steel piling sheet configured to define a lengthwise extending pan whose inclined sides are bordered by outwardly extending webs, the piling sheet being characterised in that the base of the pan (1) includes a central flat-based stiffening rib (7) and at least two intermediate flat-based stiffening ribs (8, 9) also extending lengthwise of the piling sheet, the width in millimetres of the flat base of each such rib not exceeding the product of the gauge of the steel sheet and 30."

Independent claim 10 of the granted patent has the following wording:

"10. A steel piling sheet characterised in that it is configured in section to define, across the sheet width, a first web portion (3), a first inclined side portion (2), a base portion, a second inclined side portion (2), and a second web

portion (4), with the two inclined side portions and the base portion defining a pan (1) positioned generally centrally between the two web portions (3, 4), the base portion being formed with at least one stiffening rib (7, 8, 9) whose base is generally flat and is displaced from the base portion of the pan, the width of the flat base of the rib being no greater than the product of the gauge of the steel sheet and 30."

- III. The appellant lodged an appeal against this decision, and paid the appeal fee, on 22 July 2003; a statement containing the grounds of appeal was filed on 3 November 2003.
- IV. The following documents already referred to during the opposition proceedings are relevant for this decision:
- E2: European Committee for Standardization, Eurocode 3 "Design of Steel Structures", part 1-3, pages 1 to 43;
- E3: BSI, Extract of British Standard 5950 "Structural use of steelwork in building", part 5, section four, pages 15 to 19, 1987;
- E4: DE-C-199 369.
- V. The appellant requests that the appealed decision be cancelled and that the contested patent be revoked in its entirety in accordance with Article 99 and 100(a) EPC on the ground of lack of inventive step (Article 56 EPC). It argues that a combination of the teachings provided by documents E4 and E3 would lead to the

subject-matter of independent claim 10. The appellant further argues that independent claim 1 lacks inventive step when considering typical known steel piling sheets in combination with documents E2 and E3.

The appellant's arguments with respect to claim 10 can be summarised as follows:

Starting from E4 and aiming to optimise the flat base of a stiffening rib in a thin central part of a steel piling sheet the person skilled in the art would find design recommendations in E3 which constituted common general knowledge at the priority date of the patent. Reference is made to "Section four. Local buckling" at pages 15 to 19 of E3 which specifies how the effects of local buckling should be taken into account in the determination of the design strength and stiffness of cold formed members. It is stressed that section 4.4.1 of E3 teaches that, based on a consideration of the ratio of effective width to full flat width (b_{eff}/b), the width of the flat base of the stiffening rib should be limited to the product of the gauge of the steel sheet and 30 for the most common steel grades for cold rolled section, as is the case for the steel piling sheet according to the claimed invention. It is concluded that the skilled person would combine document E4 and E3 and arrive at the subject-matter of claim 10 without involving an inventive activity.

Regarding the subject-matter of claim 1 and taking into account the description of the prior art in the introductory part of the patent specification, reference is made to the state of art shown on Figure 1.5a on page 12 of E2 with the conclusion that

for a person skilled in the art who wanted to optimise the long and thin central pan of a steel piling sheet with regard to local buckling, there was a "one way street" leading towards the solution of arranging multiple intermediate bend-type stiffeners within the thin central pan, so as to arrive at the desired embodiment shown at the lower left corner in the Figure 1.5a of E2. Section 4.7.3 of E3 teaches how to space the multiple intermediate stiffeners in order to achieve a maximum efficiency of the stiffening by limiting the spacing of the multiple intermediate stiffeners to the product of a gauge of the steel sheet and 30. The teaching of E2 and E3 thus prompted the skilled person aiming to optimise the long and thin central pan of a steel piling sheet while having due regard to local buckling to arrive at the solution claimed in claim 1 without exercising an inventive step.

- VI. The patentee (respondent) did not react to the notice of appeal or to the written statement setting out the grounds of appeal submitted by the appellant, both of which were sent to the patentee with letters of 7 November 2003 and 28 November 2003, respectively.

Reasons for the Decision

1. The appeal is admissible.
2. *Novelty*

Novelty of the subject-matter of independent claims 1 and 10 has never been an issue since no single cited

prior art document shows a steel piling sheet according to these claims.

3. *Inventive step*

3.1 State of the art

The patent specification as a whole teaches that the invention relates to steel piling and more especially to steel piling sheets. Steel piling sheets are known which include central pans whose inclined sides are bordered by outwardly extending webs. Such sheets are conventionally driven into the ground by vibrating or pneumatic hammers. It is desirable that if a piling sheet should fail, it does so by developing a plastic hinge. The pan of a piling sheet should ideally be centrally located along the width of the sheet and the bending capacity of the sheet should be optimised having regard to the sheet dimensions and gauge.

According to the introductory part of the patent specification, see column 1, line 31 ff, the above criteria have in past tended to produce a sheet section having a relatively long and thin central pan. Such a section, however, has a tendency to fail in buckling without developing the desired plastic hinge. This tendency has traditionally been solved either by increasing the thickness of the pan and/or providing within the pan a "V" shaped stiffening rib which, however, preclude the use of standard drive and extraction clamps. The invention as defined in claims 1 and 10 aims at providing stiffened piling sheets allowing the use of standard drive and extraction means.

4. *Claim 10 - Article 56 EPC*

4.1 The Board concurs with the contested decision that the most relevant state of the art is disclosed in document E4 (DE-C-199369). This was not disputed by the appellant. E4 (see especially Figure 1 and the corresponding part of the description) discloses a steel piling sheet configured in section to define, across the sheet width, a first web portion 3, a first inclined side portion 2, a base portion 1, a second inclined side portion, and a second web portion, with the two inclined side portions and the base portion defining a pan positioned generally centrally between the two web portions. The base portion is formed with a stiffening rib 6 whose base is generally flat and which is displaced from the base portion of the pan.

4.2 Starting from E4, the person skilled in the art is faced with the problem of optimising the piling sheet profile, for example to improve its stiffness.

4.3 In order to solve this problem the present invention according to claim 10 provides a piling sheet in which the width of the flat base of the stiffening rib does not exceed the product of the gauge of the steel sheet and 30.

4.4 Aiming to optimise the flat base of a stiffening rib in a thin central pan of a steel piling sheet, the person skilled in the art would find design recommendations in E3 (British standard BS 5950: Part 5: 1987); the patent relates to piling sheets such as E4 which typically have a gauge between 3 and 8 mm (see paragraphs [0009]

and [0014] of the patent specification), i.e. to cold formed sections, and E3 is the code of practice that was applicable to the design of cold formed sections at the priority date of the claimed patent. For the person skilled in the art of designing cold formed steel sections, E3 constituted common general knowledge at the priority date of the patent.

"Section four. Local buckling" at pages 15 to 19 of E3 specifies how the effects of local buckling should be taken into account when determining the design strength and stiffness of cold formed members. According to E3 a distinct portion of the section of a member is an "element". E3 mainly distinguishes two kinds of elements:

- "stiffened elements", i.e. portions of the section that are adequately supported on both longitudinal edges, and
- "unstiffened elements", i.e. portions of the section that have only one adequately supported longitudinal edge.

The characterising feature "at least one stiffening rib" of claim 10 is an element consisting of a flat base supported at both longitudinal edges by an intermediate stiffener between the base of the rib and the adjacent base portion of the pan. Consequently, the flat base of the stiffening rib is to be considered, in the language of E3, as a "stiffened element" to which the design recommendations in section 4.4 of E3 apply. It is noted that steel grades for cold rolled sheet piling commonly have a yield strength of about 280 N/mm²,

and that a K-factor of 4 is recommended by E3 in section 4.4.1 as a default value for any "stiffened element".

Furthermore, using the correction factor given in section 4.4.1 of E3, it can be derived from those design recommendations that:

- for Y_s (yield strength) = 230 N/mm² and a buckling factor $K = 4$, the ratio of effective width to full flat width (b_{eff}/b) remains equal to 1 up to $b/t \approx 33$ (t being the material thickness) and
- for $Y_s = 350$ N/mm² and $K = 4$ the ratio b_{eff}/b remains equal to 1 up to $b/t \approx 27$.

It follows from the above that the value of $b/t = 30$ can be derived from E3 as a recommended average limit value for the most common steel grades for cold rolled sections.

4.5 The Board thus does not see why a skilled person could not or would not combine documents E4 and E3 to arrive at the subject-matter of claim 10 as granted, which therefore does not satisfy the requirements of Article 56 EPC.

5. *Claim 1 - Article 56 EPC*

5.1 At the priority date of the discussed patent four types of intermediate flange stiffeners were state of the art solutions for reinforcing cold rolled sections against local buckling. These state of the art solutions are shown in Figure 1.5a on page 12 of E2 (Eurocode 3

"Design of steel structures", part 1-3) and are as follows:

- (A) rounded stiffening ribs (rounded grooves),
- (B) "V"-shaped stiffening ribs ("V"-shaped grooves),
- (C) flat-base stiffening ribs, and
- (D) bend-type stiffeners.

As outlined in paragraph [0005] of the patent specification, "V"-shaped stiffening ribs are not convenient for steel piling sheets because they preclude the use of "standard" drive and extraction clamps. Thus, ribs of type (B) would be disregarded by the person skilled in the art.

Since the same applies to rounded stiffening ribs, ribs of type (A) would also be disregarded.

From E3 it is apparent that a single bend-type stiffener of type (D) would not be sufficient for efficiently stiffening a broader element, such as the central pan of a steel piling sheet, with regard to local buckling. For the person skilled in the art who wanted to optimise the long and thin central pan of a typical prior art steel piling sheet with regard to local buckling, there was a "one way street" leading towards the solution of arranging multiple intermediate bend-type stiffeners within the thin central pan, so as to arrive at the embodiment identified with (C) in the Figure 1.5a of E2.

E3 teaches in section 4.7.3 that the multiple intermediate stiffeners should be spaced, in order to achieve a maximum efficiency of the stiffening effect,

so that the spacing of the multiple intermediate stiffeners (in other words, the width of the flat base between two successive stiffeners) is not greater than the product of the gauge of the steel sheet and 30. This will result, for prior art steel piling sheets having a wide base portion of the pan, in a number of adjacent ribs, for example in the three ribs defined in claim 1.

- 5.2 The Board takes the view that when aiming to optimise the long and thin central pan of a steel piling sheet with regard to local buckling, the teaching of E2 and E3 would prompt the person skilled in the art to design the flat base with the intermediate stiffeners of solution (C) above, and to limit the width of the flat base between two successive stiffeners to the product of the gauge of the steel sheet and 30, thereby arriving at the solution claimed in claim 1 of the patent in suit.

The subject-matter of the independent claim 1 thus lacks an inventive step within the meaning of Article 56 EPC.

6. Since dependent claims 2 to 9 must suffer the same fate as claim 1, to which they are attached, the contested patent must be revoked in its entirety.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. European patent No. 0741207 is revoked.

The Registrar:

The Chairman:

G. Magouliotis

U. Krause