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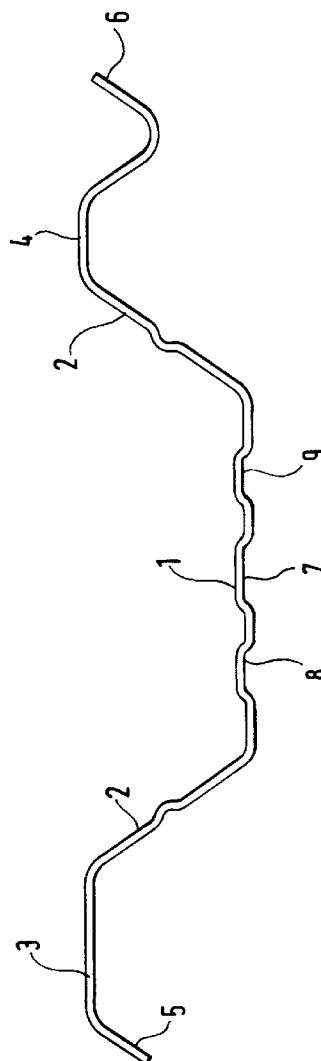
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(54) Improvements in and relating to steel piling

(57) A steel piling sheet is configured to define a lengthwise extending pan (1) whose inclined sides (2) are bordered by outwardly extending webs (3,4). The base of the pan (1) includes a central stiffening rib (7) and at least two intermediate flat-based stiffening ribs (8,9) which also extend lengthwise of the piling sheet. The width in millimetres of the flat base of such rib does not exceed the product of the gauge of the steel sheet and 30.



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Description

This invention relates to steel piling and more especially to steel piling sheets. Such piling is often referred to as trench piling.

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 which impact against straight-sided drive clamps attached to the top edges of the sheets. Conventionally these clamps are produced in standard widths of 130mm and 150mm. When removing a piling sheet from the ground after use, an extraction clamp usually of a standard width of 25mm is attached to the top edge of the piling sheet pan and a lifting force is applied through this clamp.

For commercial reasons, steel piling sheets are produced in standard widths, commonly 500mm.

As will be appreciated, piling sheets must be capable of being driven substantially vertically into the ground without suffering fatigue failure and should be designed to enable them to be installed on site and extracted using standard drive and extraction clamps. It is also desirable that if a piling sheet should fail, it does so by developing a plastic hinge. Finally, 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.

These criteria have in the 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 about which the sheet can plastically deform. The presence of such a stiffening rib has in the past precluded the use of standard drive and extraction clamps.

The present invention sets out to provide steel sheet piling which meets all of the criteria listed above.

According to the present invention in one aspect there is provided a steel piling sheet configured to define a lengthwise extending pan whose inclined sides are bordered by outwardly extending webs, the base of the pan including a central flat based stiffening rib and at least two intermediate flat-based stiffening ribs 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.

The width of the base of the pan in millimetres is preferably no less than the product of the gauge of the steel sheet and 30. Typically the pan width is 25mm to 250mm. The maximum width of the central stiffening rib is preferably 25mm; typically the minimum width of this rib is 10mm. The depth of any given stiffening rib is preferably equal to the width of the base of the rib divided by

5. Typically the depth of each rib is between 4 and 8mm.

The gauge of the steel sheet may be between 3 and 8mm. Typically, the gauge is 4mm.

In another aspect, there is provided a steel piling sheet configured in section to define, across the sheet width, a first web portion, a first inclined side portion, a base portion, 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 being formed with at least one stiffening rib 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.

The invention will now be described by way of example only with reference to the accompanying diagrammatic drawing which illustrates the section of a steel piling sheet in accordance with the invention.

The steel piling sheet illustrated in the drawing includes a central pan 1 whose inclined side walls 2 are bordered by outwardly extending webs 3, 4. The webs 3, 4 are shaped in a complementary manner to enable a downwardly extending end portion 5 of the web 3 to overlap an upwardly extending end portion 6 of the web 4. Sheets having interlocking scrolls may also be employed.

The base of the pan 1 is formed with a central stiffening rib 7 and two intermediate stiffening ribs 8, 9. Each rib is formed with a flat base and inclined sides.

The steel employed may be of any suitable grade and composition. Typically HR15 and XF450 steels are employed. The gauge of the steel sheet is typically 3 to 8mm. Other gauges may however be employed.

In use steel piling is driven into the ground by vibrating or pneumatic hammers which impact upon a drive clamp (not shown) secured to the upper edge of the sheet in the region of base 1 of the pan. Typically these clamps are supplied in standard widths of 130mm and 150mm. When installed to define, for example, one side of a trench, a piling sheet is subjected to high loads which can lead to failure due to buckling. To avoid failure due to buckling occurring, it is now preferable that on failure a plastic hinge is developed for safety reasons. Previous attempts to introduce plastically deformable stiffeners have precluded the use of standard drive and extractor clamps.

The sheet piling illustrated in the drawing includes the required stiffeners about which a plastic hinge can develop; these stiffeners do not, however, preclude the use of standard drive and extraction clamps.

As will be seen from the drawing, each rib 7, 8, 9 has a flat base and is spaced from its neighbouring rib or ribs by flats of the pan base. It is the presence of these flat bases and the selection of the dimensions discussed below which lead to the improvements discussed above.

The overall width of the illustrated pan is not less

than the gauge of the steel sheet multiplied by 30 and is typically 150mm. This width (when taken with the shallow depths of the ribs 7, 8, 9) enables standard clamps of 130mm or 150mm to be employed when driving the sheet pile into the ground.

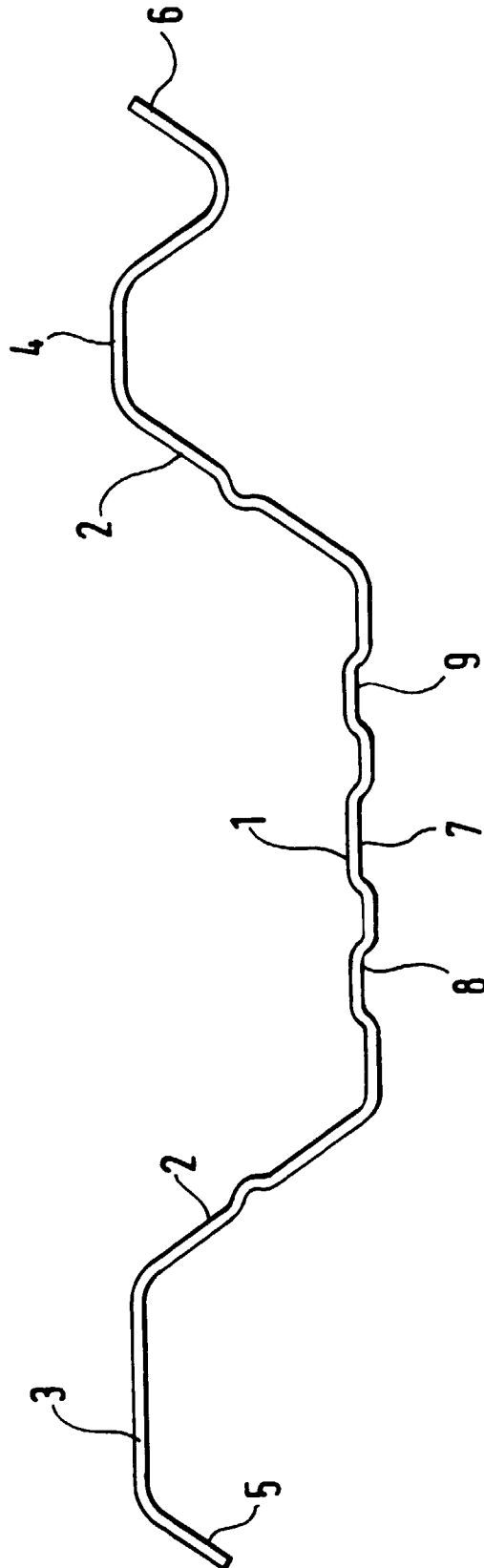
The width of the flat base of the central rib is at least 25mm to enable a standard extraction clamp of 25mm length to be employed.

The depth of any given rib approximates to the width of its base divided by 5. Typically this depth is between 3mm and the maximum clamp opening (normally about 15mm), preferably 5 or 6mm.

It will be appreciated that the foregoing is merely exemplary of steel piling in accordance with the invention and that modifications can readily be made thereto without departing from the true scope of the invention.

Claims

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.
2. A piling sheet as claimed in Claim 1 characterised in that the width of the base of the pan (1) in millimetres is no less than the product of the gauge of the steel sheet and 30.
3. A piling sheet as claimed in Claim 2 characterised in that the pan width is from 25mm to 250mm.
4. A piling sheet as claimed in any one of the preceding Claims characterised in that the maximum width of the central stiffening rib is 25mm.
5. A piling sheet as claimed in Claim 4 wherein the minimum width of this rib is 10mm.
6. A piling sheet as claimed in any one of the preceding Claims characterised in that the depth of each stiffening rib is equal to the width of the base of the rib divided by 5.
7. A piling sheet as claimed in Claim 6 characterised in that the depth of each rib is between 4mm and 8mm.
8. A piling sheet as claimed in any one of the preceding claims whose gauge is between 3mm and 8mm.
9. A piling sheet as claimed in Claim 8 whose gauge is 4mm.
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 (2, 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.





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EUROPEAN SEARCH REPORT

Application Number
EP 96 30 2426

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	DE-C-199 369 (WEMLINGER) 13 June 1908 * the whole document * ---	1,10	E02D5/04
A	FR-A-1 460 431 (MABEY & JOHNSON LTD.) 25 November 1966 * page 2, left-hand column, line 7 - line 20; figures * -----	1,10	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			E02D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 13 August 1996	Examiner Blommaert, S
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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