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(54) **FORMWORK ELEMENT AND FORMWORK SYSTEM FOR STRUCTURAL ELEMENTS**

SCHALUNGSELEMENT UND SCHALUNGSSYSTEM FÜR BAUELEMENTE

ÉLÉMENT DE COFFRAGE ET SYSTÈME DE COFFRAGE POUR ÉLÉMENTS STRUCTURAUX

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(72) Inventor: **Branco Chagas Rodrigues, Nelson dos Anjos Miratejo (PT)**

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(74) Representative: **Moniz Pereira, Manuel Gastão da Cunha Ferreira, Lda. Rua dos Bacalhoiros 4 1100-070 Lisboa (PT)**

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(73) Proprietor: **Branco Chagas Rodrigues, Nelson dos Anjos Miratejo (PT)**

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**EP 4 293 172 B1**

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## Description

### Technical field

[0001] The present invention falls within the field of building construction. In particular, it concerns an element to carry out disposable formwork, more specifically, a finishing piece that serves as a definitive self-supporting and finishing formwork for structural concrete elements that is integrated into the structural element.

### Framework of the invention

[0002] In building construction, when it is necessary to execute a vertical structure, such as, e.g., walls, pillars, or elevator cores, it is necessary to assemble a support structure, usually using metal, wood, plastic, or other less common material, with the purpose of avoiding landslides or to delimit and retain concrete as in a kind of reservoir, which guarantees that, through a watertight structure, the structure maintains its shape until it is completely dry or solidified.

[0003] These structures, called formwork, have the disadvantage of needing to be dismantled after the structure is dry or solidified.

### Background of the invention

[0004] A few documents were found that make reference to elements for the execution of formwork.

[0005] In particular, document EP0757137 presents a formwork for the production of structures to obtain prefabricated panels for façade claddings.

[0006] Also worth mentioning is document WO0222982, which discloses a formwork panel made of an insulating material and incorporating a reinforced metal core.

[0007] Also, document EP1434919, which presents hollow panels connected together to execute a formwork.

[0008] Document FR2930795A1 refers a ladder shaped spacer for cast concrete wall construction, has posts including sections cooperating in longitudinal sliding relation with profiles of rails of panels and setting plane of ladder orthogonal to planes of panels, respectively.

[0009] However, no document was found that refers to a solution for a definitive formwork for structural elements made of concrete that is integrated into the structural element and that simultaneously serves as the finishing of the structure itself.

### Advantages of the Invention

[0010] Currently, the most common method used for the execution of reinforced concrete structures is the so-called traditional formwork, which requires the use of several formwork systems, with all that this practice implies, such as the use of dismantling oils, spacers to

ensure overlap, since, once the task is complete, the formwork must be dismantled and cleaned, as well as the need to correct imperfections resulting from concreting.

[0011] There is also the need to create negatives in the several elements for shoring up the formwork, which must then be sealed, or use expensive parts to ensure this sealing. The invention is defined by the appended claims.

[0012] In the solution presented in this document, it is the finishing piece itself that serves as the formwork and finishing for the structural elements and guarantees their covering, as well as the final finishing of the elements to be concreted. It can be made of white or dyed concrete, and it can have exposure classes that are suited to the location where the work is to be done, which makes this solution very versatile in terms of finishing.

### Brief description of the drawings

[0013] These and other features can be easily understood in the accompanying drawings, which should be considered mere examples and in no way restrictive of the scope of the invention. In the drawings, and for illustrative purposes, the measurements of some of the elements may be exaggerated and not drawn to scale. The absolute dimensions and the relative dimensions do not correspond to the actual relationships for the realization of the invention.

[0014] In a preferred embodiment:

Figure 1 shows a rear view of the construction element.

Figure 2 shows a side view of the construction element.

Figure 3 shows a top view of the construction element.

Figure 4 shows an exploded perspective view of the top of the finishing piece.

Figure 5 shows several finishing pieces being assembled horizontally to form a horizontal line of formwork.

Figure 6 shows a cutaway of two vertically mounted finishing pieces, where it is possible to see how a connecting element and four construction elements are fitted together.

[0015] The elements and components of the equipment of the present invention and the elements necessary for the operation of the invention are marked in the figures:

1. finishing piece
2. construction element

- 2.1. panel
- 2.2. fitting element
- 2.3. protective element
- 3. connecting element
- S shoe

### Detailed description of the invention

**[0016]** By shapes: "substantially parallelepiped", "substantially H-shaped" are meant as preferred shapes for embodiments of the invention, which can work in other shapes.

**[0017]** By positions: "substantially parallel", "substantially coplanar", "substantially at the same distance" are understood as preferred positions for embodiments of the invention, which can work in other positions.

**[0018]** By dimensions: "substantially coextensive", "substantially the same width" are understood as preferred dimensions for embodiments of the invention, which can work with other dimensions.

**[0019]** With reference to the figures, the present invention refers to a finishing piece (1) that serves as a self-supporting disposable formwork for structural elements and is integrated into the structural element, also serving as a finishing for the structural element.

**[0020]** This finishing piece (1) comprises two construction elements (2) placed in a substantially parallel position and substantially coextensive with each other, and that are connected by connecting elements (3).

**[0021]** The construction element (2):

- is formed by a panel (2.1) made of, namely, but not exclusively, white or dyed concrete, that has a substantially parallelepiped shape, but that can have any other shape that is appropriate to the needs of the structural element being erected;
- in the uppermost and lowermost surfaces of the panel (2.1), protective elements (2.3) are embedded;
- the panel (2.1) is peripherally protected by metal elements to prevent the edges of the construction elements (2) from breaking during assembly and during transport and storage;
- the inner surface of the panel (2.1) is a rough surface that enables better adhesion of the concrete;
- the inner surface of the construction elements (2) incorporates fitting elements (2.2) into which the connecting elements (3) fit;
- its size can be adjusted to the size of the site and to the means available for assembly, such as lifting gear and available space on site.

**[0022]** The fitting elements (2.2) are, notably but not exclusively, polygonal tubes or cylindrical tubes, hollow on the inside, so that they can receive the connecting elements (3). The protective elements (2.3) are, notably but not exclusively, polygonal tubes. The fitting elements (2.2) and the protective elements (2.3) are made of any suitable material, including but not limited to steel, iron,

plastic, or carbon fibre.

**[0023]** In case the fitting elements (2.2) and the protective elements (2.3) are made of steel or iron, the construction element (2) is hot-dip galvanized to avoid possible future corrosion problems.

**[0024]** The connecting elements (3) are substantially H-shaped.

**[0025]** They comprise tubes with the same geometric shape as the fitting elements (2.2) but with a smaller perimeter than the perimeter of the fitting elements (2.2) since they have to engage inside the fitting elements (2.2).

**[0026]** The connecting elements (3) guarantee the distance between the construction element (2) and the construction element (2) that is diametrically opposite to it, ensuring that all finishing pieces (1) that are part of the structural element being erected have construction elements (2) that are substantially at the same distance from the construction element (2) that is diametrically opposite to them, ensuring that the entire structural element is substantially the same width. The connecting elements (3) also ensure that all the finishing pieces (1) are substantially coplanar, allowing the various finishing pieces (1) to be fixed to each other and serving as a guide and support for the uppermost finishing pieces (1), avoiding the need for shoring or other temporary support of the construction elements (2).

**[0027]** After being assembled, the assembly is self-supporting and does not require additional shoring beyond what is necessary to ensure the verticality of the elements to be concreted.

**[0028]** For the realization of the structural element, all the necessary reinforcement for the structural element to be executed is executed and then a plurality of finishing pieces (1) are assembled in sequence, both vertically and horizontally. After all finishing pieces (1) are in place, i.e., the elements that make up the formwork are in place, it is possible to execute the structural element by pouring the concrete in the space enclosed by the construction elements (2).

### Claims

1. Formwork element comprising a finishing piece (1) incorporating two construction elements (2) placed in a substantially parallel position and substantially coextensive with each other and that are connected by connecting elements (3) substantially H-shaped, each construction element (2):

- being formed by a panel (2.1),
- having protective elements (2.3) embedded in the uppermost and lowermost surfaces of the panel (2.1),
- including on the inner surface fitting elements (2.2) on to which connecting elements (3) fit,

wherein the connecting elements (3) comprise each two tubes having the same geometric shape as the respective two fitting elements (2.2) of the two respective construction elements (2) and a smaller perimeter than the perimeter of the fitting elements (2.2), to engage inside the fitting elements (2.2).

2. Formwork element according to claim 1, wherein the panel (2.1) is made of white or dyed concrete.
3. Formwork element according to any of the preceding claims, wherein the inner surface of the panel (2.1) is a rough surface.
4. Formwork element according to any of the preceding claims, wherein the panel (2.1) has a substantially parallelepiped shape.
5. Formwork element according to any of the preceding claims, wherein the fitting elements (2.2) are polygonal tubes or cylindrical tubes, hollow on the inside.
6. Formwork element according to any of the preceding claims, wherein the protective elements (2.3) are polygonal tubes.
7. Formwork element according to claims 5 and 6, wherein the fitting elements (2.2) and the protective elements (2.3) are made of steel, iron, plastic, or carbon fibre.
8. Formwork system for structural elements according to any of the preceding claims, wherein it comprises a plurality of finishing pieces (1) assembled sequentially vertically and horizontally.
9. Formwork system according to the preceding claim, wherein the formwork system is self-supporting.
10. Formwork system according to claims 8 and 9, wherein the formwork system is integrated into the structural element.

#### Patentansprüche

1. Schalungselement, umfassend ein Abschlusselement (1), das zwei Bauelemente (2) integriert, die in im Wesentlichen paralleler Anordnung zueinander und im Wesentlichen deckungsgleich angeordnet sind und durch im Wesentlichen H-förmige Verbindungselemente (3) miteinander verbunden sind, wobei jedes Bauelement (2):

- durch ein Paneel (2.1) gebildet ist,
- Schutzelemente (2.3) aufweist, die in die oberste und unterste Fläche des Paneels (2.1) eingebettet sind,

- an der Innenseite Aufnahmeelemente (2.2) aufweist, in welche die Verbindungselemente (3) eingreifen,

5 wobei jedes Verbindungselement (3) zwei Rohre umfasst, deren geometrische Form der Form der jeweiligen zwei Aufnahmeelemente (2.2) der beiden Bauelemente (2) entspricht, jedoch einen kleineren Umfang als die Aufnahmeelemente (2.2) aufweist, sodass ein Eingriff in die Aufnahmeelemente (2.2) erfolgt.

2. Schalungselement nach Anspruch 1, **dadurch gekennzeichnet, dass** das Paneel (2.1) aus weißem oder eingefärbtem Beton besteht.
3. Schalungselement nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Innenseite des Paneels (2.1) rau ausgeführt ist.
4. Schalungselement nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Paneel (2.1) im Wesentlichen eine quaderförmige Gestalt aufweist.
5. Schalungselement nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Aufnahmeelemente (2.2) als polygonale oder zylindrische, innen hohle Rohre ausgebildet sind.
6. Schalungselement nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Schutzelemente (2.3) als polygonale Rohre ausgeführt sind.
7. Schalungselement nach den Ansprüchen 5 und 6, **dadurch gekennzeichnet, dass** die Aufnahmeelemente (2.2) und die Schutzelemente (2.3) aus Stahl, Eisen, Kunststoff oder Kohlefaser bestehen.

8. Schalungssystem für Bauelemente gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** es eine Vielzahl von Abschlusselementen (1) umfasst, die vertikal und horizontal nacheinander zusammengefügt sind.

9. Schalungssystem gemäß dem vorhergehenden Anspruch, **dadurch gekennzeichnet, dass** das Schalungssystem selbsttragend ist.

10. Schalungssystem nach den Ansprüchen 8 und 9, **dadurch gekennzeichnet, dass** das Schalungssystem in das Bauelement integriert ist.

#### Revendications

1. Élément de coffrage comprenant une pièce de fini-

tion (1) intégrant deux éléments de construction (2) placés dans une position sensiblement parallèle et sensiblement coextensibles l'un avec l'autre, et qui sont reliés par des éléments de liaison (3) substantiellement en forme de H, chaque élément de construction (2):

- étant constitué d'un panneau (2.1),
- disposant d'éléments de protection (2.3) encastrés dans les surfaces supérieures et inférieures du panneau (2.1),
- comprenant des éléments d'assemblage (2.2) sur la surface intérieure, sur lesquels les éléments de liaison (3) sont fixés,

dans lequel les éléments de liaison (3) comprennent chacun deux tubes ayant la même forme géométrique que les deux éléments d'assemblage (2.2) correspondants des deux éléments de construction (2) correspondants et un périmètre plus petit que le périmètre des éléments d'assemblage (2.2), de manière à pouvoir s'imbriquer dans les éléments d'assemblage (2.2).

2. Élément de coffrage selon la revendication 1, dans lequel le panneau (2.1) est en béton blanc ou teinté. 25
3. Élément de coffrage selon l'une quelconque des revendications précédentes, dans lequel la surface intérieure du panneau (2.1) est une surface brute. 30
4. Élément de coffrage selon l'une quelconque des revendications précédentes, dans lequel le panneau (2.1) a une forme sensiblement parallélépipédique. 35
5. Élément de coffrage selon l'une quelconque des revendications précédentes, dans lequel les éléments d'assemblage (2.2) sont des tubes polygonaux ou des tubes cylindriques dont l'intérieur est creux. 40
6. Élément de coffrage selon l'un quelconque des revendications précédentes, dans lequel les éléments de protection (2.3) sont des tubes polygonaux. 45
7. Élément de coffrage selon les revendications 5 et 6, dans lequel les éléments d'assemblage (2.2) et les éléments de protection (2.3) sont en acier, en fer, en plastique ou en fibre de carbone. 50
8. Système de coffrage pour les éléments structurels selon l'une quelconque des revendications précédentes, dans lequel il comprend une pluralité de pièces de finition (1) assemblées successivement verticalement et horizontalement. 55
9. Système de coffrage selon la revendication précédente, dans lequel le système de coffrage est auto-

portant.

10. Système de coffrage selon les revendications 8 et 9, dans lequel le système de coffrage est intégré dans l'élément structurel.

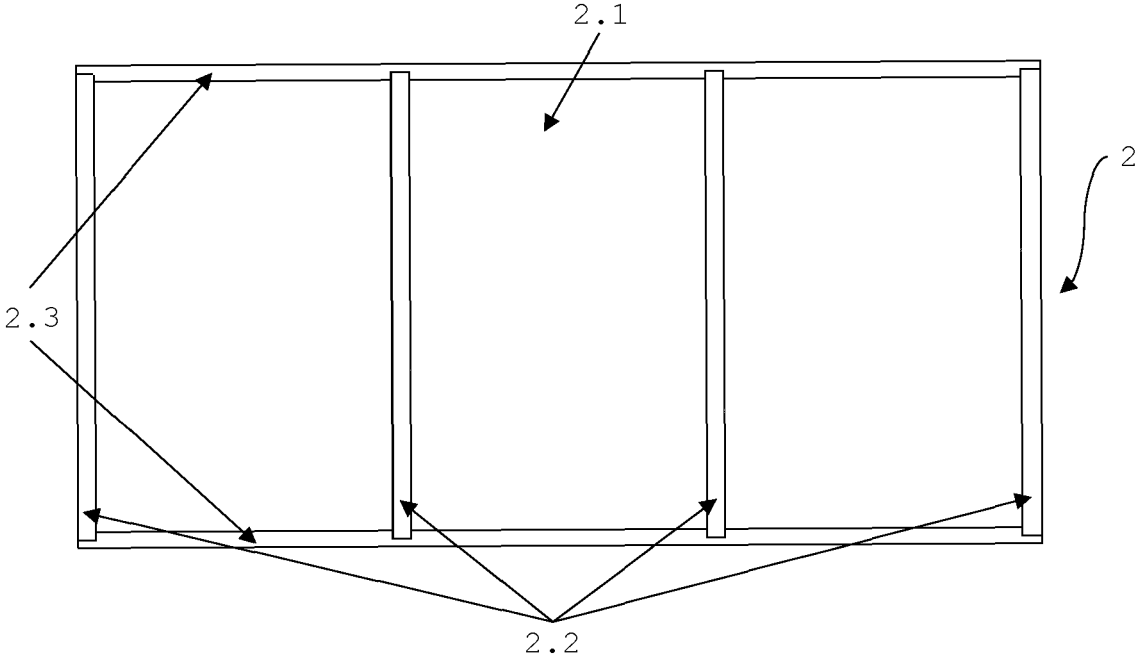


Figure 1

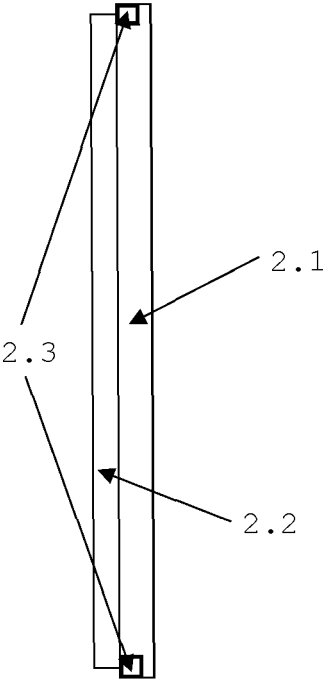


Figure 2

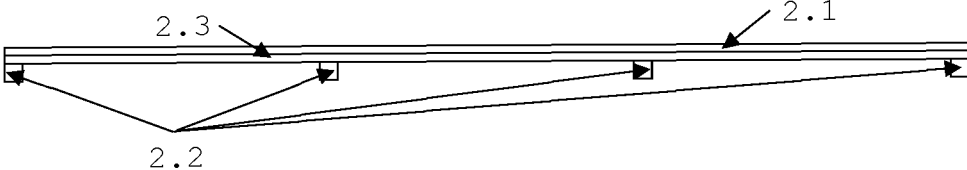


Figure 3

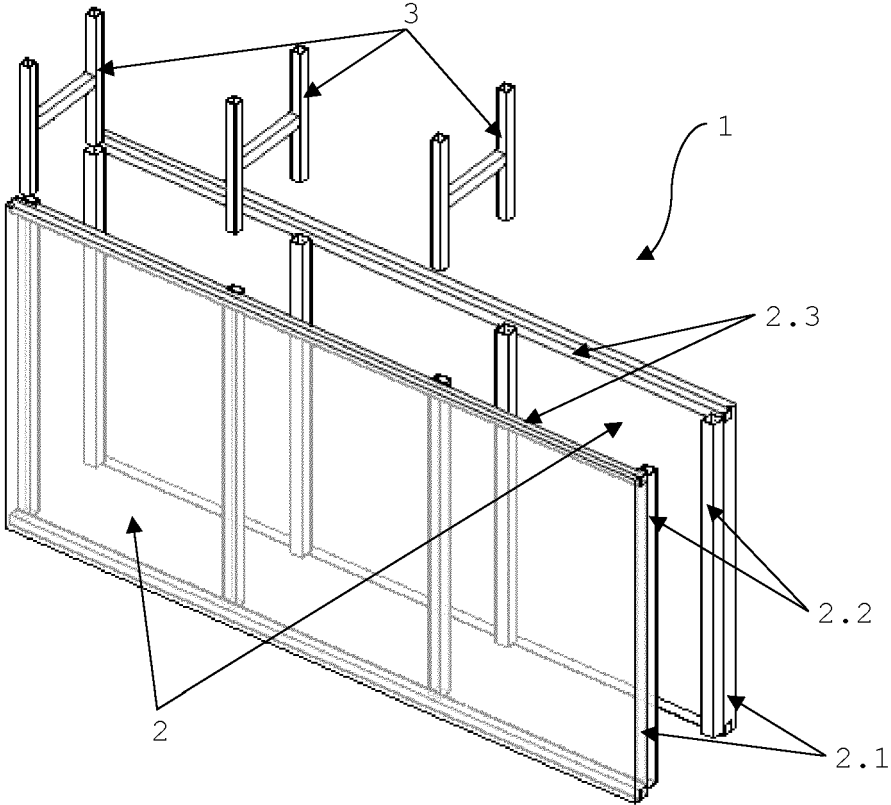


Figure 4

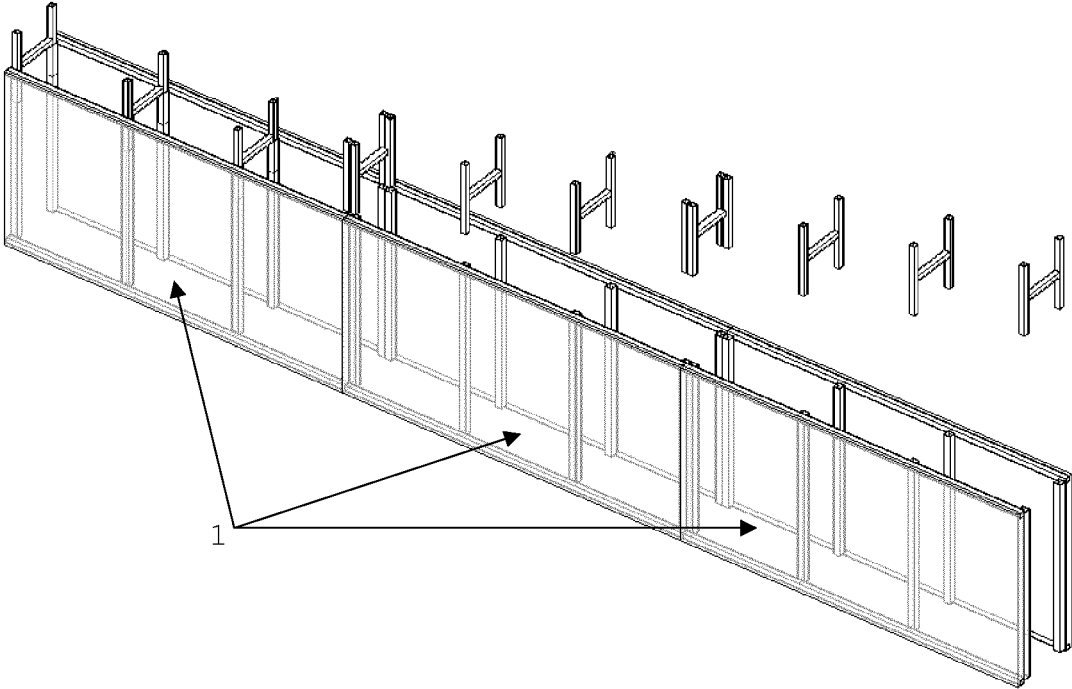


Figure 5

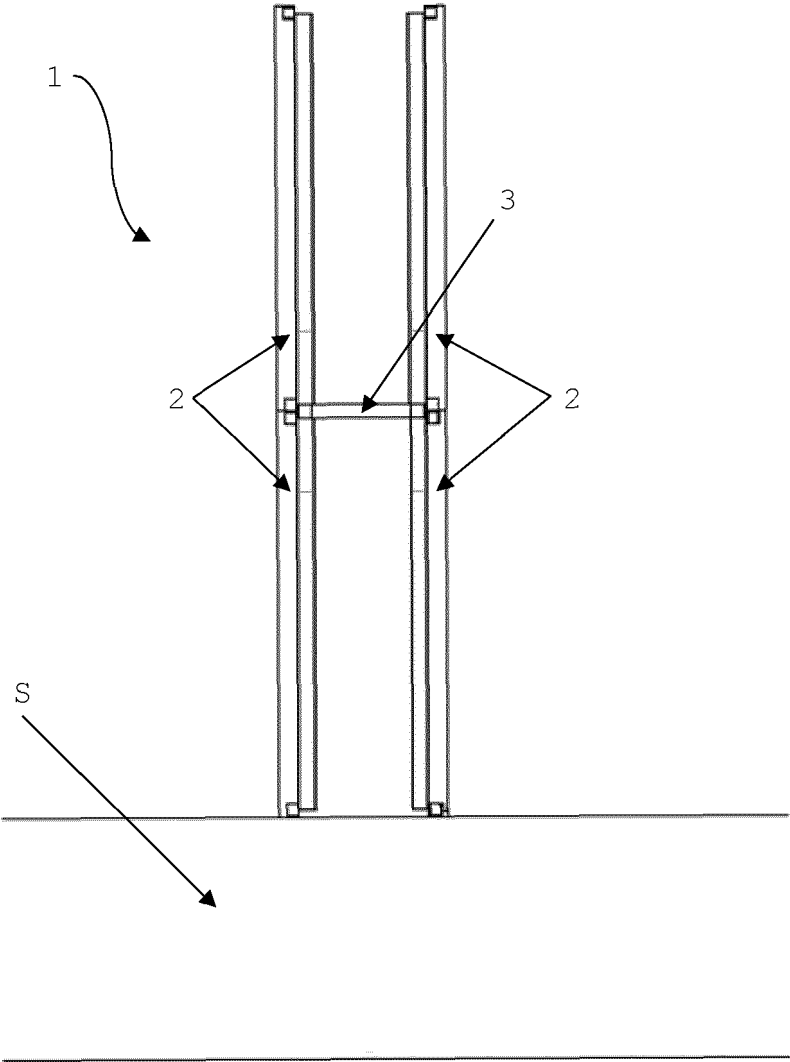


Figure 6

**REFERENCES CITED IN THE DESCRIPTION**

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