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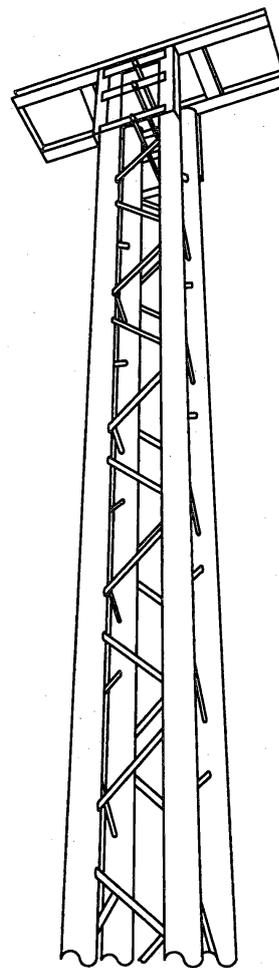
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(54) **LATTICE CONSTRUCTION**

(57) The lattice constructions according to the invention basically consist of tubular elements, or the elements of other cross-section, i.e. of other profile, which are made of polymer composites. Four lengthwise pipes (1) are arranged next to each other, as a rule vertically, on the plan of a rectangle, in its corners. It affects the maximal resistance of the lattice construction cross-section to the deformations caused by wind or snow and the characteristic loads, resulting from the intended use and the manner in which the construction is used. The interior of pipes (1), or the elements corresponding to them, can be filled with polyurethane foam or polymer concrete.

The lengthwise pipes (1) are connected to each other with the cross braces (2), which can also be in the form of tubular elements, made of polymer composites, similarly as the lengthwise pipes (1). Most preferably the lengthwise pipes (1) are connected to each other with the cross braces (2), in such a manner that each lengthwise pipe (1) is connected to two other, adjacent lengthwise pipes (1), but never with the lengthwise pipe (1) which is located diagonally in the projection of rectangle. The spacing of cross braces (2), the angle of their inclination in relation to the lengthwise pipes (1) and the manner of their arrangement can be various and are freely selected, and in any case they result from the intended use of the construction element and its parameters. The lattice construction made in such a manner forms the modular element (3).



**Fig. 3**

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## Description

**[0001]** The subject of the invention is a lattice construction, made of polymer composites, which can be used mainly as a power post, pylon, lighting mast and also as a load-bearing structure for footbridges and bridges or as the roofing construction in any structures and buildings.

**[0002]** There are a number of solutions for lattice constructions. For example, a "Spatial lattice tower with tetragonal contour of cross-section and multiply primary grating of <X> type" is known from a Polish description of invention, application no. P.284131 (publ. BUP 20/1991). This invention is characterized of the fact that in the panel of the primary grating, between the spatial joints of the primary grating, the secondary grating forms (along with the legs) the flat joints and the number of flat joints on the common leg in the planes of adjacent walls (A and B) and on the common leg in the planes of adjacent walls (A and D) differs by one flat joint in both converging planes (A and B) and in both converging planes of walls (A and D).

**[0003]** The "Lattice construction made of forge iron" is known from other Polish invention, application no. P. 313936 (publ. BUP 22/1996). The lattice construction presented here is made of steel and consists of lengthwise bars and cross-bars which have, at the crossing points, the bends enclosing (in shape) the lengthwise bars (at least partially). According to the invention, the connection of the crossing points of the cross-bars with the lengthwise bars is performed by means of permanent screw connection.

**[0004]** The "Spatial lattice construction with grating made of bent KRAP-type bars" is known from another Polish invention, application no. P. 335340 (publ. BUP 06/2001). The spatial KRAP construction is described here and it has a form of tetrahedral latticework (or with other number of walls) with the grating of cross brace type or cross brace-post type. Such latticework can be divided into segments with determined length, resulting e. g. from transport limitations, hot galvanizing, etc. This solution is characterized of the fact that the grating is fixed directly to the legs made of closed shapes (or shapes with other cross-section) and the cross braces of the grating are bent, in the shape of saw blade, from a round bar (or a bar with other cross-section). The cross braces are welded (or fixed using other technique) to the legs on the sides of shape's leg opposite to the posts, which facilitates placing the welds on small surfaces of the leg. The segments with square, round or other cross-section are connected to each other with screws (or using other technique), on the "sleeve and roller" principle.

**[0005]** Another Polish description of invention, application no. P. 358192 (BUP 14/2003), PL-199830 (publ. WUP 11/2008), presents the solution titled "Lattice girder", which is intended for constructing the bandstands, scaffoldings or similar objects, with at least two strips placed in the lengthwise direction in relation to the girder.

These strips are maintained in the distance to each other by the girder cross braces. At least two cross braces of the lattice girder cross with each other at the crossing point. At their crossing point, the cross braces of the lattice girder are connected by means of a hub, which has basically a flat area for placing the designation at least on one of its sides free from cross braces and this area is surrounded by a thickened rim protruding out of the area plane.

**[0006]** The "Lattice towers made of small-sized, manually mounted bar structures" are known from other Polish description of invention, application no. P. 114963 (publ. BUP 03/2006). The steel lattice tower presented here consists of small segments fitted to manual mounting. A single segment is a spatial structure with the square or polygon base, made of full round bars.

**[0007]** The "Latticework mast" is known from the Polish description of utility model, application no. W.120620 (BUP-14/2013), Ru-67556 (publ. WUP 01/2015). A latticework mast, containing lattice main segments with the equilateral triangle cross-section, which consist of three lengthwise closing bars, running through the corners of the triangle that constitutes the segment's cross-section, and the skew stiffening bars and the horizontal stiffening bars, forming the latticeworks on each segment side, are fixed alternately between the triangle corners. The horizontal stiffening bars of at least one side of each segment have notches on the upper external surface, running in the direction of the bar length.

**[0008]** The purpose of developed invention is to create such lattice construction that will be made of materials due to the application of which the strength parameters and the resistance to bending of the structure will be better than the strength parameters of similar steel, wooden or ferroconcrete latticeworks and simultaneously, of the material which will be resistant to the operation of external factors, including weather conditions, will not require the maintenance and will be easy and cheap in production, transport and assembly.

**[0009]** The essence of the lattice construction with tubular elements or with elements of other profile is that that at least one element is made of polymer composites.

**[0010]** Preferably, the lattice construction contains lengthwise pipes, which are arranged next to each other, as a rule vertically, on the plan of a polygon, in its corners.

**[0011]** Preferably, the lattice construction contains four lengthwise pipes which are arranged next to each other, as a rule vertically, on the plan of a rectangle, in its corners.

**[0012]** Preferably, the lengthwise pipes are connected to each other with cross braces.

**[0013]** Preferably, the cross braces form the tubular elements.

**[0014]** Preferably, the lengthwise pipes are connected to each other with cross braces, in such a manner that each lengthwise pipe is connected with two other, adjacent lengthwise pipes.

**[0015]** Preferably, the spacing of cross braces, the an-

gle of their inclination in relation to the lengthwise pipes and the manner of their arrangement are various and the latticework made in such manner forms a modular element.

**[0016]** Preferably, the modular element is fixed to the spacer, preferably made of steel.

**[0017]** Preferably, the interior of pipes or the elements of other profile corresponding to them is filled with polyurethane foam or polymer concrete.

**[0018]** The solution for the lattice construction according to the invention is characterized of high resistance to UV radiation, road salt, pesticides and urine, e.g. of animals. Such solution is also resistant to the deformations and shows high resistance to the loads caused by wind. The developed lattice construction is characterized also of high fire resistance, resistance to chemical aggression, above all to corrosion, and the lack of absorbability.

**[0019]** The lattice construction made of polymer composites according to the invention does not require painting. It has a very low weight in comparison with the weight of known solutions for lattice constructions, because the weight of one module is only about 120 kg. The developed solution is stronger and more resistant to bending than its equivalents made of ferroconcrete, steel or wood. The solution according to the invention is vandal-proof and easy to be kept clean due to the material of which the latticeworks are made.

**[0020]** The production of lattice constructions according to the invention is cheap and their assembly is easy and does not require using heavy equipment - common auxiliary devices are sufficient for the assembly. Described lattice constructions made of polymer composites do not conduct electric current, do not disrupt the transfer of radio-waves nor the operation of microwaves, radars and other similar devices.

**[0021]** Liquidated lattice constructions made of polymer composites can be processed in whole so they can be classified as environmentally friendly. The process of production of developed lattice constructions is conducted in low temperatures, with low emission of carbon dioxide.

**[0022]** The transport of latticework is easy and cheap due to its lightness.

**[0023]** The durability of developed elements of lattice constructions is assessed for a few dozen years. Therefore, it is possible to use them for building various constructions, finding their application both in temporary structures, such as bandstands or scaffoldings and in permanent structures, such as footbridges, bridges or masts.

**[0024]** The subject of the invention has been presented in more detail in the embodiment shown in figures, where: Fig. 1 - presents a perspective view of a lattice construction module, Fig. 2 - presents an axonometric view of a lattice construction module with a spacer allowing the foundation work, and Fig. 3 - presents a perspective view of an example application of lattice construction as a power pole.

**[0025]** As it is shown in figures, the lattice constructions according to the invention basically consist of tubular elements, or the elements of other cross-section, i.e. of other profile, which are made of polymer composites.

5 Four lengthwise pipes (1) are arranged next to each other, as a rule vertically, on the plan of a rectangle, in its corners. It affects the maximal resistance of the lattice construction cross-section to the deformations caused by wind or snow and the characteristic loads, resulting from the intended use and the manner in which the construction is used. The interior of pipes (1), or the elements of any cross-section corresponding to them, can be filled with polyurethane foam or polymer concrete.

10 **[0026]** The lengthwise pipes (1) are connected to each other with the cross braces (2), which can also be in the form of tubular elements, made of polymer composites, similarly as the lengthwise pipes (1). Most preferably, the lengthwise pipes (1) are connected to each other with cross braces (2), in such a manner that each lengthwise pipe (1) is connected to two other, adjacent lengthwise pipes (1), but never with the lengthwise pipe (1) which is located diagonally in the projection of rectangle. The spacing of cross braces (2), the angle of their inclination in relation to the lengthwise pipes (1) and the manner of their arrangement can be various and are freely selected, and in any case they result from the intended use of the construction element and its parameters. The lattice construction made in such a manner forms the modular element (3).

20 **[0027]** There are two possibilities for founding the lattice constructions. One of them is to bury a fragment of such construction directly in the ground. The other method is fixing the lattice construction to the foundation, which is, as a rule made, of ferroconcrete. The lengthwise pipes (1), which are founded, for instance: on ferroconcrete spot footings, foundation plates or combined footings or on piles or wells - are mounted using a special spacer (4), preferably made of steel, which is mounted to, for instance, the previously prepared foundation, located in a trench and then buried. The lattice constructions founded in such manner form very stable structures.

30 **[0028]** The developed lattice constructions are manufactured in all colours, according to the available RAL colour palette.

#### List of elements:

##### [0029]

- 45
- 50 1. lengthwise pipe;
  2. cross brace;
  3. modular element;
  4. spacer.

#### Claims

- 55
1. The lattice construction with tubular elements or with

elements of other profile, **characterized in that**, at least one element is made of polymer composites.

2. The lattice construction, according to the claim 1, **characterized in that**, it contains the lengthwise pipes (1), which are arranged next to each other, as a rule vertically, on the plan of a polygon, in its corners. 5
3. The lattice construction, according to the claim 2, **characterized in that**, it contains four lengthwise pipes (1), which are arranged next to each other, as a rule vertically, on the plan of a rectangle, in its corners. 10
4. The lattice construction, according to the claim 1 or 2 or 3, **characterized in that**, the lengthwise pipes (1) are connected to each other with the cross braces (2). 15
5. The lattice construction, according to the claim 4, **characterized in that**; the cross braces (2) are tubular elements. 20
6. The lattice construction, according to one of the claims from 2 to 5, **characterized in that**, the lengthwise pipes (1) are connected to each other with the cross braces (2) in such a manner that each lengthwise pipe (1) is connected with two other, adjacent lengthwise pipes (1). 25
7. The lattice construction, according to one of the claims from 4 to 6, **characterized in that**, the spacing of cross braces (2), the angle of their inclination in relation to the lengthwise pipes (1) and the manner of their arrangement are various, and the lattice construction made in such a manner forms a modular element (3). 30
8. The lattice construction, according to the claim 7, **characterized in that**, the modular element (3) is fixed to the spacer (4), preferably made of steel. 35
9. The lattice construction, according to one of the claims from 1 to 8, **characterized in that**, the interior of pipes (1), or the elements of other profile corresponding to them, is filled with polyurethane foam or polymer concrete. 40

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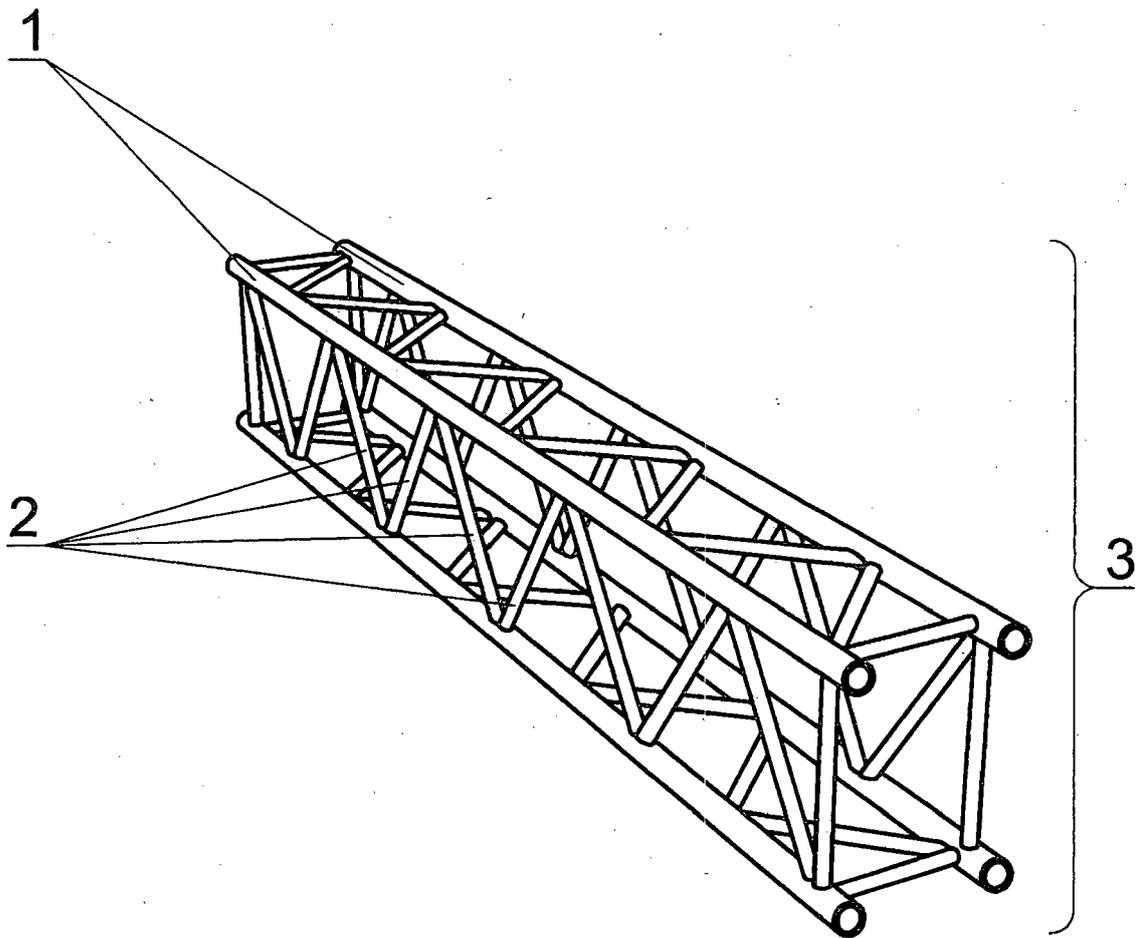


Fig. 1

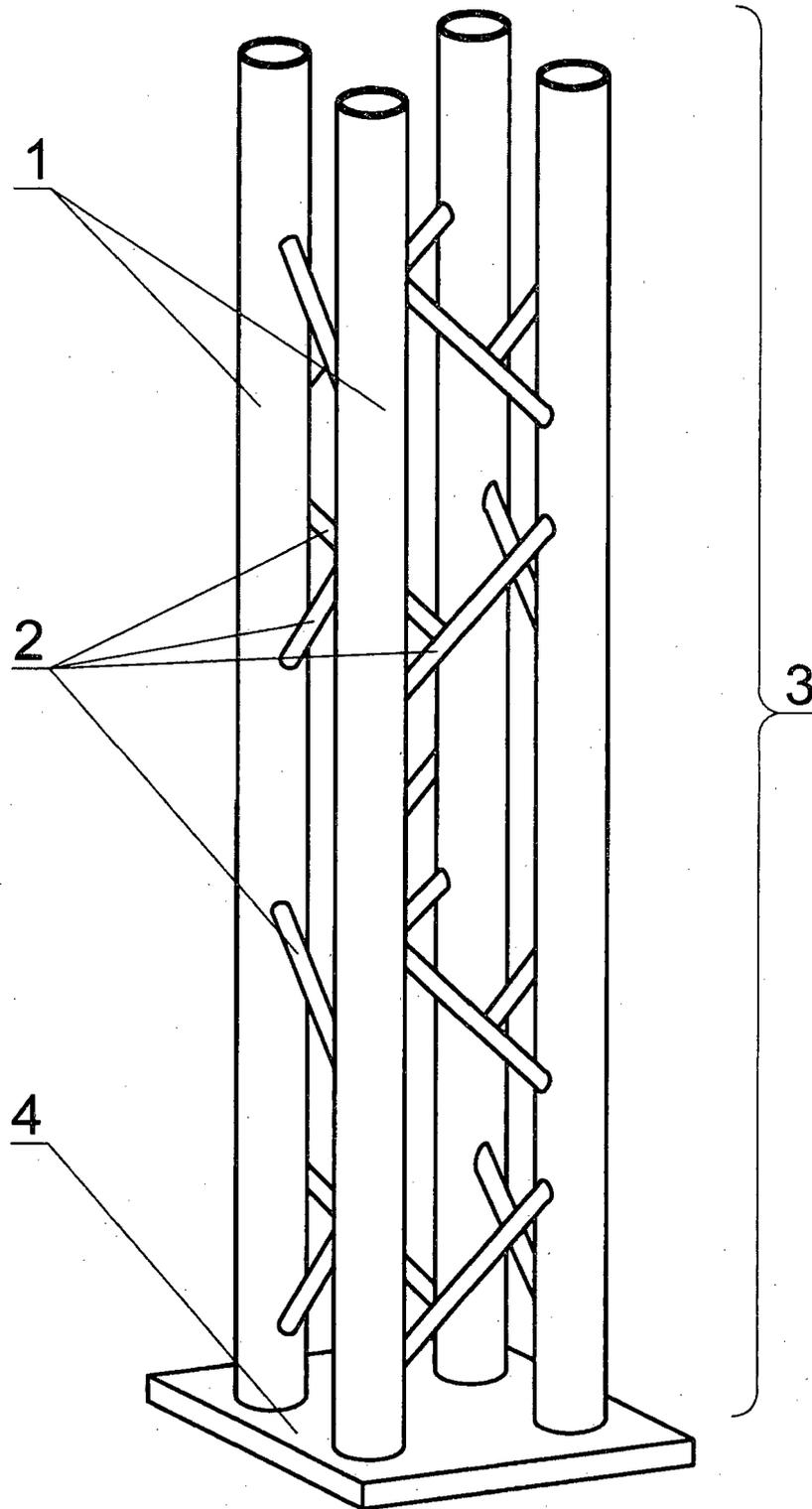


Fig. 2

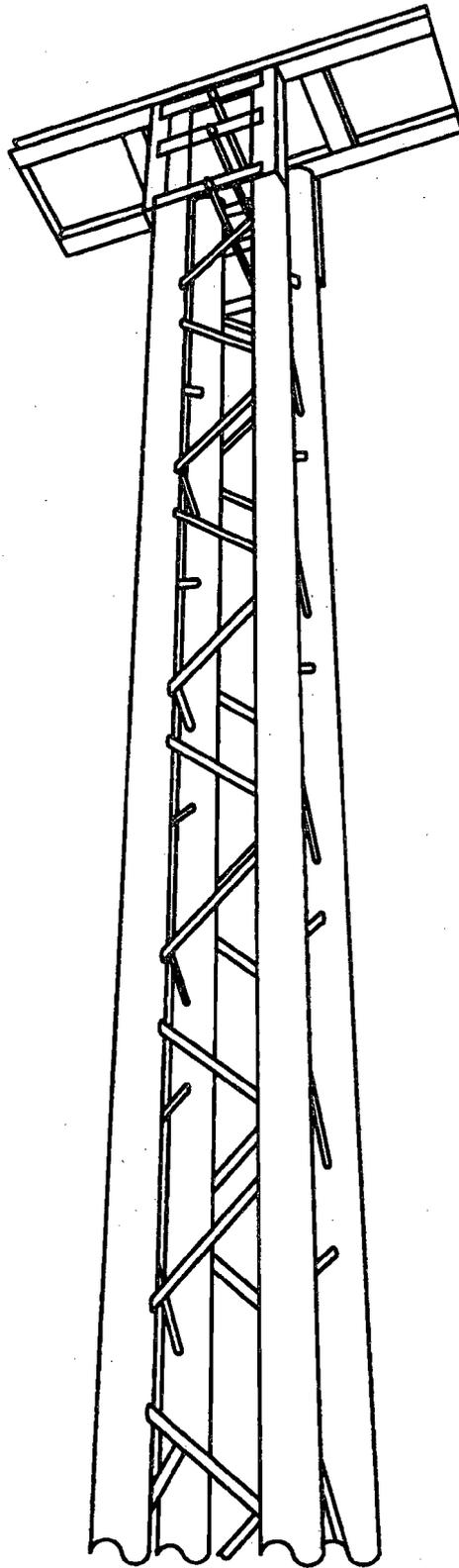


Fig. 3



EUROPEAN SEARCH REPORT

Application Number  
EP 16 46 0069

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A	WO 2014/001811 A1 (ECOPOLE AS [NO]; RAMSAY LAURA ANNE [GB]) 3 January 2014 (2014-01-03) * figures 5, 9g * * page 12, line 29 - line 30 * -----	1-9	TECHNICAL FIELDS SEARCHED (IPC)  E04C
The present search report has been drawn up for all claims			
Place of search <b>The Hague</b>		Date of completion of the search <b>6 January 2017</b>	Examiner <b>Petrinja, Etiel</b>
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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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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