(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 617 013 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
18.01.2006 Bulletin 2006/03

(51) Int Cl.:
E04G 11/48 *(2006.01)*

(21) Application number: **04398005.1**

(22) Date of filing: **13.07.2004**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL HR LT LV MK

(71) Applicant: **CEDEMAT - Aluguer de Materiais de Construçao, Lda**
Ponte de Lima (PT)

(72) Inventors:
- **Matos Gonçalves, Oscar Alberto**
  4990-751 Ponte de Lima (PT)
- **Araujo Vila Verde, Antonio Jorge**
  4750-555 Barcelos (PT)

(74) Representative: **Pereira da Cruz, Joao**
J. Pereira da Cruz, S.A.
Rua Vitor Cordon, 14
1249-103 Lisboa (PT)

(54) Horizontal formwork

(57) This formwork system for slabs is made up of five elements: vertical prop (19), poppet head (4), panel (1), longitudinal beam (2), and transversal beam (3). Each isolated system needs four poppet heads (4), three panels (1), two longitudinal beams (2) and two transversal beams (4). In the formwork of the invention each poppet head supports two longitudinal beams, and each longitudinal beam supports six panels. The transversal beams (3) are used to help in the mounting of the system, marking the correct distance between the longitudinal beams (2). The present invention is most suitable for the formwork of large areas. All the formwork elements are metallic, however, the top of the panel is covered with plywood, which stays in contact with the concrete, conferring on it a better surface finish. The system is designed so that during the removal of the formwork, before the concrete maturity, only the poppet head (4) supported in a prop (19) is maintained at position, and all of the longitudinal beams (2), transversal beams (3) and panels (1) are removed.

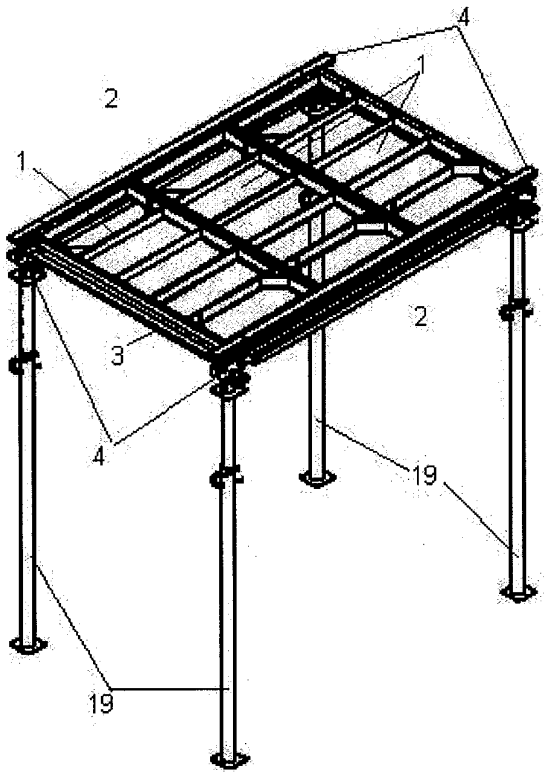

Figure 1

EP 1 617 013 A1

Description

Field of the Invention

[0001] The object of this invention is to provide the construction industry with a new slab formwork system which has a minimal number of parts in contact with the concrete makes the structural mounting quicker, allows the very rapid recovery of a large number of parts, beams and panels, before the concrete maturity, without jeopardizing the safety of the construction site.

Background of the invention

[0002] Within the slab formwork systems available in the market, considering the use of heads, two kinds of systems can be distinguished: one using headstocks and another using poppet heads. In the headstocks systems the panels rest directly on the heads and the formwork is not recovered, i.e. the formwork elements can only be removed when the concrete maturity (when the hardening coefficient is achieved. This kind of system is usually applied to small concrete areas. The slab formwork systems using poppet heads were designed so that most of their parts can be recovered before the concrete maturity achievement allowing the use of these parts in other formworks.

[0003] The poppet heads are composed by three sections: the fixed part which touches the prop at one end and the concrete at the other, the movable part that supports the longitudinal beams and has a upper position or working position and a position for removal of the formwork and the third element, which is the blocking system for the working position of the movable part.

[0004] The assembly of the system on the props begins with the positioning of the longitudinal beam, then the transversal beam is placed perpendicularly to the longitudinal beam. In this way the distance between the longitudinal beams is estimated. Finally the several panels are placed between those beams, which determines the actual distance between the longitudinal beams. The assembly of the panels involves a readjustment to the position of the beams and, consequently of the props. Therefore, at least two manual workers are needed during the assembly of the system; one is responsible for the positioning of the props and the other makes the necessary adjustments to the props and beams.

[0005] In accordance with the above descriptions and as examples of slab formwork systems using poppet heads, we can quote the documents relating to British patent no. 2.005.332 of Rapid Metal Developments Limited, German patent no. 3316557 and the German utility model G9005901 of NOE Schaltechnik GmbH, the Spanish patent no. 440.081 of SGB GROUP LIMITED; European patent no. 0718 453, French patent no. 2.475. of PERI GmbH and the Spanish patent with the publication no. WO 02084050 of ULMA.

[0006] The slab formwork systems described above have some inconveniences regarding the concrete surface finish. In the slab formwork systems described above all of their parts, poppet heads, beams and panels are in contact with the concrete. When the formwork is assembled there are several borders or separation lines between their parts. Each contact plane between two components in the formwork system implies a mark in the concrete finish. This has consequences in situations where the final appearance of the concrete is important.

Summary of the invention

[0007] The formwork system of the invention is fundamentally composed of vertical props, poppet heads mounted on the upper edge of the props, longitudinal beams supported on the edges of the poppet heads, formwork panels supported on the longitudinal beams and transversal beams with the purpose of setting the distance between the longitudinal beams.

[0008] This new formwork system was designed to satisfactorily solve the inconveniences and problems mentioned in the previous paragraphs relating to the prior art.

[0009] One of the main novel characteristics of the formwork consists of placing the transversal beams under the panels, thus reducing the number of components in contact with the concrete.

Brief description oh the drawings

[0010] The present description is accompanied by the attached non-restrictive drawings where:

Figure 1 represents one isolated formwork system, when it is in position, with the several constituent components.

Figures 2 and 3 illustrate a front and side view of the way of encasing the three principal components: panel, poppet head and longitudinal beam.

Figure 4 shows a side and perspective view of the poppet head.

Figure 5 represents an image sequence showing the assembly of the formwork system of the invention.

Figure 6 represents one isolated formwork system, after it has removed, with the several constituent components.

Figure 7 shows a front, side and perspective view of the longitudinal beam

Figure 8 shows front, top and perspective view of the formwork panel.

Figure 9 illustrates in a perspective view an isolated formwork system, in the particular situation where

there is a pillar in the middle of the formwork area.

Detailed description of the invention

[0011] As can be seen, the slab formwork system is composed of vertical props (19), poppet heads (4), longitudinal beams (2), transversal beams (3) and panels (1). The longitudinal beams provide support for the formwork panels ground (figures 5f, 5g and 5 h) and rest on the poppet heads (figure 5b and 5 c) and the poppet heads are supported by props (figure 5 a). The transversal beams rest on the poppet heads, in their own encasement (11), and they mark the distance between the longitudinal beams as shown in figures 5d and 5e.

[0012] As mentioned above, one of the main novel characteristics of this formwork system consists of placing the transversal beam under the panels, therefore removing one element in contact with the concrete.

[0013] The system is assembled as follows: the regular longitudinal beams are mounted on the poppet heads and then the transversal beams are positioned, which will indicate the position of the next prop. After this the panels are placed above the longitudinal beams (2). This assembly is illustrated by a sequence of images in figure 5.

[0014] The transversal beams (3) are therefore placed before the panels (1) and under the panels (1), so that they will not touch the concrete. These beams serve the purpose of marking the distance between the longitudinal beams.

[0015] When the desired concrete hardening coefficient is obtained, the formwork is removed. For that purpose, the poppet heads are changed to the removal position, as shown in figure 6, and then the panels (1), and the longitudinal (2) and transversal (3) beams are removed in the opposite order to which they were mounted, without the need to make any changes in the shoring.

[0016] Unlike most slab formwork systems available on the market, this one is characterized by being built with profiles and beams that are designed in order to obtain a much lighter formwork system, which is easily handled and maintained (cleaning and repairing) after being used on the construction site, having the same load capability as the systems that can be found on the market, using standard profiles and beams such as U sections and rectangular pipes among others.

[0017] The invention is essentially different from other existing slab formwork systems because of:

- The positionig of the transversal beams (3) under the panels (1);
- The form of encasement between the panels (1) and the longitudinal beams (2) (see figure 2); and
- The form of encasement between the longitudinal beams (2) and the poppet heads (4) (see figure 3), because the existing systems use a wedge quoin mortise.

[0018] The panel of the invention rests on and adjusts to the longitudinal beams through a ladder mortise as can be seen in figure 2, making use of four pins (5), one in each panel (1) vertex (see figure 8) to adjust the longitudinal beams and at the same time to serve as a blocking of the system when this one is mounted. For the encasement of the pins, the longitudinal beams have a boring every 5 cm along their length as shown in figure 7, so that adjusts in the formwork limits can be made, such as a wall or a pillar and also in order to allow the use of panels with various dimensions. The poppet head (4) is also equipped with a boring continuing the one existing in the longitudinal beams (2) (figure 4).

Claims

1. Horizontal formwork system, of the recoverable type, which uses poppet heads (4) supported on the upper edge of vertical props (19), longitudinal beams (2) supported on the edges of poppet heads (4), formwork panels (1) supported on those beams (2) and transversal beams (3) **characterized by**:

   - The positioning of the transversal beams (3) under the panels (1);
   - The form of encasement between the panels (1) and the longitudinal beams (2) (see figure 2); and
   - The form of encasement between the longitudinal (2) beams and the poppet heads (4) (see figure 3), because the existing systems use a wedge quoin mortise.

2. Horizontal formwork system, as claimed in claim 1, **characterized by** the positioning of the transversal beams (3) before the panels and under the panels, fixed in a groove (11) on the poppet head, so that these beams do not come into contact with the concrete; these beams serve the purpose of marking the distance between the longitudinal beams (2).

3. Horizontal formwork system, as claimed in claim 1, **characterized by** the longitudinal beams (2) being supported by the poppet heads (4) through rotation supports (12); these supports make it possible to raise the longitudinal beam (2) to a horizontal or working position and when it is supported on the other poppet head the system gets blocked due to the encasement interface, regardless of whether the concrete has been made or not, the system unblocking when the poppet head is placed in the removal position.

4. Horizontal formwork system, as claimed in claim 1, **characterized by** the poppet head having a blocking system using a wedge quoin (8), allowing the positioning of its movable part, built with hook shape el-

ements (9), in a working position, and when the wedge quoin is loosened after the formwork has been made those same elements are lowered and therefore the panels (1) and longitudinal beams (2) are also lowered to a a removal position; afterwards those components can be recovered in order to be used in the next formwork areas.

5. Horizontal formwork system, as claimed in claim 1, **characterized by** the longitudinal beam having a boring along its length in the panel (1) supporting area to allow encasement and accommodation of the panels (1) and at the same time to allow the use of panels with different dimensions within the limits of the formwork.

6. Horizontal formwork system, as claimed in claim 1, **characterized by** the positioning of the panels between the longitudinal beams (2) with an encased ladder type using pins (5) to be fixed in the horizontal plane; theses pins not only help in the encasement but also confer on the system assembly extra rigidity; the distance between the longitudinal beams (2) is determined by the transversal beams (3) and the panels should only be positioned after at least two longitudinal beams (2) have been fixed.

7. Horizontal formwork system, as claimed in claim 1, **characterized in that** the existing boring in the poppet head (4) movable component continues the one along the longitudinal beam (2) which is intended to receive the panel encasing pins (17), giving stability in the assembly of the system.

8. Horizontal formwork system, as claimed in claim 1, **characterized in that**, in the event of a break in the natural mounting of the formwork due to a pillar, it allows the removal of a panel so that the formwork will not be interrupted and the blank spaces can be filled with wooden panels.

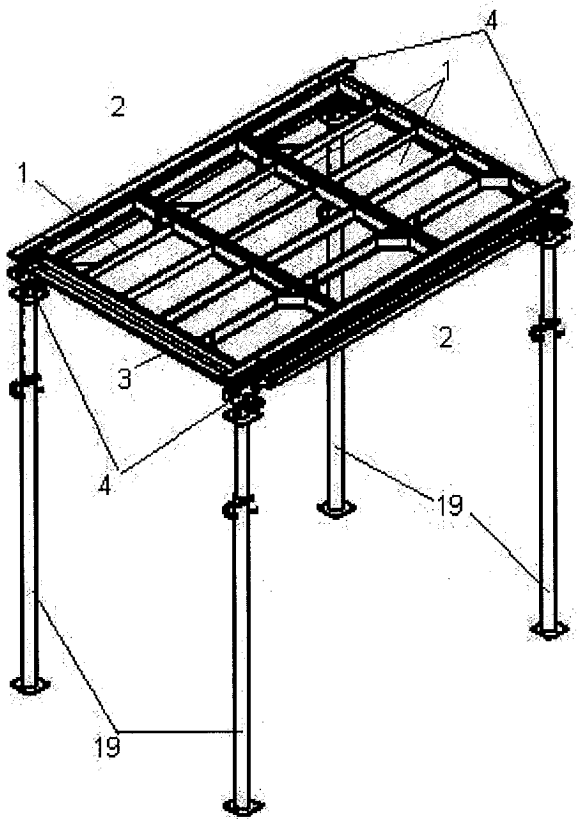

Figure 1

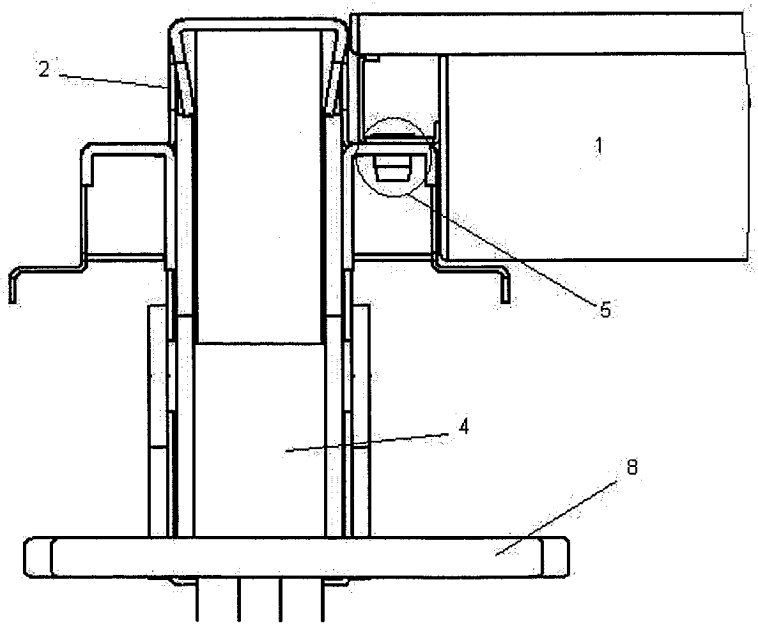

Figura 2

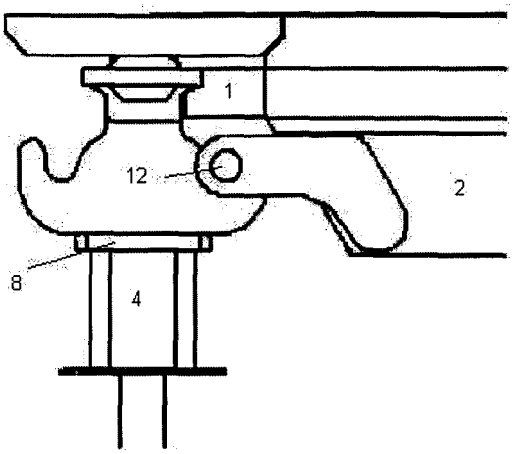

Figure 3

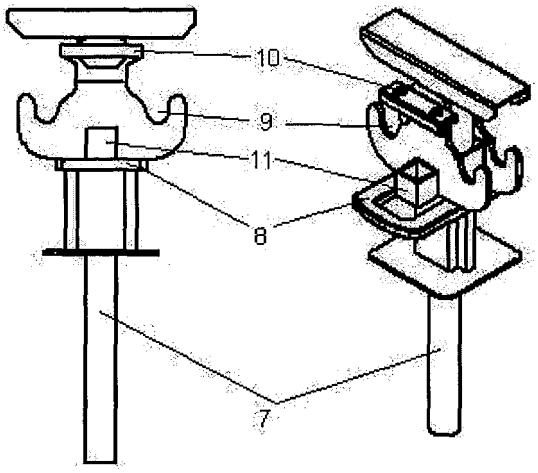

Figure 4

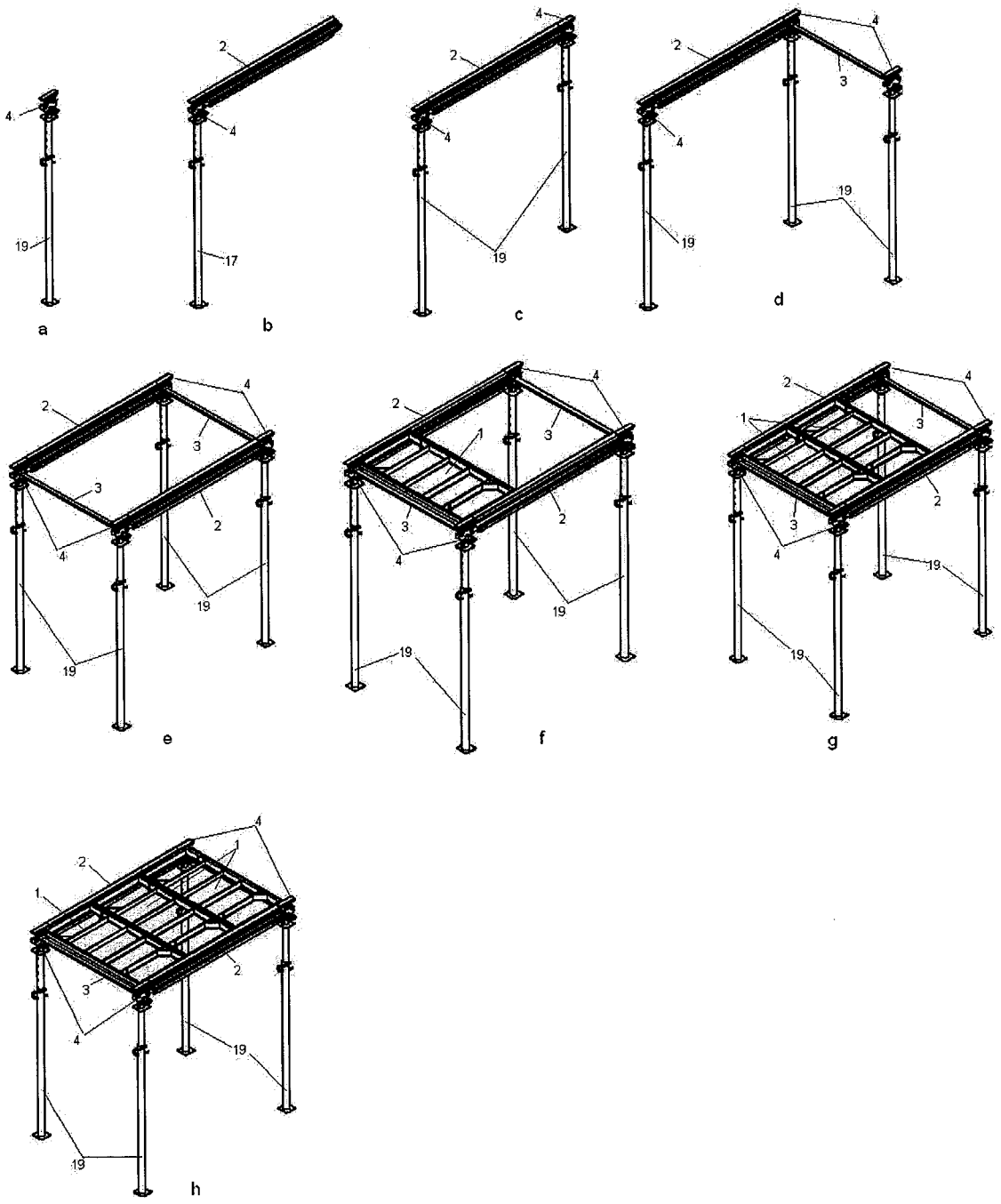

Figure 5

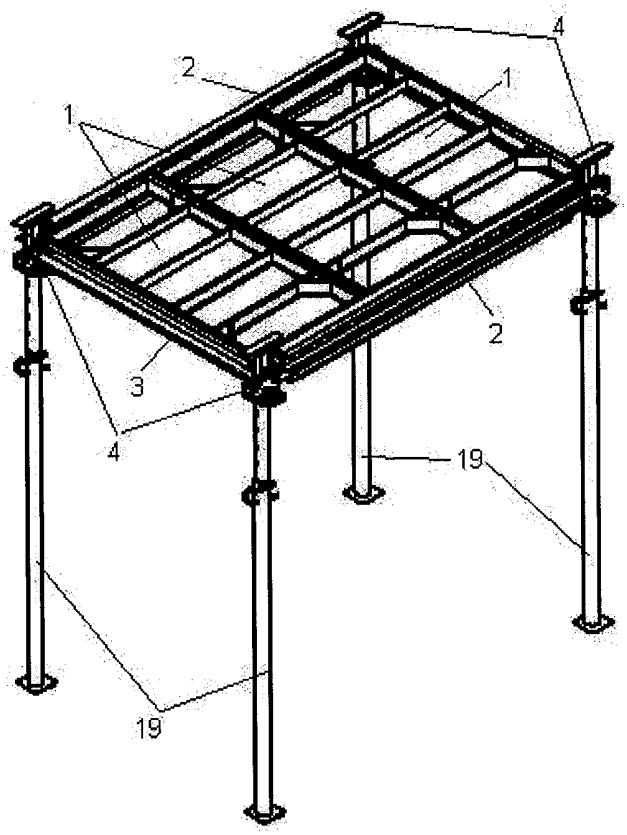

Figure 6

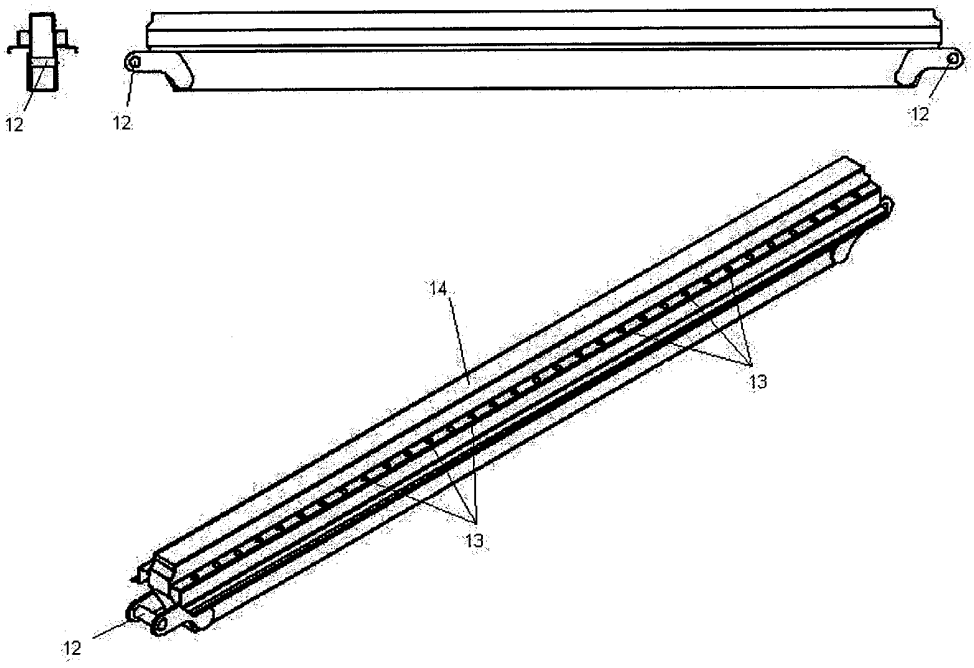

Figure 7

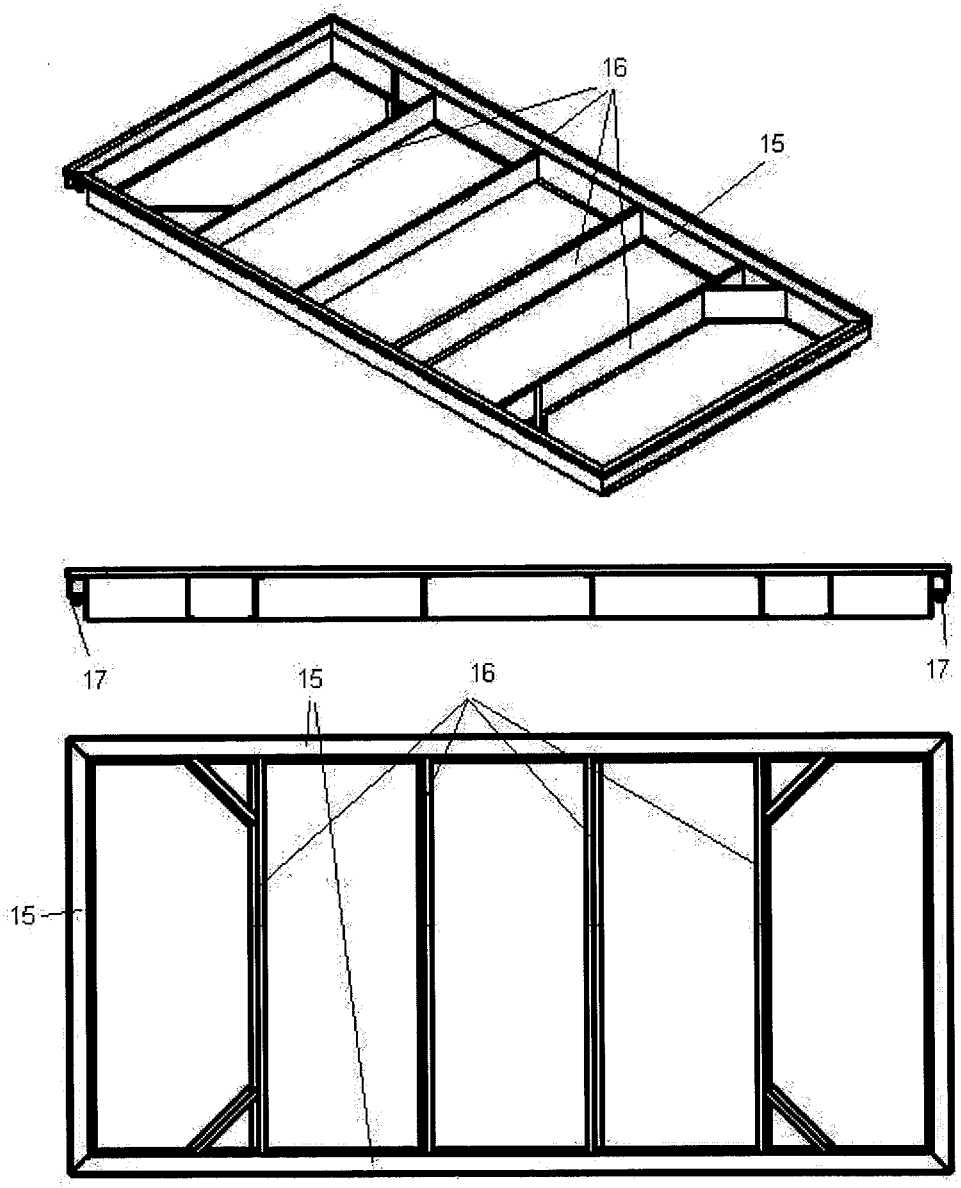

Figure 8

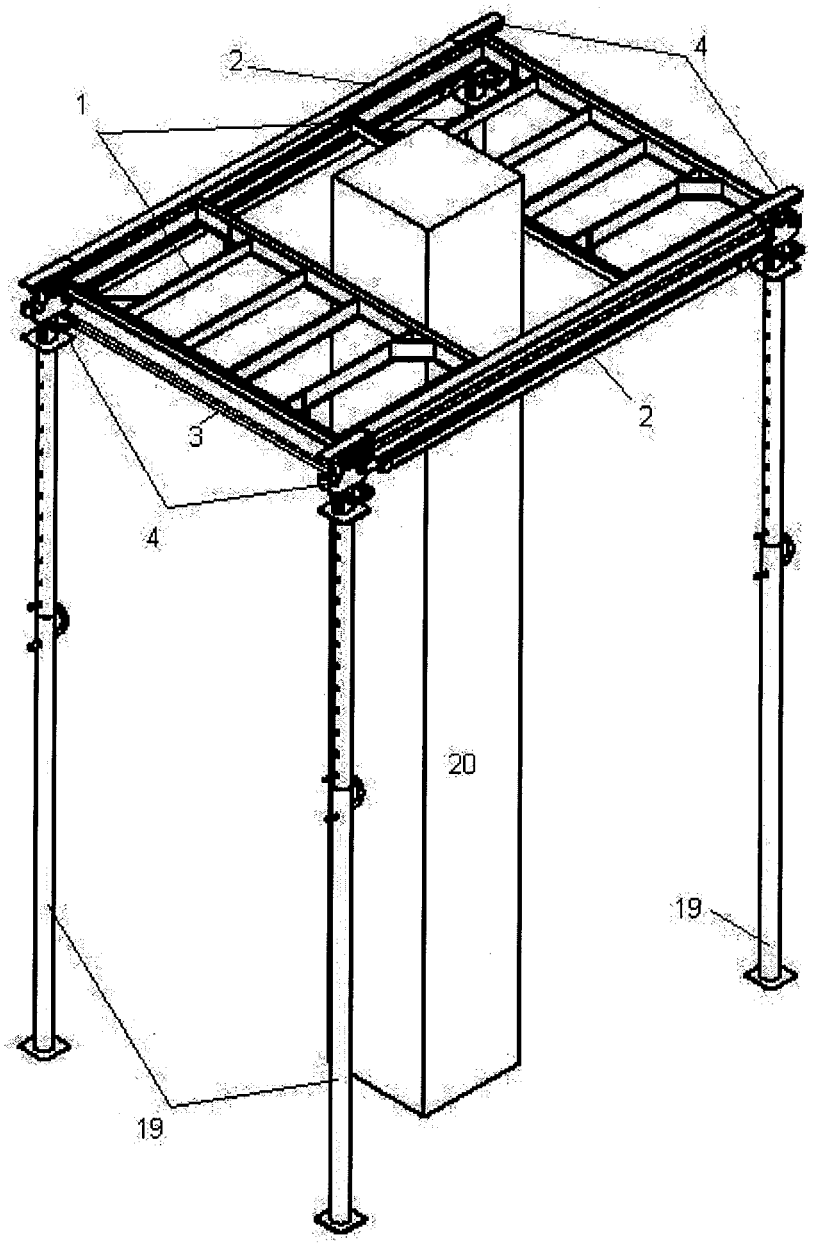

Figure 9

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 39 8005

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.7)
X	DE 29 27 116 A (NOE SCHALTECHNIK GMBH) 8 January 1981 (1981-01-08) * page 13, line 16 - line 21 * * page 14, line 1 - line 4 * * figures *	1-3,8	E04G11/48
Y		4-6	
Y	EP 1 251 222 A (INGENIERIA DE ENCOFRADOS Y SER) 23 October 2002 (2002-10-23) * figures *	4	
Y	DE 196 36 091 A (HOLLMANN NIELS) 12 March 1998 (1998-03-12) * figures *	5,6	
A	FR 2 760 482 A (RICARD BRUNO) 11 September 1998 (1998-09-11) * figures *	1,5,6	
A	EP 1 375 781 A (ULMA C Y E S COOP) 2 January 2004 (2004-01-02) * figures *	1,8	TECHNICAL FIELDS SEARCHED (Int.Cl.7)
D,A	& WO 02/084050 A (ULMA C Y E S COOP ; AROZENA BERGARETXE ALBERTO (ES)) 24 October 2002 (2002-10-24)	1,8	E04G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	16 November 2004	Andlauer, D

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

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 04 39 8005

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

16-11-2004

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 2927116 A	08-01-1981	DE 2927116 A1	08-01-1981
EP 1251222 A	23-10-2002	ES 2196951 A1	16-12-2003
		EP 1251222 A2	23-10-2002
DE 19636091 A	12-03-1998	DE 19636091 A1	12-03-1998
		AT 271634 T	15-08-2004
		DE 59711788 D1	26-08-2004
		EP 0851075 A1	01-07-1998
FR 2760482 A	11-09-1998	FR 2760482 A1	11-09-1998
EP 1375781 A	02-01-2004	WO 02084050 A1	24-10-2002
		BR 0111650 A	01-07-2003
		EP 1375781 A1	02-01-2004
		US 2004075043 A1	22-04-2004
WO 02084050 A	24-10-2002	WO 02084050 A1	24-10-2002
		BR 0111650 A	01-07-2003
		EP 1375781 A1	02-01-2004
		US 2004075043 A1	22-04-2004

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82