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(54) BUILDING BLOCK (VARIANTS)

(57) This invention relates to the building art, in particular, to building blocks for mortarless brickwork and construction of houses, buildings, structures and hardscaping items. According to the first variant the building block made in a form of polygon on each vertical and each horizontal face of which the response projections and recesses are made, coming into engagement with the projections and recesses of adjacent blocks. The projections and recesses are made in truncated cone form, along the axis of which in this block intercommunicating channels are made. According to the second variant on the faces of the building block only recesses are made in it in a form of cylinders and/or truncated cones, along the axis of which in the block the channels are made. At least, in some of the indicated recesses the fastening elements in a form of discs are installed, at both sides of which along the axe the bars, fixed in the indicated channels of the adjacent blocks are fastened. The invention allows to enlarge a range of possible variants of mutual blocks fastening.

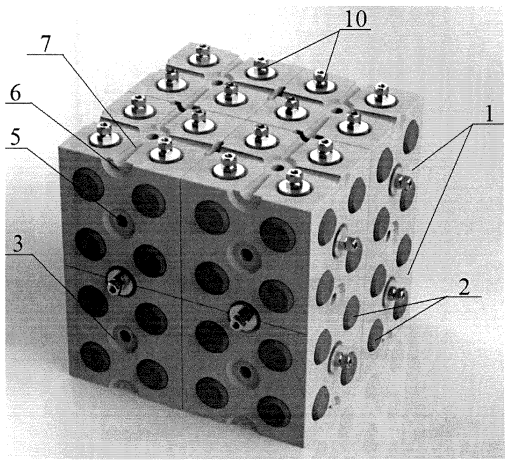

Fig. 8

EP 3 896 236 A1

Description

TECHNICAL FIELD

[0001] This invention relates to the building art, in particular, to building blocks for mortarless brickwork and construction of houses, buildings, structures and hardscaping items.

[0002] The invention may be used for masonry laying without use of mortar.

BACKGROUND OF THE INVENTION

[0003] The use of traditional building blocks, bricks, mortars and structures results in some restrictions concerning modern building. These restrictions include: need for skilled labour force to achieve a constant reproducible result; limitations in the speed, where the restricting factors are requirements for mortar setting time and limitations in the loading-carrying ability of the structure due to the change in stiffness of mutual connection between blocks.

[0004] The use of precast concrete panels become widely used in recent years, seeking to neutralize some of these restrictions. The use of such panels has its own disadvantages, including difficulties in adapting of the panels for specified place of installation, as well as necessity of mechanization for loading, transportation and installation of the panels.

[0005] Another alternative for traditional building systems using the building blocks and brick laying are the self-fixing building blocks.

[0006] From the technical background the building block for external wall erection is known, containing a solid body with front, rear, two end, upper and lower surfaces, as well as a variety of projections and recesses on upper and lower surfaces for fixation and aligning of the adjacent blocks with formation of uniform joints, which are afterwards filled with mortar (see patent US5934037, cl. E04B2/08 publ. 10.08.1999).

[0007] From the technical background the house-building system is known, including a number of the building blocks, which are mutually fixed together with the aid of nuts and bolts, where the bolt consists of respective upper and lower pieces, at that one set of fixing pieces may be placed in a hidden area together with a bolt and pass through all the structure, and another one - at the outer surface of the lower part of the bolt area. In the process of assembling the external thread of one bolt enters into engagement with the internal thread of another one, at that the blocks may contain internal thread in embedded openings for bolts installation in such a way that the upper part of bolts is at the same level with the upper part of blocks in engagement (see patent GB2528090, cl. E04B2/18, publ. 13.01.2016).

[0008] From the technical background the method of mortarless building the foundation and walls is known, including the use of mounting bars basing on the first set of mechanical binding, according to which the wall is constructed by the way of vertical laying of multiple wall blocks on the threaded bars and their fastening using mechanical binding, at that a number of connectors are fastened to the threaded bars of wall structure reinforcement, and a number of bars are fastened to the connectors of the upper walls part horizontally, forming a network of bars which connect the walls (see patent US8225578, cl. E04B1/38, publ. 24.07.2012).

[0009] The advantage of mutual-fixing building blocks is that they (?) considerably by themselves occupy the project location and don't require masonry mortar, that allows to ensure fast erection of constructions, basically with non-skilled working force. However, all described building blocks and systems were worked out with consideration to particular industrial destination and don't allow to vary the final structure form in a wide range.

[0010] The closest by its technical essence to the proposed invention is the building block made in a form of a polygon on each vertical and each horizontal face of which the response projections and recesses are made, coming into engagement with the projections and recesses of adjacent blocks (see patent CN204919955, cl. E04B2/08, publ. 30.12.2015). The known device allows to increase the structure not only in vertical but also in two horizontal directions, keeping at that accuracy and durability of the joint. However, the known device don't ensure possibility of additional fastening of the blocks with each other, and that's why it can't be used for erection of complicated geometry constructions.

SUMMARY OF THE INVENTION

[0011] The technical problem is creation of the building block that allows in short terms to erect houses and buildings without use of high-skilled working force and mechanization attraction.

[0012] The invention is destined for extension of a range of possible variants of mutual fastening of the blocks.

[0013] According to the first variant of embodiment the problem is solved so that in a building block made in a form of polygon on each vertical and each horizontal face the response projections and recesses are made, coming into engagement with the projections and recesses of adjacent blocks, the indicated projections and recesses are made in truncated cone form, along the axis of which in this block mainly intercommunicating channels are made. On each vertical and each horizontal face of the block preferably at least four projections and recesses are formed. The projections and recesses are made in truncated cones form with the angle not more than 45 degrees.

[0014] The building block may be made in a form of right parallelepiped, T-shaped, L-shaped.

[0015] The building block may be made in a form of a number of cubes or parallelepipeds, or their combination, connected with each other and forming an integral whole,

a polygonal item with complicated geometry.

[0016] The building block may be provided with inclined sections placed at the angle 10-90 degrees with crosswise structure formation, at that on the ends of inclined sections the response projections and recesses are also formed.

[0017] At the edge of vertical and/or horizontal faces the recesses as a half of truncated cone may be made, forming in assembly with the adjacent blocks recesses integral cones, at that on the indicated faces surface the channel-formed grooves may be made, forming in assembly with the adjacent blocks the channels along the recesses axis. At the corners of vertical and/or horizontal faces the recesses as a quarter of truncated cone may be made, forming in assembly with the adjacent blocks recesses integral cones, at that along the ribs of the indicated faces the channel-formed grooves may be made, forming in assembly with the adjacent blocks the channels along the recesses axis.

[0018] The block may be provided with the insertions installed in the recesses and forming projections and partially entering into respective channels.

[0019] The block may be provided with the insertions with channels allowing possibility of installation in them the fastening elements for mutual fastening between the blocks.

[0020] According to the second variant of embodiment the posed problem is solved by the way that in the building block made in a form of polygon, at each vertical and each horizontal face of which the recesses in a form of cylinders and/or truncated cones are formed, along the axis of which the channels are made in the block, at least, in some of the indicated recesses the fastening elements in a form of discs are installed, at both sides of which along the axe the bars, fixed in the indicated channels of the adjacent blocks are fastened.

[0021] The channels in a section are made in a form of a circle, ellipse, square, rectangle, triangle.

[0022] The recesses at the edge of vertical or horizontal faces made in a form of a half of truncated cone, form in assembly with the adjacent blocks recesses integral cones.

[0023] The building block may be made preferably in a form of cube or right parallelepiped, T-shaped, L-shaped.

[0024] The building block may be made in a form of a number of cubes or parallelepipeds, or their combination, connected with each other and forming an integral whole, a polygonal item with complicated geometry.

[0025] The building block may be provided with the insertions with channels allowing possibility of installation in them the fastening elements for mutual fastening between the blocks.

[0026] Using indicated building blocks a structure can be made closed around the perimeter by the way of combination of the fourth block with three adjacent blocks at linear trajectory passing through the point of connection of three faces, at the angle to each of side faces of indicates three blocks in the range from 1 to 89 degrees, preferably at the angle 45 degrees.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027] The essence of the proposed invention is illustrated by the drawings and description of the preferred variants of embodiment with references to the accompanying drawings:

Fig.1 is the general view of the building block (the first basic variant of embodiment in the form of cube with placement of projections and recesses by four at each face);
Fig.2 is a variant of embodiment with additional fifth recess at one face;
Fig.3 is the second basic variant of embodiment, but with recesses at all the faces (prior to installation of fastening elements);
Fig.4 is the same, in section;
Fig.5 is the second basic variant of embodiment with five recesses at all the faces;
Fig.6 is the second variant of embodiment with semi-recesses and bores at one face;
Fig.7 is the second variant of embodiment with semi- and quarter-recesses and bores at all the faces and ribs;
Fig.8 is an example of the structure assembling from cubic blocks according to the first variant of embodiment;
Fig.9 is a variant of a block in a form of parallelepiped;
Fig.10 is a variant of a T-shaped block;
Fig.11 is a variant of a block with inclined sections;
Fig.12 is an example of the structure assembling from the blocks with inclined sections;
Fig.13 is an example of the structure forming by the way of combination of the fourth block with three adjacent blocks at the linear trajectory passing through the point of connection of three faces at the angle (the angle is indicated with an arrow).

[0028] According to the first variant the proposed building block 1 is made in a form of polygon on each vertical and each horizontal face of which the response projections 2 and recesses 3 are made (by four or five items), coming into engagement with the projections and recesses of the adjacent blocks. Depending on the final project the block may be made in a form of cube, right parallelepiped, T-shaped, or provided with the inclined sections 4. In this last case the block is made in the form of two parallelepipeds, the lengthwise axis of which are located at the angle 10-90°, connected crosswise as an integral whole. On the ends of sections 4 the response projections 2 and recesses 3 are also formed. Combination of projections 2 and recesses 3 may be chosen at each face of the block 1 in advance, or for a particular place of its placement.

[0029] The projections 2 and recesses 3 are made in

a form of truncated cones, along the axis of which in the block the interconnected channels 5 are made. At the edge of the faces the recesses 6 may be made in a form of a half of truncated cone, forming in assembly with the analogous recesses of adjacent blocks 1 integral cones. At that on the surface of respective faces the channel-formed grooves 7 are made, forming in assembly with the adjacent blocks 1 the channels along the axis of the recesses 6. Moreover, at the corners of the faces the recesses 8 may be made in a form of a quarter of truncated cone, forming in assembly with the recesses of adjacent blocks integral cones. At that along the ribs of these faces the channel-formed grooves 9 are made, forming in assembly with the adjacent blocks the channels along the axis of the recesses 8. The conical surface of projections 2 and recesses 3, 6, 8 allows to simply connect the blocks 1 together, ensuring at that precise centering and combination of the channels 5 in a single network, which in a case of necessity may be in one operation filled with fixing material. Moreover, the relation of the channels 5 with each other ensures possibility of using transparent pins of different modification. The block 1 may be also provided with the fastening elements 10 placed in the recesses 3 and partially entering in the respective channels 5.

[0030] According to the second variant the proposed block 1 doesn't contain projections, only recesses 3 are made in it in a form of cylinders and/or truncated cones, along the axis of which in the block the channels 5 are made. In a part or in all such recesses 3 the fastening elements 10 are installed in a form of discs, at both sides of which along the axe the bars are fastened, fixed in indicated channels 5 of the adjacent blocks 1. In a part of additional recesses 6, 8 and channel-formed grooves 7, 9 for this variant the same modifications are possible that for the previous one.

[0031] The construction of the proposed blocks is erected as follows.

[0032] The first block 1 is installed on the floor and the following blocks are mounted in sequence. During installation the lateral face of each consequent block is combined with the lateral face of the previous block, at that according to the first variant the projections 2 are located in the recesses 3 without clearance, in a single structure. According to the second variant the blocks are combined with the help of the fastening element 10, installed in the channel 5 and fixing their location. For formation of the inclined beam the blocks with the inclined sections 4 are used. Combining the blocks 1 between each other and connecting them with the fastening elements or fixing material, the required structure is assembled. At that the blocks 1 are laid in relation of the axe of the laying center at one of directions and increased without displacement.

INDUSTRIAL APPLICABILITY

[0033] In such a way, the proposed invention allows to execute mortarless erection of rigidly bound laying of vertical, inclined, cupola-shaped, pyramid-shaped and any other embodiment. Moreover, the block has possibility of fastening redecoration elements and different communication lines in the grooves on the side faces. At that the proposed construction allow to enlarge a range of possible variants of mutual blocks fastening, both simply due to the forces of gravity and friction and with the aid of local fastening elements, pins or their combination.

Claims

1. The building block made in a form of polygon on each vertical and each horizontal face of which the response projections and recesses are made, coming into engagement with the projections and recesses of adjacent blocks, the distinction is that the projections and recesses are made in a form of truncated cones, along the axis of which in the block mainly intercommunicating channels are made.

2. The building block according to the claim 1, the distinction is that on each vertical and each horizontal face at least four projections and recesses are formed.

3. The building block according to the claim 1, the distinction is that the projections and recesses are made in a form of truncated cones with the angle no more than 45°

4. The building block according to the claim 1, the distinction is that it is made preferably in a form of cube.

5. The building block according to the claim 1, the distinction is that it may be made in a form of right parallelepiped, T-shaped, L-shaped.

6. The building block according to the claim 1, the distinction is that it is made in a form of a number of cubes or parallelepipeds, or their combination, mutually connected and forming an integral whole polygonal item with complicated geometry.

7. The building block according to the claim 1, the distinction is that it is provided with the inclined sections placed at the angle 10-90 degrees forming crosswise construction, at that on the ends of the inclined sections the response projections and recesses are also made.

8. The building block according to the claim 1, the distinction is that at the edge of vertical and/or horizontal faces the recesses as a half of truncated cone are made, forming in assembly with the adjacent blocks recesses integral cones.

9. The building block according to the claim 1, the distinction is that on the indicated faces surface the channel-formed grooves are made, forming in assembly with the adjacent blocks the channels along the recesses axis.

10. The building block according to the claim 1, the distinction is that at the corners of vertical and/or horizontal faces the recesses as a quarter of truncated cone are made, forming in assembly with the adjacent blocks recesses integral cones.

11. The building block according to the claim 1, the distinction is that along the ribs of the indicated faces the channel-formed grooves are made, forming in assembly with the adjacent blocks the channels along the recesses axis.

12. The building block according to the claim 1, the distinction is that it is provided with the insertion, installed in the recesses and forming projections.

13. The building block according to the claim 1, the distinction is that it is provided with the insertions with the channels with possibility of installation in them the fastening elements for binding blocks with each other.

14. The building block made in a form of polygon at each vertical and each horizontal face of which the recesses in a form of cylinders and/or truncated cones are formed, along the axis of which the channels are made in the block, at that, at least in some of the indicated recesses the insertions forming projections in a form of discs are installed, at both sides of which along the axe the bars, fixed in the indicated channels of the adjacent blocks are fastened.

16. The building block according to the claim 15, the distinction it that the channels in a section are made in a form of a circle, ellipse, square, rectangle, triangle.

17. The building block according to the claim 15, the distinction it that the recesses, at the edge of vertical or horizontal faces made in a form of a half of truncated cone, form in assembly with the adjacent blocks recesses integral cones.

18. The building block according to the claim 15, the distinction it that it is made preferably in a form of cube.

19. The building block according to the claim 15, the distinction it that it is made in a form of right parallelepiped, T-shaped, L-shaped.

20. The building block according to the claim 15, the distinction it that it is made in a form of a number of cubes or parallelepipeds, or their combination, mutually connected and forming an integral whole polygonal item with complicated geometry.

21. The building block according to the claim 15, the distinction it that it is provided with the insertions with possibility of installation in them the fastening elements for binding blocks with each other.

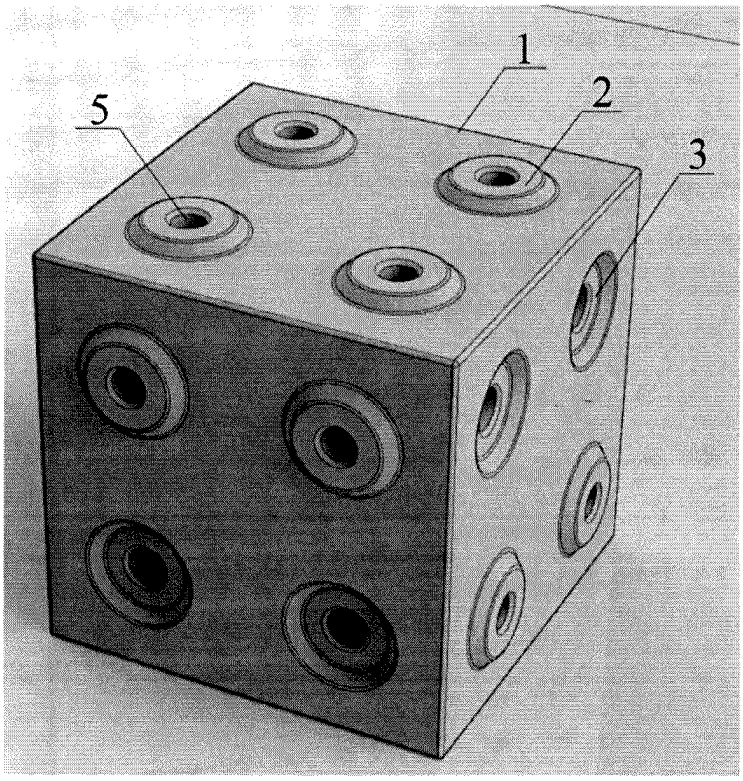

Fig. 1

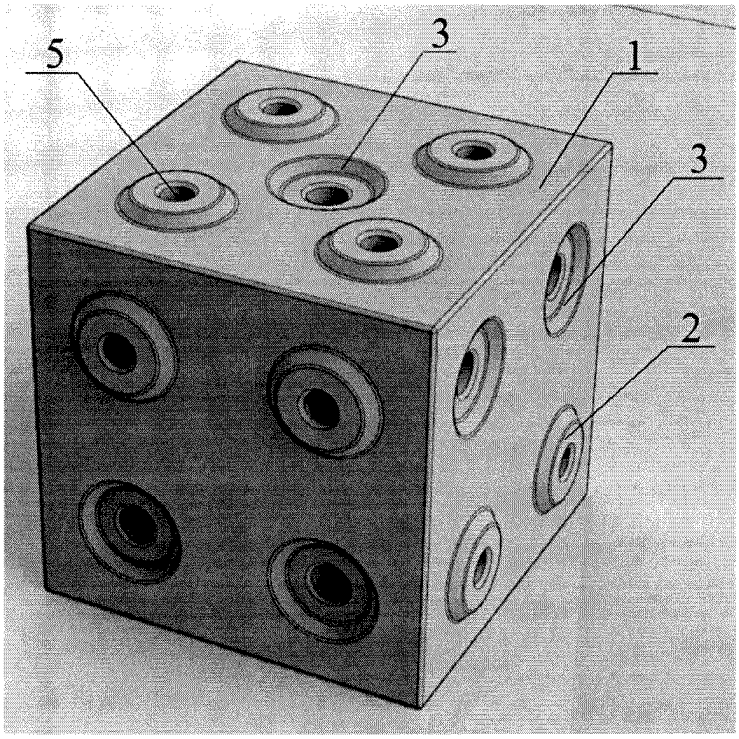

Fig. 2

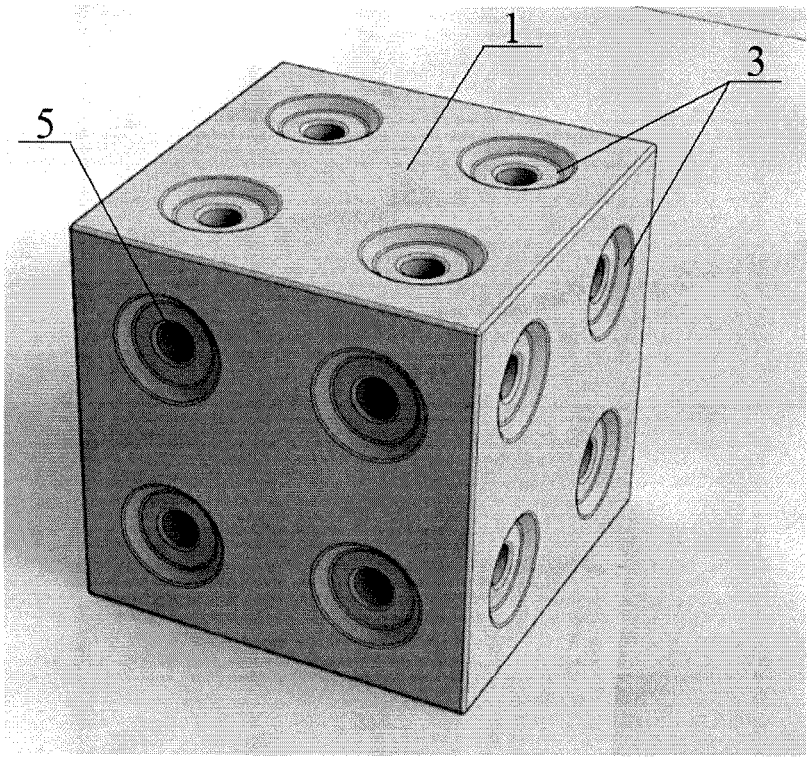

Fig. 3

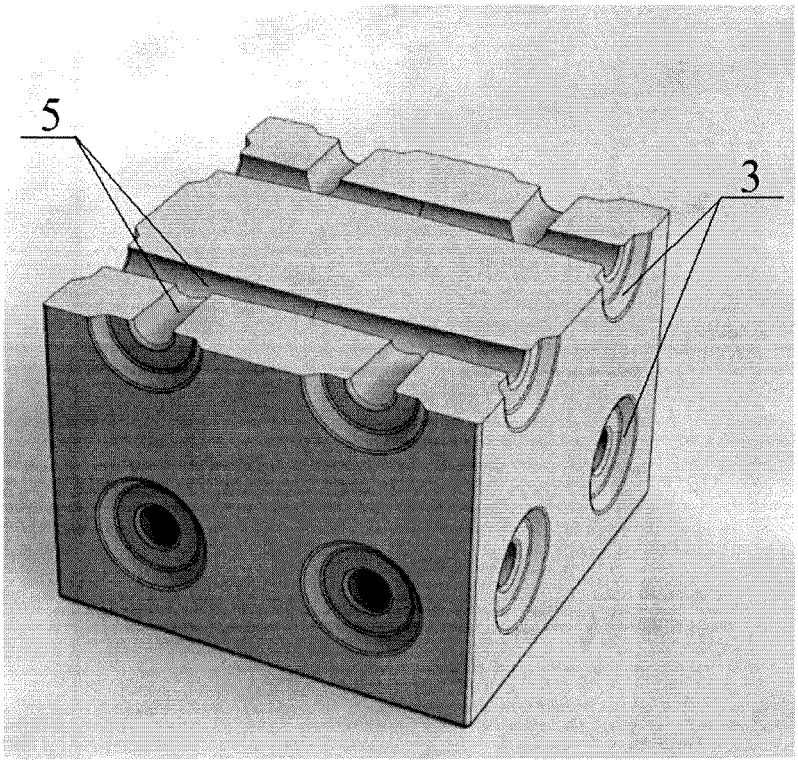

Fig. 4

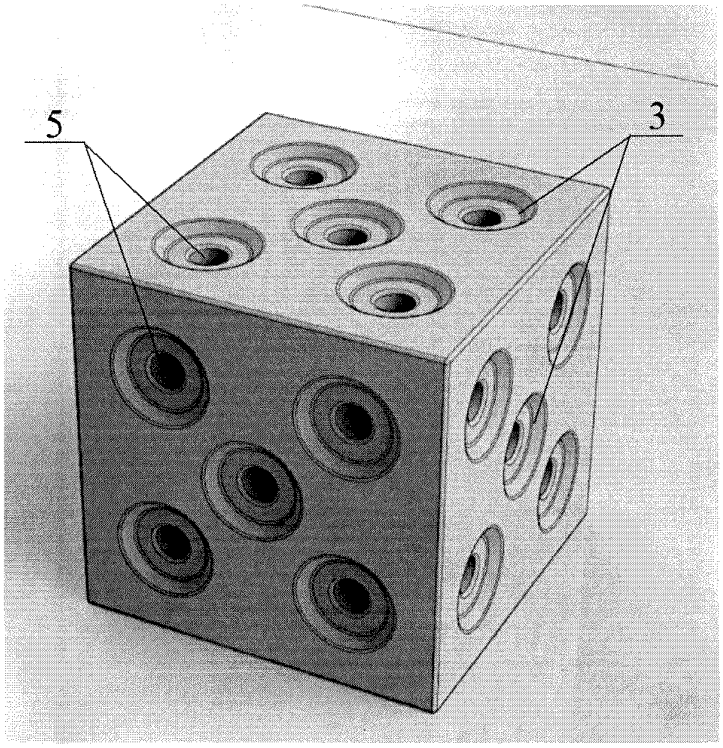

Fig. 5

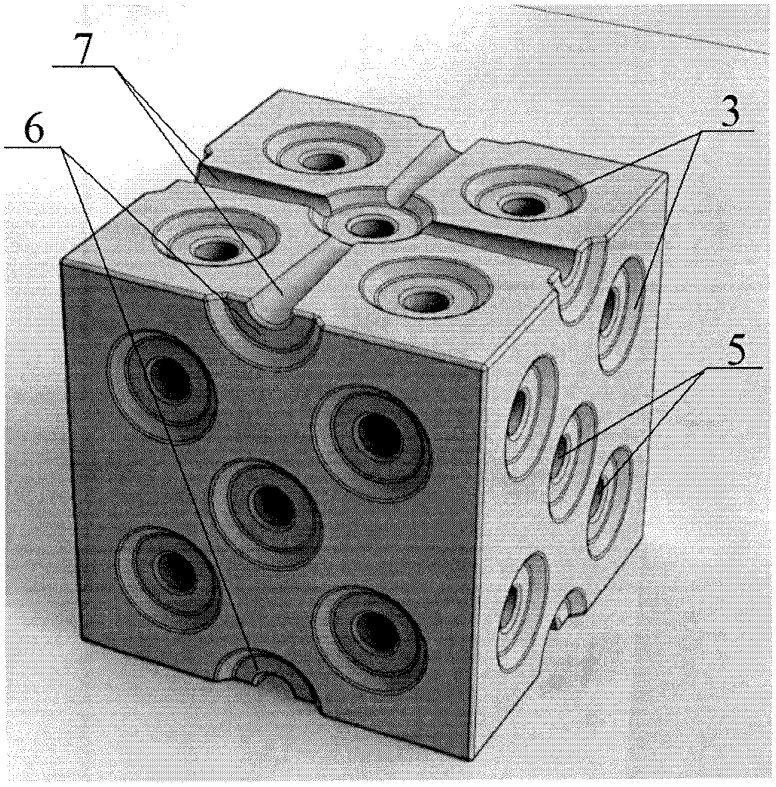

Fig. 6

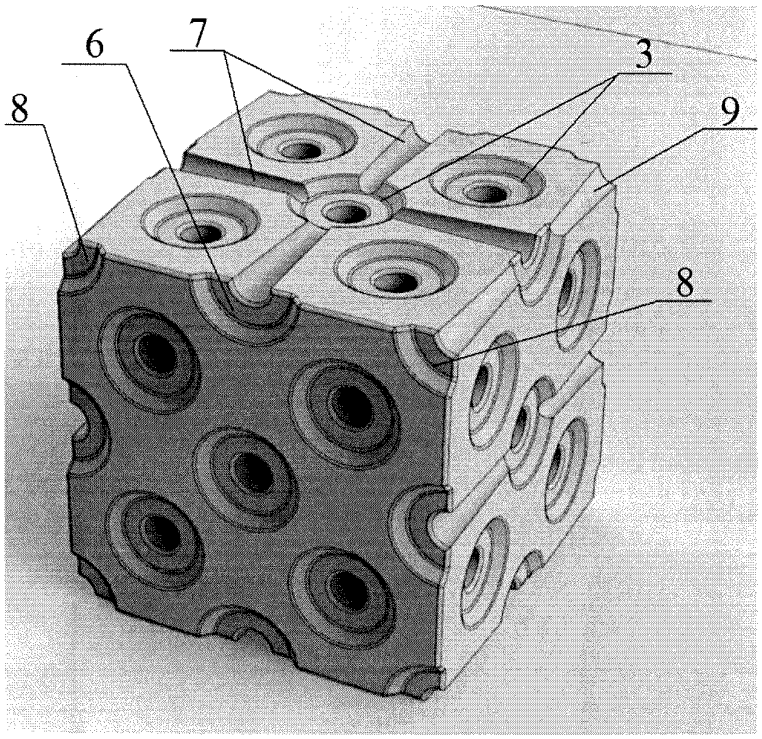

Fig. 7

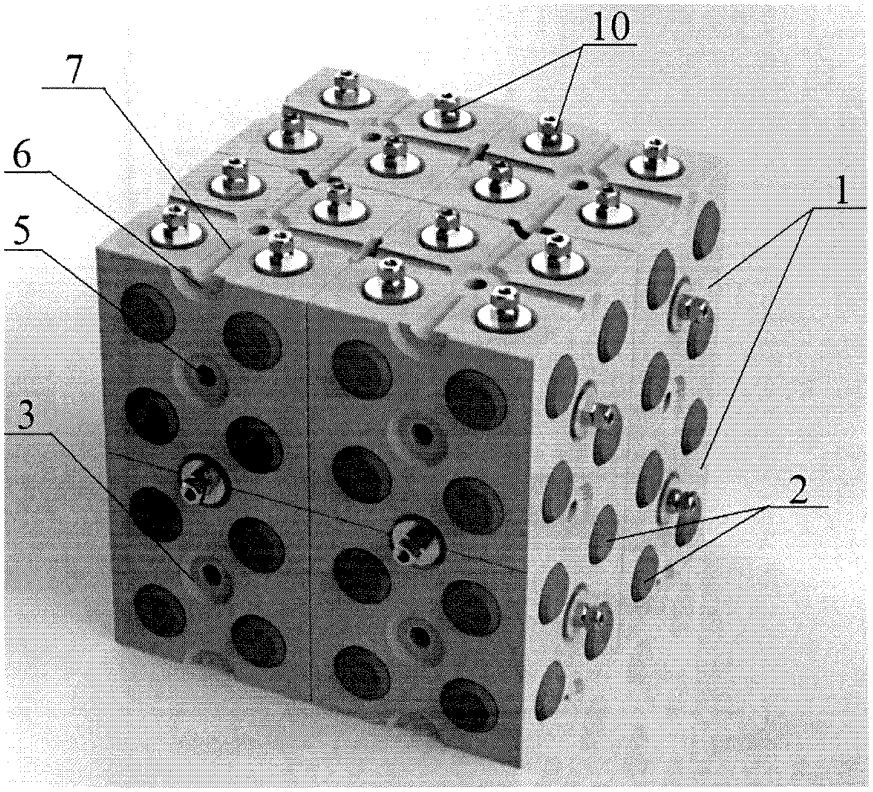

Fig. 8

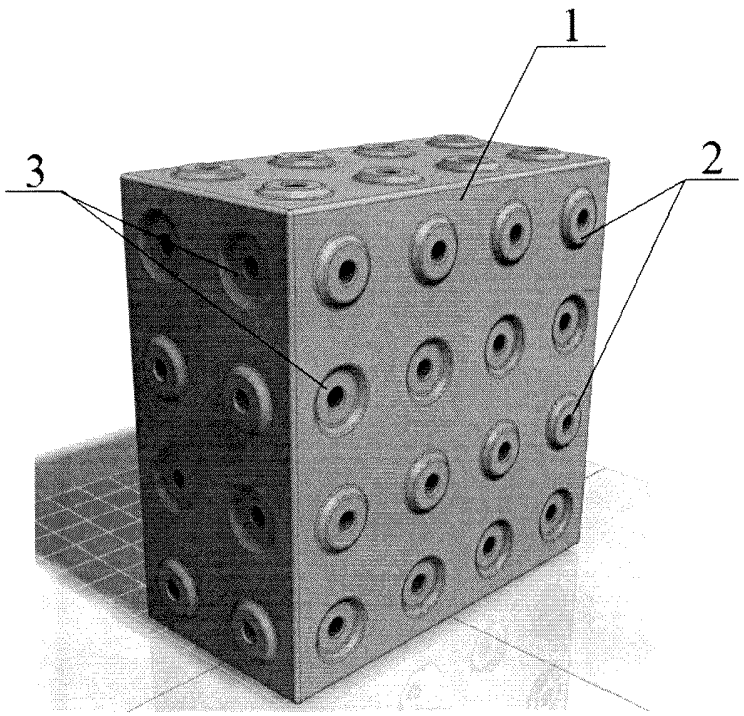

Fig. 9

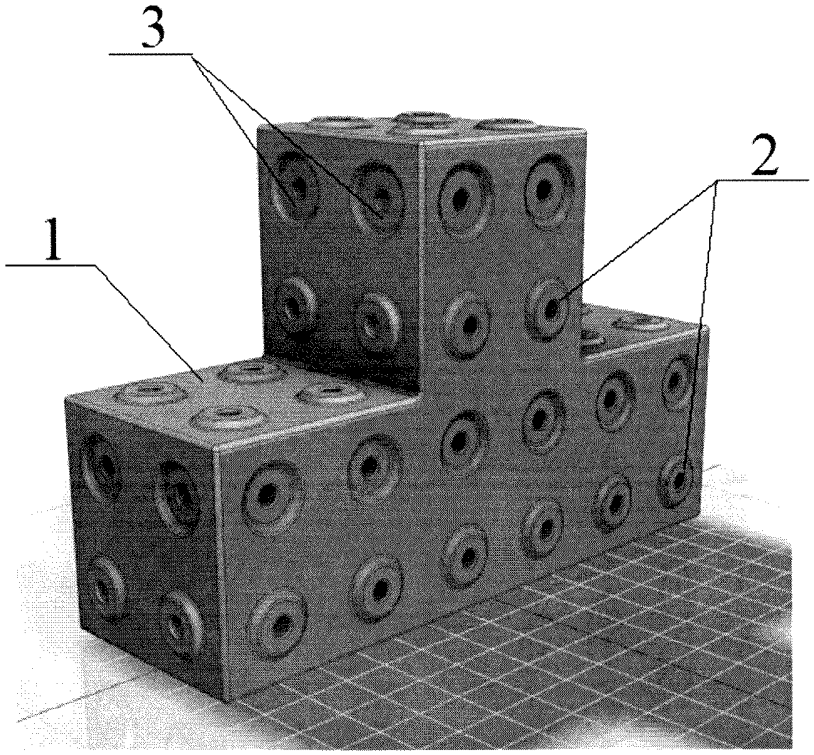

Fig. 10

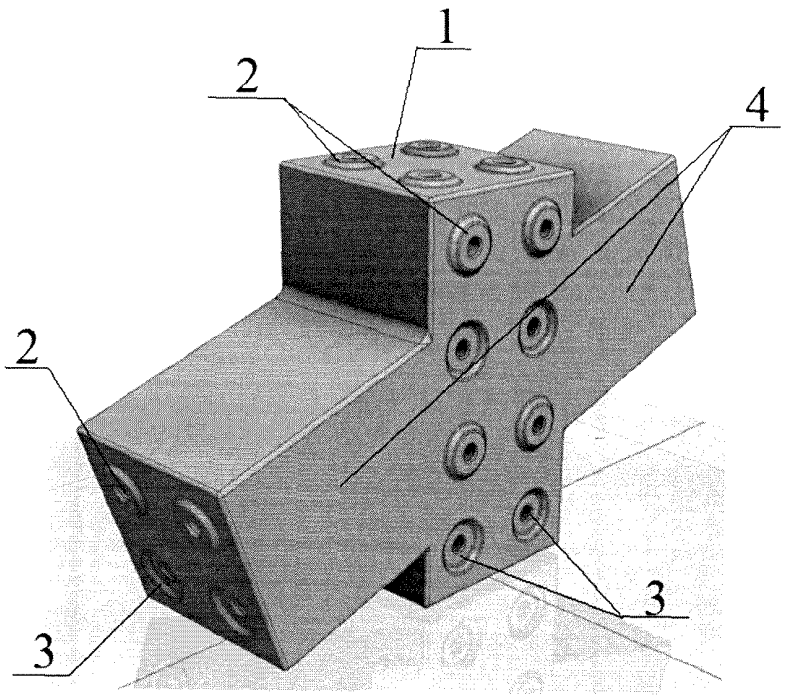

Fig. 11

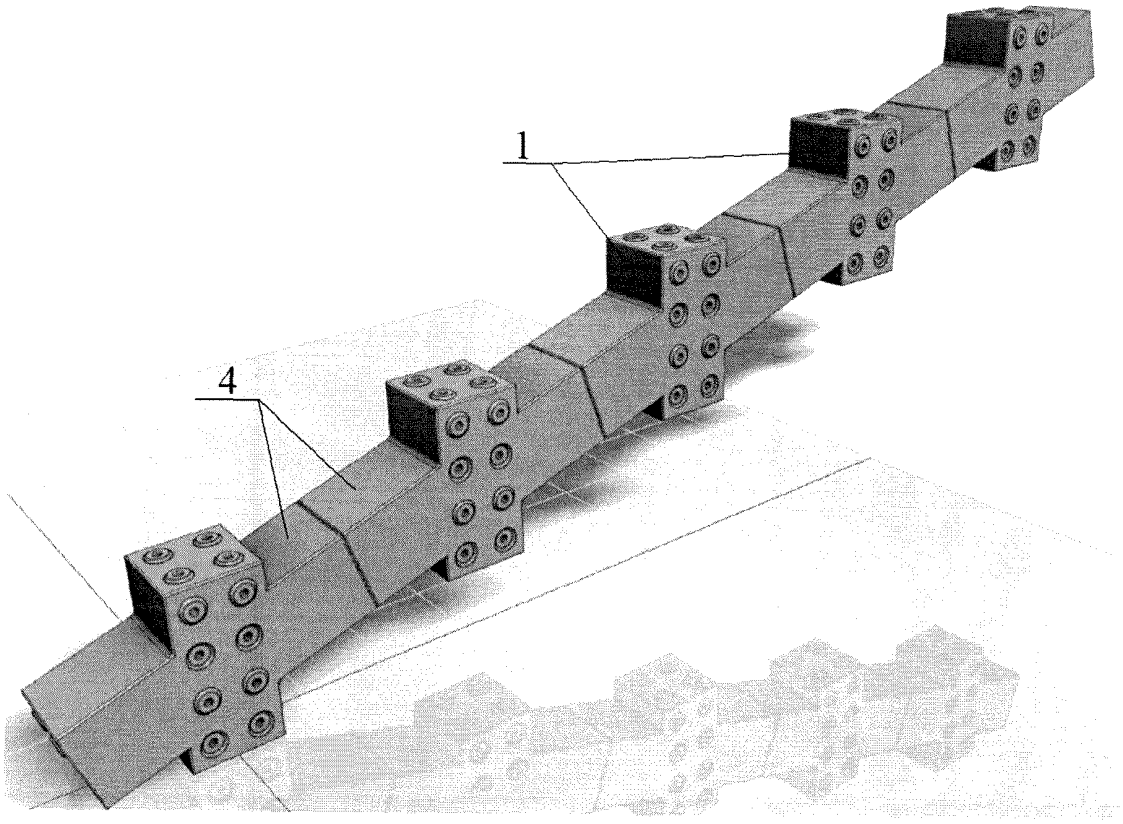

Fig. 12

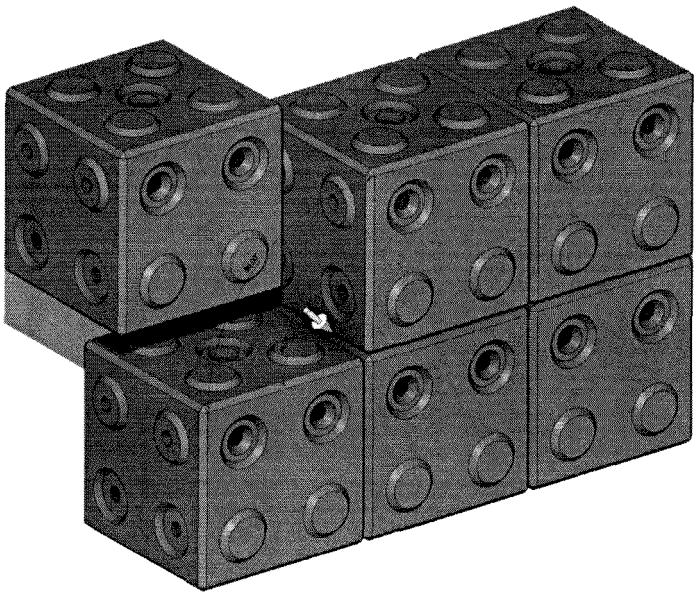

Fig. 13

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2019/001330

A. CLASSIFICATION OF SUBJECT MATTER
INV. E04B2/18 A63H33/08
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
E04B A63H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	CN 204 919 955 U (ZHENGZHOU INST AERONAUTICAL IND MAN) 30 December 2015 (2015-12-30) cited in the application figures 1-8	1-6,8-13
X	WO 2018/222542 A1 (LANGE FREDRIC A [US]) 6 December 2018 (2018-12-06)	14,16, 18-21
Y	page 12, lines 17-27; figures 8, 9, 13	17
A	WO 2013/022902 A2 (TIE CAST SYSTEMS INC [US]; SPEER BARRY G [US]) 14 February 2013 (2013-02-14)	14,16-21

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search	Date of mailing of the international search report
21 April 2020	04/05/2020

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Vratsanou, Violandi

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INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2019/001330

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 8 225 578 B2 (AZIZI RONAGH MOHAMMAD REZA [IR]) 24 July 2012 (2012-07-24) cited in the application	14,16-21
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Form PCT/ISA/210 (continuation of second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

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REFERENCES CITED IN THE DESCRIPTION

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- GB 2528090 A **[0007]**
- US 8225578 B **[0008]**
- CN 204919955 **[0010]**