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(54) **GLULAM BEAM, ANCHOR FOR SECURING IN A GLULAM BEAM, GLULAM BEAM JOINT ASSEMBLY**

(57) The invention is related to the wooden house construction, especially to the glued beam assembly and anchor, as a component of a nodal connection, a nodal connection of glued beams, and possibly be used in building various-purpose wooden constructions, as well as in furniture manufacturing.

Technical result: an improvement of technology and increase in design durability by lowering the risk of connection destruction by placing a plastic tube within the glued beam and designing a nodal connection of glued beams.

A proposed glued beam, consisting of a kit of bars, glued and mechanically processed along their perimeter and having a plastic tube placed into the beam's midsection and also having that tube placed and glued inside the beam along its entire length or part of it.

A proposed nodal connection of at least two glued beams, one end of each beam abutting a connecting component or several of them, differing from others by having at least one of the connecting components be fastened to the plastic tube, which would be at least inside one of the glued beams along its entire length or part of it.

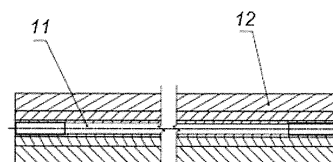


Fig. 1a



Fig. 1b

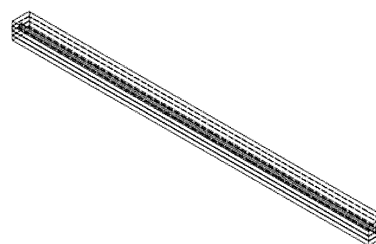


Fig. 1c

Fig. 1

Description

[0001] The invention is related to the wooden housing construction, namely to the design of glued beams and anchor as a component of a joint connection of glued beams, and may be utilized for various purpose wooden frames.

[0002] There is a complex wooden component, consisting of a gluing kit for application along the beam's perimeter [The manual for industrial manufacturing of wooden glued assemblies for construction. M., Stroyizdat, 1975].

[0003] There is a glued wooden beam [Glued wooden beams (USA). Construction designs. CINIS, M., 1978, VIII series, 4th publication, pages 34-36], which includes a kit, glued along its height with horizontally placed boards, made of different type of wood.

[0004] The closest from similar ones to the proposed solution is a glued wooden beam, which has a kit of beams that are glued and mechanically processed along its perimeter [USSR N0636244, 1978].

[0005] There is a modular design, where lumber, steel and concrete are optimally combined. Also, all angular joint components and modules are tightly and precisely fastened to each other [A brochure from a German company INDUO, 2008].

[0006] There is a joint system of two components, namely beams, which are held together by an integrated die-cast metal anchor [published international claim WO2001/98597]. Furthermore, there is an orifice with an internal thread within the anchor, while conical studs are evenly located along the anchor's length to fasten the anchor to beams.

[0007] There is a joint system [published international claim WO2001/098597] for a fixed connection for at least two components, namely beams. Furthermore, one of those components ends is connected to the contact surface of another and fastened to it (another component) by at least one fastening device, which could be an anchor. The anchor is made from a highly durable material, preferably a metal. The anchor is connected to the one of the two components by inserting it into that component. To ensure an improvement in connectability of two components, the invention designed an anchor with a continuous recession, namely a borehole. A connecting device passes through the borehole. Also, one of the components has a connecting part, namely a wooden beam.

[0008] There is a mobile design assembly method [EP2194202, 2010], which includes a fixed connection of a wooden construction angular point, which fixes angle units with fastening components. Side beams are inserted between angle components thus forming a wooden frame. The formed frames are fastened and form the next ones. Angle units are made of metal, for example, of steel.

[0009] The challenge of the current invention is to improve the assembly technology with high durability quality.

[0010] The technical result's purpose, achieved by using the invention, is to improve the technology and design durability by lowering the risk of destruction of joints by placing a plastic tube and other joint connections inside a glued beam.

[0011] To solve this challenge and to achieve the abovementioned technical result, some inventions are proposed, and at least one of them is designated to be used in another one.

[0012] One invention proposes a glued beam as a package of bars, which are glued and mechanically processed along its perimeter, and having a plastic tube (PVC, polypropylene, polyethylene, or composite materials) within the beam. This plastic tube is inserted into recession inside the beam, along its entire length or just along a part of that length.

[0013] In another invention, a glued beam has a plastic tube glued into the recession within that beam.

[0014] In another invention, a glued beam has a plastic tube glued into the recession along the length and across that beam, or at an angle related to the rolling axis of that beam.

[0015] In another invention, a glued beam has a plastic tube that is additionally is self-threaded into the beam (for example, plastic tube made of polypropylene or polyethylene).

[0016] In another invention, a glued beam has a plastic tube made of PVC, polypropylene or polyethylene or composite materials.

[0017] In another invention, a glued beam has a plastic tube with internal thread to fasten to the connecting component by a connecting device, a bolt, for example.

[0018] Another invention has a nodal connection of at least two glued beams, which have one of their ends abutting the connecting component or the assembly, consisting of several connecting components, which have a plastic tube as such a connecting component, within, at least, one of the glued beams, along its entire length or a part of its length.

[0019] A glued beam, which has a plastic tube within it, positioned in the beam's recession, along the beam's entire length or for the part of its length is shown in figures below:

Fig. 1 shows a glued beam with a plastic tube, which is glued within that beam along its entire length.

Fig. 1a shows the longitudinal section of the glued bar 12 with a plastic (PVC, polypropylene or polyethylene) tube 11 within it.

Fig. 1b shows the cross-section of the glued bar with a plastic (PVC, polypropylene or polyethylene) tube within it.

The plastic tube doesn't have to be glued into a glued beam for its entire length, but just the part of its length. The tube may be glued either along or across a glued beam, as well as at an angle.

A nodal connection of at least two glued beams, which have one of their ends abutting the connecting component or the assembly, consisting of several connecting components, which have a plastic tube as such a connecting component, within, at least, one of the glued beams, along its entire length or a part of its length is shown in figures below:

Fig. 2 shows a general view of the nodal connection of glued beams with a bolt as a connecting component to fasten the plastic tube in the beam.

Fig. 3 shows a cross-section of the nodal connection of glued beams with a bolt as a connecting component to fasten the plastic tube in the beam.

The nodal connection of glued beams consists of the connecting angle unit 33, made of metal, connected by the bolt 34, threaded into the plastic tube 31 (PVC, polypropylene or polyethylene or composite materials), which is glued into the glued beam 32 along its entire length or along a part of its length thus ensuring a reliable connection to the glued beam 32.

Fig. 4 shows the types of the connecting angle unit 41 with orifices for fastening.

Fig. 4a shows the front view of the connecting angle unit 41 with orifices for fastening.

Fig. 4b shows the top view of the connecting angle unit 41 with orifices for fastening. Fig. 4c shows the cross-section of the connecting angle unit with orifices for fastening.

Fig. 4d shows the connecting angle unit in a block diagram.

Fig. 5 shows the cross-section of the nodal connection of three glued beams with a metallic connection component with a thread at three of its ends.

A plastic tube 51 with an internal thread is screwed on the metallic part 55, which has a thread on all of its three ends, and then glued into a cylindrical orifice, located at the end of the glued beam 52, at a depth, corresponding to the length of the tube 51, and equaling the diameter of tube 51.

Fig. 6 shows the general view of the nodal connection of glued beams.

Fig. 7 shows the cross-section of the nodal connection of glued beams with internally threaded metallic anchor.

The nodal connection of glued beams consists of the connecting metallic angle unit 73 and bolt 74 as a fastening device for anchor 75, placed inside the plastic tube 71 (PVC, polypropylene or polyethylene, for example), and fastened by studs 76 to the glued

beam 72.

Fig. 8 shows an anchor. One part of the anchor 85 is threaded, while another one has an orifice with studs 86 inserted in it.

The assembly is constructed the following way:

First, in the middle of the glued beam 72, along its entire length or only a part of it, a plastic tube 71 (the PVC tube is glued, while the polypropylene or polyethylene tubes or composite material tubes are glued and also self-threaded into the beam to improve the durability) is glued, which has an anchor 75 inserted into it. The anchor has a cylindrical shape and has a thread on one of its sides to screw in a fastening device 74 and fastened to the beam by studs 76. Then, angle units 73 get attached to every angle of the assembly. After that, the side beams are inserted between angle units, further forming the wooden assembly. Created frames are strengthened and next ones are created.

The proposed nodal connection may be used in the modular assembly, where lumber, metal and concrete are optimally combined.

It should be noted that with the increase of number of studs, the carrying ability of the nodal connection is increased as well.

During the destructive test of a nodal connection (Fig. 6), while utilizing a metallic anchor (Fig. 8) and plastic (polypropylene) tube 71 (Fig. 7), it was determined that the node can withstand $F = 30$ kN force. Furthermore, the destruction occurred at $F = 32$ kN. In this case, we can draw a conclusion that the nodal connection of the proposed assembly is sufficiently durable and can withstand the load.

Fig. 9 shows the general view of the nodal connection of glued beams.

Fig. 10 shows the cross-section of the nodal connection of glued beams while using an anchor with a collet clamp as a fastener.

Fig. 11 shows an anchor with a collet clamp.

[0020] The nodal connection of glued beams consists of the metallic connecting angle unit 103, connected by the bolt 104, connecting fastening device, i.e. anchor with a collet clamp 117 (Fig. 11), which is inserted into the plastic tube 101, (PVC, polypropylene or polyethylene, for example). The anchor 117 (Fig. 11) has an inserted cylindrical cone 118 (Fig. 11) in it, which, by its movement due to screwing in a fastening device 104 into the threaded orifice inside the anchor, moving along the conical orifice, expands cylindrical walls of the anchor and thus connects with the plastic tube 101 and fastens to it.

[0021] Inside one of the anchor ends (Fig. 11) is an orifice with an internal thread, while the other end has several lateral cuts and a conical orifice. A cylindrical cone 118 is placed within the anchor.

[0022] The assembly is built by the following method:

First, in the middle of the glued beam 102, along its entire length or only a part of it, a plastic tube 101 is glued, which has an anchor with a collet clamp 117 (Fig. 11) inserted into it. The anchor has a cylindrical shape and has a thread on one of its sides to screw in a fastening device 104. Then, every angle of the assembly has angle units 103 attached to them by a fastening device 104, which is screwed into the anchor 117 (Fig. 11) and thusly moves cylindrical cone 118 along a conical orifice of anchor 117, which connect to the plastic tube 101 (Fig. 10). After that, the side beams are inserted between angle units, further forming the wooden assembly. Created frames are strengthened and next ones are created.

[0023] It is important to note that the proposed inventions have an advantage over the abovementioned technology level.

[0024] Therefore, the proposed glued beam assembly with a plastic (PVC, polypropylene or polyethylene) tube allows the usage of various connecting components within its proposed design of the nodal connection.

[0025] Connecting components may be anchors, fastened by bolts or metallic threaded studs, inserted into the plastic tube and fastened to connecting components by nuts or bolts, which connect a connecting component with the glued beam, screwed into the thread directly in the plastic tube, 60-100 mm from each of its ends, while using a thick-walled tube.

[0026] One of the ends of the glued beam is abutting the connecting angle unit and may be fastened to it by one of the proposed fasteners.

[0027] In case of the necessity to withstand a large load, instead of anchors, an M20 threaded metallic stud is inserted inside the plastic tube, which is also screwed into connecting metallic angle units, located at different ends of the glued wooden beam. Thus, the entire load will be supported by the metallic stud. This gives us an opportunity to lift more weight and use it in mobile construction applications.

[0028] In case of the necessity to withstand a small load, where there are no requirements for expansion, instead of proposed anchors, an M24 thread may be made in the plastic tube glued into the wooden beam, and then fasten the glued wooden beam to the metallic connecting component by the corresponding M24 bolts. The resulting connecting is sufficiently durable and able to solve this challenge.

[0029] During the expansion and ripping tests of this connection without a metallic anchor, using a polypropylene tube, it was determined that the tube ripped at $F = 8 \text{ kN}$.

Claims

1. A glued beam, consisting of a kit, which has bars that are glued and mechanically processed along its perimeter, which differs from others by having a plastic tube (PVC, polypropylene, polyethylene or composite materials) placed inside the recession of the beam along its entire length or just a part of it.
2. A glued beam from claim 1, but having a plastic tube glued into the recession of the beam.
3. A glued beam from claim 2, but its recession may be placed along and across the glued beam, or at an angle with respect to the lateral axis of the beam.
4. A glued beam from claim 1, but having a plastic tube that may be additionally screwed into the beam by self-threading.
5. A glued beam from claim 1, but having a plastic tube material made from PVC, polypropylene, polyethylene or composite materials.
6. A glued beam from claim 1, but having a plastic tube with internal thread to fasten to the connecting component by a bolt.
7. A nodal connection of at least two glued beams, with one of its ends abutting the connecting component or several of them, differing from others by having at least one of those connecting components fastened within the plastic tube, which is inside of at least one of the glued beams along its entire length or part of it.

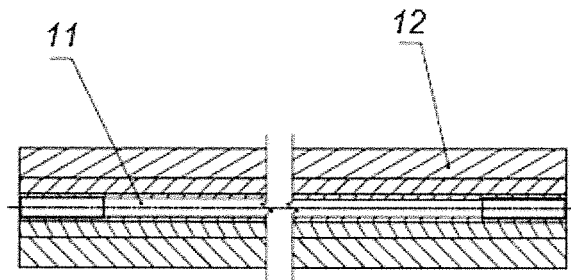


Fig. 1a

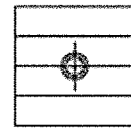


Fig. 1b

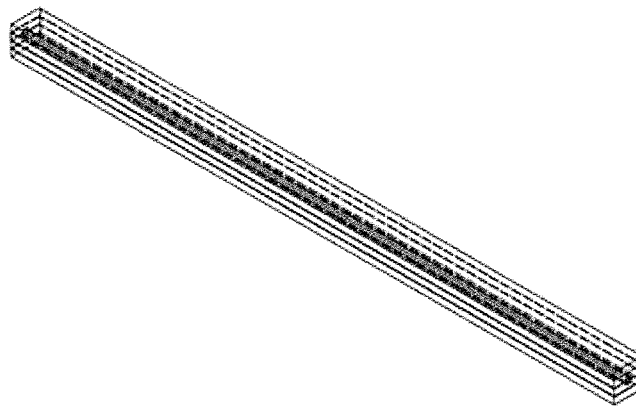


Fig. 1c

Fig. 1

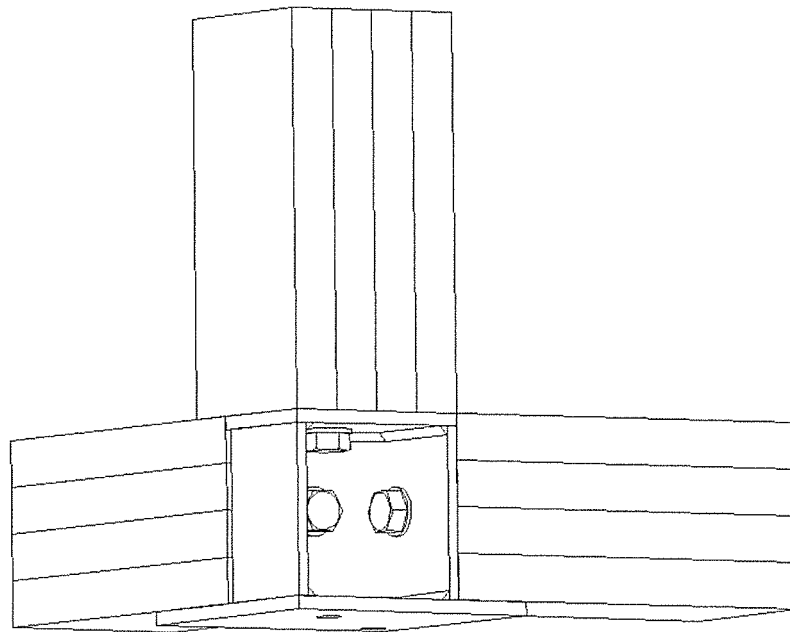


Fig. 2 (b)

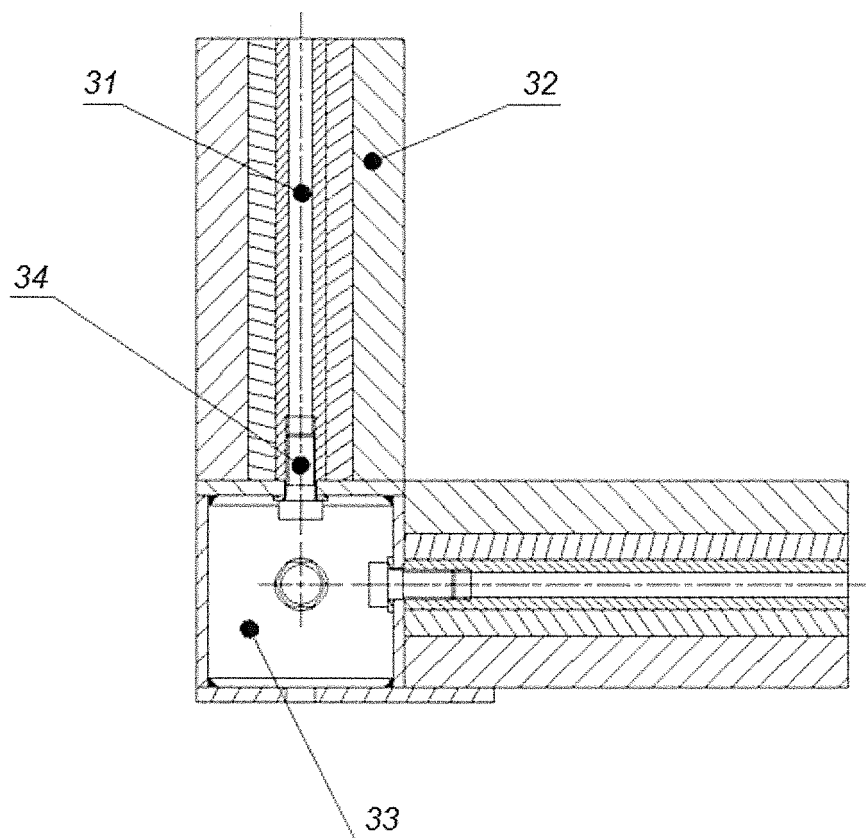


Fig. 3 (7)

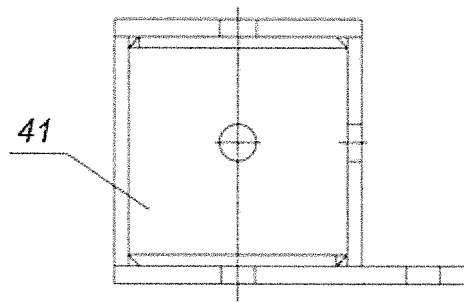


Fig. 4a

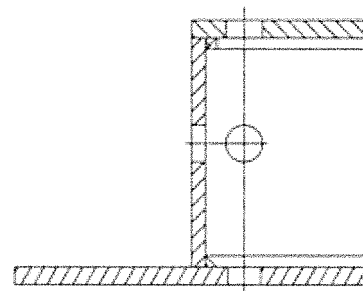


Fig. 4c

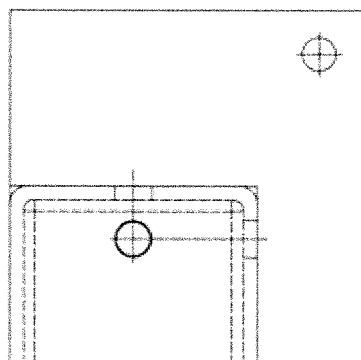


Fig. 4b

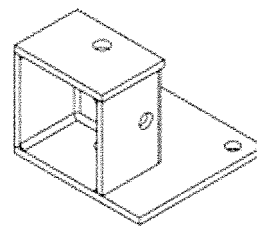


Fig. 4d

Fig. 4

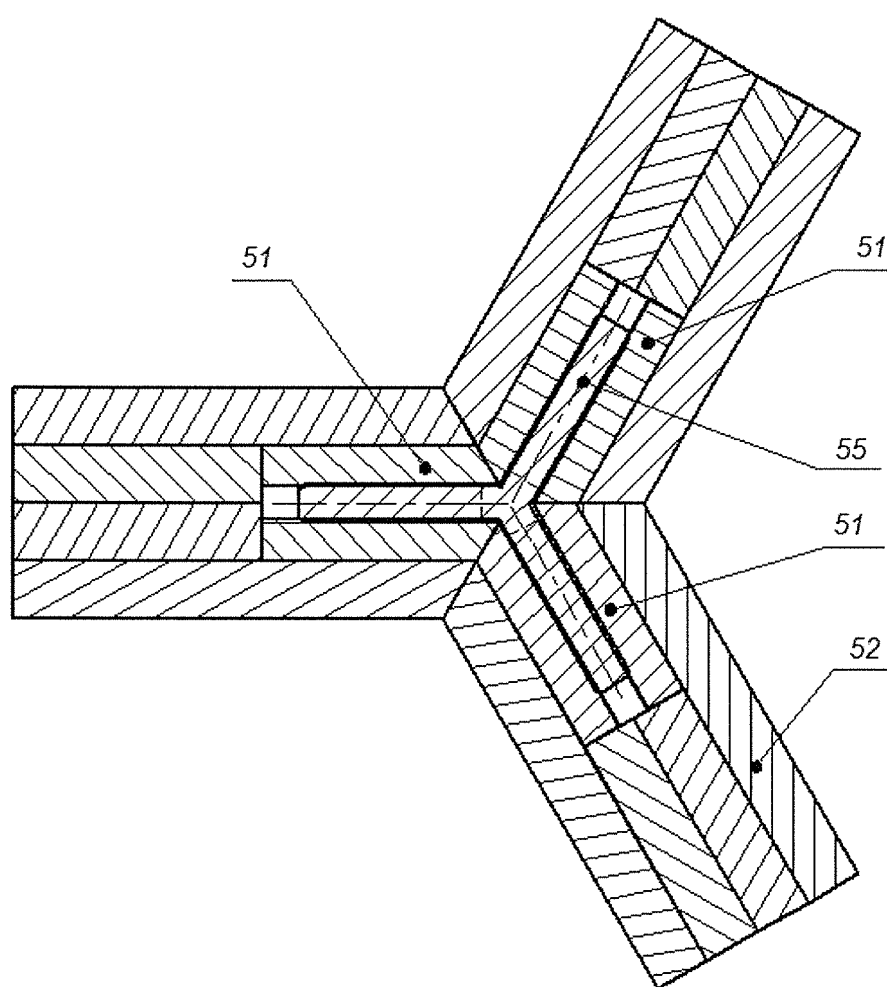


Fig. 5

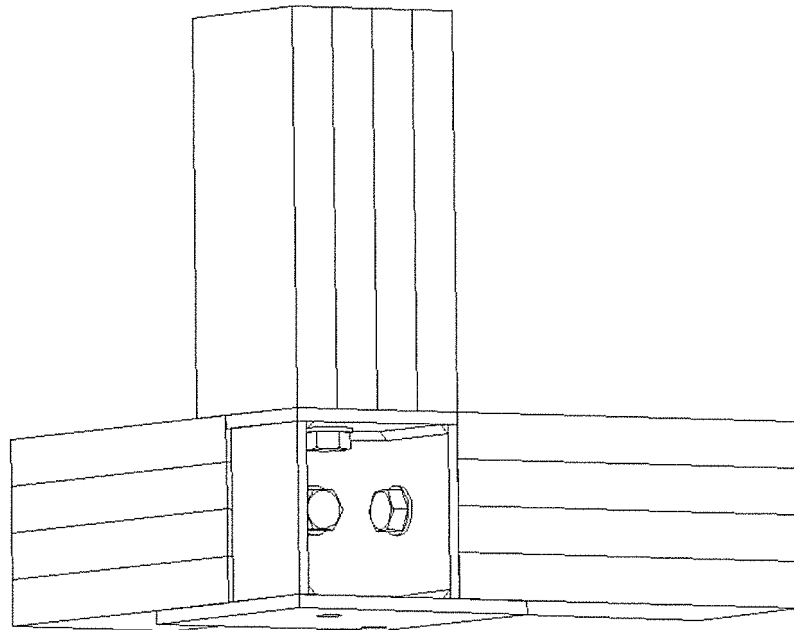


Fig. 6

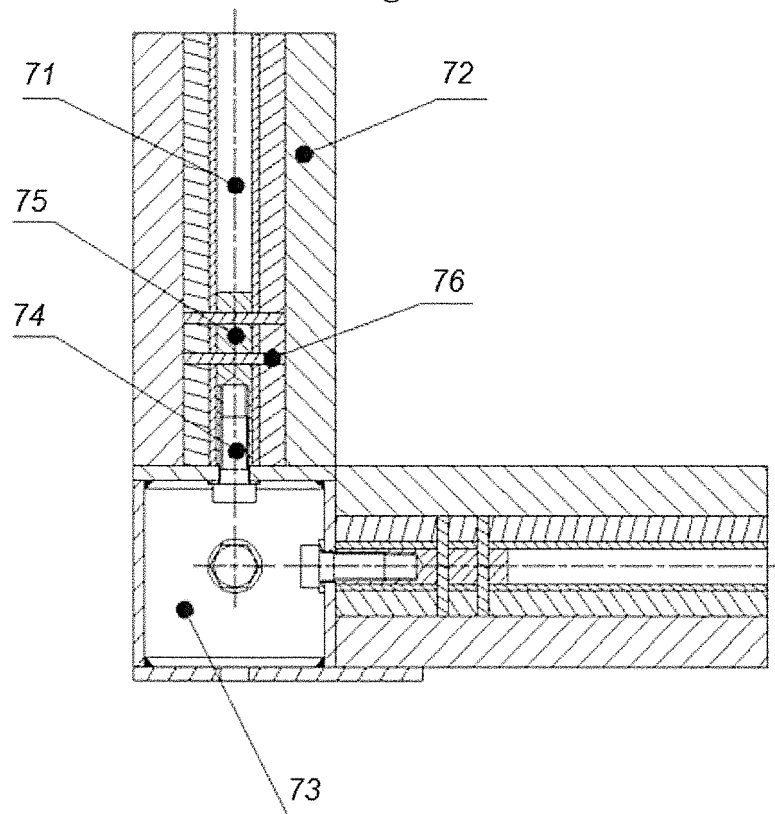


Fig. 7

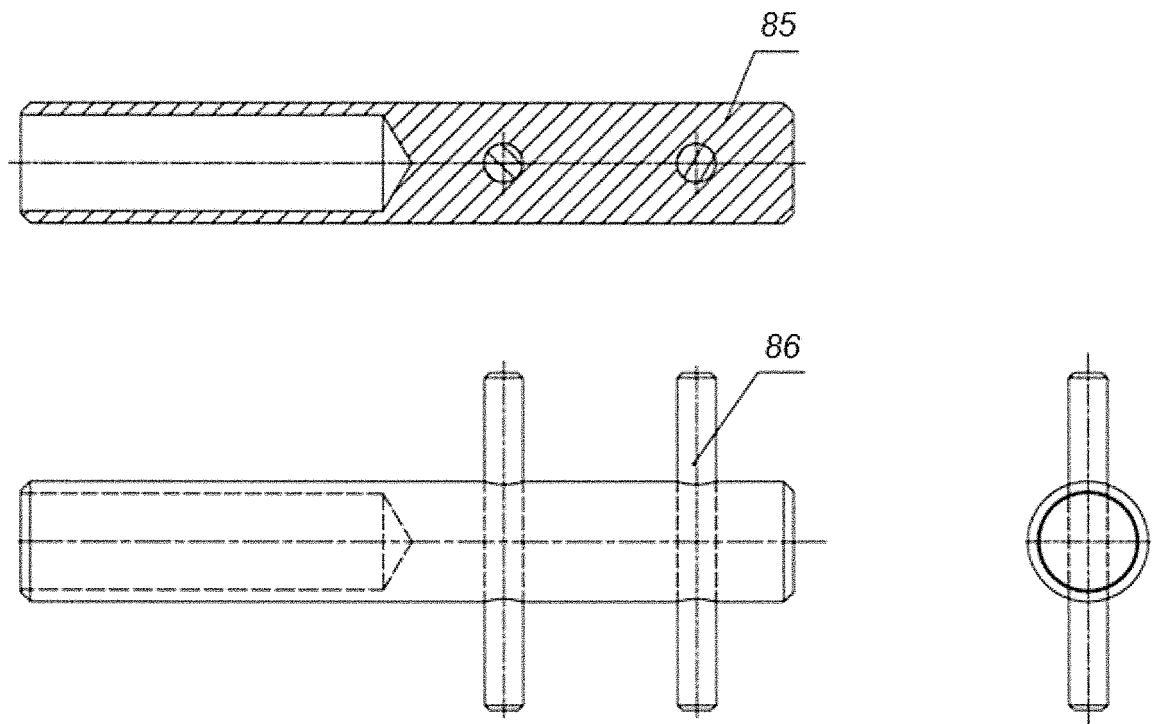


Fig. 8

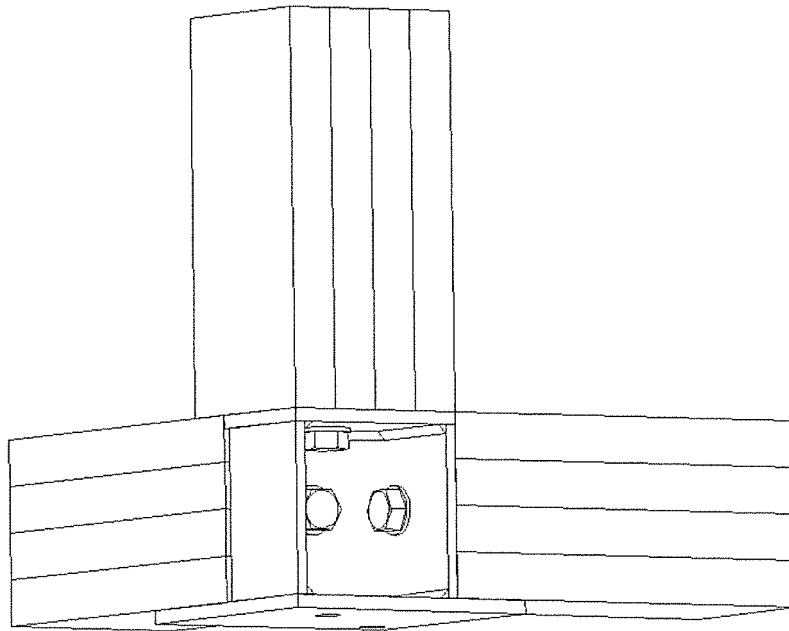


Fig. 9

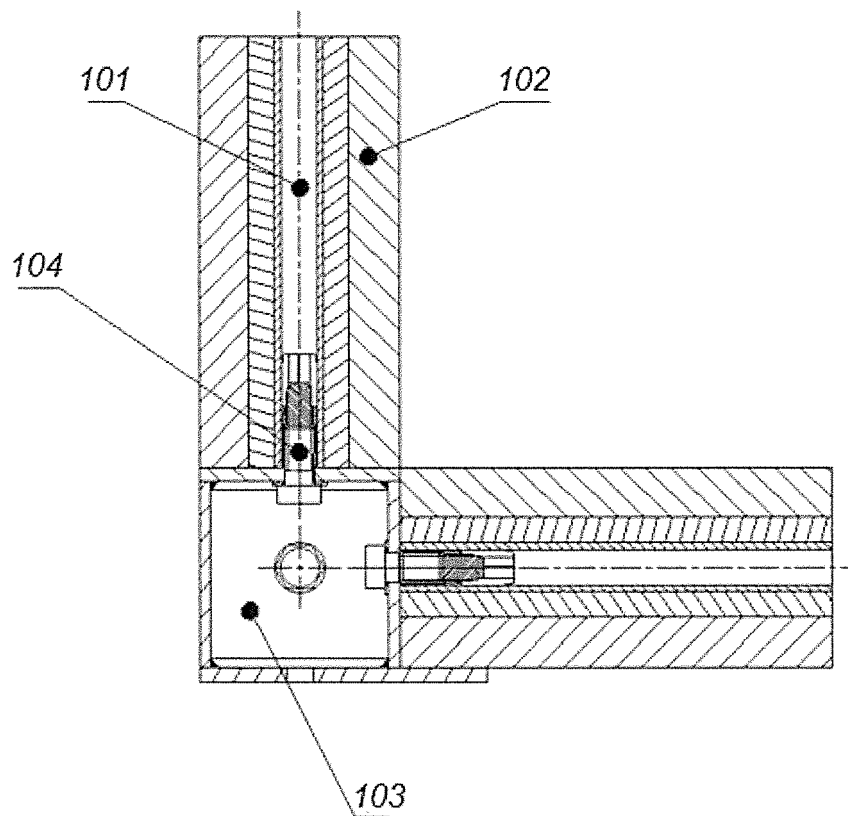


Fig. 10

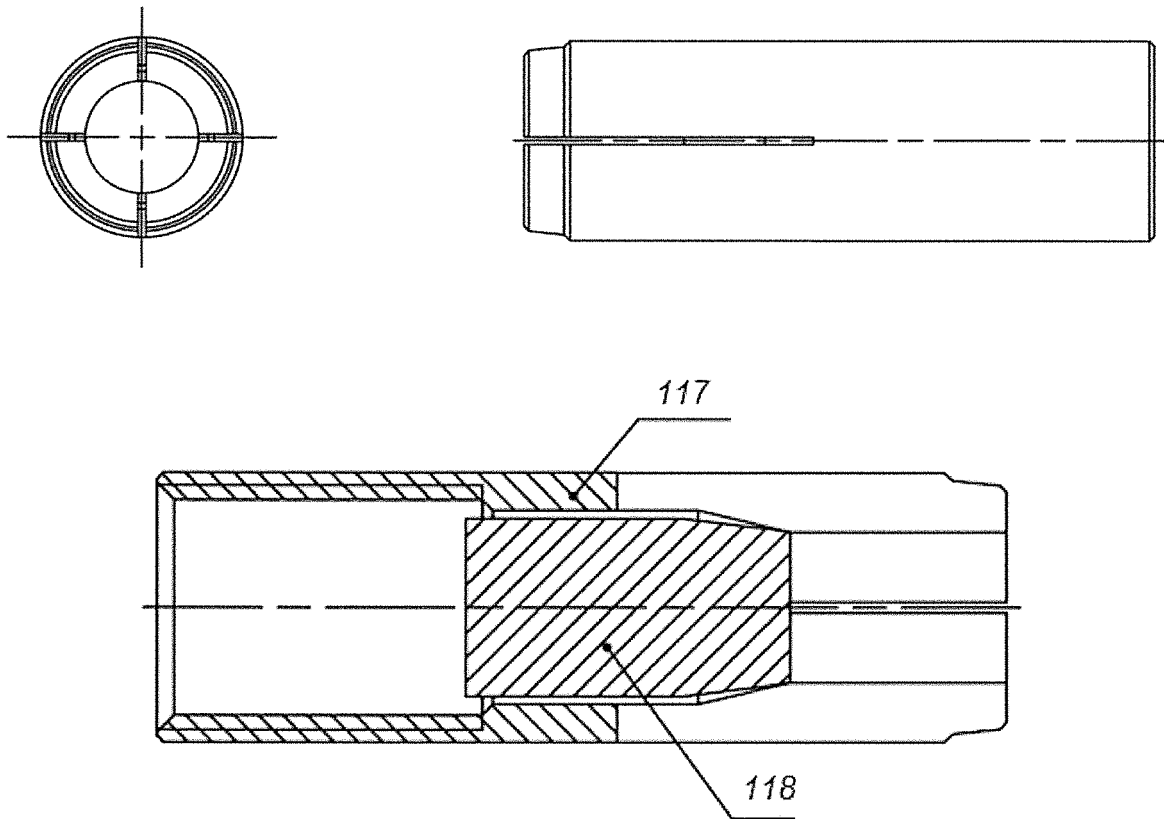


Fig. 11

INTERNATIONAL SEARCH REPORT

International application No.
PCT/RU 2014/000507

5	A. CLASSIFICATION OF SUBJECT MATTER		
	E04C 3/12 (2006.01); E04B 1/58 (2006.01)		
	According to International Patent Classification (IPC) or to both national classification and IPC		
	B. FIELDS SEARCHED		
10	Minimum documentation searched (classification system followed by classification symbols)		
	E04C 3/00, 3/12-3/16, E04B 1/38, 1/58		
	Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
15	Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
	DWPI, EAPATIS, Espacenet, PAJ, Patentscope, PatSearch (RUPTO internal), RUPTO, USPTO		
	C. DOCUMENTS CONSIDERED TO BE RELEVANT		
20	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Y	DE 19701458 C1 (MORZE-REICHARTZ, SIGRUN VON) 03.09.1998, column 2, lines 4-53, column 6, lines 37-39, fig. 3, items 32, 33 of the claims, column 5, lines 38-43, fig. 4	1-6
25	Y	EP 2090704 A2 (INDUO GESELLSCHAFT ZUR VERWERTUNG VON), 19.08.2009, paragraph [0021]	1-7
30	Y	WO 2004/099516 A1 (INDUO GESELLSCHAFT ZUR VERWERTUNG VON SCHUTZRECHTEN MBH & CO) 18.11.2004, the abstract, fig. 1, 2	3, 7
35			
40	☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
	* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
45	Date of the actual completion of the international search		Date of mailing of the international search report
	30 November 2014 (30.11.2014)		18 December 2014 (18.12.2014)
	Name and mailing address of the ISA/ RU		Authorized officer
50	Facsimile No.		Telephone No.
55			

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- EP 21942022010 A [0008]

Non-patent literature cited in the description

- **CINIS, M.** Glued wooden beams (USA). *Construction designs*, 1978, vol. VIII, 34-36 [0003]