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(54) **A TRANSPORT ANCHOR FOR HOLLOW WALLS**

(57) A transport anchor (1) for hollow walls made of a bar with a bent middle part (2) and arms (3), (4) connected by a crossbar (5), characterised in that the crossbar (5) comprises notches (6), (7), in which the arms (3), (4) are placed, and tips (8) clamped on the arms (3), (4).

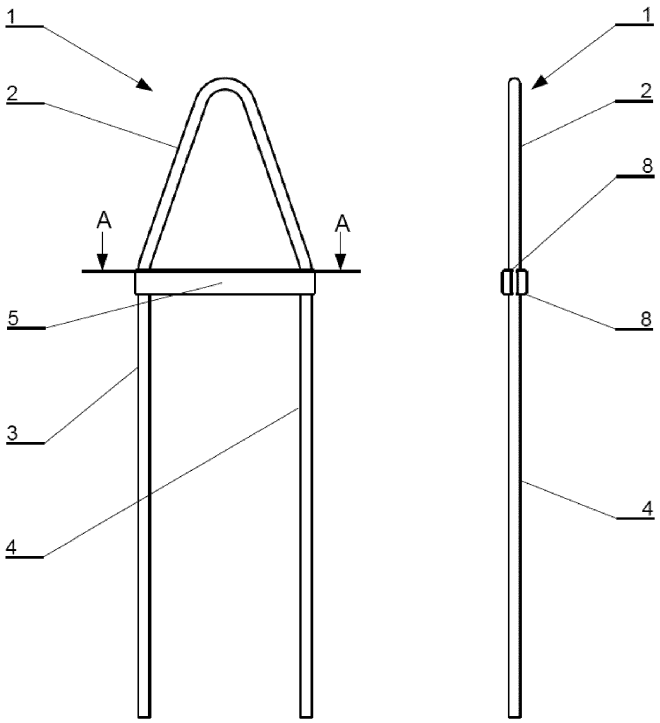

Fig. 1

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Description

[0001] The invention refers to a transport anchor for transporting construction elements in the form of slurry walls with an air hollow.

[0002] Work is still being continued in order to develop a structurally optimal, strong and durable transport anchor allowing for safe transportation of increasingly larger, and therefore heavier construction elements in the form of walls to a construction site.

[0003] From the patent specification DE102016121271 discloses a transport anchor for concrete elements with double walls, made of a bracket shaped such that its arms are mutually parallel, which is intended for seating in elements with a double wall, characterised in that it has anchor arms connected by a crossbar having an adjustable clamping element. According to the invention, the clamping element is made as a thermally insulated hollow body.

[0004] In another transport anchor described in EP3029220A1, a clamping element in the form of a crossbar is mounted by means of its ends to the arms of the transport anchor by means of welding. In this case, the clamping element is connected by spot welding. Also, the welding process locally alters and weakens the surrounding material, which reduces stability.

[0005] Also, the transport anchor described in the document DE10038249B4 has a clamping element made of steel and welded to anchoring legs. During transport of double walls at a construction site, the high forces strain these weak spots of the anchor, thus increasing the risk of fracturing the welds, and therefore subsequent excess deformation of the lifting anchor is very likely.

[0006] In the solutions described above, the existing welds can lead to breaking the transport anchor out of the concrete, which in turn can cause a breakdown of the prefabricated concrete part.

[0007] In turn, from the Polish patent application P.427814 there is known a transport anchor for hollow walls, made of a bar with a bent middle part, whose ends pass through openings in a crossbar which rigidly connects them, forming arms parallel relative to each other, which are twisted along their axis, while the crossbar constitutes a steel element with a quadrilateral cross-section and it has an inner filling in the form of polyurethane foam. The anchor described in the application P.427814 does not contain welds, but its manufacturing is rather labour-intensive due to the necessity to properly twist the bars relative to their axis, after installing the crossbar. Moreover, the applied plain bars with a square cross-section do not guarantee sufficient strength when maintaining plasticity required by the construction standards.

[0008] The object of the invention is to provide a new transport anchor of the said type, with even better performance characteristics, cheaper and simple to manufacture, fulfilling all technical requirements, having a structure that does not affect the anchor's load capacity, and thus safe to use on construction sites.

[0009] The essence of the solution according to the invention is a transport anchor for hollow walls made of a bar with a bent middle part and arms connected by a crossbar, characterised in that the crossbar has notches, in which the arms of the bar are placed, the crossbar also comprising tips clamped on the arms of the bar.

[0010] Preferably, the anchor is made of a ribbed bar.

[0011] Preferably, the anchor is made of a ribbed bar, for which the ratio of minimum yield point Re [MPa] to the immediate tensile strength Rm [MPa] is at least 1.15.

[0012] Preferably, the notches in the crossbar are made along its longitudinal axis.

[0013] Also preferably, the notches in the crossbar are made perpendicularly to the longitudinal axis of the crossbar.

[0014] Preferably, the arms of the bar are parallel relative to each other.

[0015] Preferably, the middle part is bent to a shape resembling the letter V or U.

[0016] Preferably, the crossbar is mounted in points connecting the arms to the middle part.

[0017] Preferably, the diameter of the bar is between 10 and 16 mm, the diameter of the ribbed bar most preferably being 12 mm.

[0018] Preferably, the crossbar is made of a steel element with a cross-section in the shape of a quadrilateral, most preferably in the shape of a square.

[0019] Preferably, the crossbar is made of a steel profile, most preferably of steel S235.

[0020] It is further preferable to fill the crossbar with foam.

[0021] The placement of the arms of the bar in the notches of the crossbar and clamping its tips on the arms of the bar forms a rigid connection. This prevents the crossbar of the anchor against displacement (falling out), with no need to form a welded or fused weld. Therefore, the strength of the transport anchor - its bearing capacity - is not impaired either.

[0022] Moreover, the use of a crossbar with notches for the arms of the bar makes the assembly (preparation) of the anchor very quick and simple, especially in a case when the notches in the crossbar are made perpendicularly to the longitudinal axis of the crossbar.

[0023] Also, one advantage of the transport anchor for hollow walls according to the invention is the total lack of mechanical interference with the material (welding), from which it is made, due to which it is possible to eliminate the methods for connecting elements which could result in impairing its durability, very important because of the risk of accidents occurring during the transport of such large construction elements.

[0024] The use of a ribbed bar in turn ensures reaching proper strength while maintaining the required plasticity, e.g. at a level complying with the guidelines of the German standard VDI/BV-BS 6205.

[0025] The lack of any interference with the structure of the middle part of the bar means that the original plasticity of the material remains unchanged, which is a very

important parameter due to the nature of work of this part of the transport anchor. During transport, the anchor is deformed in the place of contact with concrete, and because of proper plasticity of its middle part, the fractures of concrete in this place are minimised.

[0026] The object of the invention is presented in embodiments and in the drawing, where:

- Fig. 1 presents a front and side view of the transport anchor for hollow walls according to the first embodiment,
- Fig. 2 presents the transport anchor in a cross-section in the axis A-A according to the first embodiment,
- Fig. 3 presents magnified tips of the crossbar clamped on the bar of the anchor according to the first embodiment,
- Fig. 4 presents a front and side view of the transport anchor for hollow walls according to the second embodiment,
- Fig. 5 presents the transport anchor in a cross-section in the axis A-A according to the second embodiment,
- Fig. 6 presents a magnified tip of the crossbar clamped on the bar of the anchor according to the second embodiment.

Embodiment 1

[0027] A transport anchor 1 for hollow walls made of a ribbed bar with a bent middle part 2 in a shape resembling the letter V (in other preferable embodiments, it can be bent in a shape resembling the letter U) and parallel arms 3, 4 connected by a crossbar 5 comprising notches 6, 7 and tips 8 clamped on the arms 3, 4, the notches 6, 7 in which the arms 3, 4 are placed being made along the longitudinal axis of the crossbar 5. The crossbar 5 is made of a steel profile of steel S235, with a cross-section in a quadrilateral shape (e.g. profile 25x5x1.5), most preferably having the shape of a square. In the present embodiment, the crossbar 5 is mounted in points connecting the arms 3, 4 to the middle part 2, but in other embodiments it is possible to mount it at a different height of the arms 3, 4. The ribbed bar in the present embodiment has a diameter of 12 mm, but it is also permitted to use bars with diameters between 10 and 16 mm.

[0028] In a prefabrication plant, reinforcement is arranged on a shuttering board along with other elements used to manufacture the wall, such as mounting anchors, spacers and arms 3, 4 of the transport anchor, respectively in each of the walls forming the construction element with a hollow. Subsequently, everything is cast in a thin layer of concrete, due to which the anchor arms are permanently fixed to the construction element. During transport, the anchor is deformed in the place of contact with concrete; however, proper plasticity of the middle part 2 causes the fractures of concrete in this place to be minimised.

Example 2

[0029] A transport anchor 1 for hollow, made of a ribbed bar with a bent middle part 2 in a shape resembling the letter U (in other preferable embodiments, it can be bent in a shape resembling the letter V) and parallel arms 3, 4 connected by a crossbar 5 comprising notches 6, 7 and tips 8 clamped on the arms 3, 4, the notches 6, 7 in which the arms 3, 4 are placed being made perpendicularly to the longitudinal axis of the crossbar 5, due to which such a crossbar can be easily slid onto the arms of the bar during the assembly of the anchor. The crossbar 5 is made of a steel profile of steel S235, with a cross-section in a quadrilateral shape (e.g. profile 25x5x1.5), most preferably having the shape of a square. The crossbar 5 is mounted in points connecting the arms 3, 4 to the middle part 2, but in other embodiments it is possible to mount it at a different height of the arms 3, 4. The ribbed bar in the present embodiment has a diameter of 12 mm, but it is also permitted to use bars with diameters between 10 and 16 mm.

Example 3

[0030] A transport anchor 1 for hollow walls according to the first or second embodiment, in which the crossbar 5 is filled with polyurethane foam having thermal insulation properties.

Claims

1. A transport anchor (1) for hollow walls made of a bar with a bent middle part (2) and arms (3), (4) connected by a crossbar (5), **characterised in that** the crossbar (5) comprises:
   - notches (6), (7), in which the arms (3), (4) are placed
   - and tips (8) clamped on the arms (3), (4).
2. The anchor according to claim 1, **characterised in that** it is made of a ribbed bar.
3. The anchor according to claim 2, **characterised in that** it is made of a ribbed bar, for which the ratio of minimum yield point Re [MPa] to the immediate tensile strength Rm [MPa] is at least 1.15.
4. The anchor according to claim 1 or 3, **characterised in that** the notches (6, 7) are made along the longitudinal axis of the crossbar (5).

5. The anchor according to claim 1 or 3, **characterised in that** the notches (6, 7) are made perpendicularly to the longitudinal axis of the crossbar (5).

6. The anchor according to any of the preceding claims, **characterised in that** the arms (3, 4) are parallel relative to each other.

7. The anchor according to any of the preceding claims, **characterised in that** the middle part (2) is bent into a shape resembling the letter V or U.

8. The anchor according to any of the preceding claims, **characterised in that** the crossbar is mounted in points connecting the arms (3, 4) to the middle part (2).

9. The anchor according to any of the preceding claims, **characterised in that** the diameter of the bar is between 10 and 16 mm.

10. The anchor according to claim 9, **characterised in that** the diameter of the ribbed bar is 12 mm.

11. The anchor according to any of the preceding claims, **characterised in that** the crossbar (5) is made of a steel element with a cross-section in the shape of a quadrilateral.

12. The anchor according to claim 11, **characterised in that** the crossbar (5) is made of a steel element with a cross-section in the shape of a square.

13. The anchor according to any of the preceding claims, **characterised in that** the crossbar (5) is made of a steel profile.

14. The anchor according to any of the preceding claims, **characterised in that** the crossbar (5) is made of steel S235.

15. The anchor according to any of the preceding claims, **characterised in that** the crossbar (5) is filled with polyurethane foam.

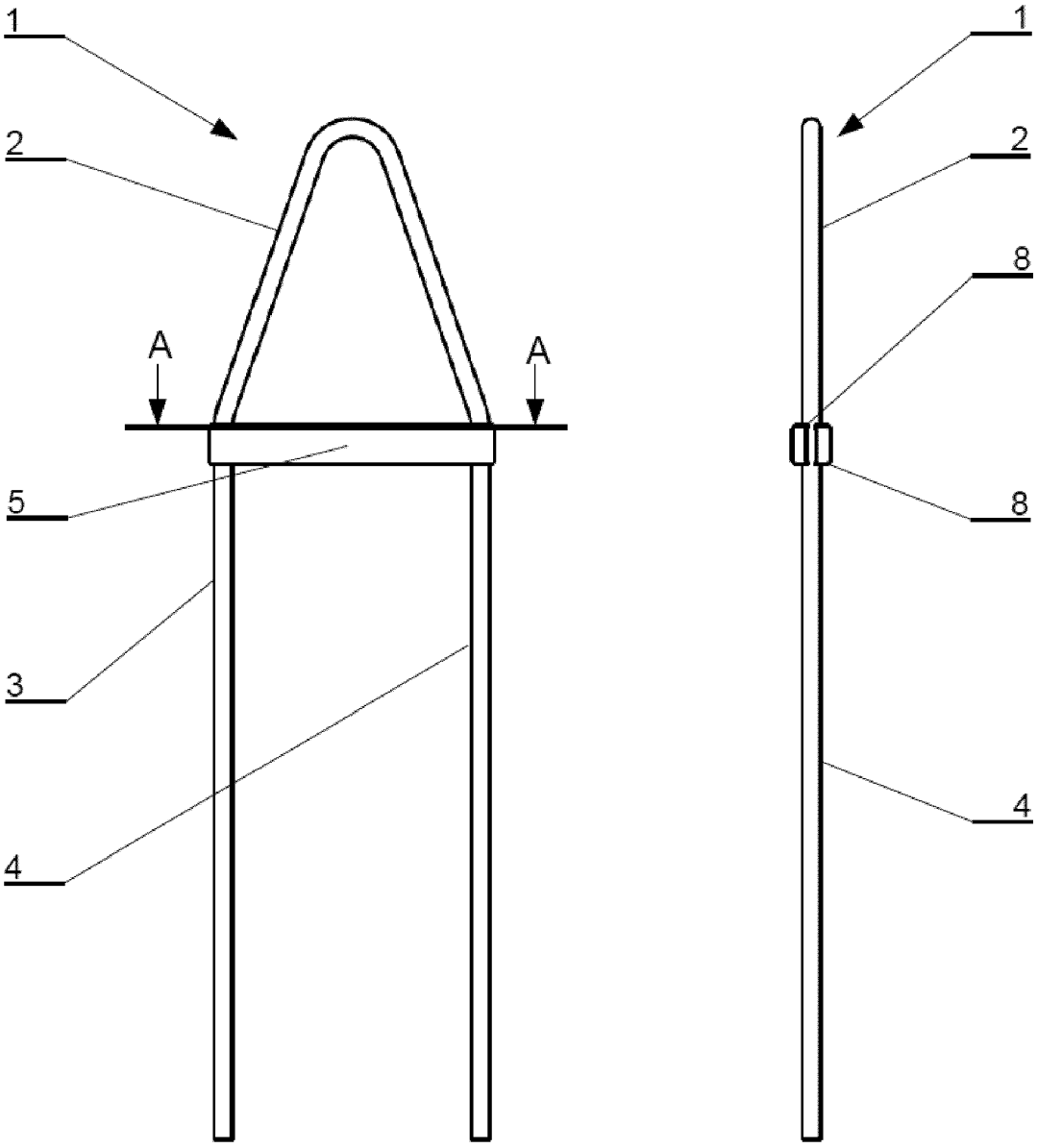

Fig. 1

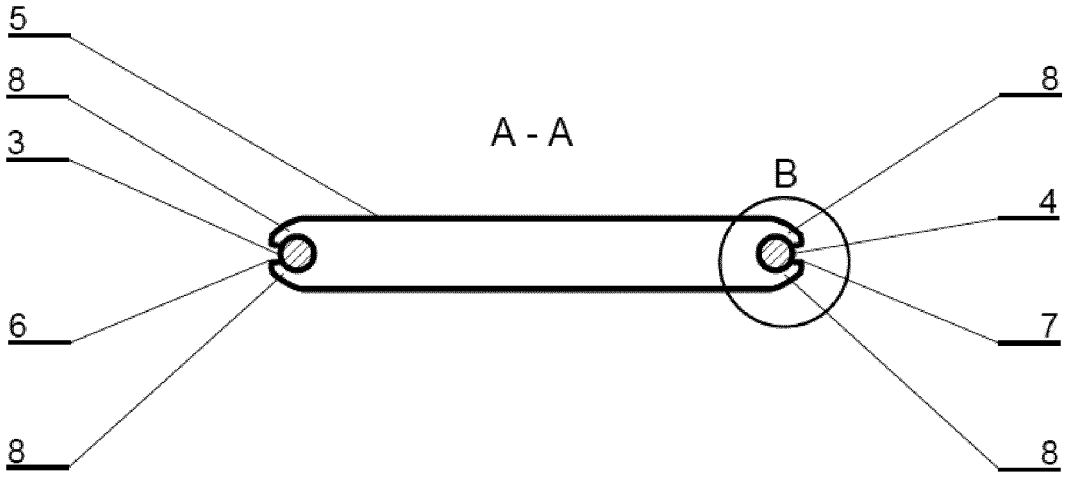

Fig. 2

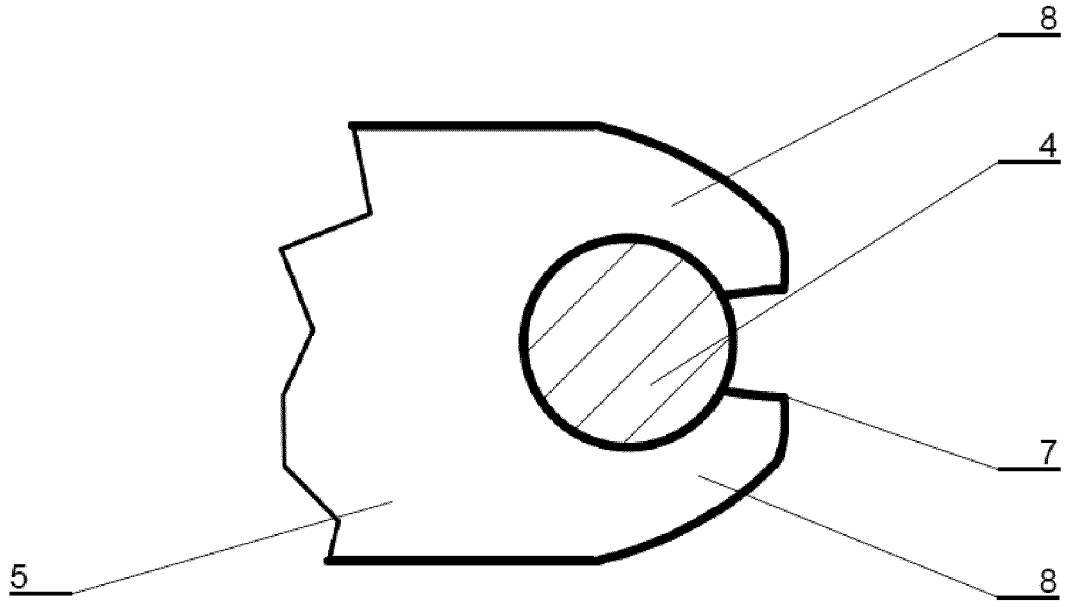

Fig. 3

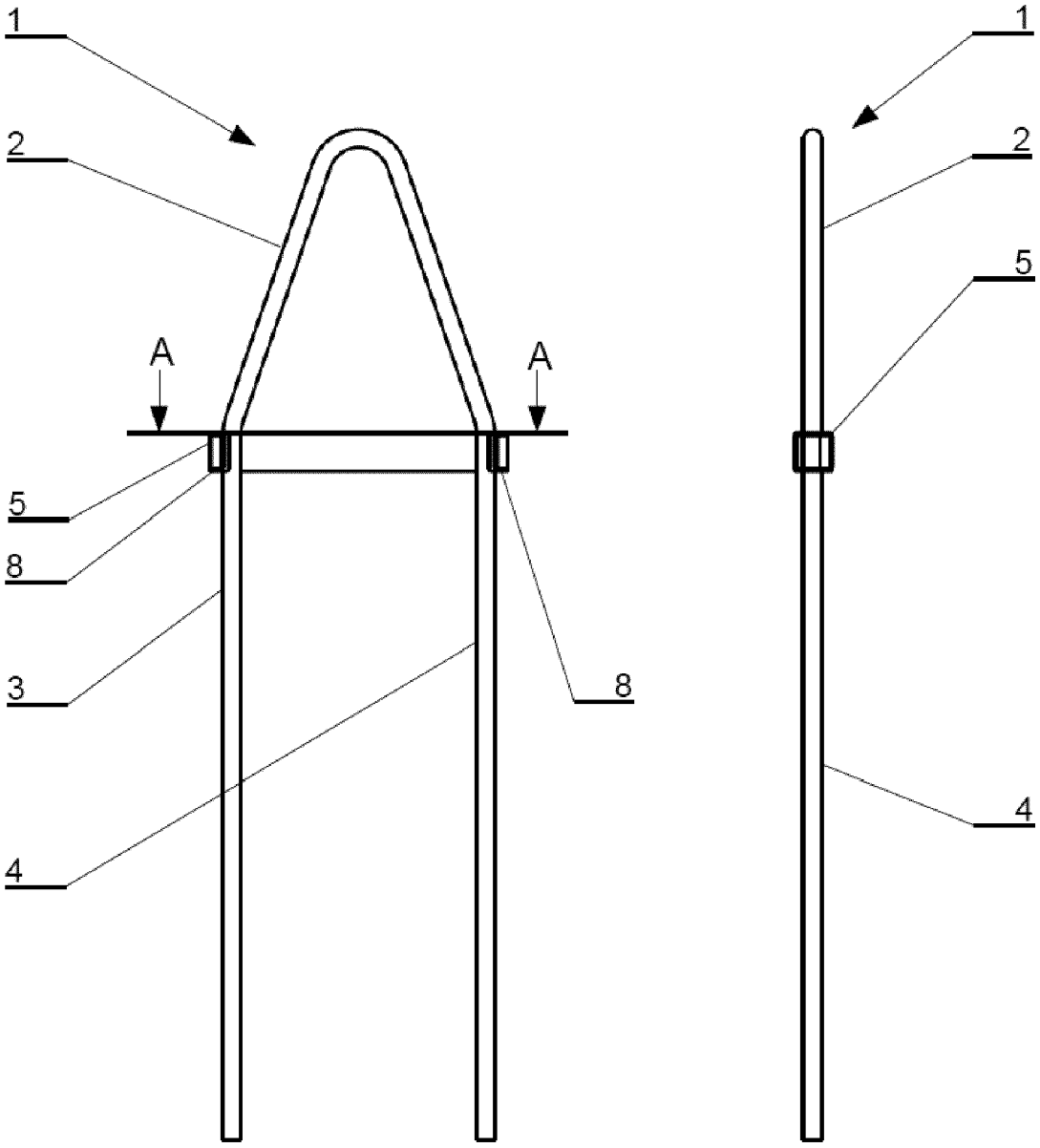

Fig. 4

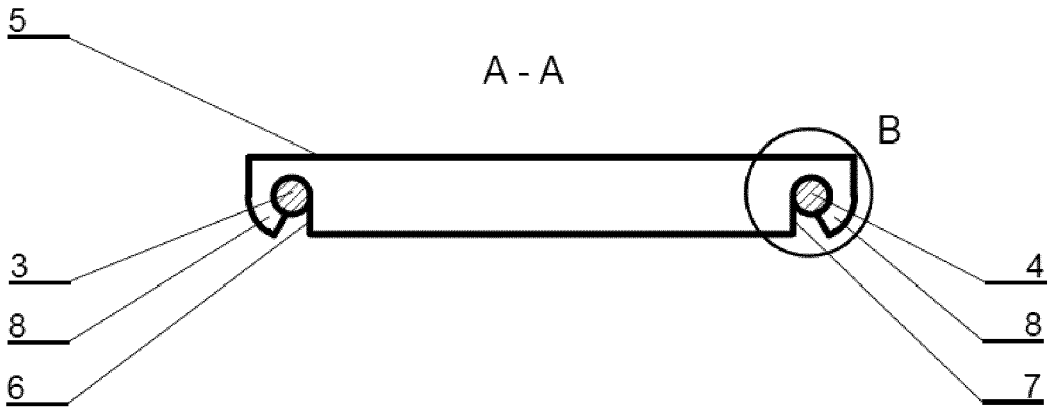

Fig. 5

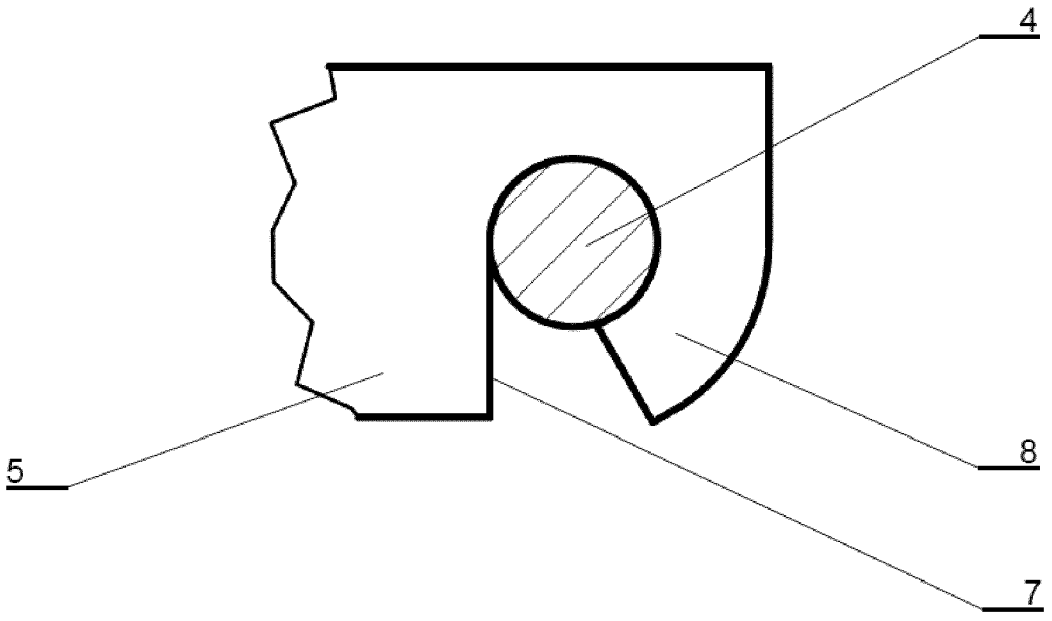

Fig. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 21 19 5023

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 3 640 410 A1 (BS INGENIEURE AG [CH]) 22 April 2020 (2020-04-22) * figures 1A, 1B, 7B, 8A *	1-15	INV. E04G21/14
A	DE 198 53 712 A1 (WEIDNER GEORG [DE]) 31 May 2000 (2000-05-31) * figures 1, 2 *	2,3,6-8	
A,D	PL 427 814 A1 (SZULC ALEKSANDER PRZED PRODUKCYJNO HANDLOWE ALRUNO [PL]) 6 May 2019 (2019-05-06) * figure 1 *	6-8,11, 12,15	

TECHNICAL FIELDS SEARCHED (IPC)

E04G

1 The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	22 January 2022	Tryfonas, N

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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- EP 3029220 A1 **[0004]**
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- PL 427814 **[0007]**