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Description

The invention relates to an anchor dowel according to the introductory part of claim 1 which is intended to be cast into a castable, hardening mass, with a mounting fixture for an element to be held by means of the anchor dowel.

Anchor dowels of the aforementioned type are known in the prior art. Such anchor dowels are used, inter alia, in erecting walls, in particular double walls. A double wall is an in most cases prefabricated wall structure which is manufactured in a factory and usually transported by truck, in a horizontal position, to a building site where it is placed upright and moved into its installation position. The shells of the double wall are in most cases made of concrete and connected with one another by means of lattice girders and have a cavity which is filled with concrete on the building site. One advantage of double walls is that no formwork is required on the building site in order to produce walls. A further advantage is that, as a result of the double walls being produced in a factory, the surface quality of these is very good. Double walls include for example double walls, thermal walls, cavity walls and filigree walls. In order to allow a double wall to be loaded and moved to the building site, transport anchors are integrated during the manufacture of the double wall.

In order to erect such walls, these are often supported by means of props which are anchored on the one hand on the corresponding wall and on the other hand on another component.

The other component can be a further wall or a component running substantially perpendicular to the wall, for example in a floor or in a ceiling. High forces can act on the walls which are to be supported, for example due to wind pressure or forces which occur during construction, e.g. stabilisation loads or bearing loads. The forces are dissipated into the other component via the props. The forces can be tensile forces or compressive forces.

It has been found that the anchorings, in particular in thin shells of element walls, can only absorb certain, relatively speaking not particularly high forces. If a particular maximum force, in particular acting in the direction of tensile force, is exceeded, the concrete is damaged and the anchoring may possibly be torn out of the concrete. Tests have shown that the tear is in most cases irregular in form. As a rule, the concrete is left badly damaged. However, if a crack is formed the maximum load-bearing capacity of the connection is reached and an abrupt loss of load-bearing capacity ensues. In this case the wall can fall over directly, constituting a risk.

The problem thus arises of developing an anchor dowel of the aforementioned type in such a way that on the one hand this can absorb higher forces than previously known anchor dowels.

The document FR 2510639 discloses an anchor dowel according to the introductory part of claim 1.

The problem is solved by an anchor dowel according to claim 1 and by a concrete component according to the independent claim 8. Further embodiments of the invention are the subject matter of the dependent claims.

An anchor dowel according to the invention is intended to be installed in a castable, hardening mass. Such a castable, hardening mass can for example be concrete. Other castable, hardening masses can also be used with the anchor dowel according to the invention, for example plastics.

The anchor dowel has a mounting fixture for an element to be held by means of the anchor dowel, in particular a connecting element. Such a connecting element can, inter alia, be a bolt, a screw, a threaded bolt or the like. The element can be fixed in the anchor dowel by means of the mounting fixture. The element can be an object which is to be held or a connection, for example a bolt, with for example a prop or the like.

According to the invention, the anchor dowel has a surface facing towards a direction of tensile force which is substantially concavely curved. Such an embodiment of the surface facing towards the direction of tensile force has the effect, on the one hand, that forces introduced, via the element, into the anchor dowel and the mass surrounding the anchor dowel, for example concrete, are distributed over a wide surface area. This reduces stress peaks and thus local overloading of the material surrounding and holding the anchor dowel, so that this does not begin to burst at a localised point, in particular if it is brittle. Instead, the introduced tensile force is distributed over a wide surface area. The dissipation of forces is thus more homogeneous than in known anchor dowels.

The direction of tensile force can in particular coincide with the surface normal of the mass into which the anchor dowel is inserted.

According to a first possible further embodiment of the anchor dowel, the concave curvature can be realised by means of a conic section, in particular a parabolic or a hyperbolic contour.

According to a further possible embodiment of the anchor dowel, the surface facing towards the direction of tensile force can be substantially rotationally symmetrical. As a result of such a rotationally symmetrical surface, if tensile force is applied a rotationally symmetrical ring of compressive stress is created. As a result, the tensile stresses resulting from the tensile load are equalised in places. In consequence, the combination of a rotationally symmetrical surface and the concave curvature leads to a higher load-bearing capacity of the anchor dowel than in the known anchor dowels.

The direction of tensile force can in particular coincide with the axis of symmetry of the anchor dowel according to the invention.

According to the invention, the anchor dowel consists substantially of plastic. On the one hand, plastic has a higher elasticity in comparison with other possible materials, for example metal, as a result of which pressure differences can be equalised when a load is applied. In addition, plastic has a more yielding surface than metal, as a result of which pressure differences and stress peaks can be diminished more effectively than if metal is used. On the other hand, plastic is as a rule more resistant than many other materials to the conditions which prevail in the installed state. In addition, a plastic component with concave surface can be manufactured economically, for example by injection moulding.

Furthermore, in the anchor dowel according to the invention the mounting fixture can be designed such that it has a through-bore. This allows a greatest possible insertion depth of the element which is to be held, resulting in a high stability transversely to the direction of tensile force.

A further aspect of the present invention relates to the provision of an inner thread in the mounting fixture. The element, in particular the connecting element, can be screwed into the anchor dowel with the aid of the inner thread. The inner thread can be used to receive a nail plate. This allows the anchor to be fixed to a formwork, for example steel formwork. Nail plates are standard products in the manufacture of precast concrete parts and are used in any precasting factory. They can be used to fix the anchor to the formwork and ensure that no concrete enters into the through-bore during fabrication of the shell.

According to a further possible embodiment, the inner thread is part of a nut arranged on a surface facing away from the direction of tensile force. In this way, the inner thread can be made of a different material than the rest of the anchor dowel. Due to the arrangement of the nut on the surface facing away from the direction of tensile force, forces introduced via the nut are transferred into the anchor dowel and dissipated there.

The provision of a nut is in particular helpful if the anchor dowel is made of plastic. In this case the nut can be made of a metal which has a higher shear strength than plastic. In addition, different connecting elements can be accommodated by providing different nuts with different properties. The nut can for example be cast in the anchor dowel or can be inserted in this. The nut can be held in a form locking manner, a frictionally locking manner or by a substance-to-substance bond.

Alternatively to a nut, but not according to the invention, a bolt can be inserted in the anchor dowel which serves to fix in place the components which are to be connected. Another variant is the use of toggle fasteners or of bolts with a toggle fastener function.

A further aspect of the anchor dowel according to the invention relates to the arrangement of a guide sleeve in the mounting fixture. Such a guide sleeve can consist of a different material than the mounting fixture itself. The mounting fixture itself can, like the rest of the anchor dowel, consist of plastic. The sleeve can be made of a stronger material than the anchor dowel, for example either of a harder plastic or metal. Transverse forces, that is to say forces perpendicular to the direction of tensile force, can be dissipated into the anchor dowel more effectively with the aid of such a sleeve, so that local wear on the anchor dowel in highly stressed regions is reduced.

According to a further aspect of the invention, at least one recess is provided in the surface to rest against a reinforcement. Resting against a reinforcement allows an additional introduction of force via the reinforcement and thus an increase in the maximum tensile forces which can be absorbed and a more ductile load-bearing behaviour, so that the load-bearing capacity is also retained even following an initial crack formation in the concrete.

A first independent subject matter of the present invention relates to a concrete component with at least one anchor dowel according to one of the preceding claims. Such a concrete component can absorb higher tensile forces than a concrete component with anchor dowels other than those according to the invention. On the one hand, this increases the load-bearing capacity of the connection. Such a concrete component can for example be a concrete wall.

According to a first further concept behind the concrete component according to the invention, an end face of the anchor dowel terminates flush with the concrete or is arranged in the concrete component in a recessed manner. A flush termination or a recessed arrangement allow a planar installation of the element to be held on the anchor dowel, so that the concrete surrounding the end face can be used for support.

A further independent aspect, but not according to the invention, relates to a method of producing a concrete component, wherein an anchor dowel according to the invention is positioned in a formwork, the formwork then being cast with concrete.

A further aspect, but not according to the invention, relates to a method according to the previous paragraph, wherein a reinforcement is rested against the anchor dowel before positioning the anchor dowel or between positioning the anchor dowel and casting.

A further aspect, but not according to the invention, relates to a method according to the previous two paragraphs, wherein the anchor dowel is positioned by means of a nail plate.

A further aspect, but not according to the invention, relates to a method of producing a concrete component according to the previously described invention. The anchor dowel is thereby positioned in a formwork. The formwork can for example be provided in the form of shuttering. The formwork is then cast with concrete. After the concrete has set, the concrete component is ready for use and the anchor dowel can be used.

According to a further aspect, a reinforcement is laid against the anchor dowel after positioning and before casting. The reinforcement can rest against the concave surface. Under application of a load, the reinforcement can absorb part of the forces and effect a more ductile load-bearing behaviour of the anchor dowel.

According to a further aspect of the method, the substantially concavely curved and in particular rotationally symmetrical surface can be oriented in the direction of a surface normal of a surface of the concrete component which is to be cast. In this way a uniform distribution of forces and a high load-bearing capacity can be achieved under the application of tensile forces.

In a possible further development of the method, the anchor dowel can be positioned in the formwork by means of a nail plate. The nail plate can be removed again after casting of the concrete component.

Further objectives, advantages, features and possible applications of the present invention are explained in the following description of an exemplary embodiment, with reference to the drawing. All of the features which are described and/or graphically illustrated, in their own right or in any expedient combination, thereby form the subject matter of the present invention, also independently of their combination in the claims or their dependencies.

The drawing shows, schematically

Fig. 1A a top view of an anchor dowel according to the invention in a first embodiment;

Fig. 1B a sectional view along the section line A-A of the anchor dowel from Fig. 1A;

Fig. 2A a top view of an anchor dowel according to the invention in a second embodiment;

Fig. 2B a sectional view along the section line A-A of the anchor dowel from Fig. 2A;

Fig. 3 a side view of a wall structure in which an anchor dowel according to the invention can be used;

Fig. 4 an enlarged sectional view through the wall structure from Fig. 3 with anchor dowel according to the invention in a first embodiment;

Fig. 5 an enlarged sectional view through the wall structure with anchor dowel according to the invention in a second embodiment, and

Fig. 6A-D phases in the manufacture of a concrete component according to the invention.

In the following figures, identical components or components with the same effect are identified with the same reference symbols.

Fig. 1A shows a top view of an anchor dowel 2 according to the invention. The direction of view runs opposite to a direction of tensile force Z. The direction of tensile force Z points into the representation plane.

A surface 4 of the anchor dowel 2 is also rotationally symmetrical. The anchor dowel 2 has a mounting fixture 6. The mounting fixture 6 is arranged centrally, i.e. it is also rotationally symmetrical to the same axis of symmetry.

The mounting fixture 6 is configured as a through-bore. A nut 8 is arranged on the underside, i.e. on the side opposite the surface 4. The nut 8 is used to screw down a connecting element.

The anchor dowel 2 is made of plastic, in particular of glass fibre reinforced plastic. A possible suitable material can be PA6 GF30, i.e. polyamide 6 with 30 % glass fibre.

Fig. 1B shows a cross section through the anchor dowel 2 along the section line A-A according to Fig. 1.

The surface 4, which is oriented in the direction of tensile force Z, is concavely curved. If a tensile force is applied in the direction of tensile force Z, the concave curvature results in a rotationally symmetrical and uniform loading of the surrounding concrete, in which a rotationally symmetrical ring of compressive stress is created. As a result, tensile stresses resulting from the tensile load are equalised in places and a higher load-bearing capacity of the anchor dowel 2 is achieved.

The nut 8 is arranged on an underside 10, which is oriented opposite the direction of tensile force Z. For this purpose, a depression 12 is formed in the surface 10, in which the nut 8 is inserted. Alternatively, the nut can be completely embedded in the anchor dowel 2.

The anchor dowel 2 has an end face 14 which can be installed flush with the concrete or in a recessed manner.

Fig. 2A shows a top view of an anchor dowel 2' according to the invention in a second embodiment.

In addition to the anchor dowel 2 according to Fig. 1A, 1B, two recesses 9 are formed in the surface 4 which are provided to rest against a reinforcement.

Fig. 2B shows a sectional view along the section line A-A of the anchor dowel 2' from Fig. 2A.

In the illustration, a reinforcement 38 is arranged in the recesses 9.

Fig. 3 shows a side view of a wall structure 20 which is erected with the aid of an anchor dowel 2 according to the invention.

The wall structure comprises a double wall 22 which stands on a concrete component 24. The concrete component 24 can be a floor slab or a foundation or a ceiling. However, horizontal supports against other components are also possible. For this purpose, a prop is mounted horizontally on the anchor dowel 2 according to the invention 2.

The double wall 22 is supported by means of a prop 26. In this case the prop 26 is not as described in the previous paragraph, but is held in the double wall 22 by means of a head point anchoring 28 and held in the concrete component 24 by means of a foot point anchoring 30. The head point anchoring 28 is fixed to anchor dowel 2 which is not shown in Fig. 3, but the embodiment corresponds to that shown in Figures 1 and 2.

Fig. 4 shows an enlarged sectional view through the wall structure from Fig. 3 with an anchor dowel 2 according to the invention in the first embodiment.

The double wall 22, in which the anchor dowel 2 is installed, corresponds to a widely known structure with two concrete shells forming a cavity, whereby a core insulation can be housed in the cavity. The core insulation is thereby in contact with the shell which later forms the outer shell of a building wall. A void can remain between the core insulation and the shell which later forms the inner shell of a building wall until the double or thermal wall is installed which is filled with in-situ concrete on the building site.

The prop 26 is shown in two different positions. The prop 26 can, as shown in Fig. 3, run diagonally downwards to a foot point anchoring or it can be supported horizontally on another wall. The horizontal support allows several walls to be supported with a smaller number of necessary props.

The prop 26 is fixed to the anchor dowel 2 by means of a connecting joint 34. The connecting joint 34 has a plate 34.1 with through-bore 34.2 through which a screw 36 can be screwed into the nut 8 of the anchor dowel 2. The prop is fixed to a flange 34.3 attached to the plate 34.1.

Alternatively, instead of being connected by means of such a connecting joint 34, the prop can also be connected with the anchor dowel 2 by other means, for example directly.

Forces acting on the wall structure 20 are dissipated via the prop 26. The forces thereby act in the direction of tensile force Z. The opposing forces are absorbed by the anchor dowel 2 and the double wall 22. Through the concave upper side 4 of the anchor dowel 2, which lies in the concrete, the opposing forces are dissipated in the concrete over a wide surface area, so that the maximum absorbable load increases.

Fig. 5 shows a sectional view through the wall structure with an anchor dowel 2' according to the invention in the second embodiment.

In addition to the features already described with reference to Fig. 4, in this embodiment a reinforcement 38 is arranged in the double wall 22 in such a way that it rests against the surface 4 of the anchor dowel 2. This allows a more ductile load dissipation behaviour of the anchor dowel to be achieved, as a result of which the load-bearing capacity of the anchor dowel 2 is further increased.

Figs. 6 A to D show phases in the manufacture of a concrete component according to the invention for two different embodiments of the invention.

According to Fig. 6 A, an anchor dowel 2 is arranged in a steel formwork 40 by means of a nail plate 32. The base of the steel formwork 40 defines the outer side of the concrete component which is to be cast, so that the nail plate 32 will initially be arranged flush with the surface of the concrete component. Following casting, the nail plate 32 is removed, the hole created can be filled with a suitable cement.

Fig. 6, the steel formwork 40 is shown cast with concrete 42. The anchor dowel 2 is dimensioned such that its underside 10 projects from the concrete 42 in order to prevent the nut 8 being soiled with concrete and rendered unserviceable. Alternatively or in addition, the nut can be protected against soiling by means of a covering, for example adhesive tape.

Figs. 6 C and D show the manufacture of a concrete component according to the second embodiment. Before or after the positioning of the anchor dowel 2' by means of a nail plate 32, a reinforcement 38 is laid in place which rests against the surface 4 of the anchor dowel 2' in the recesses 9.

Concrete 42 is then poured, as shown in Fig. 6 D.

List of reference symbols

2, 2'	anchor dowel
4	concave upper side
6	mounting fixture
8	nut
9	recess
10	underside
12	depression
14	end face
20	wall structure
22	double wall
24	concrete component
26	prop
28	head point anchoring
30	foot point anchoring
32	nail plate
34	connecting joint
34.1	plate
34.2	through-bore
34.3	flange
36	screw
38	reinforcement
40	steel formwork
42	concrete
Z	direction of tensile force
F	surface normal

Patentkrav

1. Ankerdybel, som er beregnet til indstøbning i en støbelig, hærdende masse, især beton (42), med en udsparing (6) til et forbindelseselement (34, 36), som skal holdes ved hjælp af ankerdyblen (2, 2'), hvor ankerdyblen (2, 2') har en overflade (10), som vender væk fra en trækkraftretning (Z), og en overflade (4), som vender mod trækkraftretningen (Z), hvor overfladen (4), som vender mod trækkraftretningen (Z), i alt væsentligt er konkav, således at en indført trækkraft fordeles over den støbelige, hærdende masse, som omgiver ankerdyblen, og udsparingen (6) har et indvendigt gevind (8) til sammenskruning med forbindelseselementet (36),

kendetegnet ved,

at ankerdyblen (2, 2') i alt væsentligt består af kunststof, og det indvendige gevind er del af en metalmøtrik (8) indrettet på overfladen (10), som vender væk fra trækkraftretningen (Z).

2. Ankerdybel ifølge krav 1, **kendetegnet ved, at** den konkave krumning er udført via en konisk sektion, især en parabelformet eller en hyperbelformet kontur.

3. Ankerdybel ifølge krav 1 eller 2, **kendetegnet ved, at** overfladen (4), som vender i trækkraftretningen (Z), i alt væsentligt er rotationssymmetrisk.

4. Ankerdybel ifølge et af de foregående krav, **kendetegnet ved, at** udsparingen (6) har et gennemgående hul.

5. Ankerdybel ifølge et af kravene 1 til 4, **kendetegnet ved, at** en gevindbolt eller en skrue (36) er skruet ind i det indvendige gevind (8) af udsparingen (6) som forbindelseselement.

6. Ankerdybel ifølge et af de foregående krav, **kendetegnet ved, at** en styremuffe er indsat i udsparingen (6).

7. Ankerdybel ifølge et af de foregående krav, **kendetegnet ved, at** mindst en fordybning (9) er tilvejebragt i overfladen (4) til kontakt med en armering (38).

8. Betonkomponent med mindst en ankerdybel (2, 2') ifølge et af de foregående krav.

9. Betonkomponent ifølge krav 8, **kendetegnet ved, at** en forside (14) af ankerdyblen (2, 2') flugter med betonkomponenten (22) eller er forsænket i betonkomponenten (22).

10. Betonkomponent ifølge krav 8 eller 9, **kendetegnet ved, at** en armering (38) ligger an mod overfladen (4) af ankerdyblen (2, 2').

11. Betonkomponent ifølge krav 8, 9 eller 10, **kendetegnet ved, at** den har en dobbeltvæg (22), i hvilken to betonskaller danner et hulrum, hvor ankerdyblen (2) er monteret i dobbeltvæggen.

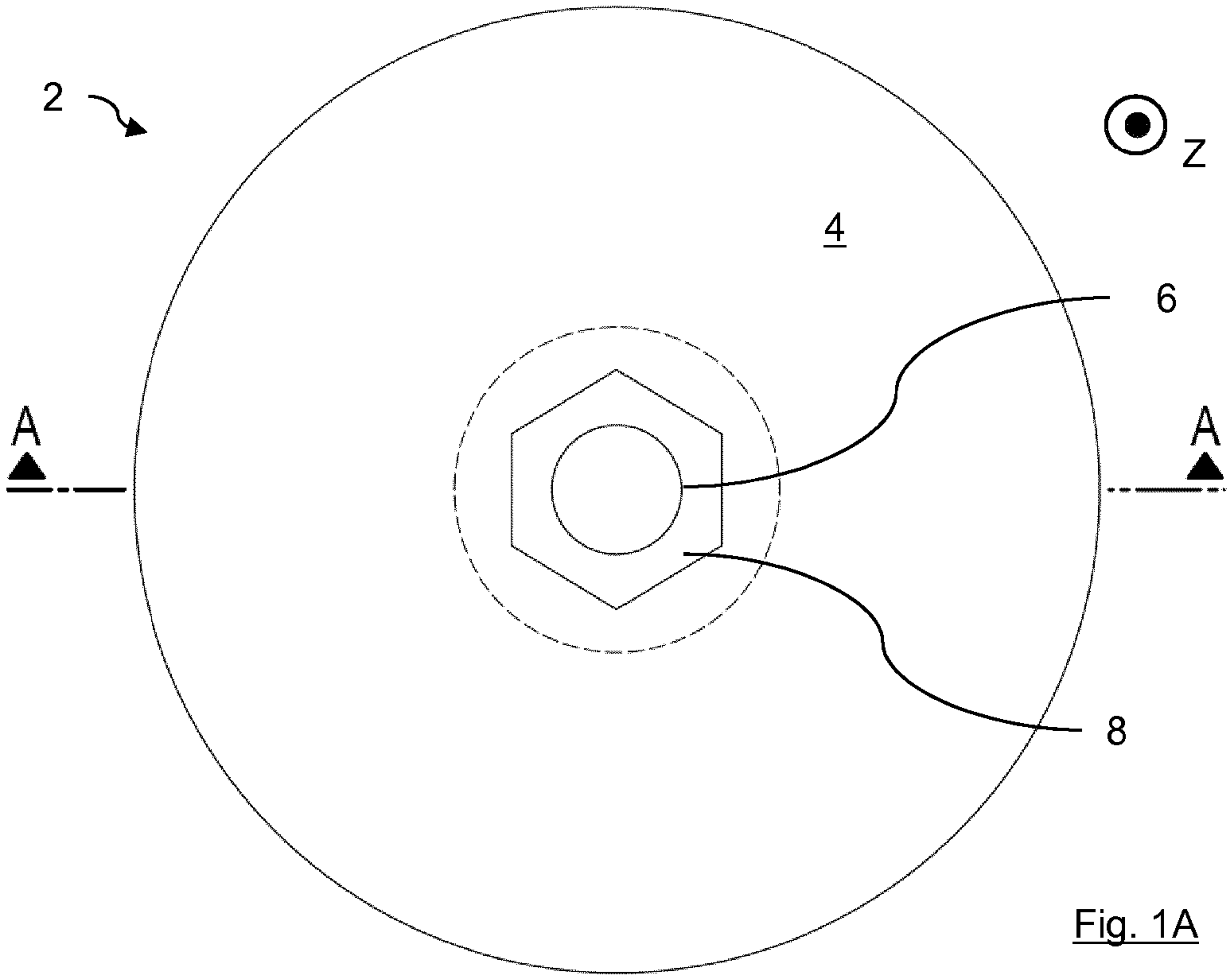

Fig. 1A

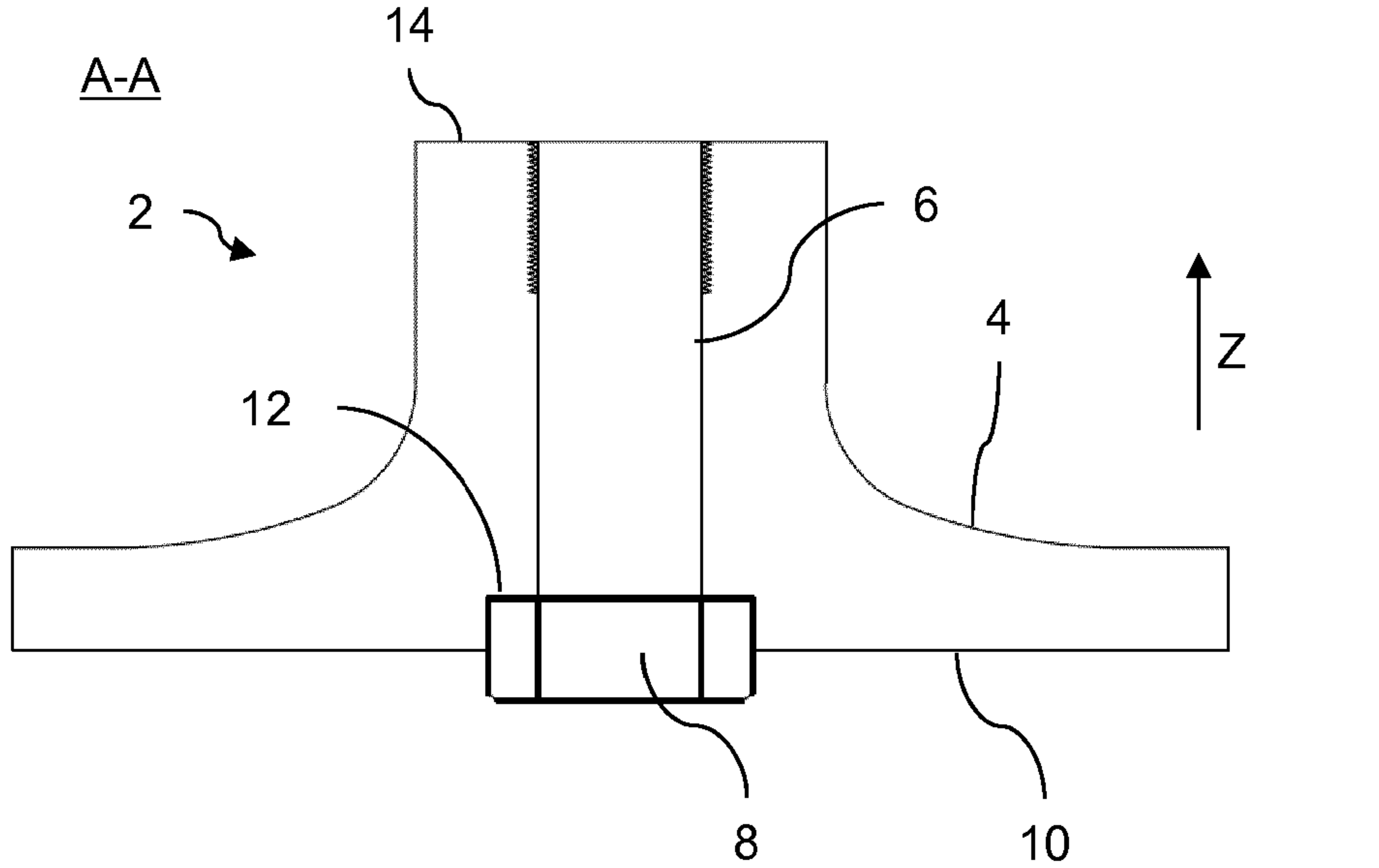

Fig. 1B

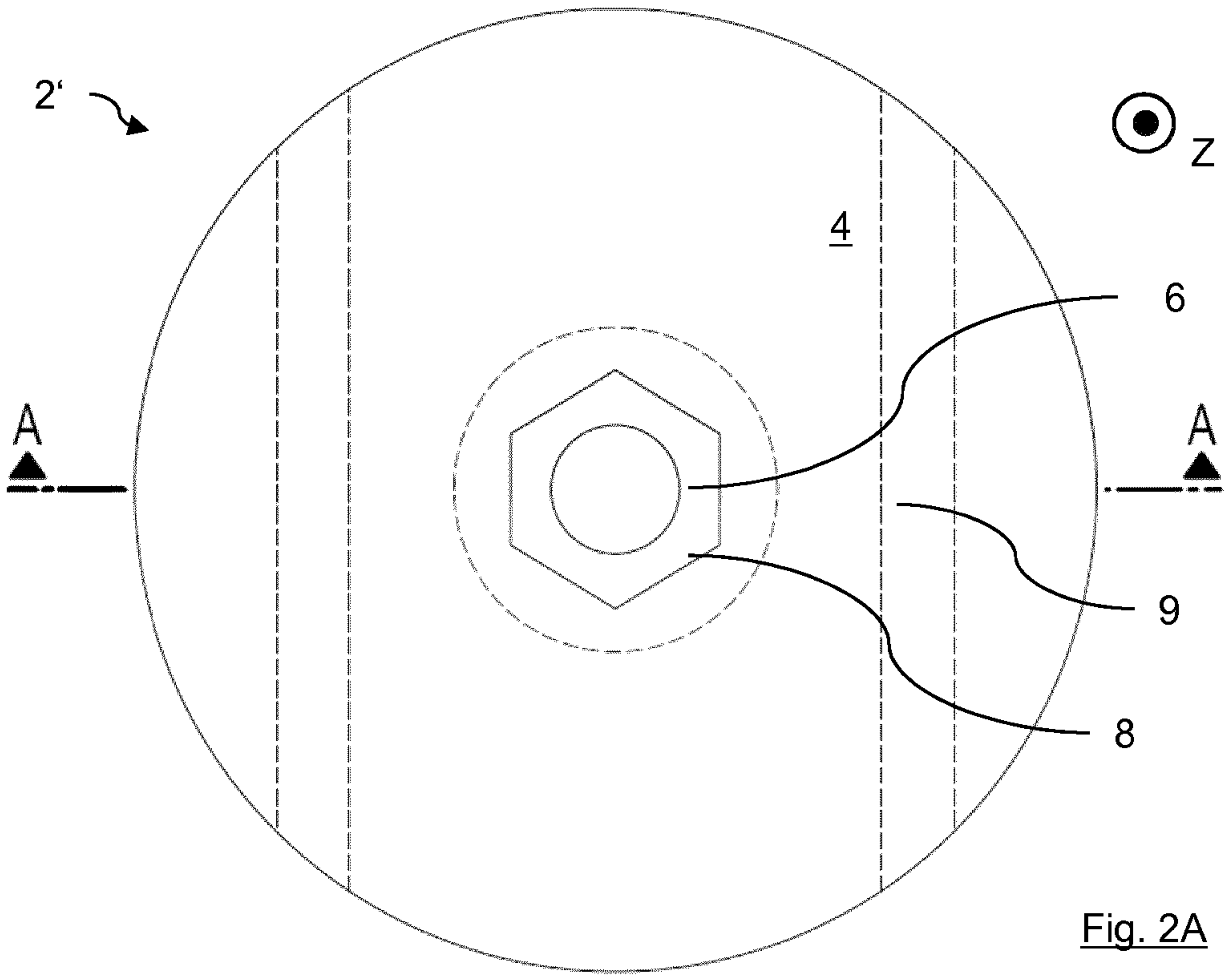

Fig. 2A

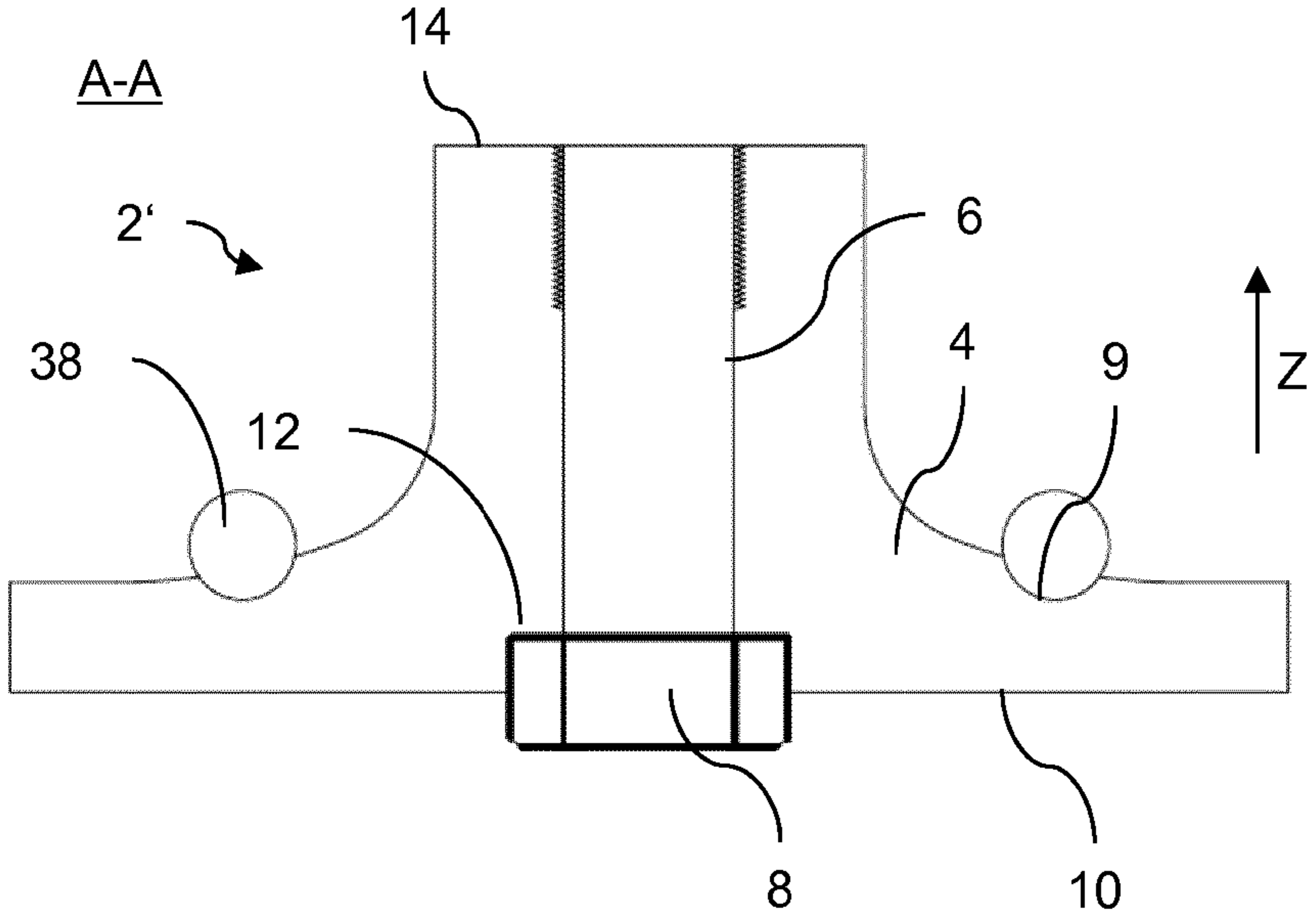

Fig. 2B

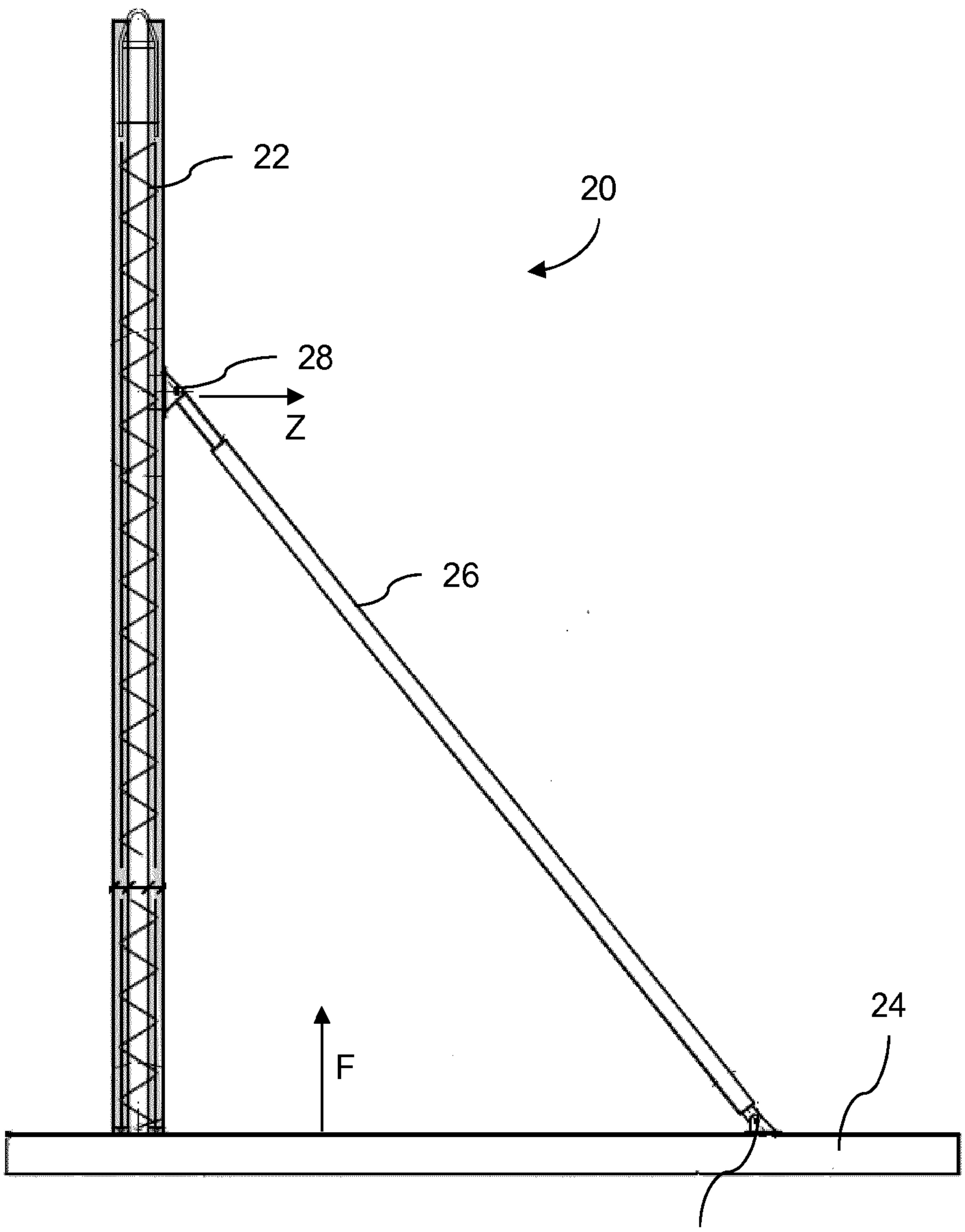

Fig. 3

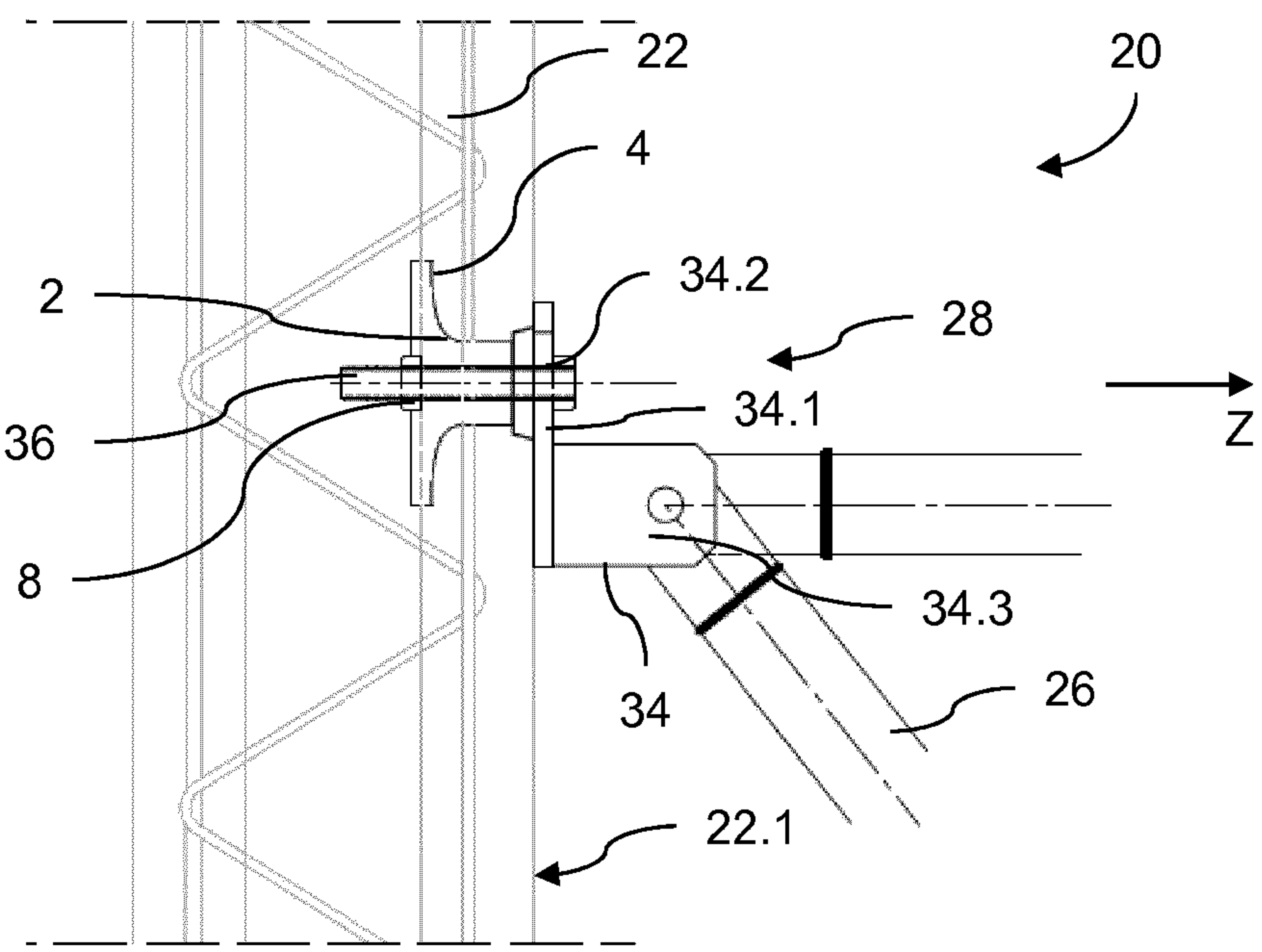
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Fig. 4

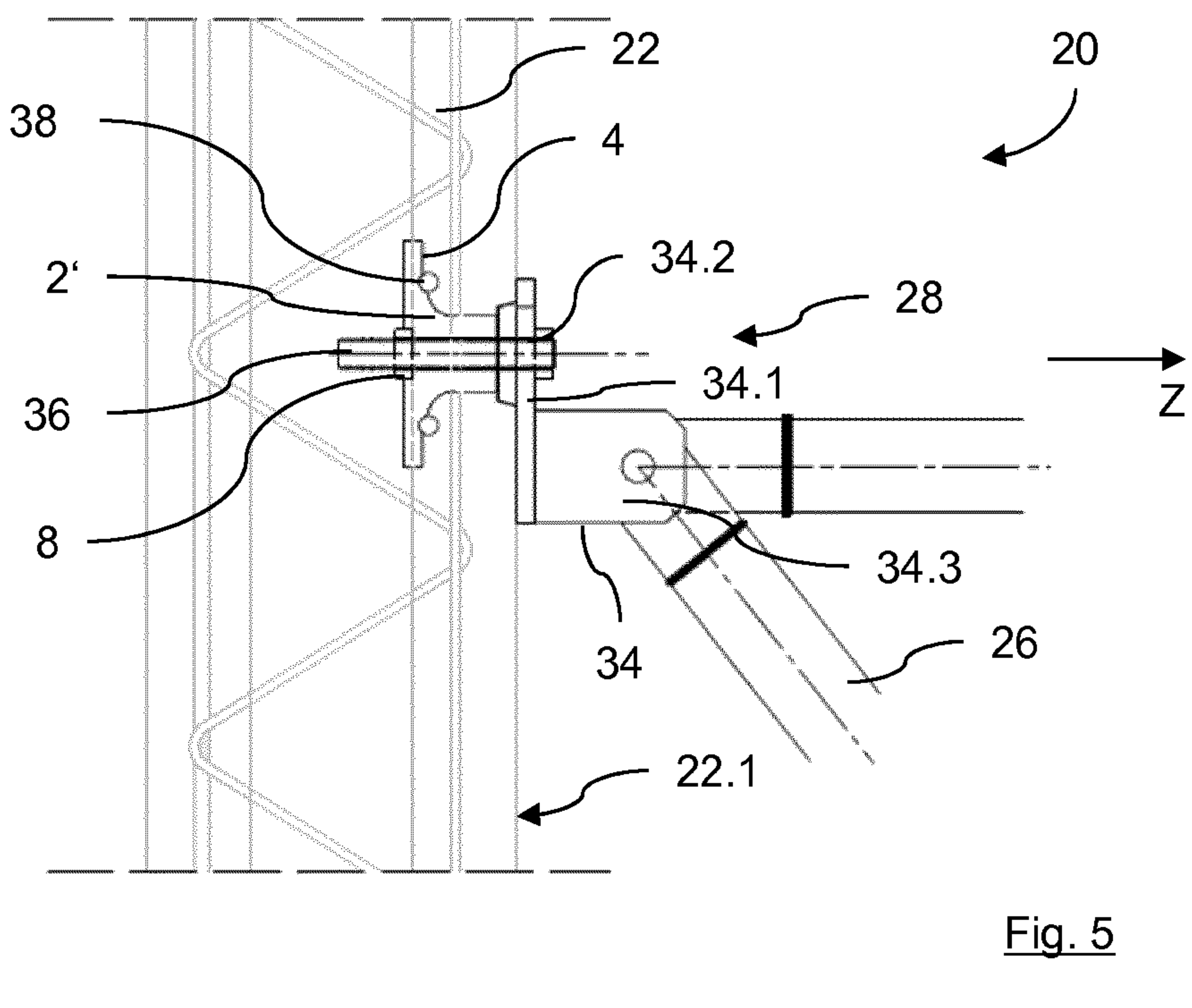
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Fig. 5

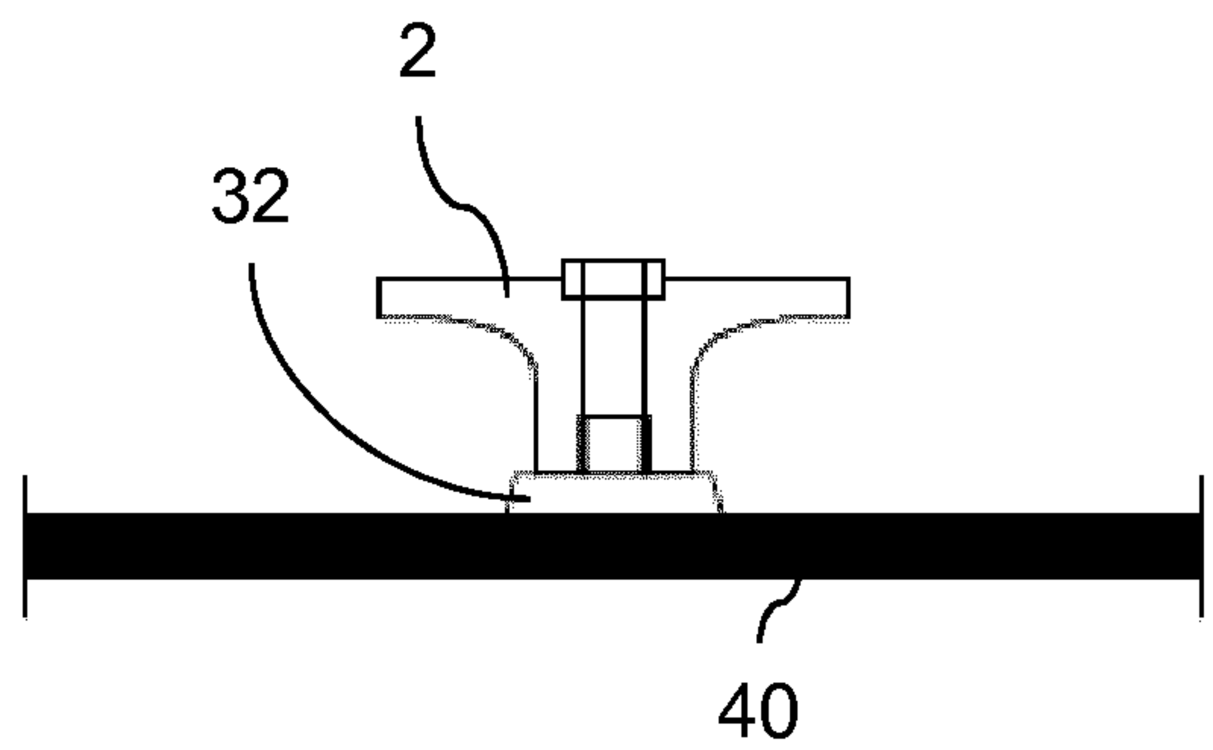

Fig. 6A

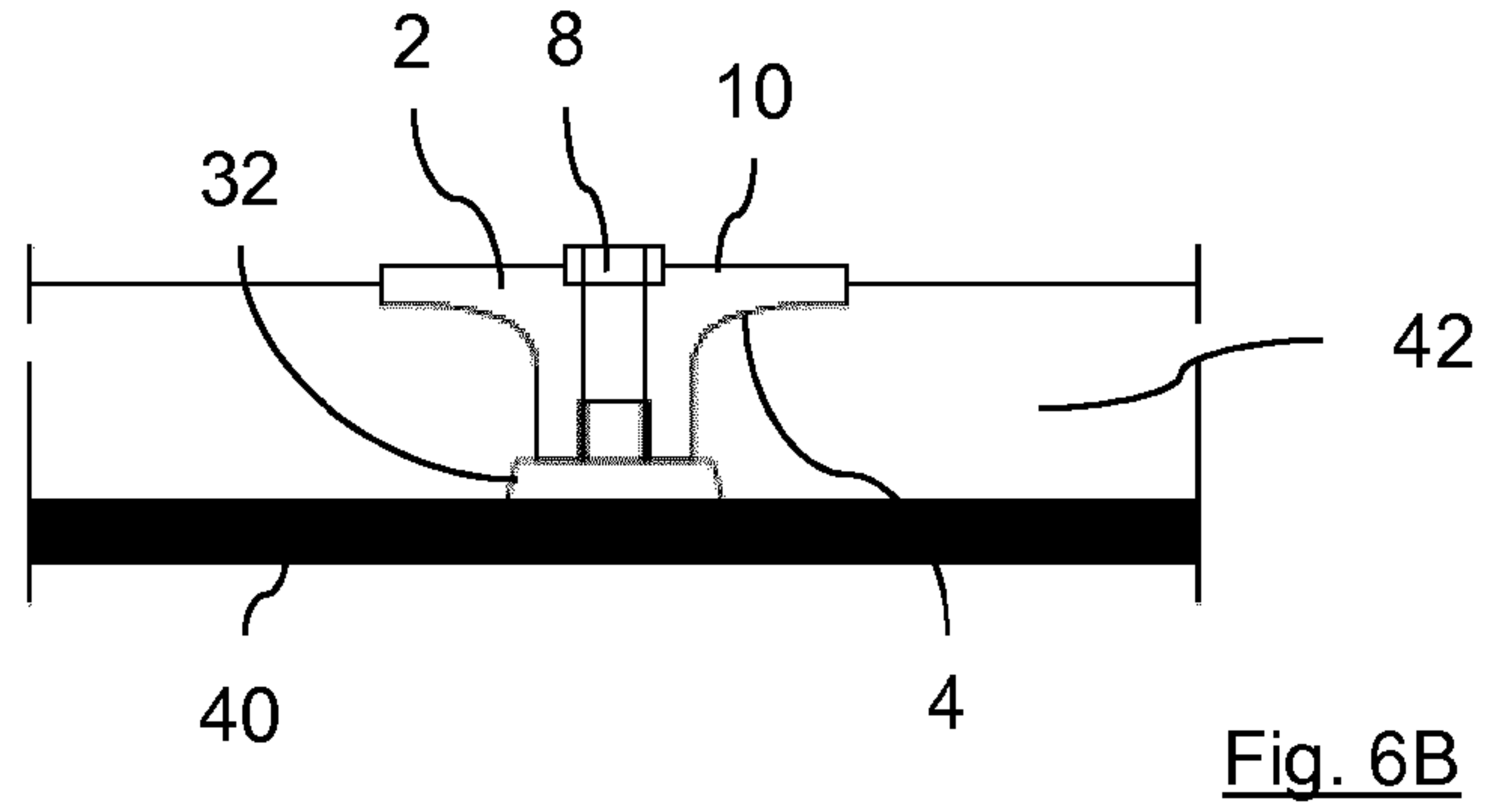

Fig. 6B

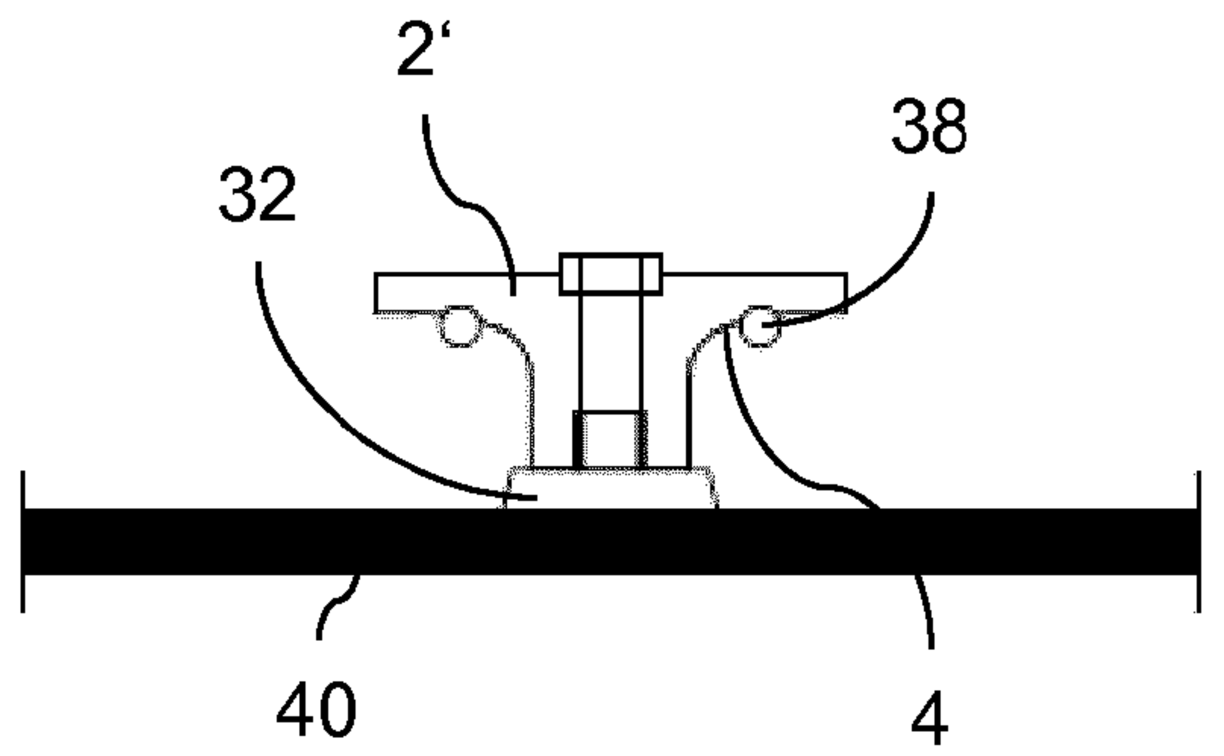

Fig. 6C

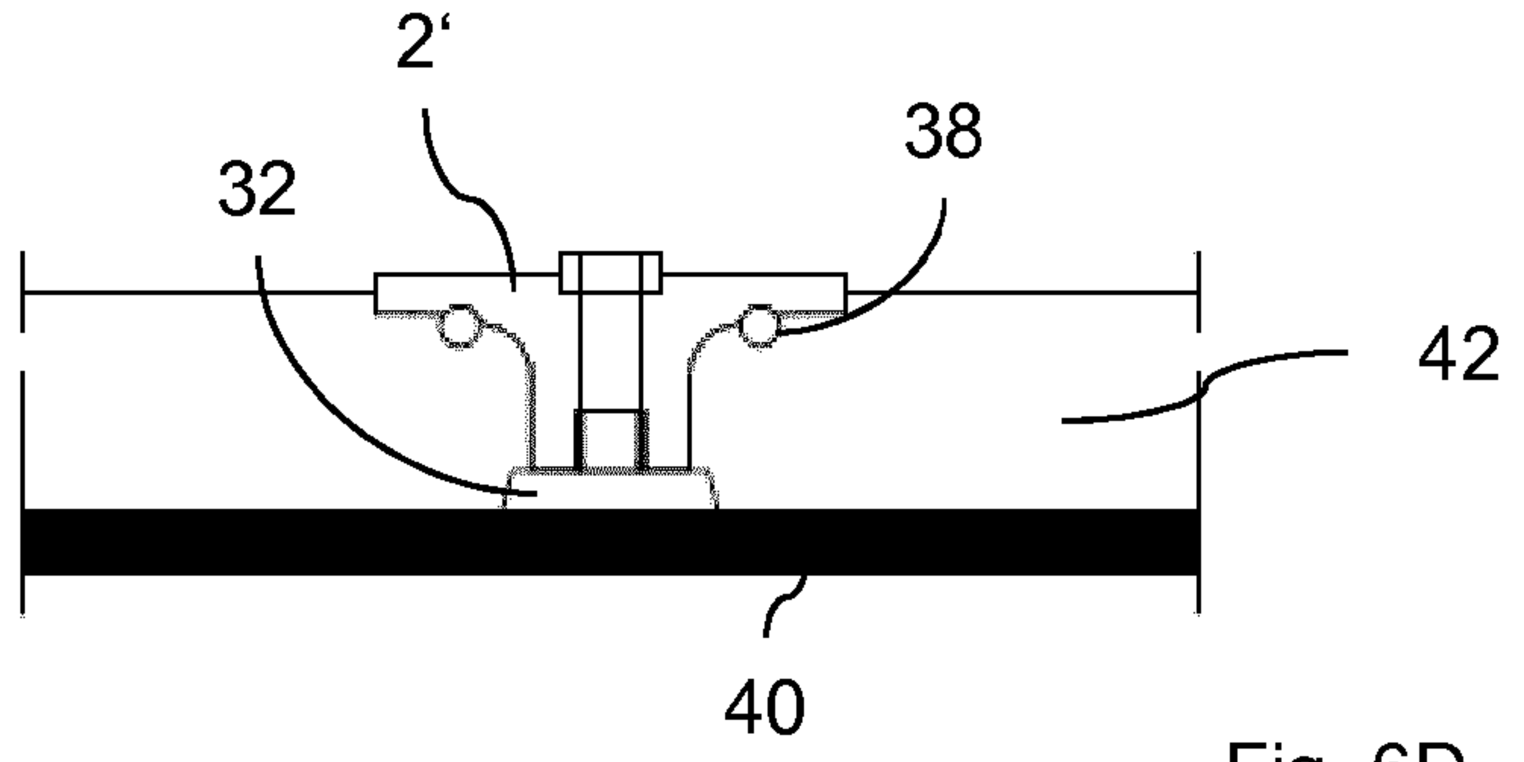

Fig. 6D