



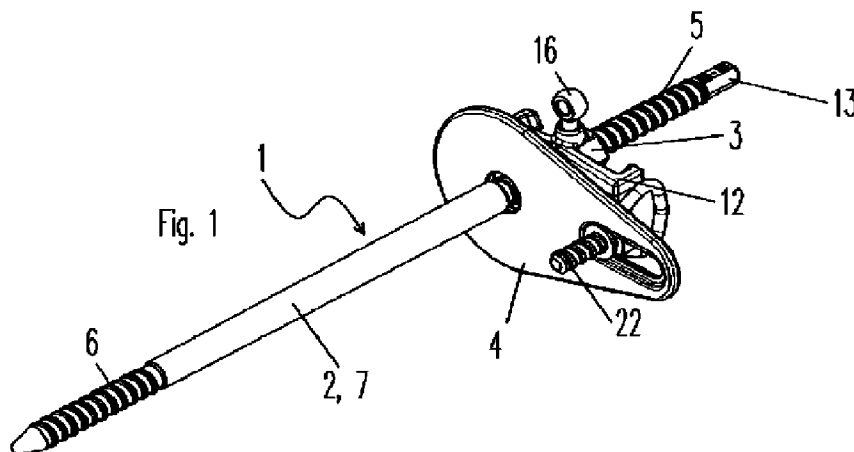
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(54) Title: FORMWORK TIE



(57) Abrégé/Abstract:

According to the invention, a tie bar (2) of a formwork tie (1) for connecting two formwork elements, which are arranged opposite each other at a distance therebetween and which have two opposing flat portions (11), and a tie nut (3) are provided with a radial fixing screw (16) which can be screwed selectively against one of the two flat portions (11) in order to fix the tie nut (3) on the tie bar (2), as a result of which the distance between the two formwork elements can be adjusted in steps of half a pitch of an external thread (5) of the tie bar (2).



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Abstract:

According to the invention, a tie bar (2) of a formwork tie (1) for connecting two formwork elements, which are arranged opposite each other at a distance therebetween and which have two opposing flat portions (11), and a tie nut (3) are provided with a radial fixing screw (16) which can be screwed selectively against one of the two flat portions (11) in order to fix the tie nut (3) on the tie bar (2), as a result of which the distance between the two formwork elements can be adjusted in steps of half a pitch of an external thread (5) of the tie bar (2).

Formwork Tie

Description

The invention relates to a formwork tie for connecting two formwork elements, which are disposed opposite and at a distance from one another, having the features of the preamble of claim 1.

Concrete formwork elements, or formwork elements for short, are used for pouring concrete walls. For this purpose, formwork elements are disposed opposite one another at a normally constant distance, which corresponds to the thickness of the wall to be poured. The formwork elements typically comprise a board made of (ply)wood or plastic as a formwork shell, and a planar panel made of longitudinally and transversely extending rectangular steel or aluminum tubes for reinforcement on a rear side of the formwork shell. For pouring the concrete, the formwork elements are disposed at a distance from one another, with the formwork shells thereof facing one another. So as to hold the formwork elements against the pressure of free-flowing concrete poured in between, these are connected by formwork ties, which comprise tie rods, including threads, at both ends, which are placed through holes in the formwork elements disposed opposite one another, and onto the threads of which tie nuts are screwed, on the rear sides of the formwork elements which face away from one another, the tie nuts holding the formwork elements at a distance with respect to one another. As an example, reference is made to a formwork tie that is known from the unexamined patent application DE 10 2010 002 108 A1.

It is the object of the invention to provide a formwork tie that can also be used for installation by insertion, with concrete wall formwork only being accessible from one side, and that allows a distance of the formwork elements to be set easily.

This object is achieved by the features of claim 1. The formwork tie according to the invention comprises a tie rod including an external thread and a tie nut, which can be screwed, or is screwed, onto the external thread. The external thread preferably extends from one end across a length that allows a distance of the formwork elements to be set in a predefined wall thickness range. The external thread can start at the end of the tie rod or is situated at a distance of, for example, one to three diameters of the tie rod from the end of the tie rod.

At an opposite end, the tie rod can likewise include an external thread for screwing on a further tie nut or another device to be fixed to a formwork element.

The tie nut includes a through-hole through which the tie rod passes, and a first internal thread for screwing on the external thread of the tie rod.

The tie rod according to the invention comprises a flattened region at a circumferential location, which extends in a longitudinal direction of the tie rod. The flattened region preferably extends along the external thread of the tie rod across the entire length, a portion of the length, or more than the length of the external thread. The flattened region preferably extends axially parallel along the tie rod, but may also be offset in a circumferential direction, for example, extend helically, in a wave-like manner or in a zig-zag-like manner. The flattened region can be designed to be continuous or interrupted in the longitudinal direction of the tie rod, so as to be composed of individual flattened regions that are consecutively disposed in the longitudinal direction of the tie rod. The flattened region is preferably a planar surface in a chordal plane of the tie rod. A hollow-round or angular depression at the one circumferential location of the tie rod is also possible as the flattened region, for example.

The tie nut comprises a fixing element, which cooperates with the flattened region of the tie rod. The fixing element can be adjusted transversely to the flattened region of the tie rod and can thereby act on the flattened region, so that the fixing element holds the tie nut non-rotatably, and thus in an axially fixed manner, on the tie rod. So as to turn the tie nut on the tie rod, the fixing element has to be lifted off the flattened region. "Transversely" means in particular an adjustability of the fixing element in the radial direction with respect to the tie rod and/or the tie nut, or perpendicular to the flattened region. For this purpose, the tie nut has to be turned on the tie rod such that the fixing element can be adjusted in the direction of the flattened region of the tie rod, which is to say, such that the adjustment direction of the fixing element runs in the direction of the flattened region of the tie rod. A different adjustment direction of the fixing element is possible, provided that the fixing element can act on the flattened region of the tie rod so as to secure the tie nut in a non-rotatable manner, or, in any case, to prevent the tie nut from being turned back on the tie rod in the direction of the end of the tie rod.

The invention allows the tie nut to be fixed on the tie rod in preferred positions, in which the tie nut is turned in each case by one or more full revolutions, and is consequently displaced on the tie rod by one or more turns of the external thread. In this way, it is possible to set the distance between two formwork elements that are disposed opposite one another in steps that correspond to one lead of the external thread of the tie rod. If the flattened region of the tie rod

does not extend in the axially parallel direction of the tie rod, but is offset, in the circumferential direction, in the longitudinal direction of the tie rod, the preferred positions of the tie nut are offset, corresponding to the offset in the circumferential direction, with respect to one another by more or less than one or more full revolutions, and consequently by more or less than the turns of the external thread of the tie rod in the longitudinal direction.

For a finer breakdown of the rotational positions than a full revolution in which the tie nut can be non-rotatably fixed on the tie rod by way of the fixing element, one embodiment of the invention provides for multiple flattened regions on the tie rod, which are preferably uniformly distributed across the circumference of the tie rod, but can also be irregularly distributed across the circumference of the tie rod.

The tie rod preferably comprises two flattened regions opposite one another, which is to say offset by 180° in the circumferential direction on the tie rod, when more than one flattened region is provided, so that the tie nut can in each instance be non-rotatably fixed on the tie rod by way of the fixing element after half a revolution.

The flattened region can be provided in the region of the external thread and/or outside the region of the external thread on the tie rod. In the region of the external thread, the flattened region is in particular a circular segment shaped recess at the outer circumference of the convolution of the external thread of the tie rod. The recesses can be less deep than, or as deep as, the convolution is high. In this case, the flattened region of the tie rod is composed of individual flattened regions at the turns of the external thread, which is or are interrupted between the turns. The recesses can also be deeper than the convolution of the external thread of the tie rod is high. In this case, the flattened region extends without interruption in the longitudinal direction of the tie rod.

The fixing element can, for example, be a bolt that is spring-loaded in the tie nut toward the inside or in the direction of the flattened region of the tie rod, or the like. Other options include a wedge or an eccentric element, serving as the fixing element, which is displaceably or pivotably guided or mounted at or in the tie nut and which can act on the flattened region of the tie rod, so as to non-rotatably hold the tie nut on the tie rod. According to one embodiment of the invention, a screw element, for example a screw or a bolt comprising a thread, can be screwed or is screwed into a second internal thread of the tie nut. The second internal thread, or a hole including the second internal thread, in the tie nut opens into the through-hole of the tie nut including the first internal thread, so that, in a rotational position of the tie nut on the external thread of the tie rod, the fixing element can be screwed against the flattened region of the tie rod, and in this way holds the tie nut non-rotatably on the tie rod. In particular, the

second internal thread extends radially or obliquely in an axial plane of the tie nut.

In a preferred embodiment of the invention, the external thread of the tie rod has a pitch of 10 millimeters, which is to say, during a revolution, the tie nut moves 10 millimeters in the longitudinal direction on the tie rod. This allows the tie nut to be fixed by way of the fixing element in 10-millimeter steps in the longitudinal direction of the tie rod, and thus likewise allows the distance between the formwork elements, which are disposed opposite one another and connected to the formwork tie, to be set in 10-millimeter steps.

According to one embodiment of the invention, distance markings are provided for the distance of the formwork elements set by way of the tie nut. These can be numerical data or other markings, which are provided at the tie rod such that the distance set by way of the tie nut can be read. If the flattened region is designed in the form of recesses of the convolution of the external thread of the tie rod, the distance markings can, for example, be provided at the individual flattened regions or at the recesses of the convolution.

According to a refinement or another embodiment of the invention, distance range information is provided for the distance of the formwork elements settable by way of the formwork tie, which is to say information about a smallest and a largest distance between the formwork elements which is possible by way of the formwork tie.

So as to be able to pull the tie rod out of the set concrete after the concrete has been poured, without having to enclose the tie rod in the concrete, for example, with a permanent tube, which is to say, with a tube that remains in the concrete, an embodiment of the invention provides a tie rod that comprises a smooth-walled and conical rod section. An end of the smooth-walled, conical rod section that has a larger diameter faces the external thread comprising the tie nut that can be screwed on or is screwed on. When the formwork tie according to the invention connects two formwork elements that are disposed opposite and at a distance from one another, as intended, the smooth-walled, conical rod section of the tie rod is located between the formwork elements or between the formwork shells thereof. The smooth-walled, conical rod section of the tie rod can extend into the formwork elements.

In a preferred embodiment of the invention, the formwork tie comprises an abutment for supporting a formwork element at the rear side. The rear side is the side of the formwork element which faces away from a formwork element disposed at a distance opposite therefrom. The abutment holds the formwork element to prevent the distance thereof with respect to the formwork element disposed opposite thereof from increasing beyond a set distance. It is also possible to hold the formwork elements to prevent the distance therebetween from decreasing,

but is not mandatory for the invention. The abutment is pivotably supported in all directions at the tie nut in the manner of a ball and socket joint about a pivot point or in the manner of a universal joint about two intersecting pivot axes, wherein the support of the abutment on the tie nut does not have to comprise a ball and socket joint, universal joint or other joint. As a result of the pivotability, the abutment aligns with the formwork element when the tie rod is obliquely positioned with respect to the formwork element.

All of the features mentioned in the description and/or shown in the drawings can be implemented individually alone or in any arbitrary combination in embodiments of the invention. Embodiments of the invention that do not comprise all, but only some of the features of a claim, including of the independent claim, are possible.

The invention will be described hereafter in greater detail based on one exemplary embodiment shown in the drawings. In the drawings:

FIG. 1 shows a formwork tie according to the invention in a perspective illustration;

FIG. 2 shows a side view of the formwork tie from FIG. 1;

FIG. 3 shows a side view of the formwork tie from FIG. 1 in an illustration that is rotated 90° compared to FIG. 2;

FIG. 4 shows an enlarged illustration of a detail according to circle IV of FIG. 2;

FIG. 5 shows an enlarged illustration of a detail according to circle V of FIG. 2;

FIG. 6 shows a tie rod of the formwork tie from FIG. 1 in a side view, with the same viewing direction as in FIG. 2;

FIG. 7 shows the tie rod of the formwork tie from FIG. 1 in a side view, with the same viewing direction as in FIG. 3;

Fig. 8 shows a tie nut comprising an abutment of the formwork tie from FIG. 1 in a front view; and

Fig. 9 shows the tie nut comprising the abutment of the formwork tie from FIG. 1 in an axial section.

The formwork tie 1 according to the invention shown in FIGS. 1 to 3 is intended for connecting two non-illustrated formwork elements, which are disposed opposite and at a distance from one another. The formwork elements comprise a board made of plywood or plastic, serving

as the formwork shell, and a panel made of longitudinally and transversely extending rectangular tubes made of steel or aluminum on a rear side of the formwork shell for reinforcing the formwork shell. The rear side is the side of the formwork shell at which the panel is disposed. The two formwork elements are set up with the formwork shells thereof facing one another.

The formwork tie 1 comprises a tie rod 2, which is shown in FIGS. 6 and 7, and a tie nut 3 comprising an abutment 4, which is shown in Figs. 8 and 9.

The tie rod 2 includes two external threads 5, 6, between which a smooth-walled, conical rod section 7 is situated. The tie nut 3 can be screwed, or is screwed, onto the external thread 5 at an end of the conical rod section 7 which has a larger diameter, the tie nut for this purpose including an axial through-hole 8 including a first internal thread 9.

Turns of a convolution 10 of the external thread 5 at the end of the conical rod section 7 of the tie rod 2 which has the larger diameter include circular segment-shaped recesses at opposing circumferential locations of the external thread 5 or of the tie rod 2 in all turns, which is to say across a length of the external thread 5. In this way, planar surfaces on outer circumferences of the turns of the convolution 10 are formed in two chordal surfaces of the tie rod 2 which are parallel to one another and parallel to an axial plane of the tie rod 2 at the opposing circumferential locations of the external thread 5 or of the tie rod 2. These planar surfaces form flattened regions 11 of the tie rod 2 at the opposing circumferential locations of the tie rod 2, which extend across the length of the external thread 5. In the exemplary embodiment, the recesses of the turns of the convolution 10 forming the flattened regions 2 are as deep as the convolution 10 is high, so that the two flattened regions 11 are interrupted at the opposing circumferential locations of the tie rod 2 between the turns of the convolution 10.

The tie nut 3 is a wing nut comprising two radially projecting wings 12 to be rotatably driven by way of hammer blows. The tie nut 3 additionally comprises a hexagon 13 to be rotatably driven by way of an open-end wrench or the like, coaxially in a center between the wings 12. Nuts other than wing nuts are possible.

Radially with respect to the through-hole 8 including the first internal thread 9, the tie nut 3 includes a radial hole 14 including a second internal thread 15, which opens into the through-hole 8. A screw is screwed into the second internal thread 15 as a fixing screw 16, which can be screwed from the outside against one of the two opposing flattened regions 11 at the external thread 5 of the tie rod 2, so that the inner end thereof, facing the tie rod 2, strikes against the flattened region 11 and holds the tie nut 3 non-rotatably on the tie rod 2. This

requires the tie nut 3 to have previously been rotated into a position on the external thread 5 in which the radial hole 14 is aligned with one of the two flattened regions 11 of the tie rod 2 in such a way that the fixing screw 16 strikes against one of the two flattened regions 11. When the fixing screw 16 does not strike perpendicularly against the flattened region 11 from the outset, the fixing screw aligns automatically perpendicularly with the flattened region 11, thereby turning the tie nut 3 slightly on the external thread 5 of the tie rod 2.

The fixing screw 16 can, generally speaking, also be interpreted as a fixing element. In the exemplary embodiment, the fixing screw 16 is an eyelet bolt, but other screws or fixing elements other than a fixing screw 16 are also possible, for example a stud-shaped fixing element that, for example, acts from the outside on the flattened region 11 of the tie rod 2 in a spring-loaded manner so as to hold the tie nut 3 non-rotatably on the tie rod 2. The list is by way of example and not exhaustive.

The tie nut 3 can in each case be fixed on the tie rod 2 by way of the fixing screw 16 after half a revolution by screwing the fixing screw 16 against one of the two opposing flattened regions 11 of the tie rod 2. In this way, it is possible to fix the tie nut 3 on the tie rod 2 in steps of half a lead of the external thread 5. The formwork tie 1 according to the invention thus allows the distance of the two formwork elements that are disposed opposite one another to be set in steps that correspond to half a lead of the external thread 5 of the tie rod 2.

In the exemplary embodiment, the external thread 5 of the tie rod 2 has a lead of 10 millimeters, so that it is possible to set the tie nut 3, and thus the distance of the two formwork elements, in steps of 5 millimeters.

As is apparent from FIG. 4, numbers are provided in the planar surfaces at the circumference of the turns of the convolution 10 of the external thread 5 on the one side of the tie rod 2, which indicate the distance of the two formwork elements set by way of the tie nut 3, which is to say a clearance of the formwork shells of the formwork elements. This distance corresponds to a wall thickness of the wall to be poured using the formwork elements. In the exemplary embodiment, the numbers in the planar surfaces of one of the two flattened regions 11 indicate the distance in millimeters and can, generally speaking, also be interpreted as distance markings 17.

For rotation, the tie rod 2 includes a hexagon at an end of the external thread 5 which faces away from the smooth-walled, conical rod section 7 and the width across the corners of which is smaller than a minor diameter of the external thread 5, so that the tie nut 3 can be screwed on. As is apparent from FIG. 5, number range information is provided at the hexagon, which

indicates a smallest and a largest distance of the formwork shells settable by way of the formwork tie 1. The number range information can, generally speaking, also be interpreted as distance range information 18.

The tie nut 3 comprises a ball-shaped section 19, which is coaxial with respect to the through-hole 8 including the first internal thread 9 and is accommodated in a hollow spherical receptacle 20 of the abutment 4 of the formwork tie 1. The ball-shaped section 19 in the hollow spherical receptacle 20 forms a ball and socket joint, by way of which the abutment 4 can be pivoted with respect to the tie nut 3 and with respect to the tie rod 2 in all directions about a center of the ball-shaped section 19, serving as the pivot point. As a result, the abutment 4 automatically aligns at a formwork element when the tie rod 2 runs obliquely with respect to the formwork element.

The abutment 4 has the shape of a plate from which a collar 21 projects, which includes the hollow spherical receptacle 20. From the hollow spherical receptacle 20, an aperture continues through the plate of the abutment 4, through which the tie rod 2 passes.

At a radial distance from the collar 21, the plate of the abutment 4 has an elongated hole, which is radial with respect to the collar 21 and in which a fastening screw 22 is accommodated perpendicularly to the plate of the abutment 4, which is displaceable in the elongated hole, so that the distance thereof with respect to the collar 21, and thus with respect to the tie nut 3, can be set. The abutment 4 can be secured at an internal thread of the panel of the formwork element by way of the fastening screw 22.

So as to connect the two non-illustrated formwork elements disposed opposite and at a distance from one another, the tie rod 2 is placed through a through-hole in one of the two formwork elements until this bears against the abutment 4 at the rear side of the formwork element, where the abutment 4 can be secured by way of the fastening screw 22. Before or after the tie rod 2 has been placed through the hole in the formwork element, the distance of the two formwork elements with respect to one another can be set by turning the tie nut 3 on the tie rod 2 or by turning the tie rod 2 in the tie nut 3. So as to turn the tie nut 3 or the tie rod 2, the fixing screw 16 has to be screwed radially so far to the outside that the tie nut 3 can be rotated on the external thread 5 of the tie rod 2. When the distance has been set, the fixing screw 16 is rotated inwardly so as to strike against one of the two flattened regions 11 and hold the tie nut 3 non-rotatably on the tie rod 2, and thereby secure the set distance of the two formwork elements with respect to one another.

The tie rod 2 is also placed through a hole in the formwork element disposed on the opposite

side, at the rear side of which a nut is disposed, for example, into which the external thread 6 on the side of the smooth-walled, conical rod section 7 of the tie rod 2 which has a smaller diameter is screwed, so that the two formwork elements are connected. The distance of the two formwork elements can be set by turning the tie nut 3 on the tie rod 2.

It is also possible to screw the nut onto the external thread 6 on the rear side of the other formwork element after the tie rod 2 has been placed through, provided that the rear side of the other formwork element is accessible.

Due to the smooth-walled, conical rod section 7, the tie rod 2 can be pulled out of or unscrewed from the concrete after the concrete has set.

Claims

1. A formwork tie for connecting two formwork elements that are disposed opposite and at a distance from one another, comprising a tie rod (2), which includes an external thread (5), and a tie nut (3), which has a through-hole (8) including a first internal thread (9), by way of which the tie nut (3) is screwed onto the external thread (5) of the tie rod (2), characterized in that the tie rod (2) comprises a flattened region (11) extending in a longitudinal direction of the tie rod (2) at a circumferential location, and the tie nut (3) comprises a fixing element (16), which can be adjusted transversely to the flattened region (11) of the tie rod (2) and act on the flattened region (11) such that the fixing element (16) holds the tie nut (3) non-rotatably on the external thread (5) of the tie rod (2).
2. The formwork tie according to claim 1, characterized in that the tie rod (2) comprises a plurality of flattened regions (11) that extend in the longitudinal direction of the tie rod (2) and are distributed across a circumference of the tie rod (2).
3. The formwork tie according to claim 2, characterized in that the tie rod (2) comprises two flattened regions (11) that extend in the longitudinal direction of the tie rod (2) and are disposed opposite one another on the tie rod (2).
4. A formwork tie according to one or more of claims 1 to 3, characterized in that the turns of a convolution (10) of the external thread (5) of the tie rod (2) comprise flattened regions (11) at the outer circumference thereof, on which the fixing element (16) can act so as to hold the tie nut (3) non-rotatably on the external thread (5) of the tie rod (2).
5. A formwork tie according to one or more of the preceding claims, characterized in that the fixing element (16) is a screw element, and the tie nut (3) includes a second internal thread (15), into which the fixing element (16) is screwed and which opens into the through-hole (8) of the tie nut (3), so that, in a rotational position of the tie nut (3) on the external thread (5) of the tie rod (2), the fixing element (16) can be screwed against the flattened region (11) of the tie rod (2) so that the fixing element (16) holds the tie nut (3) non-rotatably on the tie rod (2).

6. The formwork tie according to claim 5, characterized in that the second internal thread (15) extends radially with respect to the through-hole (8) including the first internal thread (9) of the tie nut (3).

7. A formwork tie according to one or more of the preceding claims, characterized in that the external thread (5) of the tie rod (2) has a pitch of 10 mm.

8. A formwork tie according to one or more of the preceding claims, characterized in that the tie rod (2) includes distance markings (17) for the distance of the formwork elements set by way of the tie nut (3) and/or distance range information (18) for a distance of the formwork elements settable by way of the formwork tie (1).

9. A formwork tie according to claims 4 and 8, characterized in that the distance markings (17) are disposed at the flattened regions (11) of the convolution (10).

10. A formwork tie according to one or more of the preceding claims, characterized in that the tie rod (2) comprises a smooth-walled and conical rod section (7), the end of which having the larger diameter faces the external thread (5) of the tie rod (2).

11. A formwork tie according to one or more of the preceding claims, characterized in that the formwork tie (1) comprises an abutment (4) for a rear side, facing away from the other formwork element, of the one formwork element which is pivotably supported in all directions at the tie nut (3).

