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(54) **REBAR COUPLER HAVING DOUBLE-ECCENTRIC ADJUSTMENT FUNCTION, AND COUPLING METHOD**

(57) The present invention relates to a reinforcing bar connector with a dual eccentric adjustment function and a connection method, belonging to the field of construction engineering. The present invention includes a first connecting sleeve and a second connecting sleeve, where the first connecting sleeve and the second connecting sleeve are connected by a body of the reinforcing bar connector; the body of the reinforcing bar connector includes an eccentric bolt assembly and an eccentric screw assembly; the first connecting sleeve is connected to the eccentric bolt assembly, and the second connect-

ing sleeve is connected to the eccentric screw assembly; the eccentric bolt assembly cooperates with the eccentric screw assembly; the eccentric bolt assembly includes an eccentric bolt and a connecting threaded sleeve, the eccentric screw assembly includes an eccentric screw; the first connecting sleeve is threadedly connected to a bolt shank, and the second connecting sleeve is threadedly connected to a screw shank; the connecting threaded sleeve is located on the bolt shank, and a bolt head cooperates with a screw head via the connecting threaded sleeve.

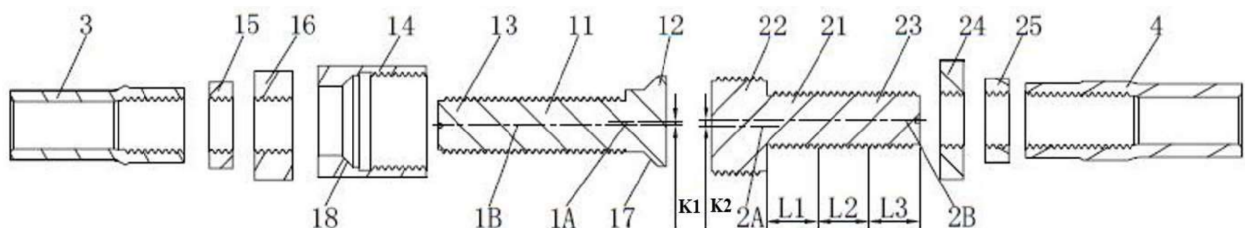


FIG. 10

Description

TECHNICAL FIELD

[0001] The present invention relates to a reinforcing bar connector with a dual eccentric adjustment function and a connection method, belonging to the field of construction engineering.

BACKGROUND TECHNOLOGY

[0002] In building construction, it is often necessary to connect reinforcing bars. For prefabricated concrete structures, such as the connection between precast concrete components and foundations, or the connections between precast beams and between precast columns, the reinforcing bars to be connected are already cast in the concrete components. The reinforcing bars to be connected on both sides cannot rotate, and there is a certain axial deviation. Furthermore, there is a certain gap between the reinforcing bars at both ends, and the gap between each group of reinforcing bars is not entirely the same.

[0003] In the prior art, grouting sleeves, double-layer threaded sleeves, or internal-external threaded sleeves are commonly used to connect two reinforcing bars. These methods have the following disadvantages: (1) When grouting sleeves are adopted for connection, the operation is cumbersome and costly, and the connection strength depends on a chemical process, making it difficult to control the connection quality; (2) When a mechanical connection such as double-layer threaded sleeves or internal-external threaded sleeves is adopted, regardless of the connection method of the double-layer threaded sleeves or the internal-external threaded sleeves, most methods still employ a tubular structure with both internal and external threads, resulting in a complex structure, numerous components, and high precision requirements for component processing, leading to high cost and construction difficulty; a single connection involves multiple threaded pair connections, potentially reaching four threaded pair connections due to the double-layer nut structure.

[0004] In view of this, patent document with application number CN 201821914415.X discloses a reinforcing bar connection device with a dual eccentric structure. In the aforementioned prior art, an eccentric adjustment function is achieved through eccentric internal and external threaded nuts and eccentric sleeves, but after adjustment, locking cannot be performed, making it difficult to guarantee strength.

[0005] In view of this, patent document with application number CN 202022055035.9 discloses a reinforcing bar connection device. The reinforcing bar connection device in the above-mentioned prior art is large in size and inconvenient to use.

[0006] In view of this, patent document with application number CN 202121092262.7 discloses a reinforcing bar

mechanical connection mechanism. In the above-mentioned prior art, eccentric adjustment is achieved by setting a first eccentric threaded sleeve (3) and a second eccentric threaded sleeve (4). Since the first eccentric threaded sleeve (3) and the second eccentric threaded sleeve (4) are provided with internal threads and external threads, it is inconvenient to control them during adjustment.

10 CONTENT OF THE INVENTION

[0007] An objective of the present invention is to overcome the above-mentioned shortcomings in the prior art and provide a reinforcing bar connector with dual eccentric adjustment function and a connection method with a reasonable structural design, which is suitable for two reinforcing bars with a large radial deviation, and capable of covering the radial deviation of the two reinforcing bars by the dual adjustment eccentricity.

[0008] The technical solution adopted by the present invention to solve the above problems is as follows: a reinforcing bar connector with dual eccentric adjustment function, including a first connecting sleeve configured to be connected to a first reinforcing bar and a second connecting sleeve configured to be connected to a second reinforcing bar, where the first connecting sleeve and the second connecting sleeve are connected by a body of the reinforcing bar connector that compensates for a distance of being an actual eccentricity between an axis of the first reinforcing bar and an axis of the second reinforcing bar during a connection process;

the body of the reinforcing bar connector includes an eccentric bolt assembly and an eccentric screw assembly, where the first connecting sleeve is connected to the eccentric bolt assembly, the second connecting sleeve is connected to the eccentric screw assembly, and the eccentric bolt assembly cooperates with the eccentric screw assembly;

the eccentric bolt assembly includes an eccentric bolt, a connecting threaded sleeve, a first locking nut and a threaded sleeve locking nut, where the eccentric bolt includes a bolt head and a bolt shank with parallel and staggered axes, and a distance between an axis of the bolt head and an axis of the bolt shank is a bolt eccentricity; and both the first locking nut and the threaded sleeve locking nut are sleeved on the bolt shank;

the eccentric screw assembly includes an eccentric screw, a screw adjusting nut and a second locking nut, where the eccentric screw includes a screw head and a screw shank with parallel and staggered axes, and a distance between an axis of the screw head and an axis of the screw shank is a screw eccentricity; and both the screw adjusting nut and the second locking nut are sleeved on the screw shank; and

the first connecting sleeve is threadedly connected

to the bolt shank, the second connecting sleeve is threadedly connected to the screw shank, the connecting threaded sleeve is located on the bolt shank, and the bolt head cooperates with the screw head by the connecting threaded sleeve; the first locking nut cooperates with the first connecting sleeve, the threaded sleeve locking nut cooperates with the connecting threaded sleeve, the screw adjusting nut cooperates with the connecting threaded sleeve, and the second locking nut cooperates with the second connecting sleeve. In the reinforcing bar connector, the eccentric bolt assembly and the eccentric screw assembly are provided to compensate for a radial deviation during the connection of the reinforcing bars. The first locking nut is provided to lock the bolt shank and a first connecting sleeve, and a threaded sleeve locking nut is provided to lock the connecting threaded sleeve. The screw adjusting nut is provided to adjust the length of the screw shank within the second connecting sleeve, and simultaneously lock the screw head and the connecting threaded sleeve. The second locking nut is provided to lock the screw shank and the second connecting sleeve.

[0009] Further, the bolt eccentricity is equal to the screw eccentricity.

[0010] Further, a sum of the bolt eccentricity and the screw eccentricity is a maximum adjustment eccentricity. The radial deviation coverage range is large.

[0011] Further, a limiting platform is provided on the bolt head, a limiting ring is provided on the connecting threaded sleeve, and the limiting ring cooperates with the limiting platform. The limiting platform is frustum-shaped, annular, or spherical, and configured to be adapted to the limiting ring. The shape of the limiting platform includes, but is not limited to, the shapes listed above. The shape of the limiting ring cooperates with the shape of the limiting platform, with the purpose of pulling the bolt shank by the connecting threaded sleeve. This allows the connecting threaded sleeve to pull the bolt head when the connecting threaded sleeve is screwed into the screw head, and the limiting ring and the limiting platform are provided to withstand tensile loads.

[0012] Further, the screw shank is provided with a nut section, a screw-out section and a connecting section.

[0013] Further, in an initial state, an axial gap exists between the bolt head and the screw head, and the screw-out section is greater than the axial gap. The screw-out section is screwed out, and the length screwed out by the screw-out section compensates for the length of the axial gap. The length of the connecting section is determined by the length of the eccentric screw in the second connecting sleeve.

[0014] Further, the first connecting sleeve is threadedly connected to or crimped to the first reinforcing bar, and the second connecting sleeve is threadedly connected to or crimped to the second reinforcing bar. If the first con-

necting sleeve and the second connecting sleeve have smooth holes at the rear portions, they can be connected to the first reinforcing bar and the second reinforcing bar using a crimping method; if they have internal threads, they can be used to connect to the reinforcing bar threads, thereby connecting the first connecting sleeve and the second connecting sleeve to the first reinforcing bar and the second reinforcing bar.

[0015] Further, the bolt shank is threadedly connected to the first connecting sleeve, and the screw shank is threadedly connected to the second connecting sleeve; and the bolt head is located inside the connecting threaded sleeve, and the connecting threaded sleeve is threadedly connected to the screw head.

[0016] Further, another technical objective of the present invention is to provide a reinforcing bar connection method for a reinforcing bar connector with a dual eccentric adjustment function.

[0017] The above-mentioned technical objective of the present invention is achieved through the following technical solution.

[0018] A reinforcing bar connection method for a reinforcing bar connector with a dual eccentric adjustment function, where a method for connecting the first connecting sleeve and the second connecting sleeve using the body of the reinforcing bar connector is as follows:

(1): rotating the first locking nut to allow the bolt shank to be in a non-locked state in the first connecting sleeve, and rotating the screw adjusting nut to allow the screw shank to be screwed out of the second connecting sleeve;

(2): rotating the eccentric bolt; when a bolt head center point coincides with a screw head center point, rotating the screw adjusting nut until an end face of the screw head is adjacent to an end face of the bolt head; and rotating the screw shank and the bolt shank to align them with each other;

(3): sleeving the connecting threaded sleeve on the screw head, and rotating the second locking nut to lock the screw shank and the second connecting sleeve; reversely rotating the screw adjusting nut to form a distance between the screw adjusting nut and the screw head; and then rotating the first locking nut to lock the bolt shank and the first connecting sleeve; and

(4): fully screwing the connecting threaded sleeve into the screw head so that a limiting ring is in contact with a limiting platform; and rotating the threaded sleeve locking nut to lock the threaded sleeve locking nut to one end of the connecting threaded sleeve, and rotating the screw adjusting nut to lock the screw adjusting nut to the other end of the connecting threaded sleeve, so as to complete the connection.

[0019] Further, before connection, the first connecting sleeve and the second connecting sleeve are connected to the first reinforcing bar and the second reinforcing bar

respectively in advance, and the first reinforcing bar and the second reinforcing bar are roughly aligned; and when a screw-out section is greater than an axial gap and the actual eccentricity is less than a maximum adjustment eccentricity, the first connecting sleeve and the second connecting sleeve are allowed to be connected through the body of the reinforcing bar connector.

[0020] Compared with the prior art, the present invention has the following advantages: 1. By using the eccentric bolt and the eccentric screw with the identical adjustment eccentricity, when the actual eccentricity of the first reinforcing bar and the second reinforcing bar is less than the maximum adjustment eccentricity, the rotation angle of the bolt shank and/or screw shank is adjusted to achieve the concentricity of the bolt head and the screw head, thereby connecting the first reinforcing bar and the second reinforcing bar.

[0021] 2. Since the bolt eccentricity and the screw eccentricity are equal and both are an adjustment eccentricity, a single adjustment eccentricity can provide the radial deviation coverage of the reinforcing bar of being twice the adjustment eccentricity (i.e., the maximum adjustment eccentricity), significantly reducing the size of the connecting threaded sleeve while providing greater adjustment for the axial eccentricity of the reinforcing bar.

[0022] 3. Both the bolt shank and the screw shank have a considerable length exposed outside the first connecting sleeve and the second connecting sleeve, and this exposed length has a certain amount of elastic deformation. Moreover, during assembly, the bolt shank and the screw shank are in a non-locked state to fully utilize the threaded gap between the bolt shank in the first connecting sleeve and the screw shank in the second connecting sleeve, both of which provide an additional floating space for the connecting threaded sleeve to be screwed into the screw head.

[0023] 4. The first connecting sleeve and the second connecting sleeve can be standard sleeves, and this reinforcing bar connector can cooperate with standard sleeves for use.

DESCRIPTION OF THE DRAWINGS

[0024]

FIG. 1 is a schematic diagram 1 of a connection process of a reinforcing bar connector according to an embodiment of the present invention.

FIG. 2 is a schematic diagram 2 of the connection process of the reinforcing bar connector according to an embodiment of the present invention.

FIG. 3 is a schematic diagram 3 of the connection process of the reinforcing bar connector according to an embodiment of the present invention.

FIG. 4 is a schematic diagram 4 of the connection process of the reinforcing bar connector according to an embodiment of the present invention.

FIG. 5 is a schematic diagram 5 of the connection

process of the reinforcing bar connector according to an embodiment of the present invention.

FIG. 6 is a structural schematic diagram 1 of an eccentric adjustment state of the reinforcing bar connector according to an embodiment of the present invention.

FIG. 7 is a structural schematic diagram 2 of an eccentric adjustment state of the reinforcing bar connector according to an embodiment of the present invention.

FIG. 8 is a structural schematic diagram 3 of an eccentric adjustment state of the reinforcing bar connector according to an embodiment of the present invention.

FIG. 9 is a structural schematic diagram 4 of an eccentric adjustment state of the reinforcing bar connector according to an embodiment of the present invention.

FIG. 10 is a cross-sectional view of the structure of the reinforcing bar connector according to an embodiment of the present invention.

FIG. 11 is a perspective view of the structure of the reinforcing bar connector according to an embodiment of the present invention.

[0025] In the figures: eccentric bolt assembly 1, eccentric screw assembly 2, first connecting sleeve 3, second connecting sleeve 4, first reinforcing bar 5, second reinforcing bar 6,

eccentric bolt 11, bolt head 12, bolt shank 13, connecting threaded sleeve 14, first locking nut 15, threaded sleeve locking nut 16, limiting platform 17, limiting ring 18,

bolt head center point 1A, bolt shank center point 1B, eccentric screw 21, screw head 22, screw shank 23, screw adjusting nut 24, second locking nut 25, screw head center point 2A, screw shank center point 2B,

nut section L1, screw-out section L2, connecting section L3, axial gap G,

bolt eccentricity K1, screw eccentricity K2, adjustment eccentricity K, maximum adjustment eccentricity 2K, actual eccentricity ΔK .

SPECIFIC IMPLEMENTATIONS

[0026] The present invention will be further described in detail below with reference to the drawings and embodiments. These embodiments are illustrative of the present invention, and the present invention is not limited to these embodiments.

[0027] Referring to FIGS. 1-11: The reinforcing bar connector with dual eccentric adjustment function in this embodiment includes the first connecting sleeve 3 configured to be connected to the first reinforcing bar 5 and the second connecting sleeve 4 configured to be connected to the second reinforcing bar 6. The first connect-

ing sleeve 3 and the second connecting sleeve 4 are connected by the body of the reinforcing bar connector that compensates for the distance of being the actual eccentricity ΔK between the axis of the first reinforcing bar 5 and the axis of the second reinforcing bar 6 during a connection process. The first connecting sleeve 3 is threadedly connected to or crimped to the first reinforcing bar 5, and the second connecting sleeve 4 is threadedly connected to or crimped to the second reinforcing bar 6. Specifically, the actual eccentricity ΔK refers to the radial distance between the axis of the first reinforcing bar 5 and the axis of the second reinforcing bar 6 when the axes are parallel in the axial direction.

[0028] In this embodiment, the body of the reinforcing bar connector includes the eccentric bolt assembly 1 and the eccentric screw assembly 2. The first connecting sleeve 3 is connected to the eccentric bolt assembly 1, and the second connecting sleeve 4 is connected to the eccentric screw assembly 2. The eccentric bolt assembly 1 cooperates with the eccentric screw assembly 2.

[0029] In this embodiment, the eccentric bolt assembly 1 includes the eccentric bolt 11, the connecting threaded sleeve 14, the first locking nut 15, and the threaded sleeve locking nut 16. The eccentric bolt 11 includes the bolt head 12 and the bolt shank 13 with parallel and staggered axes. The distance between the two axes is the bolt eccentricity K_1 .

[0030] In this embodiment, the eccentric screw assembly 2 includes the eccentric screw 21, the screw adjusting nut 24, and the second locking nut 25. One end of the eccentric screw 21 is the screw head 22. The eccentric screw 21 includes the screw head 22 and the screw shank 23 with parallel and staggered axes. The distance between the two axes is the screw eccentricity K_2 .

[0031] In this embodiment, the bolt eccentricity K_1 and the screw eccentricity K_2 are equal and both an adjustment eccentricity K . The sum of the bolt eccentricity K_1 and the screw eccentricity K_2 is the maximum adjustment eccentricity $2K$, that is, the maximum adjustment eccentricity $2K$ is equal to twice the adjustment eccentricity K .

[0032] In this embodiment, the limiting platform 17 is provided on the bolt head 12, the limiting ring 18 is provided on the connecting threaded sleeve 14, and the limiting ring 18 cooperates with the limiting platform 17. The central portion of the limiting ring 18 is the bolt hole, and the bolt shank 13 passes through the bolt hole. The limiting ring 18 is in contact with the limiting platform 17. The limiting platform 17 may be frustum-shaped, annular, or spherical, and configured to be adapted to the limiting ring 18. After the connecting threaded sleeve 14 is screwed into the screw head 22, the firm connection can be achieved by tightly pressing the limiting platform 17 with the limiting ring 18.

[0033] In this embodiment, the first connecting sleeve 3 is threadedly connected to the bolt shank 13. The first locking nut 15 and the threaded sleeve locking nut 16 are both sleeved on the bolt shank 13. The first locking nut 15 is in contact with the first connecting sleeve 3, and the

threaded sleeve locking nut 16 is in contact with the connecting threaded sleeve 14. The second connecting sleeve 4 is threadedly connected to the screw shank 23. The screw adjusting nut 24 and the second locking nut 25 are both sleeved on the screw shank 23. The screw adjusting nut 24 is in contact with the connecting threaded sleeve 14, and the second locking nut 25 is in contact with the second connecting sleeve 4. The connecting threaded sleeve 14 is located on the bolt shank 13, and the bolt head 12 cooperates with the screw head 22 by the connecting threaded sleeve 14. That is, the bolt head 12 is located inside the connecting threaded sleeve 14, and the connecting threaded sleeve 14 is threadedly connected to the screw head 22. The axis of the connecting threaded sleeve 14 coincides with the axis of the bolt head 12 and the axis of the screw head 22.

[0034] In this embodiment, the screw shank 23 is provided with the nut section L1, the screw-out section L2, and the connecting section L3. In the initial state, the axial gap G exists between the bolt head 12 and the screw head 22, and the screw-out section L2 is greater than the axial gap G . The nut section L1 is used to install the screw adjusting nut 24 and the second locking nut 25 in the initial state. The screw-out section L2 is used to compensate for the length of the axial gap G . The connecting section L3 is used to be connected to the second connecting sleeve 4. The length of the connecting section L3 is determined by the length of the eccentric screw 21 in the second connecting sleeve 4, and the length of the axial gap G is determined by the body of the reinforcing bar connector.

[0035] The "initial state" refers to the state after the eccentric bolt assembly 1 is connected to the first connecting sleeve 3 and the eccentric screw assembly 2 is connected to the second connecting sleeve 4 and before the body of the reinforcing bar connector is screwed, as shown in FIG. 1.

[0036] The reinforcing bar connection method of the reinforcing bar connector with dual eccentric adjustment function in this embodiment is as follows:

[0037] Before connection, the first connecting sleeve 3 and the second connecting sleeve 4 are connected to the first reinforcing bar 5 and the second reinforcing bar 6 respectively in advance, and the first reinforcing bar 5 and the second reinforcing bar 6 are roughly aligned. When the screw-out section L2 is greater than the axial gap G and the actual eccentricity ΔK is less than the maximum adjustment eccentricity $2K$, the first connecting sleeve 3 and the second connecting sleeve 4 are allowed to be connected through the body of the reinforcing bar connector.

[0038] The method for connecting the first connecting sleeve 3 and the second connecting sleeve 4 using the body of the reinforcing bar connector is as follows:

- (1) The first locking nut 15 is rotated to allow the bolt shank 13 to be in the non-locked state in the first connecting sleeve 3 (so that the bolt shank 13 rotates in the first connecting sleeve 3, allowing adjustment

of the length of the bolt shank 13 extending out of the first connecting sleeve 3), and the screw adjusting nut 24 is rotated to allow the screw shank 23 to be screwed out of the second connecting sleeve 4 (at this time, the screw shank 23 is in the non-locked state in the second connecting sleeve 4, and when the screw adjusting nut 24 is rotated, the screw adjusting nut 24 is in contact with the screw head 22, as shown in FIG. 1).

Specifically, the eccentric screw 21 and the screw adjusting nut 24 can be provided as an integral structure (that is, the structure similar to the screw adjusting nut 24 is directly machined on the eccentric screw 21, which also facilitates unscrewing the eccentric screw 21), or they can be provided as separate structures (i.e., the embodiment in the present application).

(2) The eccentric bolt 11 is rotated. When the bolt head center point 1A coincides with the screw head center point 2A (normally, the eccentric bolt 11 is rotated by less than half a turn to sufficiently align the bolt head 12 with the screw head 22), the screw adjusting nut 24 is rotated until an end face of the screw head 22 is adjacent to an end face of the bolt head 12 (as shown in FIG. 2). The screw shank 23 and the bolt shank 13 are rotated to align them (the screw head 22 and the bolt head 12) with each other.

(3) The connecting threaded sleeve 14 is sleeved on the screw head 22 (that is, the connecting threaded sleeve 14 is screwed on the screw head 22 with 2-3 threads), and the second locking nut 25 is rotated to lock the screw shank 23 and the second connecting sleeve 4. The screw adjusting nut 24 is reversely rotated so that there is a distance between the screw adjusting nut 24 and the screw head 22, so that the connecting threaded sleeve 14 is not interfered with by the adjusting nut 24 when the connecting threaded sleeve 14 is screwed. Then the first locking nut 15 is rotated to lock the bolt shank 13 and the first connecting sleeve 3 (as shown in FIG. 3).

(4) The connecting threaded sleeve 14 is fully screwed into the screw head 22 so that the limiting ring 18 is in contact with the limiting platform 17. At this time, the screw head 22 is fully inserted into the connecting threaded sleeve 14, and there is a distance between an end of the screw head 22 and an end of the connecting threaded sleeve 14 (as shown in FIG. 4). The threaded sleeve locking nut 16 is rotated to lock the threaded sleeve locking nut 16 to one end of the connecting threaded sleeve 14, and the screw adjusting nut 24 is rotated to lock the screw adjusting nut 24 to the other end of the connecting threaded sleeve 14, so as to complete the connection (as shown in FIG. 5). If the eccentric screw 21 and the screw adjusting nut 24 are of the integral structure, when the screw head 22 and the bolt head 12 are butted against each other, the connecting threaded sleeve 14 and the screw head 22 are

tightened to achieve locking.

[0039] Specifically, when the reinforcing bar connector is used, the eccentric bolt 11 is rotated. According to the eccentric principle, the bolt eccentricity K1 trajectory is intersected with the screw eccentricity K2 trajectory when the eccentric bolt 11 is rotated. Generally, within half a turn, the bolt head center point 1A and the screw head center point 2A have an intersecting point. When the bolt head center point 1A coincides with the screw head center point 2A, the connecting threaded sleeve 14 can be partially screwed onto the thread of the screw head 22. Typically, the connecting threaded sleeve 14 is screwed onto 2-3 threads of the screw head 22. Then, after the eccentric bolt assembly 1 and the eccentric screw assembly 2 are locked with the first connecting sleeve 3 and the second connecting sleeve 4 respectively, the connecting threaded sleeve 14 is further fully screwed onto the thread of the screw head 22 and tightened.

[0040] As shown in FIG. 6, eccentricity adjustment state state 1: The bolt head center point 1A and the screw head center point 2A are on the same axis, and meanwhile the bolt shank center point 1B and the screw shank center point 2B are also on the same axis, where the actual eccentricity ΔK is zero.

[0041] As shown in FIG. 7, eccentricity adjustment state state 2: The bolt shank 13 or the screw shank 23 is rotated approximately $1/6$ turn so that the bolt head center point 1A and the screw head center point 2A are on the same axis. At this time, the actual eccentricity ΔK is 1 time the adjustment eccentricity K.

[0042] As shown in FIG. 8, eccentricity adjustment state state 3: The bolt shank 13 or the screw shank 23 is rotated approximately $1/3$ turn so that the bolt head center point 1A and the screw head center point 2A are on the same axis. At this time, the actual eccentricity ΔK is 1.732 times the adjustment eccentricity K.

[0043] As shown in FIG. 9, eccentricity adjustment state state 4: At this time, the bolt head center point 1A and the screw head center point 2A are on the same axis, and the actual eccentricity ΔK is twice the adjustment eccentricity K, that is, at this time, the actual eccentricity ΔK is the maximum adjustment eccentricity 2K.

[0044] Furthermore, it should be noted that the specific embodiments described in the specification may have different shapes and names for their parts and components. The above content described in the specification is merely an illustrative example of the structure of the present invention.

Claims

1. A reinforcing bar connector with dual eccentric adjustment function, comprising a first connecting sleeve (3) configured to be connected to a first reinforcing bar (5) and a second connecting sleeve (4)

configured to be connected to a second reinforcing bar (6), wherein the first connecting sleeve (3) and the second connecting sleeve (4) are connected by a body of the reinforcing bar connector that compensates for a distance of being an actual eccentricity (ΔK) between an axis of the first reinforcing bar (5) and an axis of the second reinforcing bar (6) during a connection process;

the body of the reinforcing bar connector comprises an eccentric bolt assembly (1) and an eccentric screw assembly (2), wherein the first connecting sleeve (3) is connected to the eccentric bolt assembly (1), the second connecting sleeve (4) is connected to the eccentric screw assembly (2), and the eccentric bolt assembly (1) cooperates with the eccentric screw assembly (2);

the eccentric bolt assembly (1) comprises an eccentric bolt (11), a connecting threaded sleeve (14), a first locking nut (15) and a threaded sleeve locking nut (16), wherein the eccentric bolt (11) comprises a bolt head (12) and a bolt shank (13) with parallel and staggered axes, and a distance between an axis of the bolt head (12) and an axis of the bolt shank (13) is a bolt eccentricity (K1); and both the first locking nut (15) and the threaded sleeve locking nut (16) are sleeved on the bolt shank (13);

the eccentric screw assembly (2) comprises an eccentric screw (21), a screw adjusting nut (24) and a second locking nut (25), wherein the eccentric screw (21) comprises a screw head (22) and a screw shank (23) with parallel and staggered axes, and a distance between an axis of the screw head (22) and an axis of the screw shank (23) is a screw eccentricity (K2); and both the screw adjusting nut (24) and the second locking nut (25) are sleeved on the screw shank (23); and

the first connecting sleeve (3) is threadedly connected to the bolt shank (13), the second connecting sleeve (4) is threadedly connected to the screw shank (23), the connecting threaded sleeve (14) is located on the bolt shank (13), and the bolt head (12) cooperates with the screw head (22) by the connecting threaded sleeve (14); the first locking nut (15) cooperates with the first connecting sleeve (3), the threaded sleeve locking nut (16) cooperates with the connecting threaded sleeve (14), the screw adjusting nut (24) cooperates with the connecting threaded sleeve (14), and the second locking nut (25) cooperates with the second connecting sleeve (4).

2. The reinforcing bar connector with the dual eccentric adjustment function according to claim 1, wherein

the bolt eccentricity (K1) is equal to the screw eccentricity (K2).

3. The reinforcing bar connector with the dual eccentric adjustment function according to claim 1, wherein a sum of the bolt eccentricity (K1) and the screw eccentricity (K2) is a maximum adjustment eccentricity (2K).
4. The reinforcing bar connector with the dual eccentric adjustment function according to claim 1, wherein a limiting platform (17) is provided on the bolt head (12), a limiting ring (18) is provided on the connecting threaded sleeve (14), and the limiting ring (18) cooperates with the limiting platform (17).
5. The reinforcing bar connector with the dual eccentric adjustment function according to claim 1, wherein the screw shank (23) is provided with a nut section (L1), a screw-out section (L2) and a connecting section (L3).
6. The reinforcing bar connector with the dual eccentric adjustment function according to claim 5, wherein in an initial state, an axial gap (G) exists between the bolt head (12) and the screw head (22), and the screw-out section (L2) is greater than the axial gap (G).
7. The reinforcing bar connector with the dual eccentric adjustment function according to claim 1, wherein the first connecting sleeve (3) is threadedly connected to or crimped to the first reinforcing bar (5), and the second connecting sleeve (4) is threadedly connected to or crimped to the second reinforcing bar (6).
8. The reinforcing bar connector with the dual eccentric adjustment function according to claim 1, wherein the bolt head (12) is located inside the connecting threaded sleeve (14), and the connecting threaded sleeve (14) is threadedly connected to the screw head (22).
9. A reinforcing bar connection method of the reinforcing bar connector with the dual eccentric adjustment function according to any one of claims 1-8, wherein a method for connecting the first connecting sleeve (3) and the second connecting sleeve (4) using the body of the reinforcing bar connector is as follows:

(1): rotating the first locking nut (15) to allow the bolt shank (13) to be in a non-locked state in the first connecting sleeve (3), and rotating the screw adjusting nut (24) to allow the screw shank (23) to be screwed out of the second connecting sleeve (4);

(2): rotating the eccentric bolt (11); when a bolt head center point (1A) coincides with a screw head center point (2A), rotating the screw adjusting nut (24) until an end face of the screw head (22) is adjacent to an end face of the bolt head (12); and rotating the screw shank (23) and the bolt shank (13) to align them with each other; 5

(3): sleeving the connecting threaded sleeve (14) on the screw head (22), and rotating the second locking nut (25) to lock lock the screw shank (23) and the second connecting sleeve (4); reversely rotating the screw adjusting nut (24) to form a distance between the screw adjusting nut (24) and the screw head (22); and 10

then rotating the first locking nut (15) to lock the bolt shank (13) and the first connecting sleeve (3); and 15

(4): fully screwing the connecting threaded sleeve (14) into the screw head (22) so that a limiting ring 18 is in contact with a limiting platform 17; and rotating the threaded sleeve locking nut (16) to lock the threaded sleeve locking nut (16) to one end of the connecting threaded sleeve (14), and rotating the screw adjusting nut (24) to lock the screw adjusting nut (24) to the 20

other end of the connecting threaded sleeve (14), so as to complete connection. 25

10. The reinforcing bar connection method of the reinforcing bar connector with the dual eccentric adjustment function according to claim 9, wherein before the connection, the first connecting sleeve (3) and the second connecting sleeve (4) are connected to the first reinforcing bar (5) and the second reinforcing bar (6) respectively in advance, and the first reinforcing bar (5) and the second reinforcing bar (6) are roughly aligned; and when a screw-out section (L2) is greater than an axial gap (G) and the actual eccentricity (ΔK) is less than a maximum adjustment eccentricity (2K), the first connecting sleeve (3) and the second connecting sleeve (4) are allowed to be connected through the body of the reinforcing bar connector. 30
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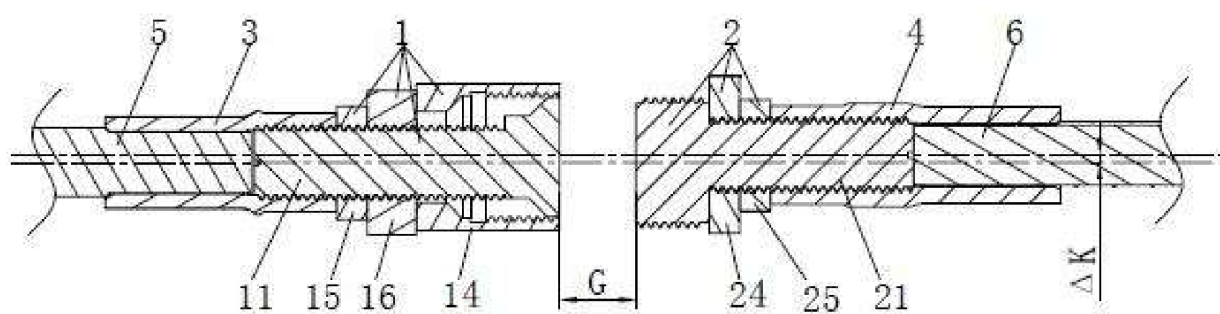


FIG. 1

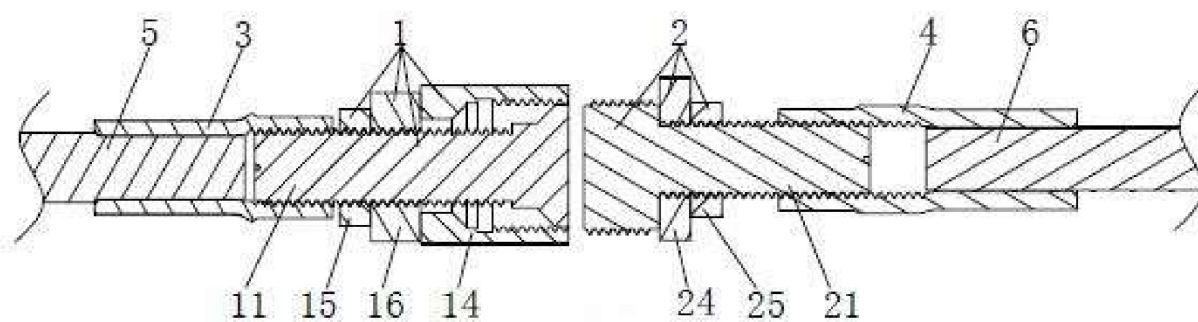


FIG. 2

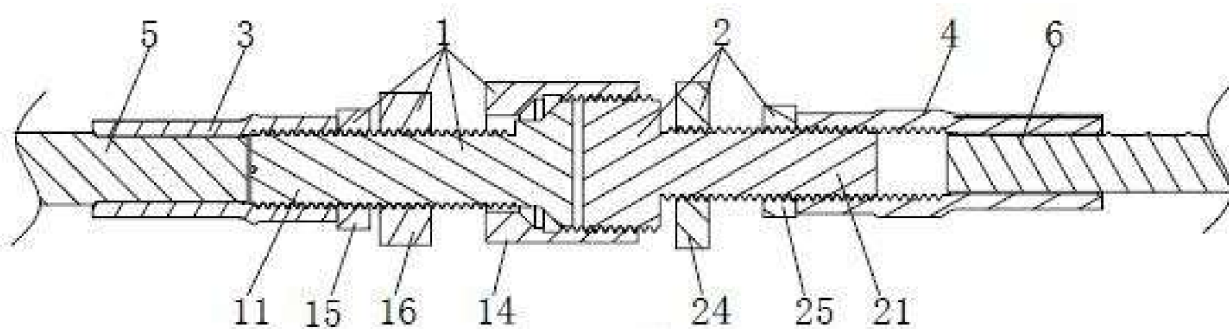


FIG. 3

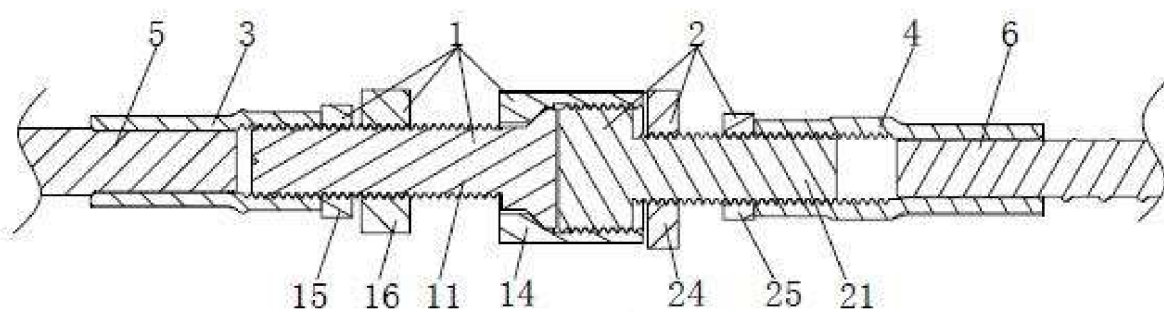


FIG. 4

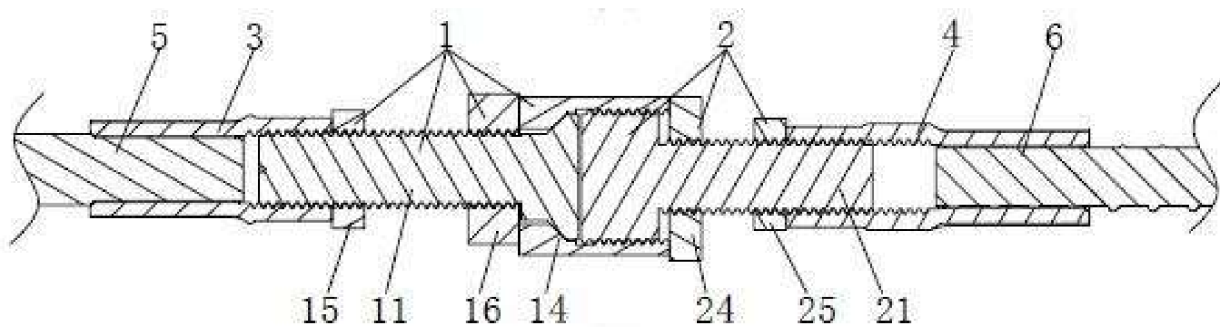


FIG. 5

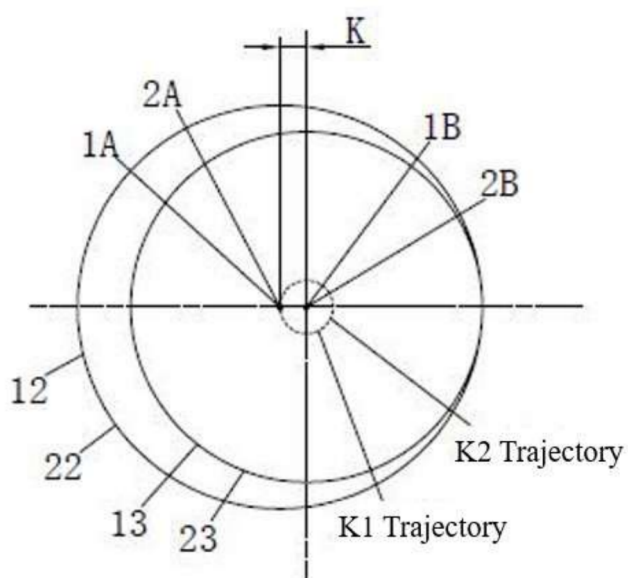


FIG. 6

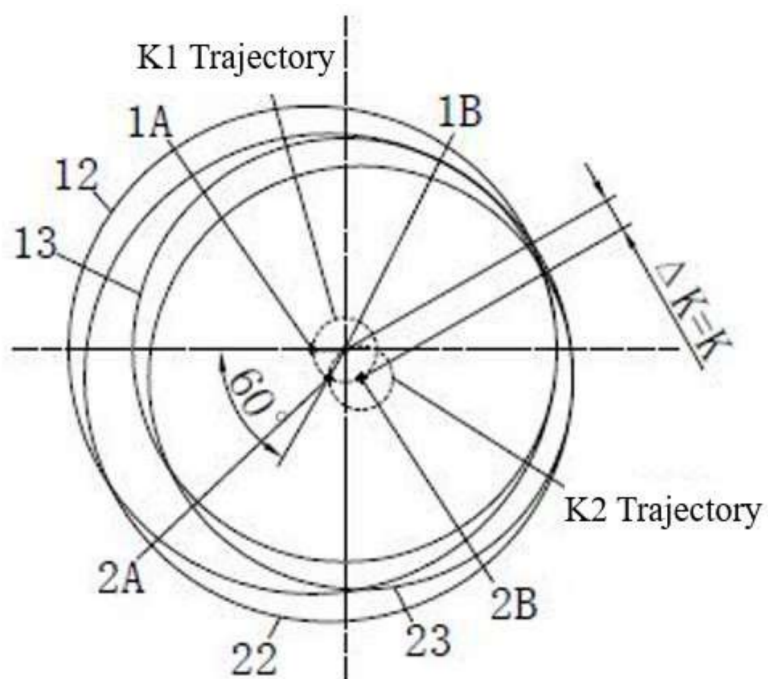


FIG. 7

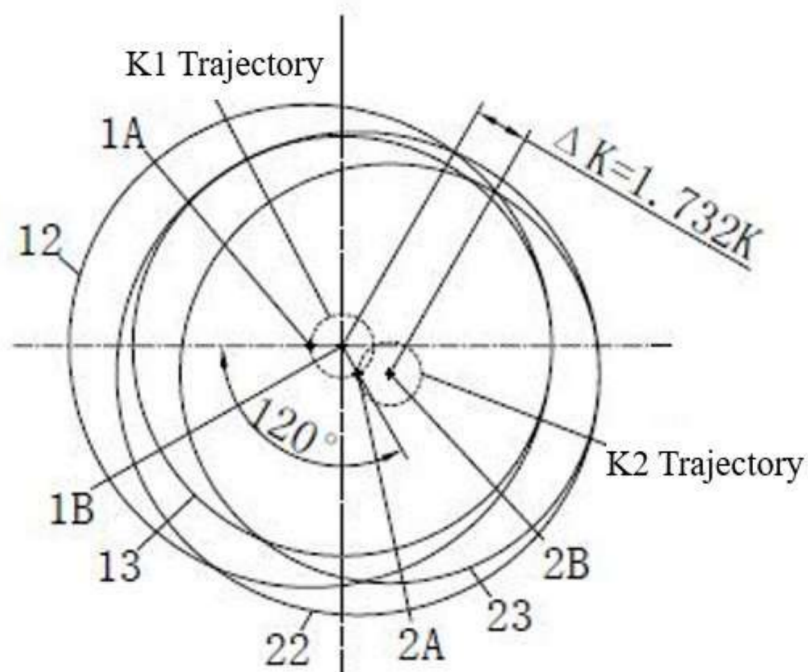


FIG. 8

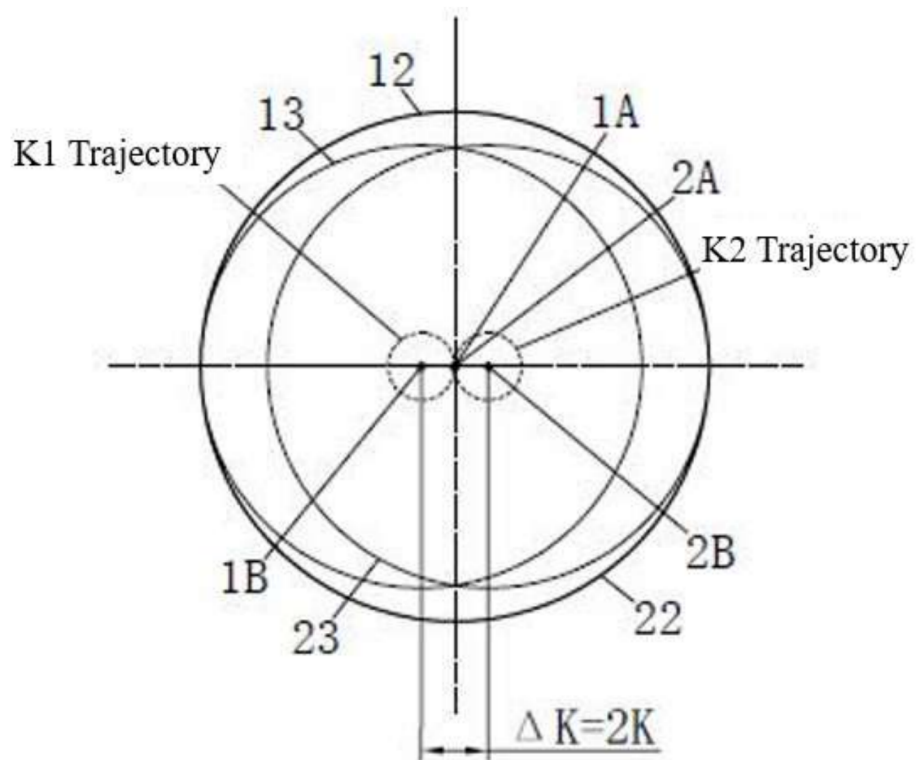


FIG. 9

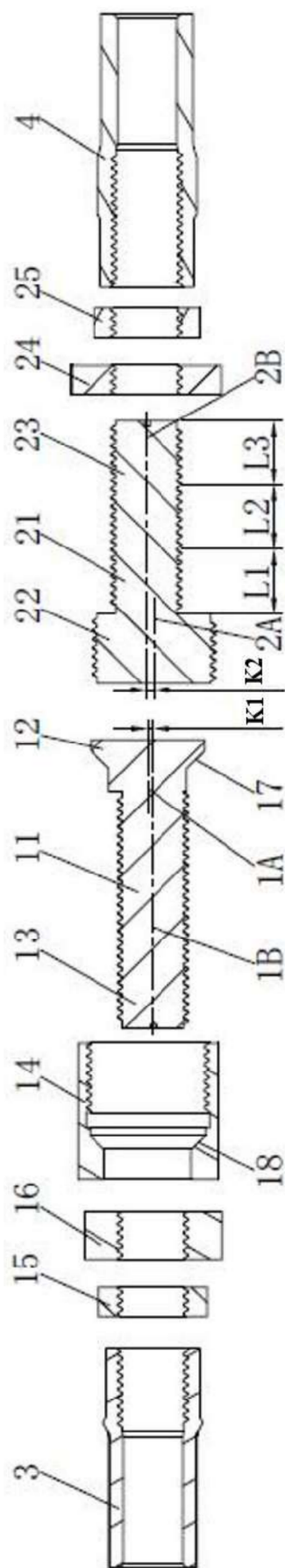


FIG. 10

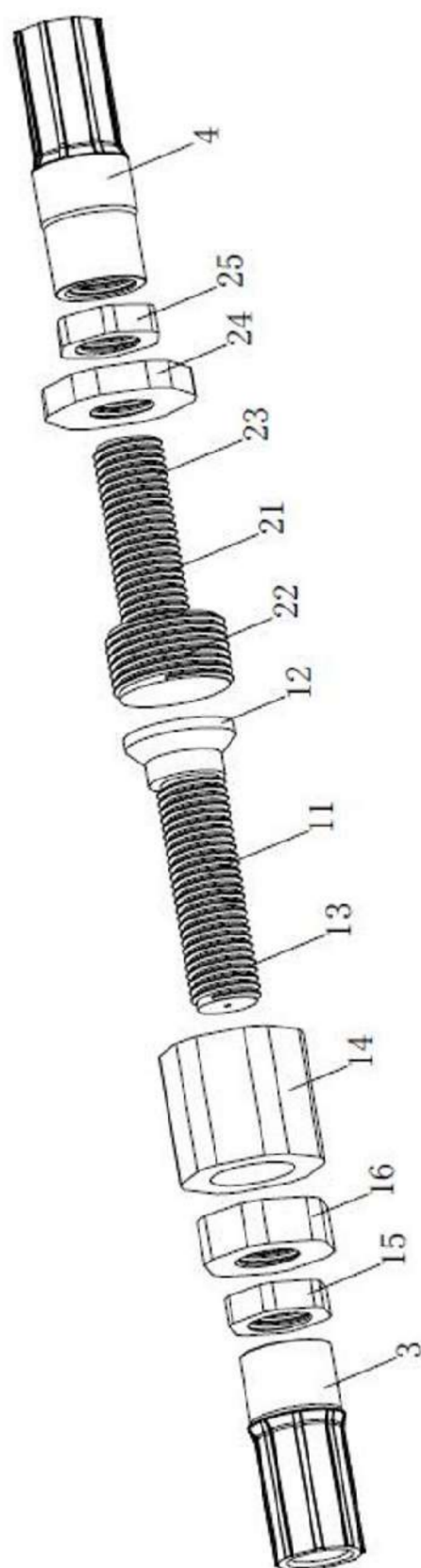


FIG. 11

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2024/112001

A. CLASSIFICATION OF SUBJECT MATTER

E04C5/16(2006.01)i; E04G21/12(2006.01)i

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)

IPC: E04C, E04G

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)

CNTXT, CNKI, ENTXTC, VEN: 偏心, 偏差, 错位, 补偿, 调节, 钢筋, 连接, 套筒, 螺, 锁紧, eccentric+, offset+, bias, decentrat
+, misposition+, compensat+, adjust+, regulat+, reinforce+, bar?, connect+, sleeve?, socket?, screw+, lock+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 117027287 A (ZHEJIANG RUICHENG MACHINERY MANUFACTURING CO., LTD.) 10 November 2023 (2023-11-10) claims 1-10	1-10
PX	CN 220686511 U (ZHEJIANG RUICHENG MACHINERY MANUFACTURING CO., LTD.) 29 March 2024 (2024-03-29) claims 1-10, description, paragraphs 0054-0061, and figures 1-11	1-10
A	CN 209538525 U (SHANGHAI BANSHENG TECHNOLOGY CO., LTD.) 25 October 2019 (2019-10-25) description, paragraphs 0004-0020, and figures 1-16	1-10
A	CN 109518886 A (SHANGHAI BANSHENG TECHNOLOGY CO., LTD.) 26 March 2019 (2019-03-26) entire document	1-10
A	CN 113323277 A (SHANGHAI YIPIN LILIAN CONSTRUCTION TECHNOLOGY CO., LTD.) 31 August 2021 (2021-08-31) entire document	1-10

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:	"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
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"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	

Date of the actual completion of the international search

17 October 2024

Date of mailing of the international search report

25 October 2024

Name and mailing address of the ISA/CN

China National Intellectual Property Administration (ISA/
CN)
China No. 6, Xitucheng Road, Jimenqiao, Haidian District,
Beijing 100088

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2024/112001

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C. DOCUMENTS CONSIDERED TO BE RELEVANT		
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A	US 5104141 A (NORTHSTAR MANUFACTURING CO., INC.) 14 April 1992 (1992-04-14) entire document	1-10
A	KR 20220109136 A (SONG, S. M.) 04 August 2022 (2022-08-04) entire document	1-10

INTERNATIONAL SEARCH REPORT
Information on patent family members

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CN	109518886	A	26 March 2019		None				
CN	113323277	A	31 August 2021		None				
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US	5104141	A	14 April 1992		None				
KR	20220109136	A	04 August 2022		KR	102521646	B1	14 April 2023	

REFERENCES CITED IN THE DESCRIPTION

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