

The invention relates to a rod connector element as set forth in the preamble of claim 1.

Such a connector element is known from European Patent Application No. EP-A2-0 297 033.

It is an object of the invention to provide a different kind of connector element of the kind specified.

The solution to this problem according to the invention is provided by means of the connector element set forth in claim 1.

US Patent Specification No. 3,982,841 discloses a connector element having a positioning sleeve, to rotate the T-head of a thread bolt through 90° after it has been introduced into an elongate opening in an attachment fitting. After the positioning of the T-head in the transverse direction, the threaded bolt is no longer rotated, but tightened in the longitudinal direction by the simultaneous rotation of two screws which are disposed on both sides of a ring rigidly connected to the rod. In that connector element a spring is disposed in a widened inner space of the positioning sleeve, but not between the tightening screws and the threaded bolt.

Other advantageous features of the invention are set forth in the dependent claims.

The invention will now be explained in greater detail by describing embodiments thereof with reference to drawings, wherein:

Figs. 1 to 4 are diagrammatic sections through different embodiments of a connector element according to the invention.

Referring to Fig. 1, a connector element has a sleeve insert 3 comprising a flange-shaped sleeve head 1 and a tubular portion 2 having an external threading 4 for attachment to one end of a rod of a three-dimensional framework. Extending through a through-bore of the sleeve insert 3 is a bolt 5 whose head 6 bears against the end wall of the tubular portion 2.

The bolt 5 has an elongate round smooth portion 7 of length L_g , a guide portion 8 of length L_f , whose cross-section can be polygonal, and an end portion 9 of length L_e which has an external threading for the attachment of the connector element to an attachment fitting of the three-dimensional framework. To simplify the drawings, attachment fitting 10 and rod 11 are merely shown in chain-dot lines. More particularly, the length L_g can be greater than the sum of the lengths L_f and L_e .

The bolt 5 extends through a through-bore of a guide sleeve 12 from which the end portion 9 extends. In the front portion of the guide sleeve 12, said through-bore is constructed to connect positively with guide portion 8 of screw-threaded bolt 5, so that

a rotary motion of the guide sleeve 12 can be transmitted to the bolt 5 with as little clearance as possible.

The through-bore of the front portion of the guide sleeve 12 can therefore also be polygonal, in agreement with the guided portion of the bolt 5. However, these cross-sections are preferably hexagonal. In contrast, in the rear zone of the guide sleeve 12 the through-bore has a preferably round cross-section, while provided between the round portion 7 of the bolt 5 and the preferably cylindrical inner wall of the guide sleeve 12 is a relatively large air gap, to form a free space in which a helical spring 13 can be accommodated. Disposed at the end of the rear portion of the guide sleeve 12, preferably in the air gap, is an annular disc 14 connected to the sleeve.

The generated surface of the guide sleeve 12 is formed with an elongate opening 15 in which a pin 16 can be loosely inserted and connected to the bolt 5, preferably radially in its guide portion 8.

The spring 13 is so disposed in the air gap that it bears on the right against the annular disc 14 and on the left against the pin 16, to force said pin forwards to force the end portion 9 out of the guide sleeve 12 when, for example, it is manually forced into the guide sleeve 12. The rotary movement is transmitted by the positive connection in the front portion of the guide sleeve 12. On the other hand, the pin 16 is provided to enable the bolt 5 to be slid manually along the elongate opening 15 against the force of the spring 13.

The embodiment illustrated in Fig. 1 has the property that the spring 13 remains jammed in the sleeve 12 if the latter is closed, for example, by gluing or welding to the disc 14. The spring 13 can therefore then be no longer readily removed from the sleeve 12. This property is sometimes desirable, so that the spring 13 does not get lost. In addition to this advantage, the connector element shown in Fig. 1 has the disadvantage that the bolt 5 is relatively long. This disadvantage, which is considerable in many cases, can be obviated by a round depression 17 in the end face of the sleeve head 1. The periphery of the depression 17 must be somewhat larger than the periphery of the guide sleeve 12, whose outside is, for example, of polygonal cross-section. The periphery of the sleeve head 1 is formed with a depression 18, to enable the sleeve insert 3 to be screwed to the end of the rod 11 by means of a tool.

The connector element illustrated in Fig. 2 substantially corresponds to the embodiment shown in Fig. 1, like elements having like references. The sleeve 19 shown in Fig. 2 has only a small round opening 20, to enable a countersunk pin 21 to be attached to the bolt 5 after the guide sleeve 19 has been mounted. Such a construction is occasionally preferred if it is desired to dispense with the visible pin for aesthetic reasons. Of course, in such a case the clearance between the head of the pin 21 and the round inside wall of the guide sleeve 19 is fairly large. Since the diameter of the helical spring 13 is clearly defined and smaller than the projecting portion of the pin 21, the spring 13 cannot slide over the head of the pin 21. The diameter of the opening 20 must be somewhat larger than the

diameter of the pin 21, to enable it to be drawn out. If necessary the opening 20 can be dispensed with, for example, if the ring 14 is attached in the sleeve 19 after the spring 13 and bolt 5 have been mounted.

The connector element illustrated in Fig. 3 substantially corresponds to the embodiment shown in Fig. 1; in this case also like elements have like references. In this embodiment the bolt is formed with a radial groove which is disposed in the plane perpendicular to the longitudinal axis of the bolt, at least substantially in the zone between the smooth portion 7 and the guide portion 8. Inserted in said groove is an open annular spring 22 whose external diameter is somewhat smaller than the internal diameter of the rear portion of a guide sleeve 23, but larger than the diameter of the smooth portion 7. The thickness of the annular spring 22 can be, for example, smaller than the diameter of the pins 16 or 21 shown in Figs. 1 and 2 respectively. In that case the guide sleeve 23 has no opening. However, in this construction a releasable annular disc 24 must be provided which can, for example, be an annular spring clampable in a groove at the end of the sleeve 23.

The sleeve 23 has at its rear end two diametrically disposed openings 26, 27 in the zone where the groove is disposed in which the annular spring 24 can be clamped, to enable the latter to be drawn out by means of tongs. The openings 26, 27 can be somewhat shorter than the height of the depression 17 in the sleeve head 1, so that it remains hidden there in the assembled state. In this construction the spring 25 is pressed between the annular

springs 22 and 24. The open annular spring 24 might also be used in the connector element shown in Fig. 1.

The connector element shown in Fig. 4 substantially corresponds to the construction illustrated in Fig. 1, like elements having like references. However, in this construction provided at the rear end of the guide sleeve 12 is an at least substantially bell-shaped flange ring 31 bounded by an inner space so dimensioned as to be able to accommodate the head 1 of the sleeve insert 3.

In the embodiment illustrated in Fig. 4 the bell-shaped flange ring 31 is separated from the actual guide sleeve 12, and a bush 32 is provided, in order to attach the flange ring 31 to the guide sleeve 12, for example, by screwing it on or by means of a bayonet-type device. The flange ring 31, the bush 32 and the guide sleeve 12 in that case form a guide device for the connector element.

The construction illustrated in Fig. 4 has the property that the spring 13 no longer remains always clamped in the sleeve 12 when this is closed, for example, by screwing to the bush 32. The spring 13 can therefore readily be removed from the sleeve 12. This property is often desirable, to enable the spring 13 to be readily replaced. In addition to this advantage, the connector element shown in Fig. 4 has the further advantage that a satisfactorily fitting transition between the rod 11 and the guide sleeve 12 can be provided by the bell-shaped flange ring 31. This construction can be produced without an opening 15 of

any kind in the generated surface of the guide sleeve 12, since it can very readily be demounted. Instead of the pin 16, a projection of the bolt might also be provided in the portions 7 and/or 8, in which case the opening 15 might also be provided in full as far as the rear end of the guide sleeve 12.

According to a further feature of the invention, the flange ring 31 might be unitarily connected to the rear end of the guide sleeve 12.

According to another feature of the invention, the flange ring 31 might be unitarily connected to the bush 32.

According to another feature of the invention the bush 32 can be dispensed with and the flange ring 31 can have a wall formed with a through-bore whose diameter is somewhat larger than the maximum diameter of the bolt 5.

Lastly, the flange ring 31 can be constructed conical on the outside, to adapt the larger periphery of the rod 11 to the smaller periphery of the guide sleeve 12.

With the exception of the springs, the other parts can be made from aluminium or some other light metal alloy.

The flange ring 31 can be made of plastics, as can the sleeve 12 (Fig. 4), if the flange ring is unitary therewith.

The variants of a sleeve having a flange ring explained in connection with Fig. 4 can also be used for connector elements of other kinds.

Lastly, it should also be pointed out that instead of a helical spring, it is also possible to use a laterally mountable, for example, meander-shaped spring, and that to maintain tolerances the flange ring and/or the sleeve can be made by diecasting, for example, bronze or zinc diecasting.

Claims

1. A rod connector element for a three-dimensional framework, having a sleeve insert (3) which can be mounted at one end of the rod (11), and an elongate bolt (5) which is partially introduced into a through-bore of the sleeve insert (3) and has a front end portion (9), an elongate portion (8, 7) and a head (6) which can bear against the rear end edge of the sleeve insert (3), the bolt (5) being partially introduced into the axial through-bore of a guide sleeve (12), to transmit via an axially sliding positive connection a rotary movement of the guide sleeve (12) to the bolt, thereby enabling the end portion (9) of the bolt (5) to be screwed to a nodal member (10) of the three-dimensional framework, while in the rear portion of the guide sleeve (12) between the latter and the bolt (5) a gap for a spring (13) is provided which forces the bolt (5) out of the guide sleeve (12), characterized in that the bolt (5) is so constructed in one piece that its elongate portion (8, 7) comprises a rear round portion (7) adjacent the head (6) and a central portion (8) which forms the positive connection with the front portion of the through-bore of the guide sleeve (12); the smallest diameter of said central portion (8) is equal to or larger than the diameter of the end portion (9) and the largest diameter of said central portion (8) is equal to or smaller than the diameter of the rear round portion (7) of the bolt (5); and the rear portion of the through-bore of the guide sleeve (12) has a diameter which is larger than the largest diameter of the front portion of its through-bore formed for the positive connection, so as to form an



air gap for the spring between the rear round portion (7) of the bolt (5) and the inside wall of the rear portion of the sleeve.

2. A connector element according to claim 1, characterized in that the sleeve insert (3) comprises a flange-shaped sleeve head (1) whose end is formed with a depression (17) into which the rear portion of the guide sleeve (12; 23) can be partially inserted.

3. A connector element according to claims 1 or 2, characterized in that the rear portion of the through-bore of the guide sleeve (12) is round.

4. A connector element according to one of claims 1 to 3, characterized in that the bolt has a projection (16; 22) at least substantially in the zone of the front end or in front of the front end of its round rear portion (7) and perpendicularly to its axis of rotation.

5. A connector element according to claim 4, characterized in that the projection is a pin (16) and the guide sleeve (12) is formed in the zone of said pin with an opening (20) from which the pin can be drawn out.

6. A connector element according to claim 5, characterized in that said opening is an elongate opening (15) extending parallel with the longitudinal axis of the bolt (5).



7. A connector element according to one of claims 1 to 6, characterized in that provided at the rear end of the guide sleeve (12; 23) is an annular disc (14; 24) whose internal diameter is larger than the external diameter of the rear round portion (7) of the bolt (5).

8. A connector element according to one of claims 1 to 7, characterized in that the rear end of the guide sleeve (12) is connected to an at least substantially bell-shaped flange ring (31) which bounds an internal space so dimensioned that it can at least partially accommodate with clearance the head (1) of the sleeve insert (3).

9. A connector element according to one of claims 1 to 8, characterized in that the cross-section of the guide sleeve (12) and of the central portion (8) of the bolt (5) is constructed polygonal, to form a positive connection with a small clearance, and the length (L_g) of the rear round portion (7) of the bolt is longer than the sum of the lengths ($L_f + L_e$) of the central portion (8) and the end portion (9).

10. A connector element according to one of claims 1 to 9, characterized in that the guide sleeve (12) is produced by diecasting.

