The present invention relates to a connecting element for a rod in accordance with the preamble to Patent Claim 1.

A connecting element of the above-mentioned type is known from European Patent Application No. EP-A2-0 297 033.

This connecting element comprises a sleeve insert with a sleeve head which has a bore into which a tubular part is rigidly connected at its end, for example by adhesion or by welding. This tubular part is provided with a bore to receive a screw-threaded bolt which is connected in axially sliding manner to the front part of a guide sleeve so that a rotary movement of the guide sleeve can be transmitted to the bolt.

The invention is based on the problem of providing a different connecting element of this type but which is more conveniently operated.

According to the invention, this problem is resolved by the connecting element according to the characterising part of Claim 1.

By virtue of the feature of the invention whereby the flange ring is integrally connected to the guide sleeve, there is in comparison with the closest state of the art the additional advantage that the head of the sleeve insert cannot be made round, so that connection of the sleeve insert to the rod is facilitated.

Further advantageous developments of the invention are indicated in the dependent claims.

The invention will be explained in greater detail hereinafter with reference to examples of embodiment shown in the accompanying drawings in which:

Figs. 1 to 3 are diagrammatic sectional views of various

alternative embodiments of the connecting element according to the invention and

Figs. 4 and 5 are a view of the guide insert of the connecting element shown in Figs. 1 or 2.

The connecting element according to Fig. 1 comprises a sleeve insert 3 consisting of a flange-shaped sleeve head 1 and a tubular part 2, whereby the tubular part 2 is provided with an external screw thread 4 for fitment on one end of a rod of a three-dimensional framework. Passing through a through-bore in the sleeve insert 3 is a bolt 5 the head 6 of which is biased against the end wall of the tubular part 2.

The bolt 5 comprises an elongate round smooth part 7 and an end part 8 provided with an external screw thread 9 for fixing the bolt to a guide insert 10 (Fig. 4).

Shown in Fig. 4 is a side and cross-sectional view crosswise to the longitudinal axis of the guide insert 10 with a screw-threaded part 11 for screwed attachment to a nodal member.

The guide insert 10 has on one side an hexagonally shaped (Fig. 5) part 12 with a screw-threaded bore 13 into which the end part 8 of the screw-threaded bolt can be screwed. Provided substantially in the middle of the outer shell of the guide piece 12 there is a perpendicularly extending screw-threaded hole 14 through which it is possible to screw the screw-threaded rod 15 shown in Fig. 1 and which may for example also be a screw-threaded rod with an hexagonally recessed socket, for guiding the guide insert 10 in the installed condition.

The bolt 5 is guided through the through-bore in a guide sleeve 16 from which the screw-threaded part 11 of the guide insert 10 projects. In the case of the front part of the guide sleeve 16, this through-bore is constructed to be form-locking together with the guide part 12 so that a rotary movement from the guide sleeve 16 can be transmitted to the screw-threaded part 11 with as little backlash as possible.

The through-bore in the front part of the guide sleeve 16 can therefore also be for example polygonal to match the guided part of the guide insert. Preferably, however, these cross-sections are hexagonal as shown in Figs. 4 and 5. In contrast, the guide sleeve 16 has its rear portion outwardly and rearwardly flange-shaped to form a substantially bell-shaped flange 17 in the interior 18 of which the sleeve head 1 can be accommodated. Furthermore, the guide sleeve 16 has in its rear portion a radially disposed annular wall 19 whereby in the interior 18' of the guide sleeve 16, between the wall 19 and the guide insert 10, a coil spring 20 is placed around the bolt 5 to press the guide insert 10 forwardly, together with the bolt 5 which is connected to it.

The maximum outside diameter of the flange 17 is preferably equal to the outside diameter of the rod 21 which is to be connected by the connecting element, in order to create an aesthetic effect and the minimum inside diameter of the flange 17 in the bell-shaped space 18 is greater than the maximum transverse dimension of the sleeve head 1 which is preferably not round so that it can be screwed to the rod 21 by using a spanner. The diameter of the bore in the annular wall 19 is greater than the diameter of the bolt 5 and smaller than the diameter of the coil spring 20. The sleeve 16 according to Fig. 1 has an aperture 22 through which the rod 15 is guided.

The way in which the element in Fig. 1 works is known from EP-PS 297 033, except that according to the present invention the rear part of the guide sleeve 16 is differently constructed. The flange-shaped design has the advantage that the transition between the end of the rod 21 and the sleeve 16 is harmonious and indeed in various alternative forms, since for example the outside of the front part of the guide sleeve 16 may be hexagonal while the flange 17 can be round.

The connecting element according to Claim 2 corresponds substantially to the embodiment shown in Fig. 1, the same reference numerals being used for identical parts. In this embodiment, however, the guide device or sleeve 16' does not have any aperture on the outer surface.

The connecting element according to Fig. 3 has a few features in common with the embodiment shown in Fig. 1 and here again the same reference numerals have been used for corresponding parts. In particular, the connecting element according to Fig. 3 likewise comprises a sleeve insert 3 consisting of a sleeve head 1 and a tubular part 2, the tubular part 2 having an external screw thread 4. Guided through a through-bore in the sleeve insert 3 is a bolt 5' the head 6 of which is braced against the end wall of the tubular part 2.

The bolt 5' comprises an elongated smooth round part 7', a guide part 23, the cross-section of which may be polygonal, and an end part 9' which has an external screw thread 9". To simplify the drawing, the nodal member 24 and the rod 25 are only indicated by broken lines.

The bolt 5' passes through the bore in a guide sleeve 26 from which the end part 9' protrudes. Where the front part of the guide sleeve 26 is concerned, this through-bore is constructed to be form-locking with the

guide part 23 of the screw-threaded bolt 5' so that a rotary movement can be transmitted from the guide sleeve 26 to the bolt 5' with the least possible backlash.

The through-bore of the front part of the guide sleeve 26 can, therefore, also be polygonal to match the guided part of the bolt 5'. Preferably, however, these cross-sections are hexagonal. In contrast, the through-bore in the rear part of the guide sleeve 26 has a preferably round cross-section, a relatively large air gap being left between the round part 7' of the bolt 5' and the preferably cylindrical inner wall of the guide sleeve 26, in order to form a free space 18' in which a coil spring 27 can be accommodated.

An elongated aperture 22 may be provided on the outer shell of the guide sleeve 26 through which a rod 15 can be loosely inserted and connected to the bolt 5', preferably radially in its guide part 23.

The spring 27 is so disposed in the air gap that on the right-hand side it is biased against a bush 28 and on the left against the rod 15 to push this latter forwards and with it press the end part 90' out of the guide sleeve 26 when for example it is pushed by hand into the guide sleeve 26. Transmission of the rotary movement is brought about by the form-locking connection at the front end of the guide sleeve 26. On the other hand, the rod 15 is provided so that the bolt 5 can be slid along the elongated aperture 22 against the action of the spring 27, possibly by the fingers.

The embodiment shown in Fig. 3 has the quality that the spring 27 no longer remains constantly clamped within the sleeve 26 when this is for example sealed by being screwed to the front part 28' of the bush 28. It is easy therefore to remove the spring 27 from the sleeve 26.

This quality is often desirable so that the spring 27 can be easily replaced. Along with this advantage, the connecting element shown in Fig. 3 has the further advantage that by virtue of the bell-shaped flange ring 29 there is a nicely fitting transition between the rod 25 and the guide sleeve 26. This embodiment can be produced without any aperture 22 of any kind whatsoever being provided on the outer shell of the guide sleeve 26 because it can be very easily dismantled. Instead of the rod, it would also be possible to envisage the bolt projecting into the parts 7' and/or 23 in which case then the aperture 22 could also be provided completely as far as the rear end of the guide sleeve 26.

In the embodiment shown in Fig. 3, the flange ring 29 is integrally connected to the rear end of the guide sleeve 26. The rear part 28" of the bush 28 is flange-shaped.

Finally, it should be noted that instead of a coil spring, it is also possible to use a laterally fitted for example meandering type of spring and that the flange ring and/or the sleeve can be produced from a pressure die cast material, for example pressure die cast bronze or zinc in order to preserve the tolerances.

Patent Claims

1. A connecting element for a rod of a three-dimensional framework with a bolt (5; 5'), with a sleeve insert (3) consisting of a head (1) and a tubular part (2) and which comprises a through-bore through which the bolt (5; 5') is guided, the bolt head (6) resting against the end wall of the tubular part (2), and with a guide sleeve (16, 16'; 26) with a front part which is so axially slidingly connected to the bolt (5; 5') that a rotary movement of the guide sleeve (16, 16'; 26) is transmitted to the bolt (5; 5'), characterised in that at the rear end of the guide sleeve (16; 16') there is an at least approximately bell-shaped flange ring (17; 29) connected integrally to the guide sleeve (16, 16'; 26) which defines an inner space (18) in which the head (1) of the sleeve insert (3) is accommodated and in that the minimum inside diameter of the flange ring (17; 29) in this inner space (18) is greater than the maximum cross-section of the sleeve head (1).

2. A connecting element according to Claim 1, characterised in that the bell-shaped flange ring (17) has a chamfer (17') in the region of the aperture of the inner space (18).

3. A connecting element according to Claim 1 or 2, characterised in that the sleeve head (1) is not round, so that the sleeve insert (3) can be screwed onto the rod (21) with a spanner.

4. A connecting element according to one of Claims 1 to 3, characterised in that the bell-shaped flange ring (17) has an annular wall (19) which constitutes a separation between the inner space (18) of the flange

ring (17) and the inner space in the guide sleeve (16, 16') and in that the wall (19) comprises a through-bore the diameter of which is greater than the maximum bolt diameter.

5. A connecting element according to one of Claims 1 to 4, characterised in that the maximum outside diameter of the bell-shaped flange ring (17; 29) is equal to the outside diameter of the rod (21; 25).

6. A connecting element according to one of Claims 1 to 5, characterised in that an end part (8) of the bolt (5) is provided with an external screw thread (9) so that the bolt (5) can be fixed in a guide insert (10) of polygonal cross-section and in that the cross-section of the through-bore in the guide sleeve (16, 16') is polygonal and is positively connected to the guide insert (10) so that a rotary movement of the guide sleeve (16, 16') is transmitted to the screw-threaded part of the guide insert (10).

7. A connecting element according to one of Claims 4 to 6, characterised in that in the inner space in the guide sleeve, a coil spring (20; 27) is fitted around the bolt (5) and is biased on the wall (19).

8. A connecting element according to one of Claims 1 to 7, characterised in that a bush (28) is provided which constitutes a separation between the inner space (18') in the flange ring (29) and the inner space of the guide sleeve (26), and has a through-bore for the bolt and in that the bolt (5') has a round part (7'), a guide part (23) of polygonal cross-section and an end part (9') with an external screw thread (9") so that the bolt (5') can be fixed to a nodal member (24) and in that the cross-section of the through-bore of the

guide sleeve (26) is polygonal in construction to form a positive connection to the guide part (23) of the bolt (5').

9. A connecting element according to one of Claims 1 to 8, characterised in that the flange ring (17) is externally conical so that the larger circumference of the rod (21) can be adapted to the smaller circumference of the guide sleeve (16, 16').

10. A connecting element according to one of Claims 1 to 9, characterised in that the outside of the front portion of the one-piece guide sleeve (16) is hexagonal while the outer surface of its flange ring (17) is round.

Two sheets of drawings

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