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The invention relates to a frame structure of the kind disclosed in the preamble to Claim 1. It is concerned with temporarily connecting together profile bars by way of a connector to form a frame structure, and, if occasion demands, dismantling it again. The connector consists of a housing with a plate-like holding member which is longitudinally displaceable therein, an eccentric pin which passes through the holding member and which is pivotally mounted in the housing, and a spring element which can be a component part of the holding member. The connector is disposed in the cavity of the one profile bar, from the end face of which a coupling hook projects which is disposed at the outward end of the holding member, whilst the eccentric pin can be reached from the outside to be rotated through a transverse bore in the wall of the profile bar. Disposed on the inner plate portion of the holding member are front and rear control projections, between which an eccentric disc disposed on the eccentric pin is mounted, and which, when rotated, moves the holding member with its coupling hook relative to the groove between a coupling-releasing extension position and a coupling-effective insertion position. The rear projection in the holding member is active when the holding member is moved into the coupling-effective insertion position in which the coupling hook engages behind the groove wall of the other profile bar and is drawn towards the profile bar in which the connector is fitted. The greater the force with which the eccentric disc loads the rear projection, the firmer the two profile bars are pressed together.

With the known frame structure with a connector of this kind (DE-C-31 53 232), the rear control projection was formed by an L-shaped angled configuration of the end of the limb. When high bracing forces occurred, the angled configuration could stretch, causing the holding member to rebound from the eccentric disc. Breakage of the angled configuration also occurred due to material fatigue after long-term loading or due to material flaws. The connector was then unable to be used. In each case, the operational safety of the connector was at stake, and there was a high accident risk because from the outside it was not possible to recognise whether a connector was defective, or even merely at risk.

The aim of the invention is to develop a cost-effective frame structure of the kind mentioned in the preamble to Claim 1 which can be assembled quickly,

which can withstand high loads and which excels itself by having a long working life despite frequent coupling and decoupling of the profile bars. This is achieved according to the invention by the features listed in the characterising part of Claim 1 which are significant for the following reasons.

According to the invention, the rear control projection is produced by a double-layer fold at the inward end of the holding member which is produced by bending back the plate material through at least 180°. Both limbs of the fold pass over one another. The bracing force exerted by the eccentric disc then acts in the direction in which the laid over limb of the fold extends which lies over the plate material in the form of a cover limb and which forms the base limb of the fold at that place. There is no transverse component which could cause the cover limb to open up again because of bracing loads. The control projection is formed by a considerable accumulation of material, namely the plate material used to form the cover limb.

In the simplest case, according to Claim 2, the end edge of the cover limb acts as the control projection. This type of control projection at the inward end of the holding member can be made particularly cost-effectively with not much plate material. Stability of a control projection like this can be increased by folding the inward end of the plate material back over the fold, and, according to Claim 3, forming an annularly closed loop. The loop can have an end limb which extends transversely to the plate material, even though manufacturing costs are increased thereby and it is not always possible to observe narrow tolerances in manufacture. The bracing forces act upon the end limb in the closure direction of the annular loop, and for this reason the loop cannot open up under bracing loads. This is particularly so for the feature according to Claim 4 or Claim 5 because in the event of high bracing forces, the end limb bears against the top inside surface of the through opening in the holding member. Therein, it is expedient to observe dimensions such as will be mentioned in greater detail in the description.

It is very useful if, as proposed in Claim 7, the head of the eccentric pin which is mounted in the transverse bore of the profile bar is used to fit and remove the connector in push button-like manner. Claims 8 to 10 mention advantageous features for this. To prevent undesirable disconnection, the

eccentric pin should be locked in the connector in a position of rotation which is different from the extension position, as proposed in Claim 11. Claims 12 to 16 mention different ways of doing this which are of independent inventive importance. Thus, according to Claim 13, a window in the housing can cooperate with the eccentric disc and thereby prevent the eccentric pin from being pushed in undesirably even when being rotated. To that end, segments according to Claim 14 can advantageously be used which are provided adjacent to the eccentric disc on the eccentric pin. It should be emphasised that it is also possible for the end limb of the afore-described loop to perform a blocking action of the eccentric pin, if provisions are made according to Claim 17. The end face of the end limb can actually cooperate in blocking manner with the rear wall of the housing, as mentioned in Claim 18, and the release position can then be produced by a recess in the rear wall of the housing. If these features are of a size such as disclosed in Claim 19, the eccentric pin is prevented from being pushed in, and thus the connector is prevented from being disconnected as long as the holding member moves with its coupling hook out of the decoupled extension position. This reliably excludes defective control.

Further features and advantages of the invention will emerge from the drawings and from the following description. The invention is directed therein at all new features and combinations of features which can be taken from the drawings and description, even if these are not explicitly mentioned in the claims. The drawings show two embodiments of the invention, wherein:

Figure 1A shows the sectional side view through a ready connection location of the frame structure with two portions of the two profile bars to be connected prior to coupling, wherein the sectional drawing is taken from the sectional line IA-IA in Figure 2A,

Figure 1B is a section, in detail, through a portion of the connector used in Figure 1A, along the sectional line IB-IB seen in Figure 2B,

Figures 2A, 2B and 2C are sectional plan views of the connection location, not yet coupled, with the profile bars which can be seen in Figure 1A, along the corresponding three sectional lines IIA, IIB and IIC in Figure 1A,

- Figure 2D is a drawing on a larger scale of a portion of the profile bar on which the connector is provided, the view corresponding to Figure 2B and 2C,
- Figure 3 is a drawing corresponding to Figure 2B of the one profile bar on which the connector is provided, wherein the pin head, serving as an assembly element between the connector and profile bar, of an eccentric pin sitting in the connector, is pushed in against the force of a spring in push button-like manner, in order to assemble or dismantle the connector to or from the profile bar,
- Figure 4 is a sectional plan view, corresponding to Figure 2B, of the coupling position of the two profile bars at the connection location,
- Figure 5 is a drawing, corresponding to Figure 1B, of a sectional view through a detail in the connector, when the coupling position is as shown in Figure 4,
- Figure 6 is a drawing, also corresponding to Figure 1B, of a portion of the connector, the eccentric pin thereof being disposed in an intermediate position, namely in a transitional phase between Figure 1A and Figure 4,
- Figure 7 is a plan view, corresponding to Figure 2A, of the portion in Figure 6,
- Figure 8 is a sectional side view, according to Figure 1A, through a connection location with an alternatively designed connector, wherein the sectional drawing is defined by the sectional line VIII-VIII shown in Figure 9,
- Figure 9 is a plan view in section similar to Figure 2B of the connection location in Figure 8 along the sectional line IX-IX there,
- Figure 10 is a drawing on a larger scale, similar to Figure 2D, of the detailed view of the connector used in Figure 9,

Figure 11 is a transverse sectional view through the profile bar provided with the connector, along the sectional line XI-XI in Figure 9,

Figure 12 is a plan view, corresponding to Figure 9, which, with the connector of Figures 8 and 9, shows the conditions which have been mentioned above in connection with Figure 3, and

Figure 13 is another sectional drawing corresponding to Figure 9 of a bracing condition similar to Figure 4 where the coupling between the two profile bars to be connected has been made.

The two connectors 20, 20' which are of different designs are intended to releasably couple two profile bars 10, 11 to form a frame structure according to the invention. To that end, the connectors 20, 20' are inserted in a cavity 12, accessible at the end side, of the one profile bar 10, and their coupling means 21, 22, 22' project from the end face of the profile 13. When coupled, as shown in Figure 4, on the one hand, and in Figure 13, on the other hand, these come to lie in a groove 14 on the other profile bar 11 which in the embodiment shown is in the form of a vertical, octagonal column. The component parts of both the connector 20 according to Figures 1A to 7 and the connector 20' according to Figures 8 to 13 are manufactured initially to form one structural unit. In the drawings, the same reference numerals are used to denote corresponding component parts, but in order to distinguish the alternative design, the component parts of the connector 20' which differ significantly from the component parts of the connector 20 are provided with a slash (''). The connectors 20 and 20' consist of a housing 23 or 23' with a holding member 24 or 24' which is longitudinally movable therein, an eccentric pin 25 and a spring member which is actually designed as a spring tongue 26 forming an integral part with the holding member 24 or 24' in the present case, but which could, if necessary, be manufactured separately therefrom, e.g. in the form of a spiral spring which radially encloses a mounting trunnion 17 of the eccentric pin 25.

The holding members 24, 24' consist of elongate profiled plate material 37 of spring steel. Provided at the outward end 27 of the plates are one or two coupling hooks 22, 22' which form the above-mentioned first coupling means and which project from the end face 13 of the profile when the connector is

fitted, as shown in Figures 2B and 9. The plate material 37 is, however, of a different profile in the two holding members 24, 24'. For this reason, the simplest design of the holding member 24' according to the connector 20' in Figures 8 to 13 shall first of all be described.

The outward end 27 of the plate is bent to form an individual coupling hook 22 with an inclined face 28 in juxtaposition at a spacing therefrom. When assembled, the inclined face 28 rests against a companion face 29 in the housing 23' which is made of zinc die cast metal. Contrary to the holding member 24 yet to be described, the spring tongue 26 is formed on this front region of the holding member 24' and is created by a U-shaped cut-out and a correspondingly profiled bent portion, the course of which is shown in Figure 9. The free end of the spring tongue 26 bears against a rear wall 30 of the housing and exerts an effective spring loading on the next plate section 31 in the direction of the arrow 32. The plate section 31 has a through opening 33, basically in the form of an elongate slot in this example, through which the eccentric pin 25 passes when the connector 20' is fitted. Disposed at either end of the through opening 33 are special control projections 35, 38 which face a front wall 36 of the housing 23' and above the top side 34 of the plate section 37. The front control projection 35 consists of a depression made in the plate material 37.

The holding member 24 with the connector 20 of the first embodiment in Figures 1A to 7 is theoretically of the same design, and for this reason the description given hitherto will largely apply. It will be sufficient to merely elucidate the differences. The plate 24 is provided with an elongate slot 57 which divides it into two plate tongue portions 65, 65' which vary in respect of their bent configurations. The longitudinal slot 57 ends in front of the afore-described rear joint plate section 31. The outward ends of the two plate tongue portions 65, 65' are of mirror-image configuration to each other relative to a longitudinal central plane of the housing 23, and they form the afore-mentioned mutually facing hooks 22, 22' which thus have adjacent thereto inclined faces 28, 28' of mirror-image configuration to each other, as can best be seen in Figures 2B and 2C. Companion faces 29, 29' in the housing 23' are associated with these inclined faces 28, 28', the companion faces having profiles of mirror-image configuration to each other. In the initial position shown in Figure 2A, the two hooks rest exactly in

alignment above each other, and therefore have only one structural width, as shown in Figure 9 with the single hook 22 of the holding member 24'. The two plate tongue portions 65, 65' have S-shaped courses of mirror-image configuration, and for this reason the two portions 28, 28' intersect. The rest of the course results in a forked configuration of the elongate slit 57, so that the afore-mentioned spring tongue portion 26 occurs therebetween, which is formed in the base of the slit, thus on the rear plate portion 31. Even if the bent configuration is of a different kind, the spring tongue portion 26 forms a third, longitudinally extending member between the afore-mentioned, hook-forming plate tongue portions 65, 65' of mirror-image configuration.

In conformity therewith, the eccentric bolt 25 with the two connectors 20, 20' first of all has a cylindrical head 15, the end face of which is provided with a tool receiving means 19 for a spanner, or the like, and a mark 18 to indicate the respective position of rotation of the pin 25. As can be seen in Figures 8 to 10, when assembled, the rotary head 25 is supported by a semi-circular base of a wall section 50. The wall section 50 makes a transition at the inward end 51 of the housing into a region of increased width 52, into which a fold 40 or a loop 40' to be described in greater detail is to be introduced on actuation of the eccentric. As can be seen in Figure 10, the actual eccentric disc 16 is adjacent to the rotary head 15, the eccentric disc being in surface contact with the front side 34 of the rear plate section 31. After assembly, the axis of rotation 44 of the eccentric pin 25 is vertical to the plane of the plate, as shown in Figure 9. By virtue of the afore-mentioned spring-loading, the rotary head 15 of the eccentric pin 25 is pressed out of the housing in the direction of the arrow 32 in Figure 10 until the oppositely disposed side of the eccentric disc 16 comes to rest on the inner face of the front wall 36 of the housing. Adjacent to the eccentric disc 16, the eccentric pin 25 has a cylindrical mounting trunnion 17 with which a mounting bore 53 is associated in the rear wall 30 of the housing. After the connector has been put together, half the periphery only of the mounting trunnion 17 engages in a semi-circular mounting receiving means 54 in the bore 53 because in that region the wall 30 of the base has a stepped portion of increased thickness 39. On the opposite side, the mounting trunnion 17 bears against the end of a guide groove 59 which extends in the longitudinal centre of the rear wall 30 of the housing. The mounting trunnion

17 has a diametral channel 58 which is complementary to the profile of the rib, and which is important in constructing the connector 20 or 20' properly from the afore-mentioned component parts.

The connector 20' is assembled in the following way: the inward end 51 of the housing 23 is open, and for this reason the plate-like holding member 24 or 24' can be inserted from behind into the housing 23 or 23' together with the eccentric pin 25 passing therethrough. The pin 25 thereby adopts a position of rotation in which the diametral channel 58 of the mounting trunnion 17 is able to slide on the guide rib 59 until the position shown in Figure 2D and Figure 10 is reached, in alignment with the mounting bore 53. The afore-mentioned mark 18 on the end of the rotary head 15, shown in Figures 1A and 8, is oriented in the extent of the channel 58. In this starting position, the eccentric disc 16 points with maximum eccentricity, as shown by the mark 18, towards the front control edge 35 of the holding member 24 or 24'. The hook 22, 22' of the holding member 24 or 24' is thus in the furthest extended position which will be referred to as the "extension position" hereinafter and which is shown in Figures 8, 9 and 1A to 3.

In this extension position, the coupling hook(s) 22, 22' at the outward end is/are fully extended, and are disposed vertically with two coupling lugs 21 of corresponding width which are integrally formed with the housing 23 and which hold the holding members 24 or 24' between them, and, with the connector 20, 20' in the assembled position shown in Figures 1A to 2C and in Figures 8 and 9, project in the profile bar 10 beyond the end face 13 of the profile. The coupling lugs 21 are the afore-mentioned second coupling means.

Opposite the depression 35 is a control projection 38 or 38' which is of a comparable but different design in the two holding members 24, 24'. The simplest design shows the holding member 24 according to Figure 2D. There, the inward end of the plate material 37 is bent back so that a loop 40 is created. A cover limb 43 which is bent forward, running parallel to the base limb 46, is separated by the rearwardly pointing folding limb 42 and is disposed above a base limb 46 which extends the afore-mentioned plate section 31 in a substantially flat configuration. The loop 40 is thus pressed flat in such a way that the end edge 38, disposed there, of the plate material 37

is in alignment with the eccentric disc 16 and thus carries out the functions of a rear control projection.

With the other design of the holding plate 24' with the connector 20' shown in Figure 10, in theory the same fold configuration exists, consisting of the base limb 46, fold limb 42 and the cover limb 43, but the plate material does not end there, but is pivoted around at right angles and further guided in an end limb 41. The end limb 41 passes through the through opening 33 in the end cavity 24', continues on the oppositely disposed plate side, and, in this embodiment, ends with its end face 47 slightly in front of the inner face of the rear wall 30 of the housing. This creates a loop 40' which is annularly closed in itself. Here, the face of the end limb 41 facing the eccentric disc 16 forms the control projection 38' shown in Figure 10. As can be seen in Figure 11, the width 48 of the end limb 41 is adapted to fit the width of the limb 48 which passes through the through opening 33. The end limb 41 can come to rest in front of the top inside edge 45 of the through opening 33 in the plate, separated by a gap 70, and extends parallel to the axis of rotation 44 of the eccentric pin 25. The end face 47 is therein provided with an aperture 49 which permits movement over the front part of the afore-mentioned guide rib 59 on the bottom. When the connector 20' is in the assembled condition, the end face 47 is aligned with a slot 55 in the rear wall 30 of the housing. Viewed in the longitudinal direction of the connector 20', the slot is of approximately the same width as the thickness of the plate 56 of the end limb 41.

The connector 20' which is manufactured as one structural unit can, as shown in Figure 12, be assembled and dismantled quickly and easily, and, as can be seen in Figure 3, this is also true of the connector 20. To do this, a pressure is exerted upon the rotary head 15 against the spring loading 32, in the direction of the arrow 62. Thereby, the rotary button is able to be pushed into the mounting housing 23 in push button-like manner until the rotary head 15 no longer projects beyond the front wall 36 of the housing. The mounting trunnion 17 thereof is displaced axially in the mounting bore 53 of the rear wall 30 of the housing. In the case of the connector 40', as shown in Figure 12, the end limb 41 also plunges into the slot 55 in the housing. The connector 20' or 20 can now be pushed in the direction of the arrow of insertion 63 in Figure 12 through the front end opening 13 in the

profile bar 10 into the cavity 12, until the pushed in rotary head 15 arrives inside the wall of the profile bar 10 in alignment with a transverse bore 60. In this case, the rotary knob 15 then automatically snaps into the transverse bore 60 under the effects of the spring loading 32. A defined installation position of the connector 20, 20' of the profile bar 10 thus results. The afore-mentioned coupling lugs 21 and the coupling hook(s) 22, 22' project beyond the end face 13 of the profile to the desired extent. The connector 20 or 20' is then taken apart in reverse, in the direction of the withdrawal arrow 64 in Figure 12.

To connect the two profile bars 10, 11, the coupling means 21, 22 and possibly 22' projecting from the end face 13 of the rod 10 are inserted into a groove 14 in the other profile bar 11. With both connectors 40, 40' the coupling means 21 to 22' have only one structural width corresponding to the internal width of the entrance to the groove 67. The rotary pin 25 is then rotated. To this end, a rotary tool, such as a spanner, is inserted in the rotary head 15 by the tool receiving means 19 shown in Figure 1A and Figure 8, the rotary head being easily accessible through the transverse bore 60 of the profile bar 10. The eccentric disc 16 rotates and due to its eccentricity entrains the holding member 24, 24' beyond the afore-described rear control projection 38 or 38' on the fold 40 or loop 40'. The longitudinal movement of the holding member 24, 24' indicated by the arrow 61 takes place. The coupling hook(s) 22, 22' is/are displaced, not only axially in the direction of the arrow 61 but also transversely thereto, as shown by the arrow 69 or 69' in Figures 1 and 4 respectively. This lateral displacement 69, 69' of the coupling hooks 22, 22' is brought about by the guiding effect of the inclined faces 28 or 28' on the companion faces 29 and 29' of the respectively associated housings 23 or 23'. Longitudinal displacement 61 is also converted into a transverse movement 69, 69'. The ends of the coupling hooks 22, 22' are thereby guided behind the inward wall 68 of the groove, shown in Figure 13 and Figure 4, and with the longitudinal displacement 61 at full extent, they press the intermediately disposed wall of the groove in the profile 11 against the end face 13 of the profile bar 10 which bears on the visible side thereof. The coupling hooks 22, 22' and the end face 13 thus act like bracing jaws which brace the wall of the groove between them. After rotation through 180° the complete bracing condition in Figures 4 and 13 is obtained, where the holding

member 24 or 24' has been pushed in to the maximum extent, and for this reason the position is termed the "insertion position".

The inclined faces 28, 28' do not always need to be designed only as two dimensional inclined flat ramps, but they can also be of a three-dimensional twisted configuration, wherein the afore-mentioned axial longitudinal movement 61 could cause torsional movement of the coupling hooks 22, 22' at the ends. The path of movement made by the coupling hooks during the coupling operation is unimportant. The only matter of importance is that the hooks 22, 22' are no longer in alignment with the coupling lugs 21 fixed to the housing, but are displaced laterally thereto, and that the afore-mentioned inward surface 68 of the groove 14 engages on the other profile bar 11. Instead of having a companion surface 29, 29' which is disposed on one side only, against which the inclined faces 28, 28' are held pressed by the spring-loading, the housing 23 or 23' could also have a narrow guide slot, one edge of which slot forms the afore-mentioned companion face 29, 29'. In the fully inserted condition, the straight portion which is disposed between the coupling hook 22, 22' and the inclined face 28, 28' and which can be seen in the drawings could run up onto the cup 72 shown in Figure 13, behind the companion face 29, whereby the transverse position of the associated coupling hook 22, 22' is held in the bracing position of the closure member 20, 20'.

In an intermediate position which can be seen in Figures 6 and 7, the eccentric disc 16 arrives at a window 73 in the upper side wall of the housing 23, where it makes an axial guiding movement. This happens shortly after the full extension position, shown in Figure 2A, has been left. This secures the exact position of the eccentric disc 16 during rotational movement. If the operator does not know the internal structure of the connector 20, he will think that he will have to exert an axial pressure as the eccentric pin 25 is being rotated. This is excluded by the fact that the eccentric disc 16 engages in the window 73 of the housing 23. Thus, during the entire rotating operation, the eccentric disc 16 keeps its proper position on the end edge 28 or end limb 41 in the folded back holding member 24, 24'.

With the connector 20, disposed inside the housing 23 is also one, or a plurality of, fixed abutments 74, which, in the full extension position, are usually positioned outside the holding member 24, as can be seen in Figures

1A to 2D. The afore-mentioned push button effect is then possible for assembly of the connector 20 according to Figure 3. However, when the eccentric rotates, the holding member 24 is pushed in 61, which, in the intermediate position in Figures 6 and 7, has already caused the inward end of the fold 40 to run up onto the fixed abutment 73 which thus has the function of acting as a run-up stopping member for the rear end of the holding member 24. The inward end of the holding member is also aligned in this way in the end position where the holding member is in the fully extended position shown in Figure 4. In each of these cases, it is no longer possible to press 62 the eccentric pin 25 in the direction of Figure 3. The pushing in movement 62 of the eccentric pin 25 is blocked. It is no longer possible for the connector 20 to be taken apart accidentally when its pin head 15 is pressed. The proper connection between the two profile bars 10, 11, shown in Figure 4, is no longer endangered.

A blocking action of this kind also takes place with the connector 20', but it is performed in a different way. As the eccentric pin 25 rotates, the end face 47 of the end limb 41 moves from the extension position shown in Figure 10 over an end portion 66 of the rear wall 30 of the housing. Even when a slight forward movement is made, due to the above-mentioned dimensions, the end face 47 is no longer in alignment with the slot 55. A displacement of only 0.1 mm causes a blocking action. The proper way in which the limb 41 of the loop engages behind the eccentric disc 16 is kept; the control edge 38' can no longer rebound. This is very much so in the case of the full insertion position shown in Figure 13. The connector is prevented from being taken apart by the pin head 15 pressing into the profile-transverse bore 60. The bottom end portion 66 forms an abutment for the loop 40'. To take it apart, it is once again necessary to align the end limb 41 with the slot 55 in the housing, as described in Figure 12.

As already mentioned in connection with Figure 10, a gap 70 is disposed between the top inside surface 45 of the through opening 33 in the holding member and the end limb 41. In the bracing position shown in Figure 13, the eccentric disc 16 receives the bracing force which emanates from the coupling hook 22 engaging behind it, by virtue of the end limb 41. The bending claims indicated there by the arrow 71 can be applied to the limb 41 because spring steel is used to form the holding member 24, as already mentioned. Therefore,

the bending claim 71 determines the maximum bracing force which acts upon the coupling hook 22. Therefore, a specific bracing force is obtained which can be kept constant to a large extent, irrespective of the tolerances of the component parts in the region of the connector 20' and the profile bar 10. Due to this limit imposed on the bracing, inadmissibly high loads are avoided which can otherwise cause damage to the rod material, usually a sensitive aluminium. On the other hand, if it is not a question of this, it is possible for the gap 70 to be small in size such that the limb 41 of the loop and the top inside surface 45 in the through opening 33 come into contact either sooner or later due to transmission of a bracing force in Figure 13. The bracing force is then transmitted through both parts of the limb, that is to say not only through the cover limb 43, but also through the base limb 46.

The afore-mentioned blocking action of the pin head 15 relative to insertion movements 62 could also be effected by abutments acting directly on the eccentric pin 25, and which permit insertion movement of the eccentric pin 25 in the full extension position, but which exclude such movement in any other position. A segment could be used which is supported in a different rotated position in the mounting region of the eccentric pin 25, whilst when the holding member 24 is in the fully extended position the segment is in alignment with an aperture in the housing wall and thus admits an insertion movement 62. These features are of importance to the invention independently of the afore-described object. The cover limb 43 would not need to extend parallel to the base limb 46 in every case, but it could be set at an angle thereto which is effective with loads in the closure direction of the fold 40. The shape of the coupling hooks 22, 22' could also be selected differently, e.g. in the shape of a hammer head.

The position of rotation of the eccentric bolt 25 with the holding member 24 in the fully inserted position is limited with the connector 40 in the way shown in Figure 5, in such a way that after rotation through 180°, a radial segment 75 on the eccentric pin abuts on the peripheral edge 76 of the through opening 33, already mentioned several times, in the holding member. Provided on the oppositely disposed side of the through opening is a cut-out profile which permits free rotation of the segment 75 until the holding member 24 reaches the fully extended position in Figure 1B, with the inclusion of the intermediate position in Figures 6 and 7.



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### CLAIMS

1. A frame structure comprising profile bars (10, 10') which can be releasably coupled together by a connector (20, 20') and of which at least some (11) have undercut grooves (14) and others (10) have an end cavity (12) for accommodating the connector (20, 20'),

the connector (20, 20') comprises a housing (23, 23') which fits in the cavity (12), at least one holding member (24, 24') which is longitudinally displaceable (61) therein and which is formed from plate material (37), and an eccentric pin (25) which is rotatably mounted in the housing (23, 23') and which passes through the holding member (24, 24') and which has an eccentric disc (16),

the holding member (24, 24') at its outward end (27) has at least one coupling hook (22, 22') which when the connector (20, 20') is fitted in position projects out of the profile bar (10) and for coupling purposes can be fitted into the groove (14) in another profile bar (11) and in the coupling situation engages behind the groove wall (68) thereof, and

the eccentric disc (16) is arranged between a front (35) and a rear control projection (38, 38') on a plate portion (31) of the holding member (24, 24') and, upon rotation of the eccentric pin (25), transfers the holding member (24, 24') with its coupling hook (22, 22') relative to the groove (14) between a coupling-releasing extension position and a coupling-effective insertion position,

characterised in that

the plate material (37) is turned over at the inward end of the holding member (24, 24') to provide a double-layer (43, 46) fold (40, 40') which is bent back towards the coupling hook (22, 22') and which forms the rear control projection (38, 38') for the eccentric disc (16).

2. A frame structure according to claim 1 characterised in that the rear control projection is formed by the end edge (38) of the plate



material (37) at the turned-over free end of the limb (43) of the fold (40).

3. A frame structure according to claim 1 characterised in that the inward end of the plate material (37), beyond the fold, is further folded to provide a loop (40') which is closed in an annular configuration in itself and which acts as a rear control edge (38') for the eccentric disc (16).

4. A frame structure according to claim 3 characterised in that the loop end forms an end limb (41) which extends transversely to the plate material (37) and which extends into a through opening (33) in the holding member (24').

5. A frame structure according to claim 4 characterised in that the through opening (33) serves at the same time for the eccentric pin (25) to pass through the holding member (24') and the end limb (41) is of a substantially straight configuration and extends parallel to the axis of rotation (44) of the eccentric pin (25).

6. A frame structure according to one or more of claims 1 to 5 characterised in that in the fold (40) or loop (40') the bent-back cover limb (43) extends substantially parallel to the base limb (46) disposed therebeneath and the base limb (46) extends in a substantially flat configuration the portion (31) of the plate material (37), which is in front of the fold (40) or the loop (40').

7. A frame structure according to one or more of claims 1 to 6 characterised in that the eccentric pin (25) is axially spring-loaded (32) and endeavours to urge a pin head (16) acting as a rotary handle out of the housing (23, 23'), and that at least in a given rotary position of the eccentric pin (25) the pin head (16) can be pressed



(62) into the housing (23, 23') against said spring loading (32) and, for fitting of the connector (20, 20') in the bar cavity (12), resiliently snaps into a transverse bore (60) in the wall of the profile bar (10).

8. A frame structure according to claim 7 characterised in that the spring loading (32) is applied to the eccentric disc (16) of the eccentric pin (25).

9. A frame structure according to claim 8 characterised in that the surface side, which is towards the cover limb (43), of the plate portion (31) which extends the base limb (46) in a single-layer configuration forms a contact surface (34) for the eccentric disc (16) and the spring loading (32) of the eccentric pin (25) is applied by way of said plate portion (31).

10. A frame structure according to claim 9 characterised in that the spring loading (32) is produced by a spring tongue (26) which is formed integrally from the resilient plate material (37) of the holding member (24, 24') and which bears against an inside surface (30) of the housing.

11. A frame structure according to one or more of claims 1 to 10 characterised in that, in the rotary position of the eccentric pin (25) which typifies the full extension position of the holding member (24, 24'), the pin head (15) can admittedly be pressed (62) axially into the housing (23, 23') against its spring loading (32) but it is blocked against being axially pressed in (62) in a rotary position which differs therefrom, preferably at least in its rotary position which determines the full insertion position of the holding member (24, 24').

12. A frame structure according to claim 11 characterised in that the blocking action is produced by a radial projection which is



disposed on the eccentric pin (25) and which rotates therewith and which bears against a contact surface on the housing (23, 23'), but that the contact surface terminates before the rotary position of the radial projection which determines the full extension position of the holding member (24, 24') and thereby permits the pin head (15) to be axially pressed in (62).

13. A frame structure according to claim 12 characterised in that the radial projection is produced by the eccentric region of the eccentric disc (16) and the associated contact surface at the housing side is formed by the top inside surface of a window (73) in the wall of the housing and the window (73) serves at the same time for axially guiding the eccentric disc (16) in that angular region of rotary movement of the eccentric pin which adjoins the full extension position of the holding member (24).

14. A frame structure according to claim 12 or claim 13 characterised in that, in addition to the eccentric disc (16), the eccentric pin (25), at its mounting trunnion (17) which is opposite to the pin head (16), has a segment which acts as the radial projection and the rear wall (30) of the housing (23), which serves to mount the mounting trunnion (17), is admittedly provided with a radial aperture in the mounting region which is axially aligned with the segment in the rotary position of the eccentric pin (25) which typifies the full insertion position of the holding member (24) but the rear wall (30) acts as an abutment surface for the segment in all other rotary positions.

15. A frame structure according to one or more of claims 11 to 14 characterised in that the holding member (24) is aligned with a stationary abutment (74) in the housing (23) for blocking the eccentric pin (25) which bears against the holding member by way of the eccentric



disc (16) to prevent the pin head (16) from being axially pressed in (62), the abutment (74) being of such dimension that the holding member (24) is free in its full extension position and permits the pin head (16) to be axially pressed in (62).

16. A frame structure according to claim 15 characterised in that the housing abutment (74) co-operates with the inward end of the holding member (24, 24'), which is bent back to provide the fold (40) or loop (40').

17. A frame structure according to claim 16 characterised in that the end limb (41) of the loop (40') crosses the plate material (37) of the holding member (24') and continues on the opposite side of the plate, the end face (47) of the end limb (41) co-operating with the housing abutment (66).

18. A frame structure according to claim 17 characterised in that the abutment (66) is formed by a rear wall (30) of the housing (23) and that - in the extension position of the holding member (24') - free movement of the extended end limb (46) of the loop (40') for pressing in (62) the eccentric pin (25) is afforded by an aperture (55) in the rear wall (30).

19. A frame structure according to claim 18 characterised in that the aperture comprises a slot (55) in the rear wall (30) of the housing, the internal width of the slot, in the direction of sliding movement (61) of the holding member (24'), being approximately equal to the thickness (56) of the plate material (37).

20. A frame structure according to one or more of claims 1 to 19 characterised in that the front wall (36) of the housing (23) has a



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cut-out (52) into which the fold (40) or loop (40') moves at least in the extension position of the holding member (24) and the fold (40) or loop (40') is of a structural height which is flush with the front wall (36) of the housing and which bears against the inside surface of the profile bar (10) to provide a guidance effect.