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The invention relates to a frame of the kind disclosed in the preamble to Claim 1. It involves joining bar members by way of a connector in order to form a frame. The component parts of the connector are pre-assembled to form one structural unit, and the connector has an eccentric pin, the pin head of which, due to spring-loading of the plate, usually projects from the one side wall of the housing, beyond the plate's contact surface which rests on the eccentric pin. However, the pin head can be pushed axially into the housing in pushbutton-like manner against the spring loading in order to be able to assemble or take apart the connector in the cavity of its bar member. The profile wall of the bar member is actually provided with a transverse bore which passes therethrough, and in which bore the pin head engages when assembled due to the effect of the plate's spring loading. The connector is taken apart from the bar member in the same way, but in reverse. The eccentric pin thus has the further function here of providing easy and fast "push button assembly" of the ready connector to its bar member. The pin head of the connector which is mounted in this way is accessible at the end through the transverse bore in the bar member, and can act as a rotary handle for the eccentric pin to bring the profiled plate over the eccentric disc between a coupling release extension position and a coupling operative retraction position.

The known frame with a connector of this kind (DE-C-31 53 232) has gained acceptance, but in practice it is still desirable to improve the coupling between the bar members and to have a connector which is more securely mounted in the bar member. The known connector had a profiled plate with only one hook. The connector was indeed advantageous because of the afore-mentioned pushbutton-type assembly by way of its eccentric pins, but when the plate was in the retraction position the hook was only able to engage behind one of the groove walls disposed on either side of the groove. This meant that the coupling between the two bar members was only present on one side. The spring-loading of the plate was in the form of an angled strip in one piece therewith, but it acted in the region of the outer plate end portion in such a way as to press the inclined face of the plate against the contact location provided in the housing, this inclined surface being used for subsequent transverse displacement of the hook head. As a result, the spring force exerted at the oppositely disposed inner end of the plate, by way of its

contact surface, upon the eccentric pin was only part of the force, and in the assembly condition unsatisfactory engagement of the pin head in the transverse bore of the bar member resulted.

With another type of connector (DE-C-22 39 370) two plates were disclosed which were arranged in juxtaposed relationship in the housing and which were moved simultaneously between an extension position and a retraction position by virtue of a joint eccentric pin. Despite the fact that the outer end portions of the two plates made contact, a large structural width resulted due to the accumulation of the hook heads and inclined surfaces. It is true that the two plates had oppositely oriented hooks, whereby, when the plates were in the retracted position, they could engage behind both the groove walls delimiting the groove opening. However, pushbutton-type assembly of the connector by way of an eccentric pin was neither provided for nor possible. It did not seem possible to transfer these features to frames with connectors of the kind disclosed in the preamble, since the outer end portions, provided with the two hooks, of the two plates needed oppositely directed spring loading in order to keep the two plates making contact pressed against a pin disposed between their two inclined surfaces. The pin acted as a joint contact location between the two plates.

The aim of the invention is to develop a frame of the kind disclosed in the preamble which excels itself through having an improved coupling between the bar members with increased fixing force, which permits reliable push button-type assembly of the connector by way of its eccentric pins, and which provides for fast assembly of a compact connector. This is obtained according to the invention by way of the features listed in the characterising part of Claim 1, which are particularly significant for the following reasons:

The longitudinal slot of the plate divides it into two plate tongues only in the region in front of the contact surface. The plate tongues are bent in opposite manner to one another, and they have hooks which point away from each other, which hooks, when the longitudinally split plate is in the retraction position, engage behind both groove walls of the groove of the other bar member. Therefore, a symmetrical coupling results of the two bar members, the coupling being very securely engaged and having a high carrying capacity. Nonetheless, the structural width of the connector is minimal, for the two

plate tongues are disposed in superposed relationship regionally, as viewed in the direction in which the grooves extend, and the space required inside the housing simply has to be sufficient to allow transverse displacement of the individual tongue portions. However, one factor of decisive importance is that a common contact surface is present in the contact region of the eccentric pin for the two plate tongues, this contact surface being spring-loaded in the direction in which the pin head is extended. Therefore, the great advantage of the pushbutton-type assembly of the two hook connector according to the invention is easily possible because the function of a one hook connector is present in the region of the contact surface. Control movement during extension and retraction of the two plate tongues has no adverse effect upon this since the transverse movements which differ from one another only take place within the plate tongues, whilst the pushbutton function takes place in the common contact surface whence longitudinal movement takes place of the two hooks over the control projections on either side of the eccentric disc. The composition of the two hook connector according to the invention is therefore simplified, since, despite there being two hooks, only one single common plate needs to be handled.

Fitment problems due to a central guide member between the two spring tongues in the region of their reciprocal inclined surfaces are prevented due to the presence of two separate contact locations on the two mutually oppositely disposed side walls of the housing. In the simplest case, oppositely extending wedge surfaces are used as the contact locations for supporting the two inclined surfaces. Therein, the bent outer end portion of the one plate tongue rests on the contact location in the housing, which contact location faces in the direction in which the eccentric head is pushed in during the pushbutton-assembly, and when the pin head is pushed in a spring-loaded yielding movement takes place. Thus, due to the spring-loading of the material of which it is made, the plate tongue assists in spring-loading the contact surface with the eccentric disc, and thus helps the pin head be pushed out from the housing, and helps securely engage the pin head in the transverse bore of the bar member.

The opposite way in which the plate tongues operate is most readily achievable by way of the mirror-image design of their end portions, as emphasised in Claim 2. These end portions are advantageously of symmetrical design relative

to a longitudinal central plane of the housing. Since the end portions intersect therein in the extension position of the plates, in spite of the two hook heads which are bent in opposite manner to one another, a very slim structural dimension is produced when the plates are in the extended position, for the hook heads, hook shanks and inclined surface sections of the two superposed tongues are able to cover over one another to a great extent in the direction in which the groove extends. Ideally, only one structural width is produced for the two hooks, as required by the dimensions of one single hook. Despite their two mutually facing hooks, the connector according to the invention also has only one structural width in the region of its two hooks, this structural width equalling that of a one hook connector. As viewed in the direction in which the groove extends, the two plate tongues are of mirror-image S-shaped configuration to each other, which, due to the intersection, produces the profile of a slim "Figure 8" in front of the common contact surface section for the eccentric disc. The two longitudinal sections can therein be guided by tips on the wedge surfaces of the two side surfaces of the housing, and serve to secure the retraction position of the two plate tongues by running up the hook shanks. If the spring-loading of the joint contact section is produced by a strip, according to Claims 3 to 6, which is angled and integral with the plate material, a separate spring element is spared which would otherwise be necessary. The design of the connector is very simple because it is composed of only three component parts, namely a housing, a plate body which is integrated into the spring-loaded strip and the two plate tongues, and the eccentric pin. Owing to this low number of structural elements, fast assembly of the connector is possible.

When the eccentric pin is turned into the retraction position of the plate, the tensional forces which are transmitted from the eccentric disc onto the rear control projection are so great that deformation can occur there which can cause the eccentric disc to jump back. If material defects are present, or if there is material fatigue because it has been subjected to load over a long period of time, even a rear control projection which acts as a control surface for the eccentric pin can break. This puts at risk the operational safety of the lock, and in extreme cases even makes the connector unusable. By virtue of a loop according to Claim 7, the rear control projection is substantially reinforced, without any significantly extra amounts of material being needed, and without manufacture being any more complex. Therein,

according to Claim 16, the loop can be designed flat enough not to hinder fitment and disconnection of the connector, and when the plate moves longitudinally the bar member is guided in the housing or inside the bar member.

A high degree of operational safety results, if, according to Claim 8, the loop closes on itself in an annular configuration. When tensional forces occur, the loop leg actually abuts on an inside edge in the through opening and thus significantly increases its strength in spite of the fact that the material is relatively thin plate material. A through opening according to Claim 9 is necessary for the eccentric pin to be guided through the plate. Therein, the loop leg should extend parallel to the axis of rotation of the eccentric pin, it should be of extended configuration, and should extend at right angles to the plate, as proposed by Claim 11. For reasons of safety alone, the loop leg will be made to cross the plate and run over on the opposite side.

There is a risk that when the plates are in the retraction position or even when they are being moved into this position, the rear control projection will jump back from the eccentric disc. In order to prevent this from happening, according to Claim 12, a stationary abutment in the housing is provided on which the inner plate end portion is guided from the start of the retraction movement, and this prevents the eccentric pin from being pushed in. Such blocking can be effected by an extended loop leg, as proposed in Claim 13. Even the side wall of the housing takes on such an abutment effect.

If the eccentric pin is rotated by the use of a tool, or the like, from the extension position of the plates into an effective coupled retraction position, there is a risk that the axial pressure exerted will accidentally be too great, and this would push the pin head entirely or partially out of the transverse bore of the bar member into the inside of the housing. This can even happen if a run-up lug in the housing is supposed to act to block the inner end of the plate in the afore-mentioned way. When such an axial pressure is exerted, the inner plate end could actually abut on the run-up lug and simulate a visible blocking of the eccentric for the operator, despite the fact that the effective coupled retraction position of the plates has not yet been reached. This phenomenon harbours a high number of possible accidents.

It is possible, by virtue of the recess mentioned in Claim 15, to secure the proper abutment position of the eccentric disc on the inner end of the plate to a minimum displacement of ca. only 0.1 mm. Then, as soon as rotation begins, the eccentric pin is basically prevented from jumping back from the plate. This then excludes accidental pushing in of the eccentric pin and thus the risk of the connector becoming disconnected from the bar member.

Further advantages and features according to the invention will emerge from the following description and drawings. Therein, the invention is directed at all new features and combinations of features which can be derived from the invention, even if these are not explicitly listed in the claims. The drawings show an embodiment of the invention, wherein:

Figure 1 shows the longitudinal sectional side view through a connection location of the frame according to the invention along the sectional line I-I in Figure 2, before the two bar members are coupled together,

Figures 2A & 2B are plan views of the connection location in section in the decoupled position along the sectional lines II A and II B in Figure 1,

Figures 3 & 4 are a side view and plan view respectively on a large scale of an important component part of the connector which is used at the connection location,

Figure 5 is a detailed view, on a large scale, of the connector shown in Figures 2A and 2B,

Figure 6 is a plan view corresponding to Figure 2A of the connector, with the component parts thereof being disposed in a dismantled position which permits fitment and removal of the connector in a bar member,

Figure 7 shows a sectional view corresponding to Figure 2A of the coupling position of the two bar members at that connection location, and

Figure 8 shows an end cross-sectional view, on a large scale, through the connection location of Figure 7, along the sectional line VIII-VIII in that drawing.

A connector 20 is to be used for the purpose of coupling together bar members 10, 11 to form a frame according to the invention. To this end, the connector 20 is inserted into a cavity 12 in a member from the end face side 13 of a bar member 10 in the direction of the arrow of insertion 63, to be described in greater detail hereinafter in connection with Figure 6, until finally special coupling means 21, 22, 22' project from the end face of the bar 13. In the coupling condition, these engage, as shown in Figure 7, in an undercut groove 14 in the other profile bar 11 which is in the form of a vertical octagonal column in the embodiment shown. The connector 20 is a ready made structural unit for which only three component parts are needed in the present example. These component parts are a housing 23 with a profiled plate 24 which is movable longitudinally therein in the direction of the arrow of movement 61, 61' in Figures 2A and 7, and an eccentric pin 25 which is mounted in the housing 23. The plate 24 is designed in a special way, as can be seen from the respective side view and plan view illustrations on a large scale in Figures 3 and 4.

The plate consists of a bent spring steel sheet metal strip. In the plate 24, a longitudinal slot 39 extends from its outer coupling means 22, 22', this slot being divided into two tongue portions 30, 30'. The two plate tongue portions 30, 30' are bent in opposite manner to each other, as shown particularly clearly in Figure 3, and therefore in this region two separate layers are produced by the plate 24. The longitudinal slot 39 ends in front of a plate portion 31 which remains in a single layer as far as a special end portion 37 to be described in further detail hereinafter. With reference to Figures 1 to 4, the following portions exist in the plate 24, and they are important for the following reasons. The outer end portions 27, 27' of the two plate tongues 30, 30' are bent equally in mirror-image fashion relative to a longitudinal central line 43, indicated by broken lines in Figures 2A and 3, in the housing 23, and comprise hooks 22, 22' which are oriented opposite one another, which are then each joined to a portion 28, 28' with inclined surfaces. In the initial position in Figures 2A and 2B, the plate 24 is in its uncoupled position; it is extended at a maximum from the housing 23 in the

direction of the extension arrow 61', and it therefore projects a long way from the end face 13 of the bar member. This position is therefore termed the "extension position" of the plate 24. In this extension position, the centres of the two inclined surface-sections 28, 28' intersect before the tongues 30, 30' make a transition into two longitudinal sections 74, 74' which point substantially in the direction of displacement of the arrows 61 and 61', these longitudinal sections being disposed on either side of the afore-mentioned longitudinal central plane 43, but no longer having to extend equally relative thereto in mirror-image manner. This produces varying angles of curvature in the mutually adjacent bent portions 72, 72' of the two tongues, which finally make a transition into the afore-mentioned substantially flat other plate portion 31.

The two hooks 22, 22' are formed from tongue ends which are bent back in a U-shaped configuration and which extend in opposite directions to each other, the two U-shaped limbs 70, 71 and 70', 71' being disposed in exact alignment over one another in the plan views shown in Figures 2A and 3, provided that the plates are in the extension position. The free U-shaped limb forms the hook head 70, 70' and therein vertically covers over the other hook shank 71, 71' formed by the other U-shaped limb. Despite the two hooks 22, 22', in the retraction position 61', a structural width 75 is produced which is simply determined by the leg width of one individual U-hook. This leg width 75 is somewhat narrower than the opening width 67 of the groove 14 of the other bar member 11 to be connected thereto. The coupling operative positions of the two U-shaped hooks 22, 22' are the ends 73, 73' of the limbs, as will be described in yet further detail with the aid of Figure 7. The two afore-mentioned longitudinal portions 74, 74' of the two plate tongues 30, 30' are disposed, due to the inclined sections 28, 28' arranged therebetween, approximately in the direction of the associated free U-shaped legs 70 or 70', whereby the two tongue portions 30, 30' are of respective S-shaped configurations. Owing to the afore-mentioned bent configurations which are of mutually mirror-image configuration, the two S-shaped configurations 70, 71, 28, 74, 72, on the one hand, and 70', 71', 74', 72', on the other hand, intersect at the point of intersection denoted by the reference numeral 76 in Figure 3. For this reason, in this extension position, the "Fig. 8" member results in the region of the two plate tongues 30, 30'.

When the eccentric is assembled, the inner plate portion 31 must be exposed to spring-loading in the direction of the arrow 32. This pushes it over the afore-mentioned contact surface 34 towards an eccentric disc 16 disposed on the eccentric pin 25, and keeps it pressed against the one side wall 36 of the housing 23. A spring force 32 like this could come from a separate spring member which is in the form of a compression spring which encloses the eccentric pin 25 and which is arranged between the rear housing wall 36' and the plate portion 31. However, in the present case, the feather steel of the plate 24 is used, and a spring-loaded strip 26 is formed integrally therewith, the free end 77 of which is capable of sliding and bearing on the inner face of the rear side wall 36' of the housing, as shown in Figure 2A. To this end, the afore-mentioned longitudinal slot 39 is provided with a region of increased width 79 in the region of the two longitudinal sections 74, 74' of the plate tongues 30, 30', the regions of increased width being sufficient to shape the central strip 26 in the base 78 of the slot. The spring-loaded strip 26 is therefore seated directly on the one-layer plate portion 31, and the free end 77 of the strip extends onto the two hooks 22, 22'. Except for the greater angle of curvature at the bottom attachment point at 78, the spring-loaded strip 26 extends like a "third tongue" towards the plate tongues 30, 30' provided with hooks. The spring-loaded strip 26 thus extends towards the end face 13 of the member in the direction of the arrow of extension 61', already mentioned several times.

Therefore, the afore-mentioned spring loading 31 chiefly takes effect at the contact surface 34, and by virtue of the eccentric disc 16 acted upon by it, is responsible for pressing the pin head 15 disposed in front of it, as shown in Figure 5, in the direction of the axis of rotation 44 of the eccentric, over the boundary of the front housing and side wall 36. The plate portion 36 comprises firstly a through opening 33 through which an eccentric pin 25 passes, and the opening being substantially in the form of an elongate hole in this example. At either end of the through opening 33 there are control projections 35, 38 which frame and overlap the control surface 34 between them. An eccentric disc 16 is then disposed between the control projections 35, 38. The control projection 35 consists of the edge of a dent which is made in the edge region of the through opening 33, whilst the other control edge 38 has a special property in the example shown, and a bent-back loop 40 is produced due to the number of bends of the inner end portion 37 of the

plate. Behind the through opening 33 the plate portion 31 is first of all still flat, and it then forms a loop leg 42, whereupon the plate material passes back, and then via an L-shaped bent configuration, makes a transition into an end limb 41 which extends substantially at right-angles to the contact surface 34, this end limb being referred to hereinafter in brief as the "loop leg 41". The zone 38 of the loop leg 31 which projects over the contact surface 34 acts as the rear control projection for the eccentric disc 16.

When the connector 20 is being assembled, the journal 17 of the eccentric pin 25 is first of all guided from the contact surface 34 through the through opening 33 in the plate 24, and these two component parts are introduced through the opening inside the end 51 of the housing into the inside of the housing as shown in Figure 5, until the cylindrical pin head 15 arrives at the semi-circular base of a wall section 50. The wall section 50 makes a transition into a portion of increased width 52 at the inner end 51 of the housing, into which the loop 40 is introduced. With this assembly, the cylindrical journal 17 in the rear side wall 36' of the housing arrives at a mounting bore 53 which encloses it semi-circularly. On the oppositely disposed side, the journal 17 then bears on a guide rib 59 which is formed on the rear side wall 36' of the housing, and which is used to accurately introduce the eccentric pin 25 when the connector 20 is being assembled. To this end, the eccentric pin 25 is provided with a diametral groove 58 on the end of its journal 17 which can slide over the guide groove 59 when the connector is being assembled. In the assembled condition, the afore-described surface contact exists between the eccentric disc 16 which is spring-loaded in the direction of spring loading 32 by the contact surface 34 on the inside face of the front side wall 36 of the housing. This is the abutment position for the afore-mentioned pin head 15 in its position where it is pushed out and which is shown in Figure 5. At the end face the pin head 15 has both an axial tool receiving means 19 and also a mark 18 which characterises its maximum eccentricity. The mark 18 can be used to detect the respective rotated position of the eccentric pin 25. After assembly in the described way, the mark 18 points towards the two hooks 22, 22'. The complete extension position 61' of the plate 24, already mentioned several times, exists. Only in this position is it possible to assemble and dismantle the connector 20 quickly and easily to and from its bar member 10, as will be described in greater detail with the aid of Figure 6.

To this end, a pressure is exerted upon the pin head 15 in the direction of the arrow 62, against the spring-loading. As a result, the eccentric pin falls back into the inside of the housing in push button-like manner because an axial free space still remains behind the end face of the journal 17 in the mounting bore 53. As can be seen in Figure 5, the loop leg 41 not only produces the afore-mentioned control projection 38 for the eccentric disc 16, but engages into the through opening 33 in the plate, and, in the present case, continues on the oppositely disposed plate side in an extension portion 46 of the leg. The end face 47 of the loop leg 41 is disposed close to the inside face of the rear side wall 36' of the housing. The end face 47 has a cut-out 82 which is shown in Figure 4 and which engages with clearance the central guide rib 59 on the inside face of the side wall 36' of the housing. In order that it may pass through the through opening 33, this extension portion of the leg 46 is narrower than the rest of the plate width. In the extension position shown in Figure 6, a recess 55 which is in the form of a hole in the side wall 36' is disposed in alignment with the end face 47 of the leg, and for this reason, as shown in Figure 6, the eccentric pin 25 can be pushed in 62. Since the pin head 15 no longer projects over the outer periphery of the bearing housing 23 in this pushed in position 62, the connector 20 can be introduced through the end opening 13 in the member, in the direction of the arrow of insertion 63 in Figure 6, for it to be assembled to the bar member 10, until the pin head 15 comes into alignment with a transverse bore 60 in the wall of the bar member 10. When this arrangement is present, the spring loading 32 pushes the pin head 15 back into its starting position where it automatically engages in a transverse bore 60 in the bar member 10, as shown in Figure 2A. The connector 20 is thus embedded in the bar member 10 to a predetermined extent.

Disposed on the housing 20 are coupling means, fixed to the housing, in the form of a pair of lugs 21, 21. When assembled, the lugs 21 abut on a rear stop surface 80 in front of the end face 13 of the bar, already mentioned several times. The width of the lugs 21 corresponds to the afore-mentioned structural width 75 of an individual hook 22 or 22', and for this reason they are covered over by the two hooks 22, 22', in the direction in which the groove, shown in Figure 1, extends 65, see the plan view in Figure 2A. The two lugs 21 hold the two hooks 22, 22' in a longitudinally extending arrangement relative to each other. In the extension position shown in

Figures 1 and 2A, the bar member 10 which is provided with the connector 20 in this way is inserted into the inside of the groove 14 through the groove opening 67, wherein the two lugs 21 rest on the insides of the groove walls on either side, and they prevent undesirable tilting of the bar member 10 relative to the column 11.

The spring-loading 32 not only acts upon the eccentric pin 25, however, but also acts upon the plate tongue 30. In the extension position shown in Figure 2A, the inclined surface 28 is thereby kept pushed against a contact location in the housing 23 in the form of a wedge surface 29. The wedge surface 29 therein makes a transition into a flat tip 81 which extends substantially parallel to the afore-described longitudinal section 74 of the plate tongue 30. This secures the afore-described predetermined position of alignment of the hook 22 in the extension position 61' of the plates. The afore-mentioned coupling means 21, 22 are in alignment, and, as shown in Figure 2A, are of small structural width 75, which, as already mentioned, results from the width of the limb 75 in Figure 3. The corresponding predetermined position is also present with the other plate tongue 30', as shown in Figure 2B.

Here too, the corresponding inclined surface 28' is disposed on a contact location of the housing 23 in the form of a wedge surface 29', which, in turn, makes a transition into a flat tip 81' which extends substantially parallel to the longitudinal portion 74' there. Thus, in the extension position 61' of the plates, the hook 22' adopts the vertical position, already mentioned a number of times, where it is in alignment between the two lugs 21. However, when they abut in this way 28', 29' owing to the spring-loaded properties of its plate material, the plate tongue 30' exerts an additional force component on the spring loading 32 which is added to the spring-loading of the spring-loaded strip 26 shown in Figure 2B. This means that the pin head 15 is held particularly securely in the transverse bore 60 of the bar member. The assembly position of the parts 20, 10 is thus particularly reliably ensured.

The bar member 10, provided with the connector 20, is joined to the other bar member 11 by the two hooks 22, 22' and the two lugs 21 being inserted into the inside of the groove through the groove opening 67, as shown by the extension position in Figure 2A. By virtue of its tool receiving means 19, the pin head 15 is thus accessible through the transverse bore 60 of the bar member 10.

A rotary tool such as a screwdriver is used and turns in the direction of the arrow 83 in Figure 1. Then, the eccentric disc 16 then begins to move the plate inwards via the rear control projection 38 in the direction of the push-in arrow 61 in Figure 7. After only a short path of movement, of 0.1 mm for example, the end face 47 of the loop leg 41 is no longer in alignment with the housing opening 55, but is moved somewhat beyond the adjacent wall portion 66. The housing opening 55 only has an opening width in the push direction 61 which corresponds to the plate thickness 56 in Figure 5. Even after a small amount of displacement, the position of the plate portion 31 in the housing 23 is ensured. The eccentric disc 16 cannot jump back from the loop leg 41 which acts as the rear control projection 38. Surface contact always exists between the eccentric disc 16 and the contact surface 34 of the plate 24. The press-in movement 62 of the eccentric pin 25, mentioned in connection with Figure 6, cannot happen now, even by accident. Dismantling of the connector 20 from the bar member 10 is thus prevented.

When rotated 83, the eccentric pin 25 can pass through an angle of rotation of 180° . To that end, the upper wall of the housing 23 in Figure 1 has a slot, so that the disc region of maximum eccentricity can rotate from the front control projection 35 as far as the rear control projection 38. Inside the control disc 16, the eccentric pin 25 still has the abutment cam 84, shown in Figure 5, which can move through the recess 85, shown in Figure 4, on one side of the through opening 33. During this rotation 83, the two hooks 22, 22' are not only displaced axially in the direction of the push-in arrow 61, but move laterally as well, since the inclined surfaces 28, 28' of the two plate tongues 30, 30' run up on the associated contact locations 29, 29' fixed to the housing. As a result of the inclined, mirror-image configuration, the two hooks 22, 22' move laterally in opposite directions. A lateral displacement 69, 69' of the two hook heads 70, 70' results which is oriented in opposite directions, and the heads continue to move behind the inner faces of the two groove walls 68, until finally, as shown in Figure 7, both ends 73, 73' are pressed against the inner face of the groove, thereby pressing the groove wall against the end face 13 of the bar member 10, the visible side of which is supported by it. The two coupling hooks 22, 22' and the end face 13 of the member thus act like two clamping jaws which clamp the two groove walls together. In the clamping position shown in Figure 7, the plate 24 is pushed in to the maximum extent, and for this reason the position is termed the

"retraction position" of the plate 24. This is to be seen by the mark 18 on the end face of the pin head 15, since this end face of the pin head, contrary to Figure 1, has been brought into the diametrically oppositely disposed position, and thus points towards the loop 40. In this retraction position, the afore-mentioned abutment cam 84 has moved in front of the edge 86 of the through opening 33 in the plate, and thus stops further rotation 83 of the eccentric pin 25.

If the loop leg 41 is resting, in the region of the through opening 33 in the plate, on the rear inside edge 45, then the loop 40 acts as a fixed abutment during clamping movement in the push-in direction 61. However, in some instances it is to be recommended, as shown in Figure 4, that a gap 54 be provided between the inside edge 45 and the loop leg 41. Then, owing to the forces which operate during the push-in movement 61, an elastic bending load on the loop leg 41 results. This bending load then determines the maximum clamping force which is to act upon the coupling hooks 22, 22' and which can be determined on the basis of structural dimensions. A clamping force defined in this way is able to prevent inadmissibly high loads which could cause damage to the bar material 10, 11, if that material is a relatively soft material such as aluminium.

The run-up movement of the two inclined surface sections 28, 28' therein does not need to end in the region of the wedge surfaces 29, 29' on the housing side. Instead, when the plates are in the fully retracted position 61, the two hook shanks 71, 71' could run up onto the flat tips 81, 81' adjacent to the housing. In this case, lateral displacement 69, 69' of the two hook heads 70, 70' would be ensured in the completely clamped condition. The two wedge surfaces 29, 29' are therein placed in front to such an extent their two wedge-shaped tips 87, 87' engage in the region of the two lugs 21, fixed to the housing, as shown in Figures 2A and 2B. They help support the groove opening 67 against the inside faces, and also help support the lugs 21, in the coupled condition.

In the retraction position 61, a push-in movement of the eccentric pin 25 is, of course, still blocked, and the correct surface contact between the plate portion 31 and eccentric disc 16 is, of course, ensured. The eccentric disc 16 is prevented from jumping back from its rear control projection 38 on the

loop 40, when in the extension position 61. The end face 47 of the loop leg 41 is actually still disposed in front of the wall portion 66 which acts as an abutment. In order to be able to dismantle the connector 20 from the bar member 10, the extension position 61' shown in Figures 1 and 2A must first of all be reached again, in which position the loop leg 41 is in alignment with the hole 55 in the housing. Only then can the pin head 15 be pushed in again in the direction of the arrow 62 in Figure 6. When the pin head 15 has been pushed in 62, the end face 13 of the connector 20 can then be withdrawn in the direction of the arrow 64 from the decoupled bar member 10 out of the cavity 12 inside the member.

The slim structural dimensions of the connector 20 mean, in terms of the housing, that the wedge surfaces and flat tips 81, 81' of the two housing-contact locations 29, 29' overlap 48, as best shown in Figure 7. By bending back the loop 40, a closed ring results, the winding loop of which produces a flat member of relatively small loop height 57. The loop height 57 therein is in size such that the loop 40 does not project beyond the front boundary of the housing-side wall 36 in the afore-mentioned starting position. The apex 42 of the loop can, however, project beyond the inside end face 51 of the housing quite easily. In spite of the loop 40, the housing 23 consequently does not have to be any greater in length.

The inclined faces 28, 28' do not need to be in the form of inclined uni-dimensional ramps, but they can be designed as two-dimensional screw surfaces. Accordingly, the associated contact locations 29, 29' fixed to the housing would be in the form of guide slots or the like. Instead of pivotal movement in the direction of the two arrows 69, 69' in Figure 7, the two hook heads 70, 70' would then make a twisting movement. It does not matter in which way the pressing surfaces 73, 73' arrive behind the inside surfaces 68 of the two groove walls in the clamping condition.



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CLAIMS

1. A frame comprising bar members (10, 11) which can be releasably coupled together by a connector (20) and of which at least some (11) have undercut grooves (14) and others have a cavity (12) for receiving the connector (20) at the end,

the connector (20) comprises a housing (23) which fits in the cavity (12), also a profiled plate (24) which is longitudinally displaceable (61, 61') in the housing between an extension position and a retraction position, and finally an eccentric pin (25) which passes through the plate (24) and which has an eccentric disc (16),

at its outer end portion (27) which projects out of the bar member the plate (24) carries a hook (22) and also has an inclined surface (28) which is guided against a contact location (29) in the housing (23) and which upon plate retraction (61) moves the hook (22) transversely (69) behind the groove wall (68) of the other bar member (11), and finally its inner plate portion (31) has a contact surface (34) for the eccentric pin (25) and also has control surfaces (35, 38) for the eccentric disc (16) for longitudinal movement (61, 61') of the plate,

wherein the eccentric pin (25) is spring-loaded (32) by way of the contact surface (34) of the inner plate portion (31) transversely to the bar member (10) and said spring loading (32) urges a pin head (15) of the eccentric pin (25), which pin head serves as a rotary handle, out of the housing (23) into a transverse bore (60) in said bar member (10),

characterised in that

a longitudinal slot (39) extends through the plate (24) from the contact surface (34) to and including the outer end (27) and produces in the plate two plate tongues (30, 30') which are disposed one above the other in the housing (23),

the two plate tongues (30, 30') have hooks (22, 22') which are directed in opposite relationship to each other on the one hand and inclined surfaces (28, 28') which extend in opposite relationship to each other on the other hand, and



the two side walls (36, 36') which are disposed opposite each other in the housing (23) have two contact locations (29, 29') which are directed towards each other for the two inclined surfaces (28, 28').

2. A frame according to claim 1 characterised in that the outer plate end portions (27, 27') of the two plate tongues (30, 30') are of identical mirror-image configuration relative to each other with respect to a longitudinal central plane (43) of the connector (20),

wherein as viewed in the extension position of the plate (24) the plate end portions (27, 27') include mutually intersecting inclined surfaces (28, 28'), in addition they have hook shanks (71, 71') which are spaced from each other substantially corresponding to the width (67) of the opening of the groove (14), and finally they have hook heads (70, 70') which substantially overlap each other in the direction (65) in which the groove (14) extends.

3. A frame according to claim 1 or claim 2 characterised in that the spring loading (32) of the contact surface (34) is produced by an integral angled strip (26) of the plate (24) which comprises spring material, the free end (7) of the strip bearing slidably against the inside surface of the one side wall (36') of the housing.

4. A frame according to claim 3 characterised in that the longitudinal slot in the plate (24) is enlarged in the inner region which is towards the contact surface (34) and serves to provide the resilient strip (26).

5. A frame according to claim 4 characterised in that the resilient strip (26) is formed on the plate (24) in the bottom (78) of the slot thereof and extends in the extension direction (61') of the plate (24).



6. A frame according to claim 1 characterised in that a longitudinal slot (39) starts from a cut-out (79) in the plate (24), which cut-out accommodates a spring strip (26), the longitudinal slot (39) extends through the plate (24) to the outer end (27) thereof and divides the plate (24) into two plate tongues (30, 30') which are disposed one above the other in the housing (23), the two plate tongues (30, 30') have two hooks (22, 22') which are directed in opposite relationship to each other and also have two inclined surfaces (28, 28') which extend in opposite relationship to each other and whose contact locations (29, 29') are at the two walls (36, 36') which are in opposite relationship in the housing (23), wherein the spring strip (26) disposed in the cut-out (79) is carried on the one-piece inner plate portion (31) and is directed with its free strip end (77) towards the two hooks (22, 22').

7. A frame according to one of claims 1 to 6 characterised in that the inner end portion (31) of the plate (24) is bent back to provide a loop (40) and forms a loop leg (41) which extends transversely to the plate (24) and which delimits the contact surface (34) of the plate (24) and serves as a rear control surface (38) for the eccentric disc (16).

8. A frame according to claim 7 characterised in that the loop (40) is closed on itself in an annular configuration and its loop leg (41) projects into a through opening (33) in the plate (24).

9. A frame according to claim 8 characterised in that the through opening (33) serves at the same time for the eccentric pin (25) to pass through the plate (24).

10. A frame according to claim 8 or claim 9 characterised in that at least in the retraction position (61) of the plate (24) the loop leg (41) is in firm contact against the inside edge (45) of the through opening (33).



11. A frame according to one of claims 8 to 10 characterised in that the loop leg (41) crosses the plate (40), is linear and extends further (46) substantially at a right angle to the plate (24) on the side of the plate which is remote from the contact surface (34).

12. A frame according to one of claims 8 to 11 characterised in that in the retraction position (61) of the plate (24) the loop (40) is admittedly aligned with a stationary abutment (66) in the housing (23) and, against the spring loading (32), blocks the eccentric pin (25) from being axially pressed (62) into the housing (23), but the loop (40) in the extension position (61') of the plate (24) is free relative to the abutment (66) and permits the eccentric pin (25) to be axially pressed in (62).

13. A frame according to claim 12 characterised in that the end face (47) of the loop leg (41) serves for blocking the eccentric pin (25) and in the retraction position (61) of the plate (24) bears against the abutment (66) when the eccentric pin (25) is pressed in (see Figure 7).

14. A frame according to one of claims 1 to 13 characterised in that the abutment (66) for the plate end portion is formed by the one side wall (36') of the housing (23).

15. A frame according to one of claims 1 to 14 characterised in that in the extension position (61') of the plate (24) the plate end portion can move when the eccentric pin (25) is pressed in (62) by virtue of a recess (55) in the side wall (36') of the housing (23).

16. A frame according to one of claims 8 to 15 characterised in that the loop (40) has a flat profile and its loop height (57) terminates at the side wall (36') of the housing (23).