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Clamping device for releasably connecting two profiled parts

The present invention relates to a clamping device for releasably connecting two profiled parts according to the preamble of patent claim 1.

Such a clamping device is known for example from CH-A-576 591. This device serves for connecting frames and/or panels composed of profiled parts. For this purpose a longitudinally displaceable bolt is provided, which is guided in a profiled part and which at its top end is T-shaped in order to engage behind a groove of another profiled part. The longitudinal displacement of the bolt is achieved through the conical tip of the screw interacting eccentrically with a conical recess in the bolt, which serves as a cam surface.

In a further embodiment of this clamping device it is known from EP-PS-0 123 683 to secure the tie bolt so that it is elongated with a rod having a widened end portion, and that the insert coin is provided with expanding fingers and has inwardly

projecting dogs to engage behind the widened end portion. Such a snap catch can also be built by a sleeve made in one piece with at least one longitudinal slot in which a pin, arranged diagonally in the rod, is guided.

Furthermore, FR-PS 2,152,941 describes a device with holding elements which are pivotally beared around an axis which is fixedly arranged in the casing. This device has no bolts and no screw which, over sliding surfaces, engages with the bolts, but rather the holding elements are pivoted directly through an eccentric. The casing has no sliding surfaces which, at an axial movement of the holding elements, cause a pivoting of the latter, but the sliding surfaces are located in the eccentric and in the bottom region of the holding elements.

It is now an object of the present invention to create such a clamping device in which the operation of the bolt is improved.

According to the invention this object is achieved by a clamping device according to the features given in the characterizing clause of patent claim 1.

Further advantageous embodiments of the invention are provided in the dependent claims.

The invention is explained in detail by way of example as follows with reference to a drawing. The figures show:

Fig. 1 an exploded representation of the clamping device according to the invention with insert core and a first profiled part,

Fig. 2 in a diagrammatic representation the assembly of an embodiment of the device according to the invention in a section across the longitudinal axis of a fixing bush,

Fig. 3 a diagrammatic representation of this device in a section transversal to the longitudinal axis of the fixing bush,

Fig. 4 a plan view of a flat or blocklike holding piece of such a device,

Fig. 5 a side view of another embodiment of an insert core according to the invention,

Fig. 6 a perspective representation of a tie bolt with a transverse mountable tie bar,

Fig. 7 a perspective representation of a spring profile for these flat holding pieces,

Figs. 8 and 9 a diagrammatic representation of a holding piece in an open position and closed position, respectively,

Figs. 10 and 11 respective front and side views of a variant of a clamping spring for the support of such holding pieces,

Fig. 12 a plan view of this clamping spring,

Fig. 13 a diagrammatic representation for the explanation of the operation of such a clamping spring, and

Figs. 14 and 15 a diagrammatic representation for the explanation of the operation of a safety mechanism in the blocked and liberated positions, respectively.

One first profiled part 1 of a frame assembled of a plurality of profiled parts is shown in figure 1, into which an insert core 2 made of a light material, preferably plastic material, can be pushed in and secured firmly. The insert core 2 is provided with a transverse bore 3 in order to uptake a fixing bush 4 with a grub screw 5 and with a longitudinal bore, unseen in figure 1, for receiving a coil spring 6 and a tie bolt 7.

The profiled part 1 preferably has a right-angle cross section with guide rails 8 protruding in a cavity for allowing the insert core 2 to be fitted into it. For this purpose the insert

core 2 can be provided with shoulders 9, 9', 10 and 10' which facilitate the fitting. The insert core 2 has on its left front side an opening 11 perpendicular to the axis of the bore 3, which can, if necessary, be covered laterally by two side plates. In figure 1 only one such side plate 12 is shown which on its left frontal surface has a projecting part 13 which juts out of the middle. The plate 12 and the shoulders 9 and 10 yield two grooves which facilitate a correct fitting of the insert core 2 via the guide rails 8. The same applies for a lower side plate which is not shown in figure 1. These side plates are preferably also made of plastic material.

The tie bolt 7 is accommodated in a movable state in the longitudinal bore, whereby between its end and the end of the longitudinal bore the coil spring or compression spring 6 is accommodated. The tie bolt 7 has an almost conically shaped recess 14 into which extends the conical end or tip 15 of the screw 5. The screw 5 is led through the fixing or threaded bush 4 which itself can be introduced into the bore 3 of the insert core 2. The bush 4 has a transverse bore 16 for the uptake of the tie bolt 7. The conical tip 15 of the screw 5 interacts with the larger conical recess 14 in accordance with the principle of inclined surfaces and displaces the tie bolt 14 to the right (fig. 1) in order to close the clamping device.

In figures 2 and 3 the longitudinal bore of the insert core 2 is seen where the spring 6 and the tie bolt 7 are accommodated, the latter being intended to support different holding pieces 17, 17', 18 and 18'. These holding pieces are stacked in a flat manner alternately on top of one another in two groups in reverse.

Figure 2 also shows a second profiled part 19 with at least one slot into which the ends of the holding pieces 17, 17' are inserted. Such holding pieces 17, 17', 18 and 18' can be held for example in a non-operative position with the aid of a profiled spring peg 20. In figure 3, for instance, two groups of holding pieces are represented and indeed four holding pieces 17, 17'... to the left and 4 holding pieces 18, 18'... to the

right, whereby the holding pieces 17, 18' are accommodated in one position and the holding pieces 17' and 18 in the reverse position.

In figure 4 an embodiment of a holding piece is represented which has at its one end area a projection 21, at the other end area a bore 22 and in the middle area an enlargement 23 with an inclined surface 24.

In figure 5 a variant of the insert core 2 is represented whose walls 25, 25', marking off the opening 11, each have a slope 26, 26' which are intended to interact with the inclined surfaces 24 of the holding pieces (fig. 4) in order to achieve the effect depicted in figures 8 and 9.

Figure 6 shows the tie bolt 7, only partly represented in figure 1, which has a cylindrical part in which the conical recess 14 is located, and a flattened part which has a bore 27 into which a rod 28 can be inserted. The rod 28, which can also be seen in figure 3, serves for supporting the holding pieces which for this purpose are provided with the bores 22 (fig. 4). Such holding pieces can be punched out of e.g. light metal or steel. The rod 28 can be centredly fixed.

The profiled spring peg 20, depicted by way of example in figure 7, has an approximately trapezoidal cross section. The longitudinal edges 30, 30' by the opening 29 of the profiled spring peg 20 are flanged so that the holding pieces can be held laterally more securely. The base of the profiled spring peg 20 has an opening 31 for the tie bolt 7. The spring action of the profiled spring peg 20 enables the holding pieces 17, 17'... 18, 18'... to be supported in such a way that their ends form a kind of block whose width is smaller than the width of the slot of the second profiled part 19, into which they are introduced together, and this independent of the orientation of the individual holding pieces with respect to the projection 21 (fig. 4) alternating to the left or the right.

The device according to the invention functions as follows:

In the non-operative position the holding pieces, for example the piece 17' in figure 8, can be introduced perpendicularly into the slot of the second profiled part 19. The distance between the axis 32 of the bore 22 of the holding piece 17' or the rod 28 of the tie bolt 7 (figures 6, 3 and 1) and a reference point P of the profiled part 19 is in this open position equal to D_0 . It can be seen from figure 2 that in this open position the deepest point of the recess 14 of the tie bolt 7 is in a shifted position relative to the axis of rotation of the screw 5 (fig. 1) or relative to the axis of symmetry of the fixing bush 4. By turning the screw 5 in the recess 14 the tie bolt 7 (fig. 2) is moved downwards so that the distance D_v between the axis 32 (fig. 9) and the point P becomes greater than D_0 . The inclined surface 24 of the holding piece 17' slides over the slope 26 of the insert core and causes a rotation of the holding piece 17' about the axis of rod 28 until the projection 21 engages behind the longitudinal groove or slot of the profiled part 19. Because the different holding pieces function alternately and therefore also separately, the result is an excellent fastening of these profiled parts 1 (fig. 1) and 19 (fig. 9).

The clamping effect according to the invention can, as explained, also be achieved with one single holding piece. In practice, however, two or more holding pieces should be used for each clamping device. Very good results could be achieved, independent of the sequence, with each of three holding pieces to the left and to the right in the tie bolt 7. The slopes 26 can be provided directly in the end region (fig. 2) of the walls in the opening 11, or a little further inside the insert core 2 (fig. 5).

Instead of slopes 26 curved sliding surfaces or embedded rods can be used. In addition, it is worth mentioning that by suitably sizing the profiled spring peg 20, which in itself is not strictly necessary, the spring 6 can be eliminated.

In the example shown in figure 3 the holding pieces 17, 17'... 18, 18'... could be clamped laterally between a circular spring and a nut so that owing to their own weight, they would not be able to rotate. Thus the spring 20 could be eliminated.

From this result of course several variants with for instance n holding pieces to the right and/or to the left, whereby n can also be equal to 1; in this case it would for example be a blocklike holding piece with the height $h = n \cdot e$.

The screw 5 with the conical tip 15 and the recess 14 of the tie bolt 7 constitute a system of cam surfaces or sliding surfaces, which can also be realized with other means, for example by a dihedrally shaped recess 14 in the tie bolt and a dihedral dog accommodated between the bush 4 and the tie bolt 7, such that a screw preferably without a tip can press the dihedral dog against the dihedrally shaped recess.

Finally, the profiled part 1 in figure 1 is provided with a bore 3' which interacts with a recessed border 4' at the threaded bush 4 in order to hold firmly the insert core 2 in the profiled part 1.

In a further embodiment of the invention the profiled spring can be a double acting clamping spring. Such a clamping spring is shown in figures 10 to 13. This clamping spring consists for example of a base 36 with a preferably round bore 37, two elongated sidewalls 38, 39 and two narrow side walls 40, 41 each of which can be provided with a small round bore 42, 42'. Such a clamping spring can operate laterally on the narrow sides of all holding pieces and/or on the extremely flat sides of the block formed by the holding pieces. Thus the rod 43 can have a constriction at each of its ends in order to hold them in the clamping spring between the bores 42, 42'. The spring 20 (fig. 7), which is a simplified version of spring 35 but without narrow side walls, could also have a round bore in the base the diameter of which is greater than the diameter of the tie bolt.

In a further embodiment of the invention the insert core can be provided in one piece instead of having stuck together plates 12, 12'. In addition, the insert core can also be constructed similarly to that known from EP-0 123 683 as far as the guide grooves and/or the holding catch described there are concerned, whereby a nut which can be screwed to the corresponding elongation of the tie bolt can also serve as holding catch.

The working surface of the projection 21 (Fig. 4) has a bevel preferably with an angle of approximately 10° . For the bevel of the plane 24 (fig. 4), the angle w' is preferably approximately 40° .

Figures 14 and 15 show the operation of the bush 4 as safety mechanism for blocking the axial movement of the bolt 7. This safety effect is caused by itself, since the outer border of the bush 4 enters into the opening 3' of the profiled piece 1 (figures 1 and 14) when the screw 5 (fig. 1) is screwed in. This means that the clamping device is blocked by itself, if it clamps as indicated in fig. 14 (without the screw 5). However, the clamping device is freed (fig. 15), if the screw 5 is not exerting. In this case the bush 4 can be pressed into the profile 1 in order to be able to take the casing out without problems. For this purpose the diameter of the bore 16 (fig. 1) of the bush 4 is about several millimeter larger than the diameter of the bolt 7 in the region of the recess 14, whereby the bore 16 can also be oval, preferably however a parallel oblong bore with rounded off edges in order to make a lateral displacement between the bolt 7 and the bush 4 possible.

For this application the pitch of the thread of the screw 5 or of the bush 4 (fig. 1) can be larger than 1 mm per revolution. Very good results could be achieved for example with values of 3 and 4,5 mm per revolution. Preferably a trapezoidal thread is used, for example Type M10x3.

In contrast to the embodiment of figure 7, the springs 20 in figures 14 and 15 have a very slight trapezoidal cross section which could be omitted if the casing 2 (fig. 5), in the lower

region of the space where the spring 20 is inserted, has beveled surfaces 44, 45 on the inside which act as a guide for the base of the spring 20. This embodiment can be of importance, especially in case the elongated side walls of the spring 20 extend perpendicularly to the base 36 (fig. 12).

The threaded bush 4 according to figures 14 and 15 has an outer frontal area 46, a shoulder area 47, a front supporting area 48 and a rear supporting area 49. On locking the frontal area 46 in the bore 3' the shoulder area 47 can lean against the edge of the wall of the bore 3'. The distance between the surfaces 48 and 49 corresponds to the expanded diameter of the transverse bore 16 which preferably is an oblong bore. The distance between the surfaces 46 and 48 (fig. 15) is preferably only a little smaller than the smallest distance between the wall 1' and the bolt 7 in the region of the recess 14, and the distance between the surfaces 47 and 49 (fig. 14) is preferably only a little larger than the largest distance between the wall 1' in the region of the bore 3' and the bolt 7 in the region behind the recess 14.

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Claims

1. Clamping device for releasably connecting two profiled parts (1, 19) wherein an insert core (2) intended to be inserted and fixed in a first of the profiled parts (1) has an axially movable bolt (7) having an end portion which comprises a projection intended to be introduced at least partially in an opening of a second profiled part (19) in order to exert a force against a portion of said second profiled part partially covering said opening, wherein a screw (5) received in a threaded bush (4) engages the bolt (7) by means of a system of sliding surfaces (14, 15) in order to displace the bolt axially, characterized in that the bolt (7) has supporting means (27, 28) for pivotally supporting at least one holding piece (17, 17', 18, 18'), and that said holding piece and at least one of the interior walls of the insert core (2) have a second system of sliding surfaces (24, 26) which owing to an axial movement of the bolt (7) cause a deviation of the holding piece (17) having in its free end area said projection (21) intended to exert said force.

2. Device according to claim 1, characterized in that said supporting means (27, 28) support several individually pivotally hinged holding pieces (17, 17', 18, 18').

3. Device according to claim 2, characterized in that said holding pieces are stacked flat and alternating with the projection (21) in one or the other direction.



4. Device according to claim 2 or 3, characterized in that said supporting means (27, 28) comprise a rod (28) transversely arranged in the end region of the bolt (7).

5. Device according to one of the claims 1 to 4, characterized in that the working surface of the projection (21) of the holding pieces has a bevel.

6. Device according to one of the claims 1 to 5, characterized in that the second system of sliding surfaces comprises at least one slope (26, 26') on the inside of a wall (25, 25') of the insert core (2) and one inclined surface (24) associated with it in an extension (23) of the holding pieces.

7. Device according to one of the claims 1 to 6, characterized in that the holding pieces are partly clamped on the inside of a spring (20; 35).

8. Device according to one of the claims 1 to 7, characterized in that the insert core (2) has bevelled surfaces (44, 45) in order to facilitate at least approximately a centered introduction of the holding pieces (17, 17', 18, 18') beared by said supporting means.

9. Device according to one of the claims 1 to 8, characterized in that the thread of the screw (5) and of the threaded bush (4) respectively has a pitch of more than 1 mm per revolution.

10. Device according to one of the claims 1 to 9, characterized in that the bolt (7) is guided through a laterally expanded transverse hole (16) of the threaded bush (4) and wherein a transverse bore (3) of the insert core (2) and the threaded bush (4) guided in it are designed in such a form-locking way that a lateral displacement of the threaded bush (4) along the transverse bore (3) of the insert core (2) is possible.