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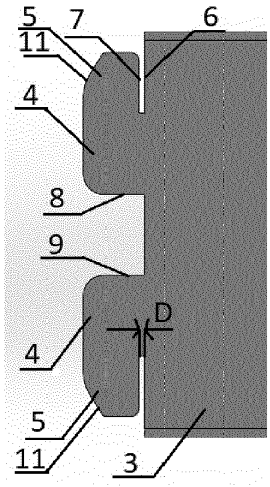
(54) JOINING SYSTEM FOR PROFILES OF FENCES

(57) A system for joining closed profiles which allows two closed profiles to be joined by means of special catches (4) which are cut out in the receiving profile (1), while in a second, donor profile (3) special receiving slots (2) are cut out, adjusted in shape and size to the catches (4) of the donor profile (3), and the method for joining closed profiles with the use of the system for joining closed profiles according to the invention.

Fig. 1

A



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Description

TECHNICAL FIELD

[0001] The object of the invention is a system for joining closed profiles, allowing two closed profiles to be joined with the use of special catches, which are cut out in one of the profiles, while special receiving slots are cut out in the other profile, the said slots matching the shape and size of the donor profile catches. The invention also relates to a method for joining closed profiles with the use of the system for joining closed profiles, wherein in the receiving profile, after inserting the catches into the receiving slots, after the profiles are properly positioned in relation to each other, the wings of the catches are bent. The fastening made in this way ensures a permanent inseparable connection of two closed profiles.

PRIOR ART

[0002] For fencing premises, houses or other buildings, fencing spans, gates and wickets are usually used, which are manufactured using the technology of joining semi-finished products in the form of closed profiles with the use of welding or braze welding process. This type of technology is used as a standard technology in many companies manufacturing fences. Depending on the type of span, gate, wicket, there are various types of joints of square and rectangular profiles joined by welding or braze welding operation.

[0003] Publication PL 359911 discloses a method for joining two aluminium profiles perpendicular to each other, wherein the closed first profile comprises a load-bearing section embedded inside the end part, the external shape of which corresponds to the shape of the internal part of the first profile, while in the opening in the second profile and in the corresponding opening in the load-bearing section, there is a fastening screw element by means of which the profiles are joined.

[0004] Methods are known for joining closed profiles with press-in connectors but this joining does not ensure a permanent stable connection, particularly when joining profiles at right angles, and is not suitable for use in the construction of fences.

[0005] From the patent application PL420725A1, it is known to join profiles by shaping them mutually in such a way that a permanent connection is obtained by pressing the joined part into a properly prepared element, e.g. a span post.

[0006] From the publication PL300776 A1, a method is known for rigidly joining two sections having a closed profile and a rectangular cross-section, which consists in inserting the joint through the openings in the walls of the first section into the openings in the walls of the second section, shifting these sections together with the joint in relation to each other and tightening. The joint is made of a solid metal plate with an internal cut-out and an external cut-out forming identical catches along one side of the plate. This joint allows only longitudinal joining of two profiles and does not allow joining two profiles at a right angle to each other.

[0007] Joining by means of a welding seam ensures a permanent, stiff connection of two closed profiles. However, this is a very costly and time-consuming operation, during welding the material heats up and it deforms under the influence of temperature. After joining two closed profiles at a right angle, a visible unaesthetic weld remains on the joint, which is visible even after covering the weld seam with varnish or paint.

[0008] Hence, in order to optimise the process and to increase the aesthetics of the connections of closed profiles joined at a right angle, solutions are sought that enable a permanent, inseparable connection of closed profiles with the use of another alternative, stable connection method other than welding.

DISCLOSURE OF THE INVENTION

[0009] In view of the described prior art, the object of the present invention is to overcome the indicated disadvantages and to provide a system for connecting two closed profiles, preferably for use in joining closed profiles in the production of fences, for joining profiles at a right angle to each other, which will eliminate the need for welding operations, avoid heating the material during this process and avoid the deformations associated with it, and at the same time it will ensure increased strength and high stability of the connection, as well as ensure increased aesthetics of the connection, as the connection will be devoid of visible bolts and weld seams.

[0010] This object has been achieved by the present invention which relates to a unique system for joining two closed profiles as well as a method for joining two closed profiles with the use of this system.

[0011] The invention relates to a system for joining two closed profiles, which comprises a first closed profile constituting a receiving profile provided with at least four cut-outs forming receiving slots; a second closed profile constituting a donor profile which at least at one end E of the donor profile has four catches cut out, provided with wings, which catches are arranged in two pairs parallel to each other, the catches have a shaped oblique edge of the catch wing, the catches being characterised by properly selected shape and size parameters that enable mechanical cooperation with the receiving profile; wherein the receiving slots are shaped in the receiving profile such that the spacing of the receiving slots, the height H of the receiving slots and the width W of the receiving slots are compatible with the spacing of the catches, the height H1 of the catches, the width W1 of the catches of the donor profile so as to allow easy insertion of the four catches of the donor profile into four receiving slots in the receiving profile; wherein each catch has an internal edge of the catch shaped parallel to the outer edge of the donor profile, wherein the internal edge of the catch and the external edge of the donor profile are substan-

tially parallel to each other and are separated from each other at a distance D equal to or greater than the wall thickness D1 of the receiving panel on which there are receiving slots.

[0012] Preferably, in the system for joining two closed profiles, the catch has a shaped external rounding of the catch, located on the side of the stabilising edge.

[0013] Preferably, in the system for joining two closed profiles, the catch has an internal rounding of the catch wing.

[0014] Preferably, in the system for joining two closed profiles, in the catch, at least one horizontal longitudinal recess is shaped at a location between the part forming the catch wing and the rest of the catch, preferably located on the inside of the donor profile.

[0015] Preferably, in the system for joining two closed profiles, a mounting hole is cut out in the receiving profile, and preferably the mounting hole is located on the opposite wall of the receiving profile relative to the wall on which the receiving slots are located.

[0016] The invention also relates to a method for joining two closed profiles from the system for joining two closed profiles according to the invention, in which the following steps are performed:

a) the catches of the donor profile are inserted into the receiving slots in the receiving profile until resistance is reached at the external edge of the donor profile;

b) the catches are bent by bending the catches' wings towards the axis of the receiving profile.

[0017] Preferably, in the method for joining two closed profiles in step b), the wings of the catches are bent by an angle of 35-60°, more preferably by an angle of about 45°.

[0018] Preferably, in the method for joining two closed profiles in step b), the bending of the catches' wings is carried out through the mounting hole in the receiving profile.

[0019] The invention is thus based on the unique shape of the configurations and cut-outs in the receiving profile and in the donor profile which together provide a permanent connection by changing the geometry of the catches' wings in the donor profile when the wings of the donor profile are located in the receiving slots in the receiving profile.

[0020] The system for joining two closed profiles according to the invention is ensured by the unique shape of the closed donor profile which, at the end of the profile, has four catches cut out, characterised by appropriately selected shape parameters enabling mechanical cooperation with the second closed profile, the so-called receiving profile. In the receiving profile, four receiving slots are cut out, the height and width of which are adjusted to the height and width of the donor profile catches, and their spacing both along the X and Y axes is adjusted to allow easy insertion of four catches of the donor profile into four slots in the receiving profile. In a preferred embodiment, the receiving profile has a substantially square or rectangular cross-section and the donor profile has a substantially rectangular or square cross-section, the width of the donor profile being slightly smaller than the width of the receiving profile so as to allow slots to be made in the receiving profile for insertion of the donor profile catches therein. In the receiving profile, the cut out slots are arranged in two parallel pairs along the receiving profile at distances selected so that they can mechanically cooperate with the second closed profile, i.e. at distances corresponding to the four shaped catches of the donor profile. The stability of the connection is ensured by the appropriate shape of each of the four catches of the donor profile and their mutual position, each of which has a stabilising edge acting as a connection stabiliser in the Y axis.

[0021] Each catch has an internal edge of the catch, shaped parallel to the external edge of the donor profile, the internal edge of the catch and the external edge of the donor profile being parallel to each other and being separated from each other at a distance D equal to or slightly greater than the wall thickness D1 of the receiving panel on which the receiving slots are located. Properly selected distance D in the system for joining two closed profiles according to the invention is particularly important from the point of view of a proper and permanent connection of the system for joining two closed profiles and affects the quality, stability and stiffness of the connection. The catches form an upper pair and a lower pair. The stabilising edges of the upper catches and the stabilising edges of the lower catches, after inserting the catches into the receiving slots, cooperate with the horizontal edges of the receiving slots, thus ensuring mutual stabilisation of the connection in the Y axis and preventing the profiles from sliding in relation to each other in the vertical axis. The borders of the catches cooperate with the vertical edges of the receiving slots, thus ensuring mutual stabilisation of the connection in the Z axis. The wall thickness of the receiving panel is equal to D1, where D=D1+v, with v being zero or a positive number. The height H of the receiving slots is preferably slightly greater than the height H1 of the catches, where H=H1+v, with v being zero or a positive number. The width W of the receiving slot is preferably slightly greater than the wall thickness W1 of the profile, where W=W1+v, with v being zero or a positive number. The distances between the lower horizontal edge of the upper slot and the upper horizontal edge of the lower slot are matched to the distances between the stabilising edges of the lower and upper catches.

[0022] The shape and contour of the catch has been designed in such a way as to ensure its easy insertion into the receiving slots, proper positioning in the receiving profile as well as final stability of the connection. The catch has an external rounding located from the side of the stabilising edge with a specific internal radius, pref-

erably forming the rounding of the right angle. In the catch, an oblique edge of the catch is formed, which is placed at an appropriate angle relative to the contour of the catch to enable quick and collision-free insertion of the catch of donor profile into the slot in the receiving profile.

[0023] A small diameter radius has been used in the internal rounding of the catch wing, its task being to reduce the friction of the internal edge of the catch against the internal wall of the profile during the catch bending operation. The advantageous effect of shaping the catch in this manner is that the two elements of system for joining closed profiles are easy to assemble.

[0024] When assembling two closed profiles with the use of the system for joining two closed profiles according to the invention, after inserting the catches from the donor profile into the receiving slots in the receiving profile until resistance is reached at the external edge of the donor profile, we proceed to the operation of bending the catches by bending the wings of the catches (wherein the catch wing being understood as the bent part of the catch) towards the axis of the receiving profile, preferably by an angle close to the angle of 45°.

[0025] Preferably, in the catch, at least one horizontal longitudinal recess is made at a location between the part forming the wing of the catch and the rest of the catch, preferably located on the inside of the donor profile, facilitating the bending of the catch wing towards the axis of the receiving profile. The upper and lower catches are located with their wings apart, and with their stabilising edges towards each other.

[0026] Obtaining a permanent connection between the closed profiles included in the system for joining two closed profiles is achieved by successively bending the donor profile catches towards the axis of the receiving profile. The bending of all the wings of the four catches ensures stiffness and strength of the connection. The bending of the catch wings is carried out through the mounting hole, preferably located in the receiving profile on the opposite wall of the profile relative to the wall on which the receiving slots are located.

[0027] The mounting operation performed in this manner ensures a permanent, inseparable connection which has many advantages over a welded connection or other methods for joining two closed profiles known in the art, especially joining them at a right angle to each other. From the point of view of the production company, the mounting time is reduced, labour consumption and costs of producing such connection are reduced, and the production capacity of the welding process is released, which gives greater efficiency to the remaining production.

[0028] Another effect of the use of the system for joining closed profiles according to the invention is that the time for mounting the profiles is shorter than in the case of joining them using the welding process, which shortens the production time of the fencing span with this technology by about 30% of the process time, in addition, fewer skilled workers have to be employed for mounting operations because highly skilled welders are not needed.

[0029] In the case of fencing elements, such as fencing spans, gate wings or wickets, the product has so far been fully painted or varnished, i.e. a ready welded span or wing. During the production of these elements, with mounting of closed profiles with the use of the system for joining closed profiles according to the invention, instead of the welding process, changes in the varnishing process are also made. Each element can be varnished separately, which gives less workload on the painting line, as well as a greater number of elements can be varnished at the same time due to the fact that a greater number of individual elements will fit in the paint chamber at the same time. At the same time, the possibility to separately varnish individual elements mounted together allows eventually the production of products composed of profiles varnished in various colours, thus enabling the obtaining of individualised products tailored to the various needs of recipients.

[0030] The mounting hole located in the receiving profile can then be used to mount other elements forming the final product or to connect individual elements to each other, for example to connect elements forming a fence. Preferably, the mounting hole has a shape adapted for mounting a shaped profile therein, preferably adapted for mounting a shaped profile with a press-in connector as described in the publication of the patent application PL420725.

[0031] The system for joining closed profiles according to the invention allows for the production of a much larger number and greater variety of products, thus satisfying the increasingly greater basic human needs.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

[0032] Exemplary embodiments of the invention are presented in the figures of the drawing, in which:

Fig.1 A - shows the end of the donor profile with visible two shaped catches in a side view. **B-**shows a side view of the receiving profile with two pairs of receiving slots cut out, adapted to receive two pairs of catches from the donor profile. **C-** shows a side view of the donor profile with the upper catch.

Fig. 2 shows the successive steps of joining profiles from the system for joining closed profiles according to the invention to obtain the permanent, inseparable connection of two closed profiles at a right angle. **A-** inserting catches of the donor profile into receiving slots of the receiving profile; **B-** side view when fully inserted, **C-** view after insertion from the side of the receiving profile with the shown wall of the receiving profile from the opposite side with a visible mounting hole in the receiving profile; **D-** view as in **C-** not shown wall of the receiving profile with the mounting hole, visible catches before bending the wings; **E-**

view as in **D** with the catches' wings bent to the centre of the axis of the receiving profile, **F-** permanently joined closed profiles from the system for joining closed profiles according to the invention in a side view.

Fig. 3 A- shows a schematic front view of a fencing span manufactured with the use of the system for joining closed profiles according to the invention, **B-** shows a part of the manufactured fencing span, shown in the photo, with the connector described in the publication of the patent application PL420725 mounted in the mounting hole.

EXAMPLES

[0033] The invention is shown in more detail in the embodiments below which do not limit its scope.

Example 1

Producing the system for joining closed profiles

[0034] A non-limiting embodiment of the system for joining closed profiles according to the present invention is shown schematically in **Fig. 1** and **Fig. 2.** The present embodiment relates to a system for joining closed profiles used for the construction of fencing elements, e.g. fencing panels, gates and wickets, however, the system for joining closed profiles according to the invention allows for permanent connection of closed profiles, especially their connection at a right angle to each other in any of their applications and any products manufactured with the use of this system for joining two closed profiles.

[0035] In the present embodiment, the corresponding configuration in Figs. 1A-C and the method for joining two closed profiles in Figs. 2A-D are shown, together forming the system for joining closed profiles according to the invention, and the method for joining them is described in detail below.

[0036] In the described example of producing the system for joining closed profiles, steel closed profiles were used: as a receiving profile 1 - a steel closed profile with a 25x25 mm square cross-section, the profile wall having a thickness of 1.5 mm and a length of 1.18 m, and as a donor profile 3 - a profile with a 100x20 mm rectangular cross-section, the profile wall having of 1.0 mm (profile wall thickness W1) and a length of 1 m. In the present example, D1 was 1.5mm and D=1.8mm. The height H1 of the catches was 30 mm, and the height H of the receiving slots was 31 mm. The width W of the receiving slot was 1.5 mm.

[0037] The system for joining two closed profiles ensures a suitable matching between the receiving profile 1 and the donor profile 3. In the donor profile 3, four catches 4 are cut out at the end of the profile, each provided with a catch wing 5. The arrangement, size and spacing of the catches 4 have been selected so that they can be inserted into the four corresponding receiving slots 2 in the receiving profile 1 and have the possibility of mechanical cooperation with this profile and with the edges of the receiving slots 2. The size (height and width) of the receiving slots 2 of the receiving profile 1 is matched to the height and width of the catches 4 of the donor profile 3, as well as their spacing both in the X and Y axes is matched so as to allow the simultaneous insertion of four catches 4 of the donor profile 3 into four receiving slots 2 in the receiving profile 1. In each catch 4, there is an external rounding 12 of the catch, located on the side of the stabilising edge 8, 9 of the upper and lower catches, respectively, with a specific internal radius, preferably forming the rounding of the right angle. In each catch 4, an oblique edge 11 of the catch 4 is formed, which is placed at an appropriate angle with respect to the contour of the catch. Preferably, the oblique edge may deviate from the Y axis towards the external edge of the donor profile by the angle of 20-70°, preferably by the angle of 30-50°, preferably by the angle of 35-45°.

[0038] The small diameter radius has been used in the internal rounding 13 of the catch wing 5, its task being to reduce the friction of the internal edge 7 of the catch against the internal wall of the receiving profile during the catch bending operation. Such the configuration of the catch facilitates the mounting of closed profiles from the system for joining two closed profiles according to the invention.

[0039] In the embodiment shown, the receiving profile 1 had the substantially square cross-section and the donor profile 3 had the substantially rectangular cross-section, the width of the donor profile 3 being smaller than the width of the receiving profile 1 aligned in the same axis, so as to allow the receiving slots 2 to be formed in the receiving profile 1 for inserting the catches 4 of the donor profile 3 therein.

[0040] In the receiving profile 1, receiving slots 2 were cut out, arranged in two parallel pairs along one wall of the receiving profile 1, at distances selected so as to enable inserting the catches therein and to mechanically cooperate with the closed catches 4 of the donor profile 3. Closure of the catches 4 consists in bending the wings 5 of the catch towards the centre of the axis of the receiving profile. The connection stability of the system for joining closed profiles was ensured by the appropriate shape of each of the four catches 4 of the donor profile 3 and their mutual positions, each of which catches 4 had a stabilising edge 8, 9 acting as a connection stabiliser in the Y axis. Each catch 4 had an internal edge 7 of the catch 4 shaped parallel to the external edge 6 of the donor profile 3, with the internal edge 7 of the catch 4 and the external edge 6 of the donor profile 3 being parallel to each other and located at a distance D equal to or slightly greater than the wall thickness D1 of the receiving panel 1 on which the receiving slots 2 were located.

[0041] The catches 4 form an upper pair and a lower pair. The stabilising edges of the upper catches 8 and the stabilising edges of the lower catches 9, after inserting

the catches into the receiving slots, cooperated with the horizontal edges of the receiving slots 2, which ensured mutual stabilisation of the connection in the Y axis and prevented the profiles from sliding in relation to each other in the vertical axis. The sides of the catches 4 cooperated with the vertical edges of the slots, thus ensuring mutual stabilisation of the connection in the Z axis.

Example 2

The system for joining closed profiles with facilitated bending of the wings

[0042] The system for joining closed profiles was produced as in Example 1, with the difference that additionally, both in the upper and lower catches, a horizontal longitudinal recess was made between the catch wing and the rest of the catch, located on the inside of the donor profile, which facilitated bending of the catch wing towards the axis of the receiving profile.

Example 3

The method of joining elements from the system for joining closed profiles

[0043] The mounting of two closed profiles included in the system for joining closed profiles produced according to **Example 2** was carried out. After inserting the catches 4 of the donor profile 3 into the receiving slots 2 in the receiving profile 1 until resistance is reached on the external edge 6 of the donor profile 3 through the mounting hole 10 located in the receiving profile, the catches 4 were bent by bending the wings 5 of the catches towards the axis of the receiving profile 1 by an angle close to the angle of 45°.

[0044] In this way, the permanent connection between the closed profiles and their stable positioning at the right angle to each other were achieved in a very short time, which turned out to be inseparable and stable in all three planes.

Example 4

The use of the joining method in fencing structures

[0045] Using the system for joining closed profiles produced according to **Example 1,** a fencing span was produced, which consisted of many horizontal profiles (rails), while the system for joining closed profiles according to the invention was used only in the upper and lower rail of the fencing span, which lower and upper rail was the donor profile 3 provided with catches 4 at both ends E of the donor profile 3. The use of the system for joining closed profiles for the production of fencing elements, such as the fencing span, is shown in **Fig. 3A.** With the use of the system for joining closed profiles, the process of producing the fencing span was optimised, as there was no need to weld individual elements of the span together, or to join them on each mounted profile (rail). To ensure proper connection and stiffness, only in the upper and lower rail, at their both ends E, the connection was made and used, which resulted in about 30% reduction in mounting time and the welding process was completely eliminated. The fencing span constructed in this way retains its stiffness and functionality, in addition, the technical opening, which is the mounting hole 10 used for bending wings 5 of the catches 4, has been appropriately designed so that it can be used in the construction of a fencing with the use of such the fencing span also for mounting the span connector (the press-in connector as described in the publication of the patent application PL420725), thanks to which no additional mounting holes have to be cut, so that the structure of the supporting profile, which is the receiving profile 1, is not additionally weakened (see **Fig. 3B**).

LIST OF DESIGNATIONS

[0046]

1	receiving profile
2	receiving slot
3	donor profile
4	catch
5	catch wing
6	external edge of the donor profile
7	internal edge of the catch
8	stabilising edge of the upper catch
9	stabilising edge of the lower catch
10	mounting hole
11	oblique edge of the catch wing
12	external rounding of the catch
13	internal rounding of the catch wing
D	distance - between the external edge of the donor profile and the internal edge of the catch
D1	thickness of the receiving wall of the receiving profile
E	end of the donor profile

Claims

1. A system for joining two closed profiles, **characterised in that** it comprises

a first closed profile constituting a receiving profile (1), provided with at least four cut-outs forming receiving slots (2),
a second closed profile constituting a donor profile (3), which at least at one end E of the donor profile (3) has four catches (4) cut out, provided with wings (5), which catches (4) are arranged in two pairs parallel to each other, the catches (4) have a shaped oblique edge (11) of the catch wing, wherein the catches (4) are **character-**

ised by appropriately selected shape and size parameters that enable mechanical cooperation with the receiving profile (1),
wherein the receiving slots (2) are shaped in the receiving profile (1) so that the spacing of the receiving slots (2), the height H of the receiving slots and the width W of the receiving slots are compatible with the spacing of the catches, the height H1 of the catches, the width W1 of the catches of the profile donor (3) so as to allow the four catches (4) of the donor profile (3) to be easily inserted into the four receiving slots (2) in the receiving profile (1);
wherein each catch (4) has an internal edge (7) of the catch, shaped parallel to the external edge (6) of the donor profile, wherein the internal edge (7) of the catch and the external edge (6) of the donor profile are substantially parallel to each other and are located apart from each other at a distance D equal to or greater than the wall thickness D1 of the receiving panel on which the receiving slots are located.

2. The system for joining two closed profiles according to claim 1, **characterised in that** the catch (4) has a shaped external rounding (12) of the catch, located on the side of the stabilising edge.

3. The system for joining two closed profiles according to claim 1-2, **characterised in that** the catch (4) has a shaped internal rounding of the catch wing (13).

4. The system for joining two closed profiles according to claim 1-3, **characterised in that** at least one horizontal longitudinal recess is formed in the catch (4) at a location between the part forming the wing (5) of the catch and the rest of the catch (4), preferably located on the inside of the donor profile.

5. The system for joining two closed profiles according to claim 1-4, **characterised in that** a mounting hole (10) is cut out in the receiving profile (1), preferably the mounting hole (10) is located on the opposite wall of the receiving profile (1) in relation to the wall on which the receiving slots (2) are located.

6. A method for joining two closed profiles from the system for joining two closed profiles, as defined in claims 1-5, including the steps in which

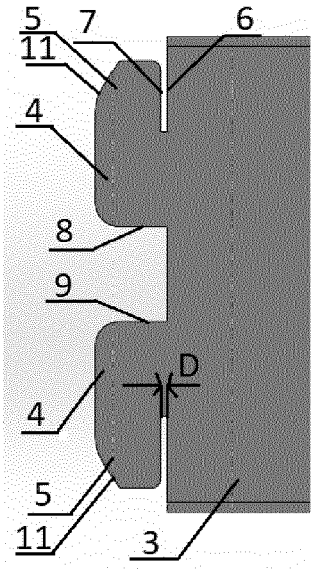
a) the catches (4) of the donor profile (3) are inserted into the receiving slots (2) in the receiving profile until resistance is reached against the external edge (6) of the donor profile (3);
b) the catches (4) are bent by bending the wings (5) of the catches towards the axis of the receiving profile (1).

7. The method for joining two closed profiles according to claim 6, **characterised in that** in step b), the wings (5) of the catches are bent by an angle of 35-60°, more preferably by the angle of about 45°.

8. The method for joining two closed profiles according to claim 6-7, **characterised in that** in step b), the bending of the catches (5) is carried out through the mounting hole (10) in the receiving profile.

Fig. 1

A



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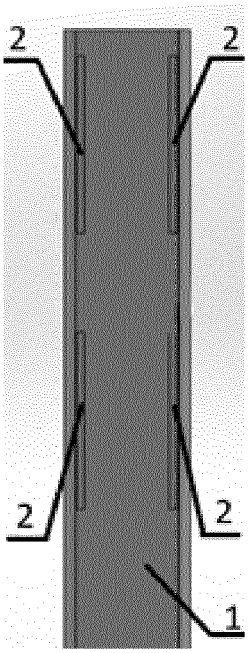

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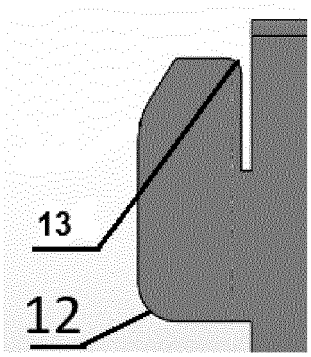


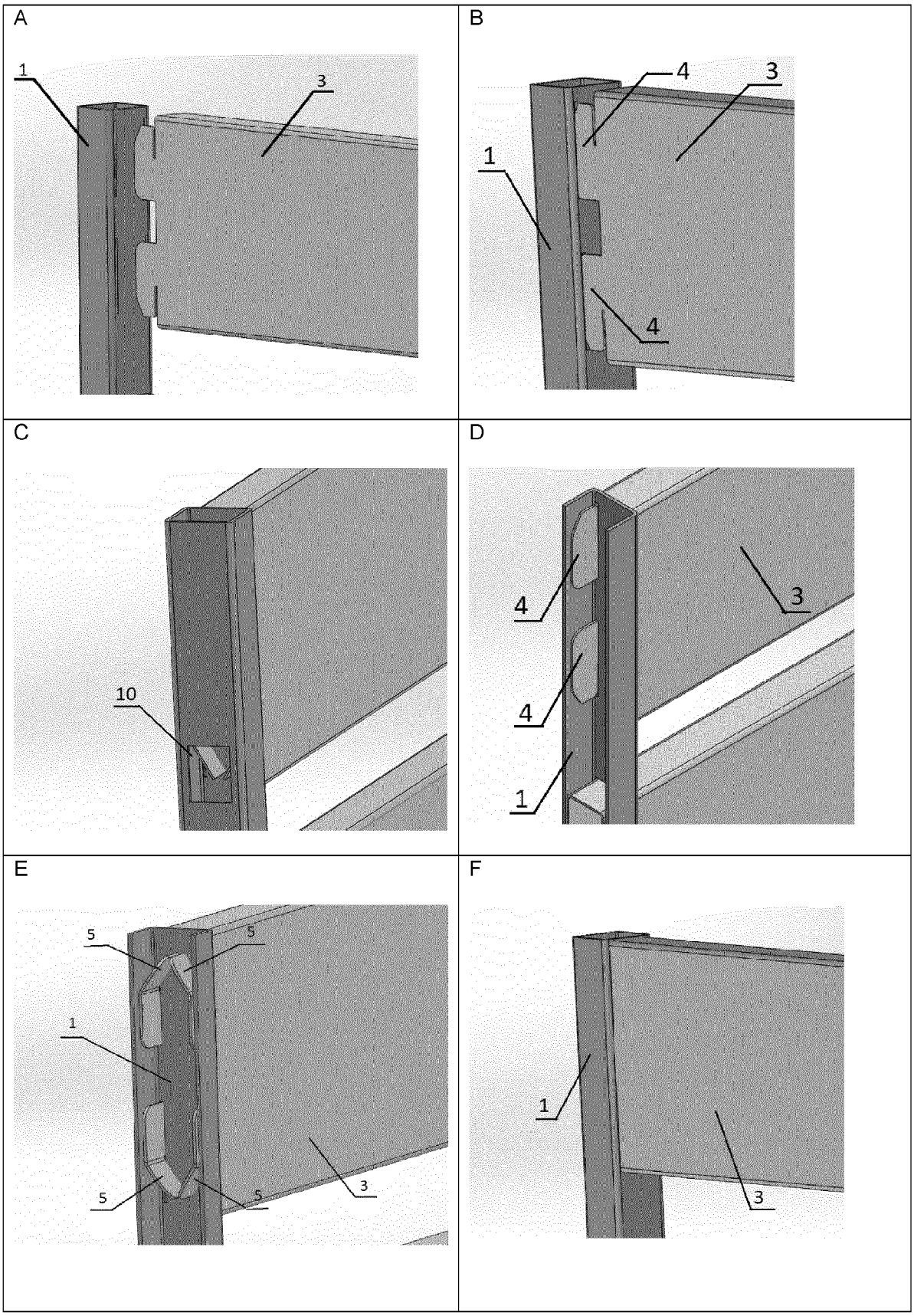
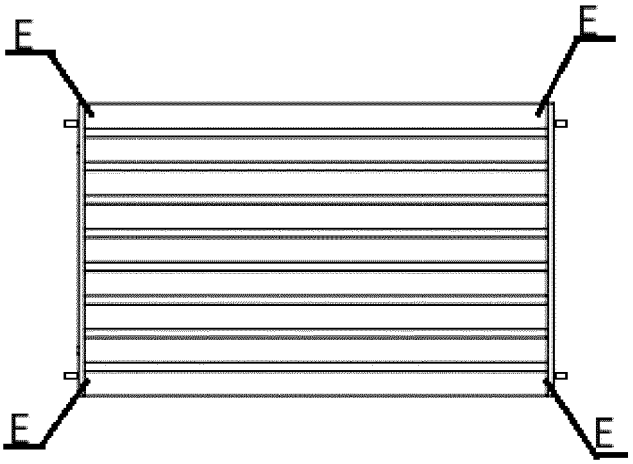


Fig. 2

Fig. 3

A



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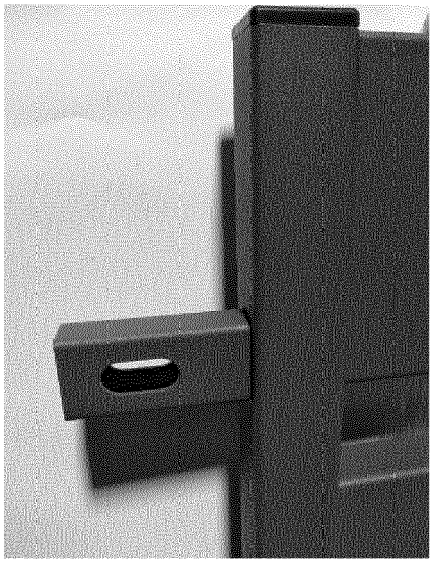

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EUROPEAN SEARCH REPORT

Application Number
EP 21 16 5424

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	23 July 2021	Valenta, Ivar

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