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54 **Mechanical tubular elements connection system and method of connecting a first and second tubular element of such a tubular elements connection system.**

57 The present invention relates to a screw actuated mechanical tubular elements connection system to connect a first tubular element provided with a screw hole with a second tubular element via a connector assembly adapted to be inserted into the passages of the tubular elements. The connector assembly comprises a rigid body with a foot portion, a movable gripping element, a movable screw actuated portion and a transmission between these movable elements. The tubulars connection system is operable such that upon actuation of the screw, in succession the gripping element exerts a pushing force perpendicular to the wall, to provide a gripping connection between the movable gripping element and the inner surface and an engagement between the foot portion and the opposed inner surface, and a pulling force to pull the second tubular element towards the first tubular element.

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Title: Mechanical tubular elements connection system and method of connecting a first and second tubular element of such a tubular elements connection system

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The present invention relates to a mechanical tubular elements connection system wherein use is made of a connector assembly, and a method of connecting a first and second tubular element of such a tubular elements connection system.

10 A method of connecting first and second tubular elements is to weld the elements together. However, welding deteriorates the properties, such as yield strength of the tubular elements. Therefore, a mechanical connection system is preferred.

Known mechanical tubular elements connection systems comprise first and second tubular
15 elements and a connector assembly, adapted to connect the first and second tubular elements.

These systems are conventionally applied in building frames or structures, e.g. comprising hollow vertical tubular elements. Other applications include other structures from tubular
20 elements, such as truck beds or trailers, or utility pole assemblies for lighting.

The aim of the present invention is to provide an improved tubular elements connection system and method, that is easy to produce and to operate, and provides a reliable and stable connection.

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This aim is accomplished by a mechanical tubular elements connection system according to claim 1, comprising

- an actuating screw provided with screw thread,
- a first tubular element having a wall with an outer and an inner surface defining a first
30 passage and two opposed end faces, at a distance from the end face the wall of the first tubular element being provided with a screw hole in communication with the first passage, the screw hole being provided with screw thread matching the screw thread of the actuating screw and wherein the length of the actuating screw exceeds that of the wall of the first tubular element;
- 35 • a second tubular element comprising a wall with an outer and an inner surface defining second passage and two opposed end faces , the second tubular element

having a cross-section essentially matching the cross-section of the first tubular element,

- a connector assembly being adapted to connect the first and second tubular elements, comprising a first half adapted to be inserted into the first passage, and a second half adapted to be inserted into the second passage, the connector assembly comprising in particular:

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- a rigid body comprising a foot portion extending over the first and second half, adapted to engage with the inner surface of the first and second tubular elements; and

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- a movable gripping element provided at the second half of the connector assembly, opposite the foot portion, being movable between a mounting position allowing the second half of the connector assembly to be inserted into the second passage, and an assembled position in which the gripping element grips the wall of the second tubular element, and

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- exerts a pressing force against the wall of the second tubular element, resulting in a gripping connection between the movable gripping element and the inner surface and an engagement between the foot portion and the opposed inner surface, and

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- to exert a pulling force in line with the walls of the tubular elements, to pull the second tubular element towards the first tubular element,

- a movable screw actuated portion provided at the first half of the connector assembly, the screw actuated portion being movable with respect to the rigid body upon actuation by the actuating screw, between a mounting position in which the screw actuated portion is brought in line with the screw hole, and an assembled position;

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- a transmission provided between the gripping element and the screw actuated portion;

the tubulars connection system being operable such that the connector assembly is insertable into the first and second passages, and wherein the screw actuated portion is

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being actuated, so that in succession:

- the gripping element exerts a pushing force perpendicular to the wall to provide a gripping connection between the movable gripping element and the inner surface and an engagement between the foot portion and the opposed inner surface,
- the gripping element exerts a pulling force to pull the second tubular element towards the first tubular element.

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In an embodiment, the connector assembly further comprises:

- a movable stop ridge provided between the first and second half of the connector assembly, which in a mounting position provides a stop for both end faces of the first and second tubular elements to position the connector assembly in relation to the first and second tubular elements, and which in an assembled position is retracted inward into the first or second passage allowing the end faces of the first and second tubular elements to be in contact with each other,

wherein the movable screw actuated portion is provided at a distance from the stop ridge essentially corresponding to the distance between the end face and the screw hole,

and wherein the transmission provided between the gripping element, the stop ridge, and the screw actuated portion;

and wherein the connector assembly is insertable into the first and second passages, and the stop ridge abuts the end faces of the first and second tubular elements,

and wherein after the screw actuated portion is being actuated, the stop ridge is moved to the retracted assembled position, prior to the gripping element exerting a pushing and a pulling force.

In an embodiment, the rigid body of the connector assembly further comprises an axial fixation portion provided in the first half of the connector assembly, adapted to engage with

a fixation element, e.g. the actuating screw, to fixate the connector assembly and the first tubular element in axial direction, and wherein after axial fixation of the first half of the connector assembly and the first tubular element is accomplished the screw actuated portion is being actuated.

An advantage of the a mechanical tubular elements connection system of the present invention is that the connection is mechanical and non-destructive, and hence, the connector assembly is re-usable for many times.

The first and second tubular elements to be connected are generally elongated poles, vertical columns, horizontal beams, cantilevers etc. Advantageously, the tubular elements are made by extrusion. It is also conceivable that tubular elements have a reduced length and form a base component, a corner element or a small connection portion.

The tubular elements have a wall with an outer and an inner surface defining a passage and two opposed end faces. The cross-section of the internal passage, or lumen, is generally square or circular, but alternative cross-sections such as rectangular or oval cross-sections are also conceivable. According to the invention, the cross-section of the second tubular

element essentially matches the cross-section of the first tubular element. It is conceivable that deviations occur as a result of tolerances occurring during manufacturing of the tubular elements.

- 5 The wall of a tubular element may comprise a smooth outer and inner surface, but it is also conceivable that ribs or screw thread is provided onto a surface. One or both of the surfaces of the tubular element may be treated, e.g. paint can be applied, or the surface may be anodised. It is an advantage of the present invention that no special treatment of the wall of the tubular element is required to provide an adequate connection with the connector
10 assembly of the present invention. On the other hand, when the surface has been treated, this does not effect the operation of the mechanical tubular elements connection system of the invention.

The tubular elements may be made from many materials which are suitable for their
15 intended application, e.g. steel, aluminium, plastics or other materials. Aluminium is popular because of its light weight and corrosion resistant qualities.

The mechanical tubular elements connection system of the invention comprises a first and second tubular element, and a connector assembly to connect the first and second tubular
20 elements. For its operation, an actuating screw is provided, comprising screw thread. The wall of the first tubular element is provided with a screw hole with matching thread, at a distance from the end face. The screw hole extends from the outer surface to the inner surface, and hence the screw hole is in communication with the first passage. The length of the actuating screw exceeds that of the wall of the first tubular element, and as a results, it is
25 allowed to enter the first passage.

In order to connect the first and second tubular elements, the connector assembly comprises a first half adapted to be inserted into the first passage, and a second half adapted to be inserted into the second passage. The first and second half may be of similar length, but it is
30 also conceivable that the length of the first half exceeds the length of the second half, or vice versa. It is important that the length of the first and second half suffices to provide an adequate connection. To that end, the components of the connector assembly should be adequately able to contact the inner surfaces of the first and second tubular elements.

- 35 The connector assembly comprises in particular:
- a rigid body,
 - a movable gripping element,

- a movable screw actuated portion and
- a transmission between the gripping element and actuated portion.

The rigid body and transmission extend over the first and second half, while the movable gripping element is provided at the second half and the screw actuated portion at the first
5 half.

Preferably, the overall cross-section of the connector assembly, in particular of the rigid body, substantially matches the cross-section of the tubular elements. With 'substantially match' it is meant that it is slightly smaller, to enable easy fitting of the connector assembly.
10 However, advantageously, the cross-section is only smaller to a very small extent, and hence, the phrase 'substantially match' is used. This way, the connector assembly essentially fills the first and second passage, and thereby provides an improved strength.

Advantageously, the 'substantially matching' cross section of the connector assembly of the
15 invention provides a reliable and stable connection, as its dimensions allow to compensate for the size tolerances of the first and second passages of the tubular elements. In the manufacturing process of tubular elements, a certain tolerance has to be admitted, to prevent adding considerable expense to the process. When the connector assembly is too small, the fit will be loose and a hinge effect will occur. This not only reduces the initial load
20 capacity, but permits additional reductions in capacity if the tubular elements are fatigued with the motion as time passes. On the other hand, if the connector assembly is too large and is jammed into the passage, a shear problem may occur. In any event, the stretching of the tubular element by an oversized connector assembly will stress the tubular element, and may actually cause a rupture, hairline crack or the like.

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The rigid body of the connector assembly comprises a foot portion and preferably also an axial fixation portion. Advantageously, the rigid body is of a one-part construction, made by extrusion. This is in particular advantageous in view of the reduced production costs.

30 The foot portion of the rigid body extends over the first and second half, and is adapted to engage with the inner surface of the first and second tubular elements. In particular, the foot portion is adapted to engage with a bottom surface of the tubular elements. The foot portion may be of a one-part construction, or comprise interconnected portions, in particular a first foot adapted to engage the first tubular element and a second foot adapted to engage the
35 second tubular element. The foot portion may comprise a smooth or roughened surface to engage with the surfaces of the tubular elements. It is also conceivable that gripping elements are provided in the foot portion, gripping the surface of the tubular elements.

Advantageously, with tubular elements of a rectangular or square cross-section, the foot portion extends over the entire inner bottom surface of the tubular element, to provide optimized engagement of the tubular element and the connection element.

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With tubular elements of a circular or oval cross-section, the foot portion advantageously comprises a curvature matching that of the cross-section. The foot portion extends of a segment of this circle or oval, the segment preferably between a quarter and a half.

10 The rigid body of the connector assembly preferably further comprises an axial fixation portion provided in the first half of the connector assembly, adapted to engage with a fixation element, to fixate the connector assembly and the first tubular element in axial direction. The fixation element can be a pin or a screw, and the axial fixation portion may be formed by an opening or hole. Alternatively, the axial fixation portion can also be formed by a ridge or protrusion, the dimension of which matching the pitch of the screw thread of a screw fixation element. The mechanical tubular elements connection system of the invention already comprises an actuating screw, and hence it is conceivable that this actuating screw also functions as the fixation element. Alternatively, it is also conceivable that a separate fixation element is provided.

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In an embodiment, it is conceivable that the connector assembly comprises a further axial fixation portion in the second half of the connector assembly, adapted to engage with a further fixation element, to fixate the connector assembly and the second tubular element in axial direction.

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The connector assembly preferably further comprises a movable gripping element, a movable stop ridge, a movable screw actuated portion and a transmission between the gripping element, stop ridge, and actuated portion.

30 The transmission can be formed by any type of mechanical transmission, provided it is actuable by the actuating screw and it is adapted to move the gripping element and in an embodiment also the stop ridge between the respective mounting position and assembled position thereof. The transmission can e.g. comprise a gear wheel assembly, transmission belt, chain drive, crankshaft, lever assembly etc.

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In an embodiment, the gripping element, stop ridge, actuated portion and transmission formed by a single movable lever element, preferably made by extrusion. Hence, in an

embodiment all elements of the connector assembly can be made by extrusion, which is advantageous in view of production costs. The movable lever element advantageously rests on a fulcrum provided by the rigid body.

- 5 In an embodiment, the rigid body further comprises a spring member engaging with the second arm of the lever, providing a spring force to the lever which prior to engagement of the actuating screw prevents a free-pivotal motion of the lever over the fulcrum and positions the stop ridge in the mounting position.
- 10 The movable gripping element of the connector assembly is according to the invention provided at the second half of the connector assembly, opposite the foot portion. When forming part of the movable lever element, the gripping element is preferably provided on the second arm. The gripping element of the invention is movable between a mounting position, allowing the second half of the connector assembly to be inserted and fit into the
- 15 second passage, and an assembled position, in which the gripping element grips the wall of the second tubular element, opposite the foot portion. With tubular elements of a rectangular or square cross-section, the foot portion extends over the inner bottom surface of the tubular element and hence, the gripping element grips the wall at the inner upper surface of the tubular element. Advantageously, the gripping element extends over a substantial part of the
- 20 width of the upper surface, to optimize contact.

In the assembled position the gripping element grips the wall of the second tubular element, and exerts both a pressing force against the wall of the second tubular element, resulting in a gripping connection between the movable gripping element and the inner surface and an

25 engagement between the foot portion and the opposed inner surface, and a pulling force in line with the walls of the tubular elements, to pull the second tubular element towards the first tubular element. This combined exertion of forces is advantageously accomplished by the combination of transmission and configuration of the gripping element. The operation will be explained later.

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In an embodiment, the gripping element comprises a leaf spring attributing to the exert the pulling force to pull the second tubular element towards the first tubular element. The leaf spring preferably extends perpendicular to the longitudinal axis of the tubular elements.

- 35 In an embodiment, the connector assembly further comprises a movable stop ridge, provided between the first and second half of the connector assembly. The movable stop ridge is movable between a mounting position, in which it provides a stop for both end faces

of the first and second tubular elements, to position the connector assembly in relation to the first and second tubular elements, and an assembled position, in which the stop ridge is retracted inward into the first or second passage allowing the end faces of the first and second tubular elements to be in contact with each other and abut each other. When
5 forming part of the movable lever element, the stop ridge is preferably positioned centrally on the lever element. The width of the stop ridge is preferably small, in the order of 0,1-1mm. The length of the stop ridge is preferably significant: with tubular elements of a rectangular or square cross-section, the length of the stop ridge essentially matches the width of the top surface of the tubular elements. With tubular elements of a circular or oval
10 cross-section, stop ridge advantageously comprises a curvature matching that of the cross-section, and extends of a segment of this circle or oval, the segment preferably between a quarter and a half.

The connector assembly further comprises a movable screw actuated portion, provided at
15 the first half of the connector assembly. In an embodiment, the portion is provided at a distance from the stop ridge essentially corresponding to the distance between the end face and the screw hole. This is important as for the operation of the tubulars connection system, the screw actuated portion of the connector assembly needs to be aligned with the screw hole of the first tubular element. When forming part of the movable lever element, the screw
20 actuated portion is preferably positioned at the first arm of the lever element.

The screw actuated portion is movable with respect to the rigid body, upon actuation by the actuating screw, between a mounting position in which the screw actuated portion is brought in line with the screw hole, and an assembled position. In this assembled position, the screw
25 actuated portion has, via the transmission, moved the gripping element and optionally the stop ridge to their assembled position, such that in the assembled position the first and second tubular element are connected to each other.

The tubulars connection system of the invention is operable such that the connector
30 assembly is insertable into the first and second passages, and optionally the stop ridge is allowed to abut the end faces of the first and second tubular elements. Subsequently, axial fixation of the first half of the connector assembly and the first tubular element is optionally accomplished, and finally the screw actuated portion is being actuated. This results, in succession, in that:

35 - optionally the stop ridge is moved to the retraced assembled position,

- the gripping element exerts a pushing force perpendicular to the wall to provide a gripping connection between the movable gripping element and the inner surface and an engagement between the foot portion and the opposed inner surface, and
- the gripping element exerts a pulling force to pull the second tubular element towards the first tubular element.

The stop ridge is optionally provided for accurately assembling the connector assembly into the first and second tubular elements. When this function is completed and all elements abut each other and are appropriately positioned, the stop ridge is allowed to retract into the first or second passage.

The gripping element exerts two forces. The pulling force, pulling the second tubular element towards the first tubular element, is optionally being counteracted by the axial fixation of the first tubular element. Hence, an adequate connection is achieved. The connection is further achieved by the pushing force perpendicular to the wall, providing a gripping connection between the gripping element and the inner surface, but also, at the opposed side, an engagement between the foot portion and the inner surface it engages.

The invention further relates to a method of connecting a first and second tubular element of a mechanical tubular elements connection system according to claim 1, comprising the steps of:

- inserting the first half of the connector assembly into the first passage,
- optionally aligning the screw actuated portion of the connector assembly with the screw hole of the first tubular element,
- inserting the connector assembly into the second passage,
- actuating the screw onto the screw actuated portion, so that in succession:
 - o the gripping element exerts a pushing force perpendicular to the wall to provide a gripping connection between the movable gripping element and the inner surface and an engagement between the foot portion and the opposed inner surface, and
 - o the gripping element exerts a pulling force to pull the second tubular element towards the first tubular element.

The invention will be further elucidated in relation to the attached drawings, in which:
Fig. 1 represents a schematical side view of a mechanical tubular elements connection system of the invention in a first position, with a first embodiment of the connector assembly;
Fig. 2 represents a perspective view of the first embodiment of the connector assembly;

Fig. 3. represents a schematical side view of a mechanical tubular elements connection system of the invention in a second position;

Fig. 4a represents a schematical side view of a mechanical tubular elements connection system of the invention in a third position;

5 Fig. 4b represents a perspective view of the mechanical tubular elements connection system of the invention in the third position;

Fig. 5 represents a schematical side view of a mechanical tubular elements connection system of the invention in a fourth position;

10 Fig. 6 represents a schematical side view of a mechanical tubular elements connection system of the invention in a fifth position;

Fig. 7 represents a schematical side view of a mechanical tubular elements connection system of the invention in a third position, with a second embodiment of the connector assembly.

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In figs. 1-6 a possible embodiment of a mechanical tubular elements connection system 100 according to the present invention is shown, in various views and various positions. In particular, figures 1/3, 4A, 5 and 6 represent consecutive steps of the assembly process of tubular elements 101 and 102. Same parts are given same numerals.

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As indicated in figure 1 and in the perspective view of figure 4B, the first tubular element 101 has a wall 101b with an outer surface 101b' and an inner surface 101b'' defining a first passage 101a and two opposed end faces 101c and 101d. Second tubular element 102 comprises a wall 102b defining a second passage 102a and two opposed end faces 102c, 25 102d. The second tubular element 102 has an essentially square cross-section matching the cross-section of the first tubular element 101. It is noted that the invention is not restricted to tubular elements of a square cross-section: a rectangular, circular or oval cross-section is also conceivable, with a connector assembly having similar specifics according to claim 1.

30 At a distance from the end face 101c the wall 101b of the first tubular element 101 is provided with a screw hole 101s in communication with the first passage, the screw hole being provided with screw thread 101s'. The tubular elements connection system 100 comprises an actuating screw 2 provided with screw thread 2'. The screw thread 101s' of the screw hole 101s matches the screw thread 2' of the actuating screw 2. The length l of the 35 actuating screw 2 exceeds that of the wall 101b of the first tubular element (see fig. 3).

The mechanical tubular elements connection system 100 further comprises a connector assembly 50, represented as a single element in perspective view in fig. 2. The connector assembly of the invention is adapted to connect the first and second tubular elements 101a, 101b, as represented in the drawings. The connector assembly 50 comprises a first half 50a adapted to be inserted into the first passage 101a, and a second half 50b adapted to be inserted into the second passage 102a. This indicated in figs. 2 and 6.

The connector assembly 50 of the invention comprises a rigid body 24 with a foot portion 18, extending over the first and second half. In particular, as indicated in fig. 4a, the foot portion comprises a first half foot portion 18a adapted to engage with the inner surface 101b" of the first tubular element 101, and a second half foot portion 18b, adapted to engage with the inner surface 102b" of the second tubular element 102. When the connector assembly is assembled into the tubular elements, the foot portion is pressed onto the inner surfaces of the tubular elements, to attribute to the connection between the tubular elements. The foot portion may be smooth or provided with a surface structure. In the shown embodiment with tubular elements with a square cross-section the foot portion 18 may comprise a flat plate-shaped bottom to engage with the inner surface. In case of a circular tubular element the bottom of the foot portion is rounded, with a curvature matching that of the tubular elements. In the shown embodiment, the foot portion 18 is provided with a recess 19, to provide space for roughnesses/ irregularities such as wire edges at the end faces, created during machining of the tubular elements, and beadings. The recess 19 ensures a stable contact surface between the foot portion and the inner surface of the tubular elements.

In the shown embodiment, the rigid body 25 furthermore comprises an axial fixation portion 5, here embodied as a ridge or flange, provided in the first half 50a of the connector assembly 50, which is adapted to engage with a fixation element, here the actuating screw 2, to fixate the connector assembly 50 and the first tubular element 101 in axial direction.

In the shown embodiment, passages 22 and 23 are provided inside and at the flanks of the rigid body, which may be provided to allow the passage of cables, e.g. electricity cables, or alternatively simply to reduce material, and consequently weight and costs. Not visible, but it is conceivable that passages are not only provided perpendicular to the longitudinal axis of the tubular elements, but also in line with the longitudinal axis of the tubular elements.

The connector assembly of the invention is furthermore provided with a movable gripping element 15 provided at the second half 50b of the connector assembly 50, opposite the second half foot portion 18b. The gripping element is movable between a mounting position,

visible in fig. 1, allowing the second half to be inserted into the second passage 102a, and an assembled position in which the gripping element grips the wall 102b of the second tubular element, as visible in fig. 6.

5 Any configuration of the gripping element is possible, provided it is capable of exerting two functions according to the invention:

- to exert a pressing force, here directed upwardly, against the wall 102b of the second tubular element, resulting in a gripping connection between the movable gripping element and the inner surface 102b” and an engagement between the foot
10 portion 18 and the opposed inner surface 102b”, and
- to exert a pulling force, here directed sideward, to the right in the drawings, in line with the walls of the tubular elements, to pull the second tubular element towards the first tubular element.

15 Gripping element 15 in the shown embodiment comprises a leaf spring 15a, mounted in a recess 16. Leaf spring 15a is preferably made of a metal of significant hardness, to grip the inner surface 102b” of the wall 102b of the second tubular element. The hardness positively attributes to the gripping properties of the gripping element. Once additional pressure is exerted onto the gripping element, the gripping element will be fixed in place with respect to
20 the second tubular element. The spring-shape guarantees the exertion of pressure and grip, also after optional deformation of a tubular element. The spring-shape furthermore provides a continuous axial pulling force, which is advantageous in situations of overload.

Advantageously, the leaf spring 15a comprises a curvature 15a’, visible in fig. 2. This curvature positively attributes to the pulling force exerted by the gripping element. Within the
25 recess 16, space 20 is provided which is free space in fig. 1, and occupied by the spring leaf 15a in fig. 6. This space 20 is provided to allow the leaf spring 15a to perform a spring motion within said space and exert the forces according to the invention, and prevent plastic deformation of the leaf spring 15a. Advantageously, the spring leaf 15a is mounted such that it is replaceable when desired.

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In the shown embodiment, gripping element 15 further comprises a crest 17, also adapted to grip the wall of the second tubular element and exert the forces of the gripping element. In addition, the crest 17 and adjacent slope 21 provide a stop surface for the leaf spring 15a.

35 The combination of leaf spring 15a and recess 16, and crest 17 and slope 21, provide a surplus value in performance in exerting both the pressing force and the pulling force.

In the shown embodiment, the connector assembly further comprises a movable stop ridge 1 provided between the first half 50a and the second half 50b of the connector assembly 50. In a mounting position, shown in figs. 1 and 4A and 4B, the stop ridge 1 provides a stop for both end faces 101c, 102c of the first and second tubular elements to position the connector assembly in relation to the first and second tubular elements. The movable stop ridge 1 is movable to an assembled position, shown in figs. 5 and in particular in fig. 6, in which the stop ridge 1 is retracted inward into the first passage 101a, allowing the end faces 101c, 102c of the first and second tubular elements to be in contact with each other, as visible in fig. 6.

10 In the shown embodiment, the connector assembly 50 comprises adjacent stop ridge 1 a first half top surface 14 and a second half top surface 13. First half top surface 14 is adapted to be inserted into the first passage 101a, and is adapted to abut the inner surface 101b" opposite the surface engaged by the foot portion of the connector assembly 50. Second half top surface 13 is adapted to be inserted into the second passage 10sa, and is adapted to abut the inner surface 101b" opposite the surface engaged by the foot portion of the connector assembly 50, adjacent the portion of the inner surface being gripped by the gripping element 15. Top surfaces 13 and 14 are movable together with the movable stop ridge 1. In the mounting position, the top surfaces 13 and 14 enable an easy mounting of the connector assembly into the passages of the tubular elements. Preferably, a light degree of jamming between the top surfaces and the inner surfaces of the tubular elements is possible, as a result of which the connector assembly can be mounted into the tubular elements without or with minimal play, whereby the tubular elements are accurately aligned. The light degree of jamming ensures the connector assembly to maintain to be positioned within the tubular elements, even prior to actuating the screw element to provide the actual connection between the tubular elements.

The moveable stop ridge 1 of the shown embodiment ensures the alignment between the actuating screw 2 in the bore hole 101s and a movable screw actuated portion 4, provided at the first half 50a of the connector assembly 50. This screw actuated portion is provided at a distance d (visible in fig. 2) from the stop ridge 1, which distance d essentially corresponds to the distance between the end face 101c and the screw hole 101s. The screw actuated portion 4 is movable with respect to the rigid body 24 upon actuation by the actuating screw 2, between a mounting position in which the screw actuated portion is brought in line with the screw hole, as shown in fig. 1, and an assembled position, as shown in fig. 6. In the shown embodiment, a centerpeak 3 is provided on the screw actuated portion to optimize contact with an actuating screw 2, provided centrally with a crater 2c.

In the shown embodiment, the screw actuated portion 4 is provided at one arm 25a of a lever element 25, forming a transmission between the gripping element 15, the stop ridge 1 and the screw actuated portion 4. The gripping element 15 is provided at the opposed arm 25b of lever element 25. It is noted that alternative transmissions are also conceivable, e.g. comprising multiple levers as indicated schematically in fig. 7.

According to the invention, actuation of the screw 2 results in actuation of the screw actuated portion, here downward movement of the arm 25a of the lever element.

Subsequently,

- 10 - optionally the stop ridge 1 is moved to the retracted assembled position as visible in fig. 5, and
- the gripping element 15 exerts a pushing force perpendicular to the wall 102b to provide a gripping connection between the movable gripping element 15 and the inner surface 102b" and an engagement between the foot portion 18 and the
- 15 opposed inner surface 102b", and
- the gripping element 15 exerts a pulling force to pull the second tubular element 102 towards the first tubular element 101.

Rigid body 24 comprises a fulcrum 8 for the movable lever element 25, and lever element 25 is provided with a socket 6 to engage with the fulcrum 8. In this embodiment, the rigid body 24 further comprising a spring member 9 engaging with ridge 10 of the second arm 25b of the lever element 25. The spring member 9, in combination with slope 12, provides a spring force to the lever. As a result, a free-pivotal motion of the lever over the fulcrum may be prevented, and the stop ridge may be maintained in the mounting position. Hence, a the starting position, i.e. the mounting position of the lever element 25 is assured. In addition, it attributes to a jamming positioning of the second half of the connector assembly into the second tubular element.

The shown configuration of fulcrum 8 and lever element 25 comprises a few advantageous aspects.

There is a free space 7 provided between the socket 6 and the fulcrum 8, which allows vertical translation of the lever element 25 upon actuation by the screw 2 to allow the stop ridge 1 to freely move away from the end faces 101c and 102c, to retract into the passage 101a or 101b, here 101a. This allow the end faces 101c and 102b to be in abutting contact with each other, resulting in a seamless connection between the tubular elements. The free space 7 allows a variable fit in vertical direction, to compensate for deviations and

tolerances of the tubular elements, which are common during the production of tubular elements. As a result, the connector assembly ensures a good fit, adequate positioning and sufficient jamming of the lever element 25 with respect to the inner surfaces of the tubular elements 101 and 102, and an adequate connection between the tubular elements and the
5 connector assembly.

Furthermore, the design of the free space 7 results in a translatable pivot point of the lever element with respect to the rigid body. As a result, first a pushing force is exerted by the gripping member, perpendicular to the wall and later a pulling force, pulling the tubular
10 elements towards each other. This also results in an advantageous position of the leaf spring 15a of an embodiment of the gripping element 15 with such a leaf spring 15a. The advantageously provided spring member 9 and the configuration of slope 12 of the rigid body 24 adjacent the fulcrum attribute to the adequate order of events. In particular, the slope 12 and the free space 7 enable a translation of the lever element 25, compensating
15 for large pulling forces. When the pulling force is too large, the end faces 101c and 102c may not be properly aligned prior to completing the connection, resulting in a ridge/ seam.

Lever element 25 comprises a ridge 11 adjacent the socket 6, engaging the rigid body 24 just below the fulcrum 8 at a slope 12. Ridge 11 attributes to the correct starting position of
20 the lever element 25, wherein the movable gripping element, stop ridge and screw actuated portion are all in mounting position. Slope 12 also forms a translation guide for the ridge 11 once the pivoting movement of the lever element 25 is no longer possible, upon further actuation by the screw 2.

25 In operation, first the first half 50a of the connector assembly 50 is inserted into the passage 101a of the first tubular element 101, provided with screw hole 101s for actuating screw 2. Stop ridge 1 prevents the connector assembly 50 to be inserted into the passage 101a too far. This is shown in fig. 1. Optionally, depending on the geometry of the passage, the screw actuated portion 4 of the connector assembly 50 has to be aligned with the screw hole 101s
30 of the first tubular element 101. When the cross section of the first passage is square, and the connector assembly 50 has a matching cross section, alignment is not necessary. On the other hand, with a circular cross section, or when the width of the connector assembly is significantly smaller than that of the passage, alignment of the screw actuated portion and the screw hole is necessary.

35

Once the connector assembly is in its correct position in the first tubular element, the second tubular element 102 can be fitted over the connector assembly 50, until the stop ridge 1

abuts the end face 102c of the second tubular element. An intermediate position is shown in fig. 3.

As visible in fig. 2, prior to mounting the connector assembly 50 into the tubular elements, the spring member 9, in combination with slope 12, provides an upwardly directed spring force to the lever element 25. As a result, a free-pivotal motion of the lever over the fulcrum may be prevented, and the stop ridge may be maintained in the mounting position. Hence, at the starting position, i.e. the mounting position of the lever element 25 is assured. In addition, it attributes to a jamming positioning of the connector assembly into the tubular elements.

In figs. 4A and 4B, the tubular elements 101 and 102 are positioned against the stop ridge 1, and the connector assembly is adequately positioned therein and therebetween. In particular:

- 15 - the fixation element 5 is positioned adjacent the screw hole 101s with the actuating screw 2, and thus the actuation screw 2 can engage the fixation element 5 of the first half of the connector assembly;
- the screw actuated portion 4 is positioned below the screw hole 101s, and can thus be actuated by the actuation screw 2;
- 20 - recess 19 is positioned above the end faces 101c and 102c, providing space for roughnesses/ irregularities such as wire edges and beadings, enabling a stable contact surface between the foot portion 189 of the connector assembly and the inner surface of the tubular elements 101b" and 102b"

25 Subsequently, the actuation screw may be operated. The stop ridge 1 and the fixation element 5 fixate the position of the connector assembly 50. Fixation element 5 also attributes to the correct positioning of the actuating screw 2 upon actuating the screw actuated portion 4.

30 In fig. 5, the actuating screw 2 has been actuated to be in contact with the screw actuated portion 4, and consequently, the transmission, here lever element 25, has rotated about ridge 11 because of the jamming operation of the spring member 9 engaging with ridge 10 of the second arm 25b. The spring element 15a grips the second tubular element 102 and as a result, the tubular elements are brought in line and the lever element 25 is lowered.

35 Consequently, the stop ridge 1 is allowed to lower from its mounting position to the retracted assembled position, in which it is retracted into the first passage 101a. Also, after lowering, the socket 6 is allowed to contact fulcrum 8. Vertical translation of the stop ridge 1 is

enabled by compensation of the radial motion. This is accomplished by a translation of the ridge 11 over the slope 12 of the rigid body 24. As a result, stop ridge 1 cannot block against the tubular element, and centerpeak 3 cannot translate radially with respect to the actuating screw 2, and friction during actuating of the screw 2 is prevented. The free space 16

5 between the leaf spring 15a and the slope 21 prevents the grip from the leaf spring 15a to be excessive, which could prevent the tubular elements from being aligned prior to being pressed towards each other.

In the assembled position shown in fig. 6, stop ridge 1 is positioned in the first passage
10 101a, leaf spring 15a grips the second tubular element and pushes it seamless towards the first tubular element. The fixation element 5 fixates the connector assembly with respect to the actuating screw 2. The socket 6 of the lever element 25 is pressed onto the fulcrum 8 of the rigid body 24. Upon further actuation of the actuating screw 2 onto the screw actuated portion 4 of the lever element 25, crest 17 is allowed to grip the inner surface 102b” at a
15 radial angle, thereby exerting a pushing force perpendicular to the wall to provide a gripping connection between the movable gripping element and the inner surface, and an engagement between the foot portion and the opposed inner surface, and to exert a pulling force to pull the second tubular element towards the first tubular element. In addition to these forces, leaf spring 15a generates a moment also creating a combined pushing force
20 perpendicular to the wall and a pulling force. To prevent the spring leaf 15a from being plastically deformed, a free space 20 is provided below the spring leaf 15a. As a result, the spring leaf can maintain its original shape and jamming force and will the spring leaf 15a be able to provide sufficient pushing and pulling force, even when plastic deformation occurs during prolonged load of the connection.

25

In fig. 7, a mechanical tubular elements connection system 200 similar to that of figures 1-6 is schematically depicted in a position similar to that shown in fig. 5, comprising an alternative transmission. In this embodiment, the transmission provided between gripping element 115, stop ridge 101 and screw actuated portion 104 is formed by a second lever element 125, pivotable about fulcum 108 of rigid body 124, and first lever element 126,
30 pivotable about fulcrum 118 on the second lever element 125. Upon actuation by the actuating screw 102, first the first lever element 126 is allowed to pivot, and only upon further actuation by the actuating screw 102, also the second lever element 125 is being actuated and allowed to pivot about fulcrum 108.

35

CONCLUSIES

1. Mechanisch buiselementenverbindingssysteem (100), omvattende:

- een bedieningsschroef (2) voorzien van schroefdraad (101s'),
- een eerste buiselement (101) met een wand (101b) met een buitenste (101b') en een binnenste (101b'') oppervlak die een eerste doorgang (101a) definieert en twee tegenoverliggende eindvlakken (101c, 101d), waarbij op een afstand van het eindvlak (101c) de wand van het eerste buiselement is voorzien van een schroefgat (101s) dat in verbinding staat met de eerste doorgang (101a), welk schroefgat is voorzien van schroefdraad dat overeenkomt met schroefdraad (101s') van de bedieningsschroef, en waarbij de lengte (l) van de bedieningsschroef groter is dan die van de wand (101b) van het eerste buiselement;
- een tweede buiselement (102) omvattende een wand (102b) met een buitenste (102b') en een binnenste (102b'') oppervlak dat een tweede doorgang (102a) definieert en twee tegenoverliggende eindvlakken (102c, 102d), waarbij het tweede buiselement een doorsnede heeft die in hoofdzaak overeen komt met de doorsnede van het eerste buiselement,
- een verbindingssamenstel (50) dat geschikt is om het eerste en het tweede buiselement te verbinden, omvattende een eerste helft (50a) geschikt om in de eerste doorgang (101a) te worden geplaatst, en een tweede helft (50b) geschikt om in de tweede doorgang (102a) te worden geplaatst, waarbij het verbindingssamenstel in het bijzonder omvat:
 - een stijf lichaam (24) omvattende een voetgedeelte (18) zich uitstrekkende over de eerste en de tweede helft, geschikt om aan te grijpen op het binnenoppervlak van de eerste en tweede buiselementen; en
 - een beweegbaar grijpelement (15) voorzien in de tweede helft (50b) van het verbindingssamenstel, tegenover het voetgedeelte, dat beweegbaar is tussen een montagepositie die het mogelijk maakt de tweede helft van het verbindingssamenstel in de tweede doorgang te plaatsen, en een geassembleerde positie waarin het grijpelement de wand van het tweede buiselement grijpt, en
 - een drukkracht uitoefent tegen de wand van het tweede buiselement, resulterend in een grijpende verbinding tussen het beweegbare grijpelement en het binnenoppervlak en een aangrijping tussen het voetgedeelte en het tegenoverliggende binnenoppervlak, en

- een trekkracht uitoefent die in lijn staat met de wanden van de buiselementen, om het tweede buiselement naar het eerste buiselement toe te trekken,
- een beweegbaar door een schroef bediend gedeelte (4), voorzien aan de eerste helft van het verbindingssamenstel, waarbij het door een schroef bediend gedeelte beweegbaar is ten opzichte van het vaste lichaam (24) door bediening met de bedieningsschroef (2), tussen een montagepositie waarin het door een schroef bediend gedeelte in lijn is gebracht met het schroefgat, en een geassembleerde positie;
- een transmissie (25) voorzien tussen het grijpelement (15) en het door een schroef bediend gedeelte (4);

waarbij het buiselementen verbindingssysteem zodanig bedienbaar is dat het verbindingssamenstel in de eerste en tweede passages is te plaatsen, en waarbij het door een schroef bediend gedeelte wordt bediend, zodat achtereenvolgens:

- het grijpelement een duwkracht loodrecht op de wand uitoefent om een grijpende verbinding tussen het beweegbare grijpelement en het binnenoppervlak te verkrijgen, en een aangrijping tussen het voetgedeelte en het tegenoverliggende binnenoppervlak te verkrijgen,
- het grijpelement een trekkracht uitoefent om het tweede buiselement naar het eerste buiselement toe te trekken.

2. Mechanisch buiselementenverbindingssysteem volgens conclusie 1, waarbij de totale doorsnede van het verbindingssamenstel, in het bijzonder het stijve lichaam van het verbindingssamenstel, in hoofdzaak overeen komt met de doorsnede van de buisvormige elementen.

3. Mechanisch buiselementenverbindingssysteem volgens één of meer van de voorgaande conclusies, waarbij het stijve lichaam van het verbindingssamenstel door extrusie is gemaakt.

4. Mechanisch buiselementenverbindingssysteem volgens één of meer van de voorgaande conclusies, waarbij het grijpelement (15), door een schroef bediend gedeelte (4) en transmissie (25) zijn gevormd door een enkel beweegbaar hefboomelement (25), bij voorkeur gemaakt door extrusie, en waarbij het stijve lichaam een hefpunt (8) omvat voor het beweegbare hefboomelement, waarbij op een eerste arm (25a) ervan het met een schroef bediend gedeelte (4) is voorzien en op een tweede arm (25b) ervan het grijpelement (15) is voorzien.

5. Mechanisch buiselementenverbindingssysteem volgens conclusie 4, waarbij het stijve lichaam (24) verder een veerelement (9) omvat dat aangrijpt op de tweede arm (25b) van het hefboomelement.

5

6. Mechanisch buiselementenverbindingssysteem volgens één of meer van de voorgaande conclusies, waarbij de doorsnede van de buiselementen vierkant, rechthoekig of cirkelvormig is.

10 7. Mechanisch buiselementenverbindingssysteem volgens één of meer van de voorgaande conclusies, waarbij het buiselement is gemaakt door extrusie en de wand een glad buiten- en binnenoppervlak heeft.

15 8. Mechanisch buiselementenverbindingssysteem volgens één of meer van de voorgaande conclusies, waarbij het stijf lichaam van het verbindingssamenstel verder omvat een axiaal fixatiegedeelte (5), voorzien in de eerste helft van het verbindingssamenstel, geschikt om aan te grijpen op een fixatie-element, bijvoorbeeld de bedieningsschroef (2), om het verbindingssamenstel (50) en het eerste buiselement (101) in axiale richting te fixeren, en waarbij na axiale fixatie van de eerste helft van het verbindingssamenstel en het
20 eerste buiselement het door een schroef bediend gedeelte wordt bediend.

9. Mechanisch buiselementenverbindingssysteem volgens één of meer van de voorgaande conclusies, waarbij het verbindingssamenstel verder omvat:

25 • een beweegbare stoprand (1) voorzien tussen de eerste en tweede helft van het verbindingssamenstel, die in een montagepositie een stop vormt voor beide eindoppervlakken (101c, 102c) van de eerste en tweede buiselementen om het verbindingssamenstel ten opzichte van de eerste en tweede buiselementen te positioneren, en die in een geassembleerde positie is teruggetrokken naar binnen in de eerste of tweede doorgang om zo mogelijk te maken dat de eindvlakken van het
30 eerste en tweede buiselement in contact met elkaar komen,

waarbij het beweegbaar door een schroef bediend gedeelte (4), op een afstand (d) van de stoprand (1) is gesitueerd, die in hoofdzaak overeen komend met de afstand tussen het eindvlak (101c) en het schroefgat (101s),

35 en waarbij de transmissie (25) is voorzien tussen het grijpelement (15), de stoprand (1), en het door een schroef bediend gedeelte (4);

en waarbij het verbindingssamenstel in de eerste en tweede passages is te plaatsen zodanig dat de stoprand tegen de eindvlakken van de eerste en tweede buiselementen aan ligt,

5 en waarbij nadat het door een schroef bediend gedeelte wordt bediend, de stoprand naar de teruggetrokken positie wordt bewogen, voordat het grijpelement een duwkracht en een trekkracht uitoefent.

10. Werkwijze voor het verbinden van een eerste en tweede buiselement van een mechanisch buiselementenverbindingssysteem volgens conclusie 1, omvattende de stappen
10 van:

- het plaatsen van een eerste helft van het verbindingssamenstel in een eerste doorgang,
- het optioneel op één lijn brengen van het door een schroef bediend gedeelte van het verbindingssamenstel met het schroefgat van het eerste buiselement,
- 15 - het plaatsen van het verbindingssamenstel in de tweede doorgang
- het bedienen van de schroef op het door een schroef bediend gedeelte, zodat achtereenvolgens:
 - o het grijpelement een duwkracht uitoefent loodrecht op de wand om een grijpverbinding tussen het beweegbare grijpelement en het binnenoppervlak
20 te verkrijgen, en een aangrijping tussen het voetgedeelte en het tegenoverliggende binnenoppervlak, en
 - o het grijpelement een trekkracht uitoefent om het tweede buiselement naar het eerste buiselement toe te trekken.

25 11. Werkwijze volgens conclusie 10, voor het verbinden van een eerste en tweede buiselement van een mechanisch buiselementenverbindingssysteem volgens conclusie 8, verder omvattende de stap van het aangrijpen van het fixatie-element, bijvoorbeeld de bedieningsschroef, met het axiale fixatiegedeelte in de eerste helft van het verbindingssamenstel.

30

12. Werkwijze volgens conclusie 10 of 11, voor het verbinden van een eerste en tweede buiselement van een mechanisch buiselementenverbindingssysteem volgens conclusie 9, verder omvattende de stappen van:

- het plaatsen van een eerste helft van het verbindingssamenstel in een eerste
35 doorgang totdat de stoprand tegen het eindvlak van het eerste buiselement aan ligt,
- het plaatsen van het verbindingssamenstel in de tweede doorgang totdat de stoprand tegen het eindvlak van het tweede buiselement aan ligt,

en waarbij na het bedienen van de schroef op het door een schroef bediend gedeelte de stoprand naar een teruggetrokken geassembleerde positie wordt bewogen.

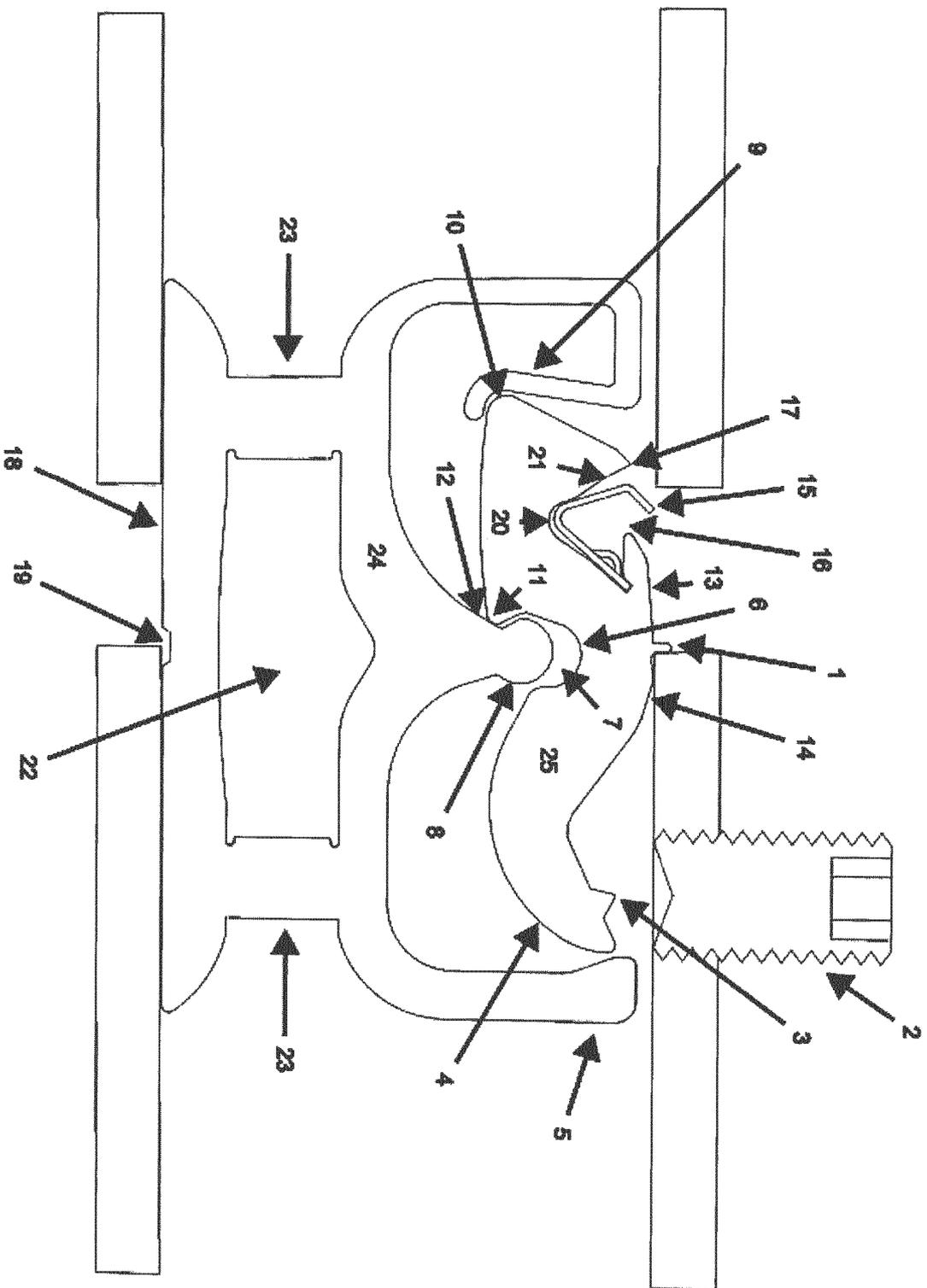


Fig. 1

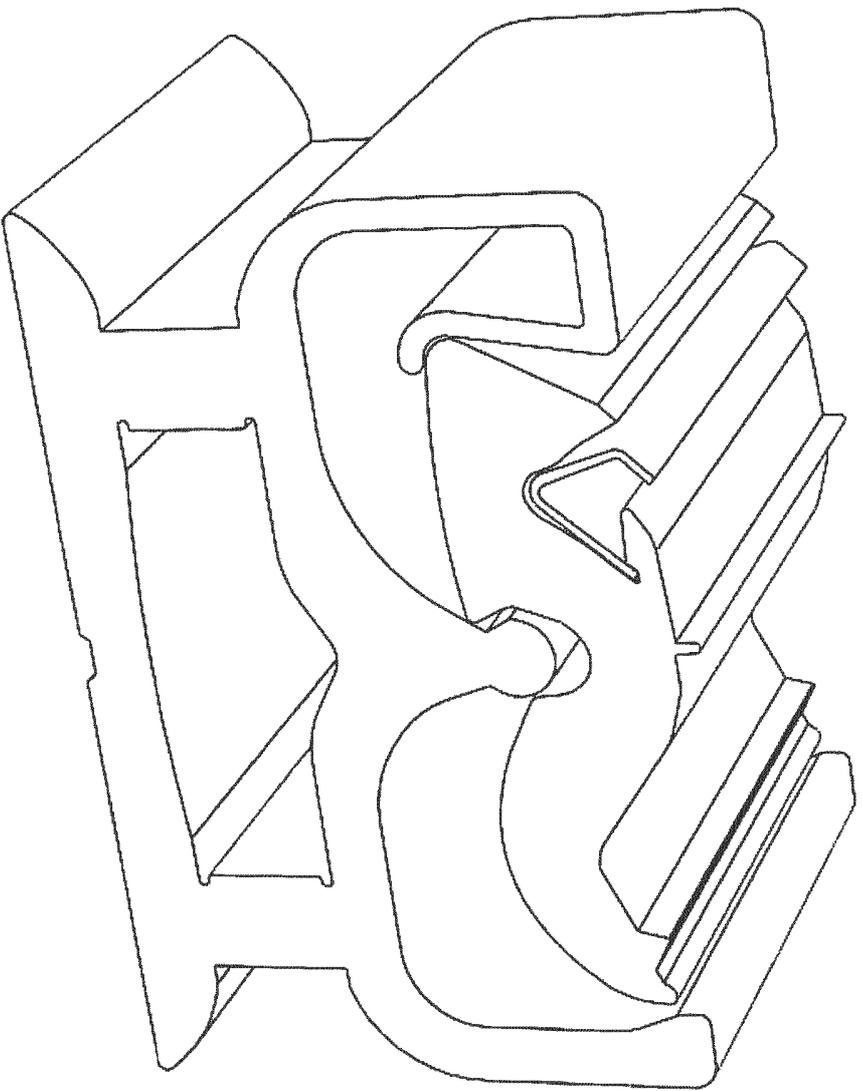


Fig. 2

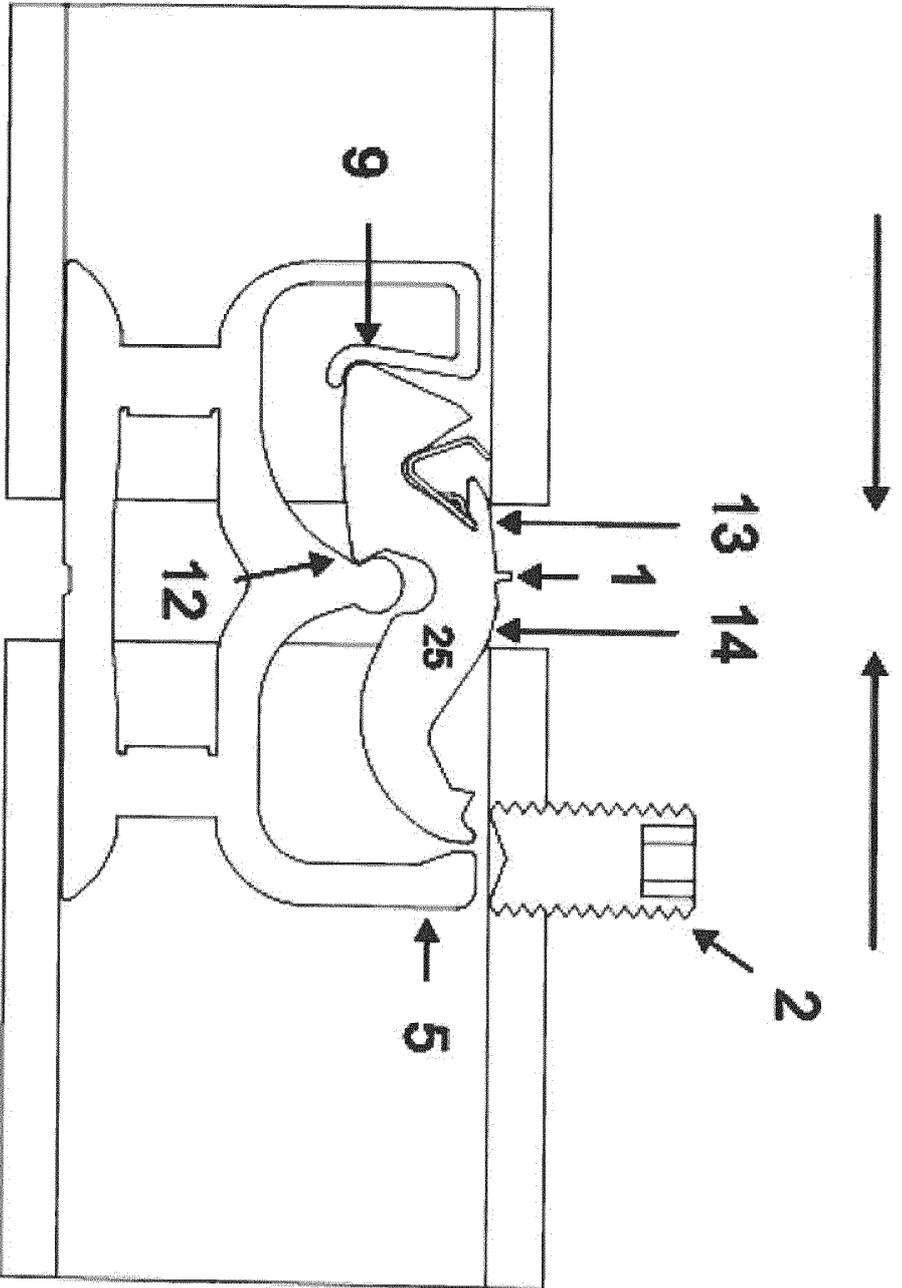


Fig. 3

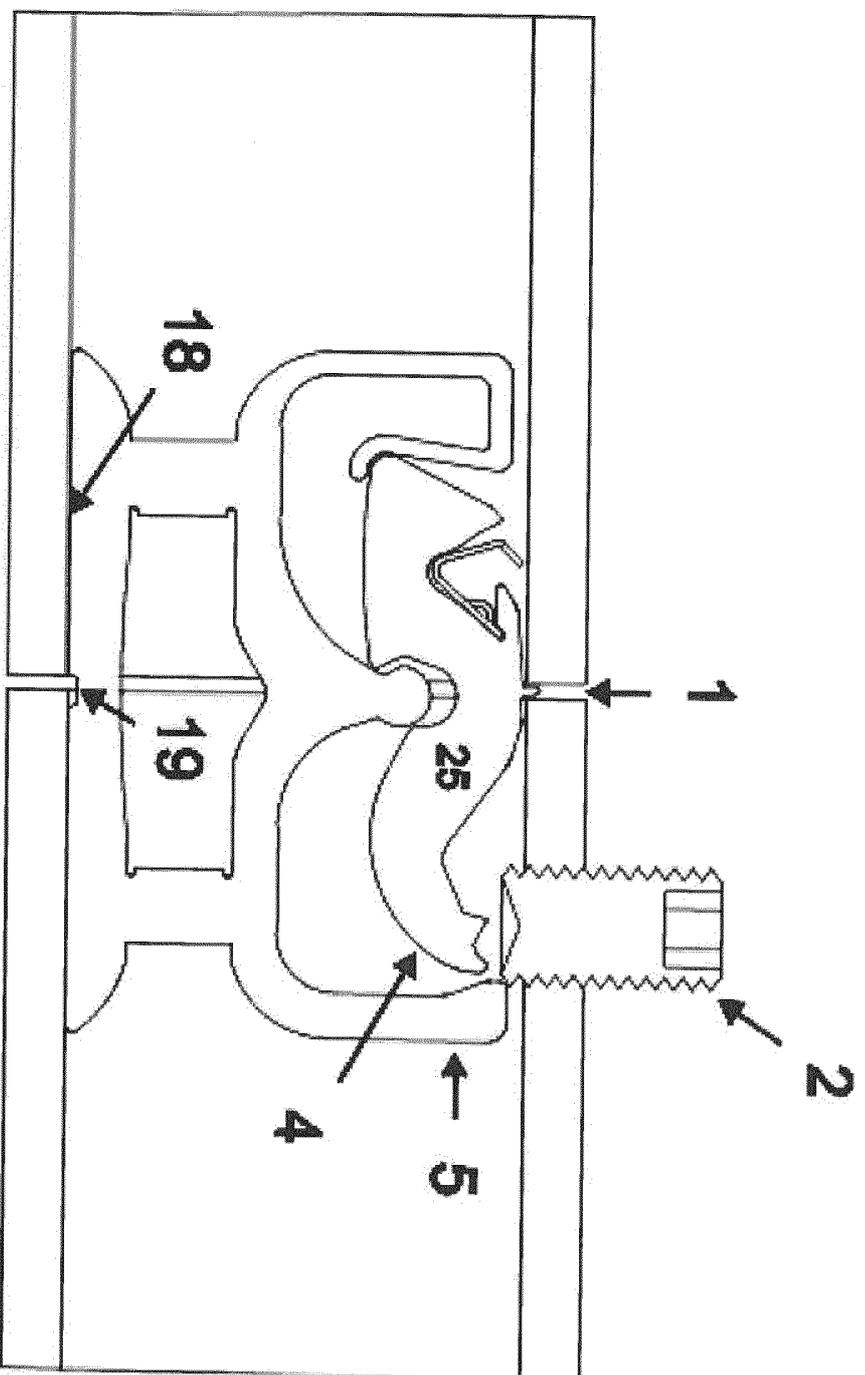


Fig. 4A

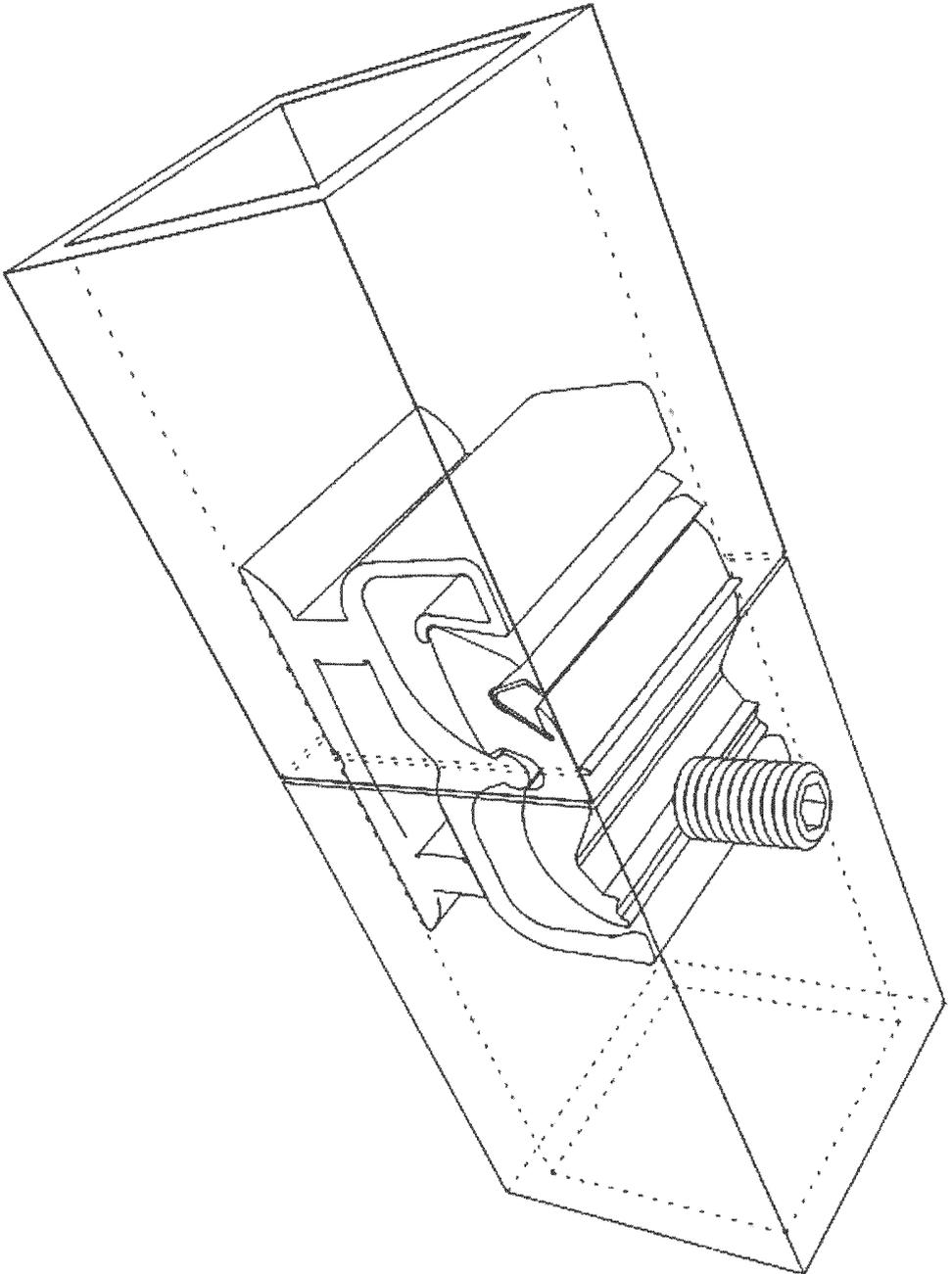


Fig. 4B

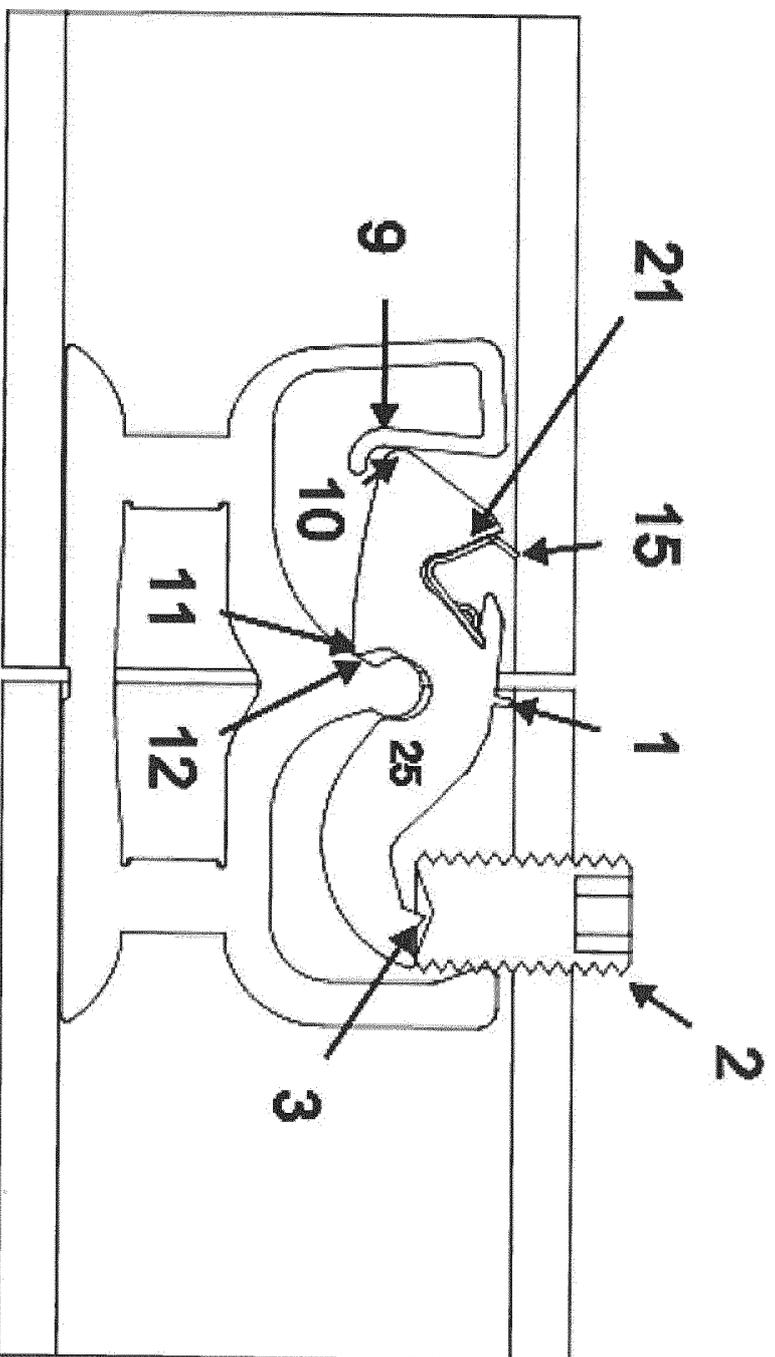


Fig. 5

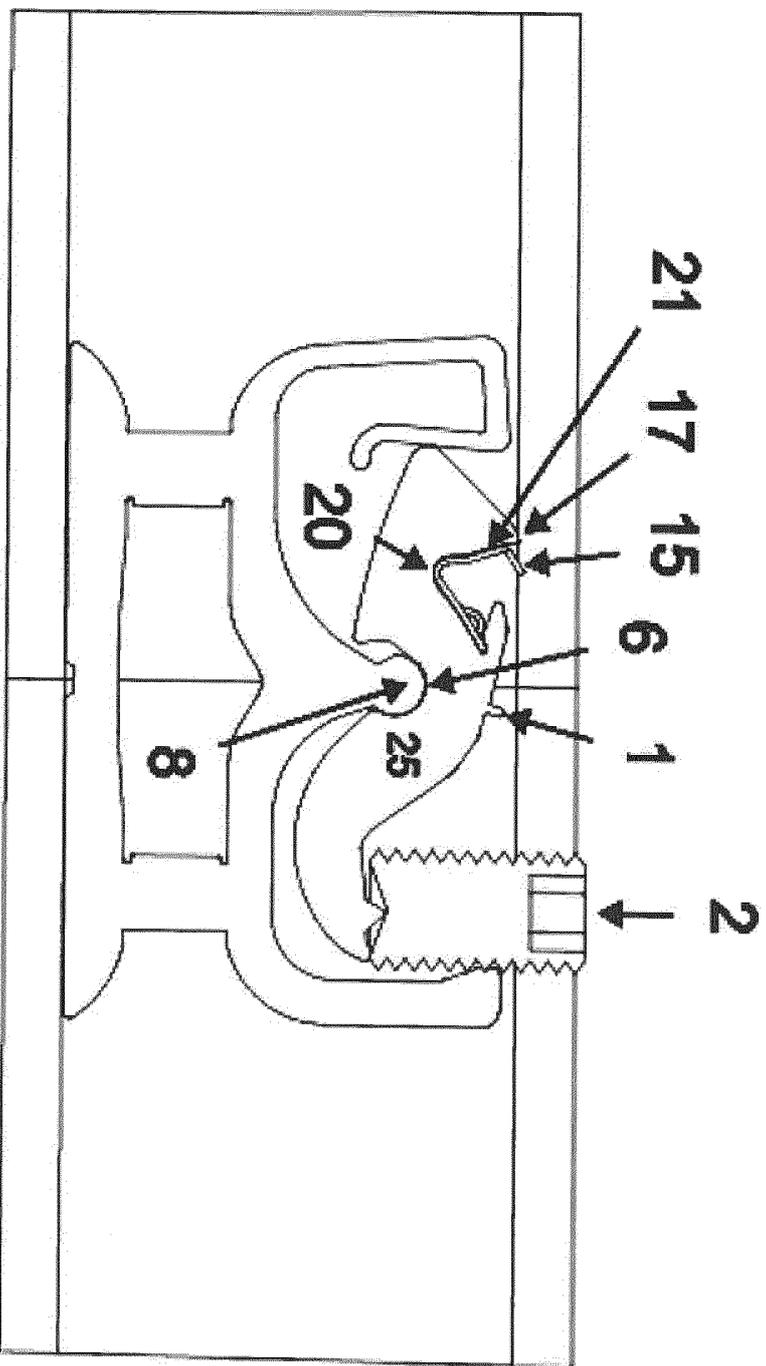


Fig. 6

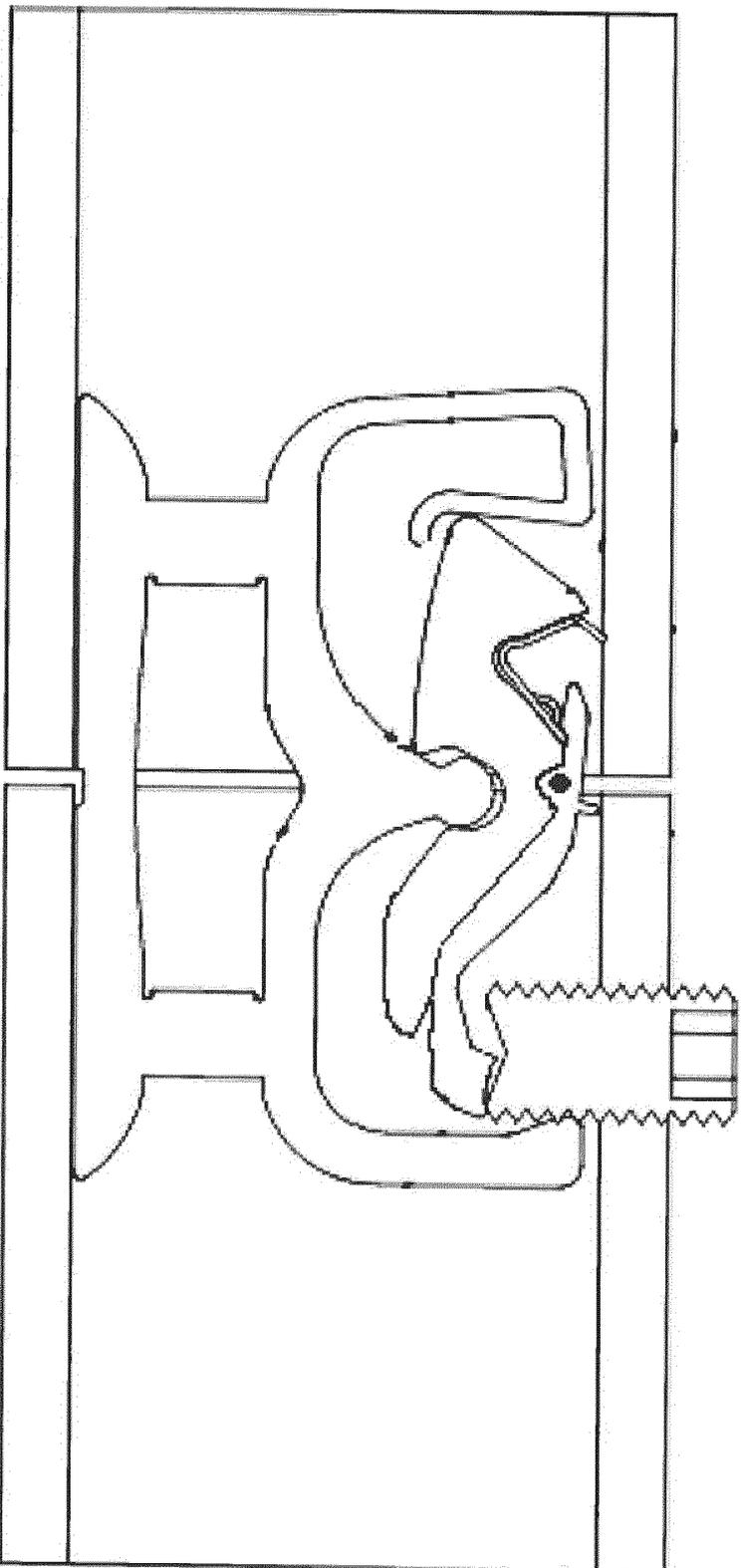


Fig. 7

SAMENWERKINGSVERDRAG (PCT)

RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE	KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE
	P31863NL00/IWO
Nederlands aanvraag nr.	Indieningsdatum
2012293	20-02-2014
	Ingeroepen voorrangdatum
Aanvrager (Naam)	
Asaclamp B.V	
Datum van het verzoek voor een onderzoek van internationaal type	Door de Instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr.
14-06-2014	SN62142
I. CLASSIFICATIE VAN HET ONDERWERP (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)	
Volgens de internationale classificatie (IPC)	
F16B7/02	
II. ONDERZOCHE GEBIEDEN VAN DE TECHNIEK	
Onderzochte minimumdocumentatie	
Classificatiesysteem	Classificatiesymbolen
IPC	F16B
Onderzochte andere documentatie dan de minimum documentatie, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen	
III. <input type="checkbox"/>	GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES (opmerkingen op aanvullingsblad)
IV. <input type="checkbox"/>	GEBREK AAN EENHEID VAN UITVINDING (opmerkingen op aanvullingsblad)

**ONDERZOEKSRAPPORT BETREFFENDE HET
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Nummer van het verzoek om een onderzoek naar
de stand van de techniek

NL 2012293

A. CLASSIFICATIE VAN HET ONDERWERP

INV. F16B7/02
ADD.

Volgens de Internationale Classificatie van octrooien (IPC) of zowel volgens de nationale classificatie als volgens de IPC.

B. ONDERZOCHE GEBIEDEN VAN DE TECHNIEK

Onderzochte minimum documentatie (classificatie gevolgd door classificatiesymbolen)

F16B

Onderzochte andere documentatie dan de minimum documentatie, voor dergelijke documenten, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

Tijdens het onderzoek geraadpleegde elektronische gegevensbestanden (naam van de gegevensbestanden en, waar uitvoerbaar, gebruikte trefwoorden)

EPO-Internal

C. VAN BELANG GEACHTE DOCUMENTEN

Categorie °	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
X	DE 20 2009 012601 U1 (SCHUNKE KURT [DE]) 7 januari 2010 (2010-01-07) * alinea [0013] - alinea [0017]; figuren 1,2 *	1-12
X	US 4 540 307 A (HOLLAENDER II ROBERT P [US] ET AL) 10 september 1985 (1985-09-10) * kolom 3, regel 3 - kolom 6, regel 40; figuren 1-3 *	1-12
X	WO 92/21886 A1 (KEE KLAMPS LTD [GB]) 10 december 1992 (1992-12-10) * bladzijde 3, alinea 4 - bladzijde 4, laatste alinea; figuren 1/2-2/2 *	1-12

Verdere documenten worden vermeld in het vervolg van vak C.

Leden van dezelfde octroofamilie zijn vermeld in een bijlage

° Speciale categorieën van aangehaalde documenten

A niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft

D in de octrooiaanvraag vermeld

E eerdere octrooi(aanvraag), gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven

L om andere redenen vermelde literatuur

O niet-schriftelijke stand van de techniek

P tussen de voorrangsdatum en de indieningsdatum gepubliceerde literatuur

T na de indieningsdatum of de voorrangsdatum gepubliceerde literatuur die niet bezwarend is voor de octrooiaanvraag, maar wordt vermeld ter verheldering van de theorie of het principe dat ten grondslag ligt aan de uitvinding

X de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur

Y de conclusie wordt als niet inventief beschouwd ten opzichte van de combinatie van deze literatuur met andere geciteerde literatuur van dezelfde categorie, waarbij de combinatie voor de vakman voor de hand liggend wordt geacht

Z lid van dezelfde octroofamilie of overeenkomstige octrooipublicatie

Datum waarop het onderzoek naar de stand van de techniek van internationaal type werd voltooid

6 november 2014

Verzenddatum van het rapport van het onderzoek naar de stand van de techniek van internationaal type

Naam en adres van de instantie

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

De bevoegde ambtenaar

Comei, Ezio

**ONDERZOEKSRAPPORT BETREFFENDE HET
 RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
 VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Informatie over leden van dezelfde octrooifamilie

Nummer van het verzoek om een onderzoek naar
 de stand van de techniek

NL 2012293

In het rapport genoemd octrooigeschrift	Datum van publicatie	Overeenkomend(e) geschrift(en)	Datum van publicatie
DE 202009012601 U1	07-01-2010	DE 202009012601 U1	07-01-2010
		EP 2302225 A1	30-03-2011
US 4540307	A 10-09-1985	EP 0163363 A1	04-12-1985
		US 4540307 A	10-09-1985
WO 9221886	A1 10-12-1992	AU 1771892 A	08-01-1993
		WO 9221886 A1	10-12-1992

WRITTEN OPINION

File No. SN62142	Filing date (<i>day/month/year</i>) 20.02.2014	Priority date (<i>day/month/year</i>)	Application No. NL2012293
International Patent Classification (IPC) INV. F16B7/02			
Applicant Asaclamp B.V.			

This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the application
- Box No. VIII Certain observations on the application

	Examiner Comel, Ezio
--	-------------------------

WRITTEN OPINION

Application number
NL2012293

Box No. I Basis of this opinion

1. This opinion has been established on the basis of the latest set of claims filed before the start of the search.
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - a sequence listing
 - table(s) related to the sequence listing
 - b. format of material:
 - on paper
 - in electronic form
 - c. time of filing/furnishing:
 - contained in the application as filed.
 - filed together with the application in electronic form.
 - furnished subsequently for the purposes of search.
3. In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty	Yes: Claims	2-9, 11, 12
	No: Claims	1, 10
Inventive step	Yes: Claims	
	No: Claims	1-12
Industrial applicability	Yes: Claims	1-12
	No: Claims	

2. Citations and explanations

see separate sheet

Item V :

- 1 The subject-matter of claims 1 and 10 is not new.
- 2 The following documents (D) are referred to in this communication; the numbering will be adhered to in the rest of the communication:
 - D1 DE 20 2009 012601 U1 (SCHUNKE KURT [DE]) 7 januari 2010 (2010-01-07)
 - D2 US 4 540 307 A (HOLLAENDER II ROBERT P [US] ET AL) 10 september 1985 (1985-09-10)
 - D3 WO 92/21886 A1 (KEE KLAMPS LTD [GB]) 10 december 1992 (1992-12-10)
- 3 Document D1 (alinea [0013] - alinea [0017]; figuren 1,2) discloses a "mechanisch buiselementenverbindingssysteem 3, omvattende:.. een bedieningsschroef 3a voorzien van schroefdraad, een eerste buiselement 1 met een wand met een buitenste en een binnenste oppervlak die een eerste doorgang definieert en twee tegenoverliggende eindvlakken, waarbij op een afstand van het eindvlak de wand van het eerste buiselement is voorzien van een schroefgat dat in verbinding staat met de eerste doorgang, welk schroefgat is voorzien van schroefdraad dat overeenkomt met schroefdraad van de bedieningsschroef, en waarbij de lengte (l) van de bedieningsschroef groter is dan die van de wand van het eerste buiselement; een tweede buiselement 1' omvattende een wand met een buitenste en een binnenste oppervlak dat een tweede doorgang definieert en twee tegenoverliggende eindvlakken, waarbij het tweede buiselement een doorsnede heeft die in hoofdzaak overeen komt met de doorsnede van het eerste buiselement, een verbindingssamenstel dat geschikt is om het eerste en het tweede buiselement te verbinden, omvattende een eerste helft geschikt om in de eerste doorgang te worden geplaatst, en een tweede helft geschikt om in de tweede doorgang te worden geplaatst, waarbij het verbindingssamenstel in het bijzonder omvat een stijf lichaam 2 omvattende een voetgedeelte zich uitstrekkende over de eerste en de tweede helft, geschikt om aan te grijpen op het binnenoppervlak van de eerste en tweede buiselementen; en een beweegbaar grijpelement 3c voorzien in de tweede helft van het verbindingssamenstel, tegenover het voetgedeelte, dat beweegbaar is tussen een montagepositie die het mogelijk maakt de tweede helft van het verbindingssamenstel in de tweede doorgang te plaatsen, en een geassembleerde positie waarin het grijpelement de wand van het tweede buiselement grijpt, en een drukkracht uitoefent tegen de wand van het tweede

buisselement, resulterend in een grijpende verbinding tussen het beweegbare grijpelement en het binnenoppervlak en een aangrijping tussen het voetgedeelte en het tegenoverliggende binnenoppervlak, en een trekkracht uitoefent die in lijn staat met de wanden van de buiselementen, om het tweede buiselement naar het eerste buiselement toe te trekken, o een beweegbaar door een schroef bediend gedeelte 3b, voorzien aan de eerste helft van het verbindingssamenstel, waarbij het door een schroef bediend gedeelte beweegbaar is ten opzichte van het vaste lichaam 2 door bediening met de bedieningsschroef 3a, tussen een montagepositie waarin het door een schroef bediend gedeelte in lijn is gebracht met het schroefgat, en een geassembleerde positie; o een transmissie voorzien tussen het grijpelement en het door een schroef bediend gedeelte; waarbij het buiselementen verbindingssysteem zodanig bedienbaar is dat het verbindingssamenstel in de eerste en tweede passages is te plaatsen, en waarbij het door een schroef bediend gedeelte wordt bediend, zodat achtereenvolgens: - het grijpelement een duwkracht loodrecht op de wand uitoefent om een grijpende verbinding tussen het beweegbare grijpelement en het binnenoppervlak te verkrijgen, en een aangrijping tussen het voetgedeelte en het tegenoverliggende binnenoppervlak te verkrijgen, - het grijpelement een trekkracht uitoefent om het tweede buiselement naar het eerste buiselement toe te trekken", a device corresponding to all features of claim 1.

- 4 Therefore, the subject-matter of claim 1 lacks novelty.
- 5 A method according to independent claim 10 can be derived from the cited document D1 using the same reasons as explained above. Therefore subject-matter of claim 10 also lacks novelty.
- 6 It is pointed out that each of the documents D2 (kolom 3, regel 3 - kolom 6, regel 40; figuren 1-3) and D3 (bladzijde 3, alinea 4 - bladzijde 4, laatste alinea; figuren 1/2-2/2) also disclose all the characteristics of the claims 1 and 10. Accordingly, each of these documents also take the novelty of claims 1 and 10.
- 7 Dependent claims 2-9, 11 and 12 at present do not appear to contain any additional features which, in combination with the features of any claim to which they refer, involve an inventive step for the following reasons:

The features of said dependent claims 2-9, 11 and 12 would come within the scope of the customary practice followed by persons skilled in the art and would be rendered obvious by the above mentioned documents.

- 8 The same feature shall be denoted by the same reference sign throughout the application. This requirement is not met in view of the use of reference numbers 100 and higher which have no correspondence in the drawings.
- 9 The applicant should also indicate in the letter of reply the difference vis à vis the state of the art and the significance thereof. In case of filing new claims the following points should be also taken account, to facilitate a final examination:
- 10 The description must be brought into conformity with the new claims to be filed; care should be taken during revision, especially of the introductory portion including any statements of problem or advantage, not to add subject-matter which extends beyond the content of the application as originally filed.
- 11 The documents D1, D2 and D3 should be identified in the description and the relevant background art disclosed therein should be briefly discussed.