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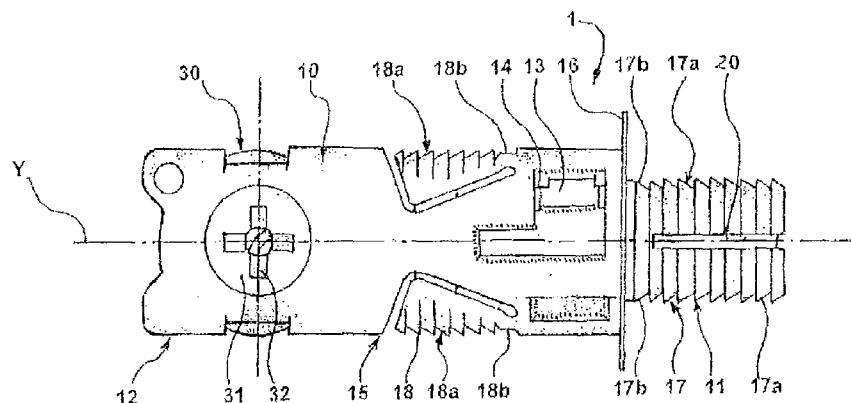


FIG. 1

(57) Abstract: A connecting device between components of a piece of furniture includes: - A casing (10, 110, 210) capable of being received in a first seat (4) and in a second seat (5) obtained respectively in a first and in a second component (2, 3) of the piece of furniture, and comprising a first and a second radially expandable region (17, 18) to engage respectively the first and the second component in correspondence of the first and the second seat, - A tie rod (20) received inside the casing with axial sliding power towards and from a locking position, and comprising a first segment (23) in enlarged section and a second segment (24) in enlarged section susceptible of engagement respectively with the first and the second region (17, 18) to determine a radial expansion of the casing when the rod is moved in the locking position, and - An eccentric element (30) arranged to engage a head (21) of the tie rod and axially move it towards the locking position when the eccentric element rotates around its main axis (X).

CONNECTING DEVICE BETWEEN COMPONENTS OF A PIECE OF FURNITURE

Technical Field

- 5 The present invention relates to a connecting device between components of a piece of furniture, having the characteristics set out in the preamble of the main claim.

State of the art

- 10 In the production of furniture, and more generally of elements of furniture, it is known the use of connecting devices to connect the different components of furniture and tighten them, in particular via panels used as shelves or walls, in order to assemble the piece of furniture and/or to fix it in a room in the desired position.
- 15 In particular, the known connecting devices are those comprising a rod-shaped pin, fixed to its first end to a first of component of the piece of furniture, and an eccentric element, generally cylindrical shaped, which is inserted in a seat formed in a first component of the piece of furniture to engage a head of the rod protruding from the first component. The
- 20 eccentric element is provided with coupling means of the tie rod head, so that as a consequence of the rotation of the eccentric element around its own axis, the rod is moved to the inside of the first connecting element, obtaining in this way the approach and the clamping of the two components of the piece of furniture.
- 25 This type of connecting device finds a preferred application in the union of a horizontal panel (shelf) with a vertical wall.
- In one embodiment of the connecting device of the type indicated above, it is provided that the fastening of the tie rod in the seat of the first component if the piece of furniture is obtained by a coupling of the type
- 30 with gusset.

In this case the end of the tie rod opposite to the eccentric head engaged in the element features a segment in enlarged section, typically with tapered profile, and the tie rod is received sliding inside a casing provided with a corresponding end radially expandable, so that the axial displacement of the rod caused by the rotation of the eccentric element determines the radial expansion of said end and its engagement in the seat of the component of the piece of furniture in which it is received.

The connecting devices of the type described above, however, have some drawbacks. A first drawback is the fact that, with the completed assembly, the eccentric element is visible in the second component of the piece of furniture.

Furthermore, the seat provided in the second component of the piece of furniture for the eccentric element housing has not negligible diameters, generally higher than 14 mm.

A second drawback of the connecting device according to the known technique is given by the fact that each connecting device is formed by at least two separate components, the eccentric element and the tie rod, which must be separately mounted on the respective components of the piece of furniture to be assembled.

This obviously involves a high possibility of loss of one of these components and a greater difficulty in their positioning in the assembly phase.

A third drawback is the fact that the connecting device does not exert a sufficient reciprocal clamping action of the two components of the piece of furniture.

Object of the invention

The problem underlying the present invention is that of making a device which is structurally and functionally conceived to overcome, at least in part, one or more of the limitations described above with reference to the cited prior art.

In this context, it is an object of the invention to provide a connecting device which is simple to use, which features optimal characteristics of tensile strength and that is achievable with a low cost.

Another object of the invention is to provide a connecting device which also allows an effective disassembly of the components of the piece of furniture.

A further object of the invention is to provide a connecting device which is applicable to most common thicknesses of panels currently used.

Another object is to provide a connecting device configured to perform an effective reciprocal clamping action of the two components of the piece of furniture.

This problem has been solved and these objects are achieved by the present invention by means of a connecting device formed in accordance with the following claims.

Brief description of the drawings

The characteristics and benefits of the invention will be more apparent in the detailed description of some examples of the preferred embodiments, illustrated only by way of non-limiting example with reference to the attached drawings in which:

- Figure 1 is a schematic plan view of a first example of the connecting device according to the present invention,
- Figure 2 is a schematic side view of the device of Figure 1,
- Figure 3 is an exploded view of the device of Figure 2,
- Figures 4 and 5 are longitudinal sectional views of the device of Figure 1 in two different operating positions,
- Figure 6 is a schematic view of an assembling phase of two components of a piece of furniture in which the device of Figure 1 is used,
- Figure 7 is a schematic exploded view of a second example of the connecting device according to the present invention,
- Figure 8 is a longitudinal sectional view of the connecting device of Figure 7;

- Figure 9 is a longitudinal sectional view of a third embodiment of the connecting device according to the present invention;
- Figure 10 is a front view of the device of Figure 9.

5 **Detailed description of preferred embodiments of the invention**

With initial reference to figures 1 to 6, with 1 it is globally indicated a first example of the connecting device made in accordance with the present invention.

10 The connecting device 1 is arranged to mutually connect and tighten a first and a second component of a piece of furniture, respectively represented here in a generic manner by a first panel 2 and by a second panel 3, oriented in a perpendicular way to each other.

15 The panels are preferably made of wood-based material and have a thickness of between 12 mm and 30 mm, according to the most common construction standards in the furniture industry and furniture in general.

It is understood that the first and the second components of the piece of furniture can be made with different materials or shapes and can be positioned for the mutual coupling according to any other appropriate arrangement.

20 The connecting device 1 comprises a casing 10 inside which both a tie rod 20 and an eccentric element 30 of the tie rod 20 handling are accommodated.

25 The casing 10 is extended along a longitudinal axis Y of the connecting device 1 between a first end 11, capable of being received in a first seat 4 obtained in the first panel 2 of the piece of furniture 5 and a second end 12 capable of being received in a second seat 5 obtained in the second panel 3 of the piece of furniture.

30 The casing 10 is preferably made of plastic material, so as to be elastically deformable, and comprises a pair of shells 10a and 10b, mutually coupling in such a way as to enclose inside them the tie rod 20 and the eccentric element 30.

The shells 10a and 10b comprise two pairs of male and female 13, 14, even snap-in, locking elements which allow their mutual coupling.

In correspondence of the second end 12, the housing 10 has a section having a first diameter in correspondence of the first end 11, the casing 10
5 has a substantially cylindrical shape with circular section having a first diameter D1, while in correspondence of the second end 12 and a median region 15, the casing 10 has a substantially cylindrical shape with circular section having a second diameter D2 which is bigger than the first diameter D1.

10 Between the first end 11 and the median region 15 is provided an abutment flange 16, projecting radially, which is arranged to abut the first panel 2 or the second panel 3 when the first end 11 of the casing 10 is inserted in the first seat 4 or, respectively, when the second end 12 of the casing 10 is inserted in the second seat 5.

15 Preferably, the abutment flange 16 includes at least one protrusion or radial tooth, i.e. protruding away in the longitudinal axis Y of casing 10.

In the preferred embodiment, the abutment flange 16 includes two radial protrusions obtained by opposite sides of the casing 10, i.e. mutually protruding away.

20 Note that the two shells 10a, 10b have a surface area of mutual contact defining a median plane of the device, preferably passing through the longitudinal axis Y (defining the central axis of the device).

Preferably, the protrusions defining the flange 16 are placed so as not to intersect said median plane.

25 Therefore, protrusions are both anchored to only one of the shells 10a, 10b so as not to intersect said median plane. Preferably, said protrusions of the flange 16 have a first face lying on said median plane, i.e. coplanar with the area of contact of the respective shell 10a, and a second face spaced from the first one with a thickness equal to
30 protrusion itself.

In this regard, preferably the second panel 3 of the piece of furniture has

an elongated milling formed in a coupling face with the second panel 2, in which the first seat 5 is made (or vice versa).

Such milling is shaped to accommodate said flange 16, i.e. protrusions, in order to prevent the device from rotating around its longitudinal axis Y once inserted in the seat 5.

Advantageously, the fact that the flange 16 (i.e. protrusions) is off-centered with respect to the median plane, i.e. it determines a central asymmetry of the device 1, obliges the user to put the device 1 with predetermined orientation, avoiding mounting errors.

10 According to a first aspect of the present invention, the casing 10 includes a first region 17 radially expandable to engage the first panel 2 in correspondence of the first seat 4, and a second region 18, also radially expandable, adapted to engage the second panel 3 in correspondence of the second seat 5.

15 Preferably, the first region 17 is defined by the first end 11 of the casing 10, and the second region 18 is defined by the median region 15 of the casing 10.

The first region 17 includes several tabs 17a, arranged side by side, separated by respective axial slots, so as to form a collar defining the first end 11 of the casing 10.

Preferably, the tabs 17a are articulated in oscillation around a respective end 17b of theirs facing the opposite side to the first end 11.

The second region 18 includes several tabs 18a, arranged on the diametrically opposite side of the median region 15 the casing 10, which are articulated in oscillation around a respective end 18b of theirs facing the first end 11.

Preferably, the outer surfaces of both tabs 17a and tabs 18a have a saw-tooth profile.

The tie rod 20 is also extended along the longitudinal axis Y, between a head 21 and a free end 22, and is preferably made of metallic material.

The tie rod 20 is received inside the casing 10 having limited possibilities

of sliding along the longitudinal axis Y between a release position, in which the tie rod 20 is displaced towards the first end 11, and a locking position in which the tie rod 20 is more displaced towards the second end 12.

The tie rod 20 includes a first segment 23 in enlarged section susceptible
5 of engagement with the first region 17 to determine the radial expansion of the casing 10 when the tie rod 20 is moved in the locking position.

Furthermore, the tie rod 20 includes a second segment 24 in enlarged section susceptible of engagement with the second region 18 to determine
10 the radial expansion of the casing 10 when the tie rod is moved in the locking position.

Preferably, the first segment 23 is formed in correspondence of the free end 22, opposite to the head 21, while the second segment 24 is defined on a median segment 25 of the tie rod 20.

The first segment 23 has a conical profile conformation, progressively
15 tapered starting from the free end 22 towards the head 21, and susceptible to encounter the tabs 17a.

In the preferred embodiment here described, the second segment 24 has a wedge-shaped conformation, with a pair of inclined planes 24a, 24b, tapered toward the head 21, which may encounter the tabs 18a.

20 Thanks to the conformation of the tabs 17a, 18a and of the segments in enlarged section 23 and 24, when the tie rod 20 is axially moved in locking position, tabs 17a and 18a are swung in opposite angular directions.

The eccentric element 30 has a generally cylindrical shape and is received inside the casing 10, in correspondence of its second end 12, with
25 possibility of rotation around its main axis X, perpendicular to the longitudinal axis Y.

The eccentric element 30, preferably made of metallic material, is thus housed in the casing 10 and arranged to engage the head 21 of the tie rod 20 so as to move it axially towards the locking position as a result of an
30 eccentric element 30 rotation around the main axis X. Preferably, the eccentric element 30 is formed by two shells 30a, 30b coupled together by

means of one or more male-female couplings, in which the head 21 of the tie rod 20 is received in engagement.

Therefore, the eccentric element 30 has a lower bulk than the casing and is integrated to it, defining with it and the tie rod a single device, movable
5 and storable individually.

The eccentric element 30 may have, in certain applications, a diameter significantly greater than its axial dimension. In these cases, it is preferable that, in correspondence of the second end 12 and of the median region 15, the casing 10 presents a substantially cylindrical shape
10 with elliptical section, with minor axis parallel to the main axis X of the eccentric element 30.

This variant of the embodiment, not represented in the attached figures, is particularly suitable in applications where the connecting device has to be mounted on panels with a reduced thickness.

15 To favour the eccentric rotation of the element 30 around the main axis X, on a base 31 of the eccentric element 30 a seat 32 for a manoeuvring tool, such as a screwdriver has been obtained in a position aligned with the main axis X.

The base 31, in the area immediately surrounding the seat 32, is not
20 coated by the casing 10 in order to allow its access from the outside.

Preferably, the eccentric element 30 defines internally a guide for the head 21 of the tie rod 20, more preferably a reversible drive.

More precisely, the eccentric element 30 is shaped to act reversibly in thrust on the head 21 of the tie rod 20 both in a first direction, towards the
25 locking position, and in a second direction opposite to the first, towards the release position.

In particular, inside the eccentric element 30 there is a seat for receiving the head 21 delimited by a first segment 33 and a second active segment 35 obtained by opposite sides of the head 21 of the tie rod 20 and
30 configured to encounter said head respectively as a result of a rotation of the eccentric element 30 around the axis X in a first direction or in a

second direction, opposite to the first.

Therefore, the eccentric element includes a first active segment 33 engageable with the head 21 of the tie rod 20 and shaped to impart to the tie rod 20 an axial offset from the release position to the locking position
5 following a rotation of the eccentric element 30 in a first rotating direction.

Moreover, the eccentric element 30 includes a second active segment 35 engageable with the head 21 of the tie rod 20 and shaped to impart to the tie rod 20 an axial offset from the locking position to the release position following a rotation of the eccentric element 30 in a second rotating
10 direction, in opposition to the first.

Advantageously, in this way the head 21 of the tie rod 20 is always "guiding", i.e. it is constantly engageable by the eccentric element 30 allowing the reversibility of the expansion operation.

In the preferred embodiment, the first active segment is defined by a cam
15 surface 33, formed on a curved projection 34, capable of encountering the head 21. The cam surface has a progressively decreasing distance from the main axis X, so that when the eccentric element 30 is rotated around the main axis X in a first rotating direction, the head 21 is dragged towards the inner part of the eccentric element 30, axially moving the tie rod 20
20 toward the locking position.

The head 21 advantageously has a U-shape with the concavity facing the main axis X. In addition, on the head 21 an extended countersink 21a in the direction of the main axis X and facing the base 31 is obtained.

Thanks to at least one of these characteristics, possible interferences with
25 the tip of a manoeuvring tool used to rotate the eccentric element 30 and engaged in the seat 32 are avoided.

In accordance with this embodiment, the second active portion is preferably defined by an abutment element 35, capable of encountering the head 21 on the opposite side of the cam surface 33, in order to axially
30 move the tie rod 20 away from the locking position when the eccentric element 30 is rotated around the main axis X in the direction opposite to

the first rotating direction.

In the embodiment as described herein, the abutment element 35 is formed by an axially extended cylinder in an offset position with respect to the main axis X.

- 5 The connecting device is used in the assembly of panels 2 and 3 according the following mode.

The connecting device 1, with the tie rod 20 moved to the release position (Figure 4), is axially inserted in the second seat 5 with the second end 12 of the casing 10 facing the bottom of the seat 5, until it abuts against the
10 flange abutment 16.

The second seat 5 has an opening obtained on a side of the second panel 3 and extends parallel to the surface of the panel to an extent comparable to the axial dimension of the casing 10 from the abutment flange 16 to the second end 12.

- 15 The second seat 5 has a substantially constant section along its longitudinal development, similar to the section of the second end 12 and the median region 15 of the casing 10. Moreover, in correspondence of the seat 32 of the eccentric element 30, the second seat 5 has a hole 6 opened on the surface of the second panel 3 and adapted to allow the
20 insertion of a manoeuvring tool 7 to rotate the eccentric element 30.

Advantageously, the hole 6 has a relatively small diameter, for example of about 5 mm.

- Once inserted the connecting device 1 in the second seat 5, the first end 11 is inserted in the first seat 4 of first panel 2 until it abuts against the
25 abutment flange 16.

The first housing 4 has an opening obtained on a main surface of the first panel 2 and extends perpendicularly to the surface of the panel 2 to a similar extent of the axial dimension of the first end 11 of the casing 10.

- The first housing 4 has a substantially constant section along its
30 longitudinal development, similar to the first end section 11.

As soon as the first and second panels 2, 3 are placed in the desired

relative position, the eccentric element 30 is rotated around the main axis X, for example by means of the screwdriver 7 inserted in the seat 32 through the hole 6 in the first rotating direction, so that the tie rod 20 is moved along the longitudinal axis Y in the locking position.

- 5 Due to this displacement the first segment 23 and second segment 24 cause the opening oscillation of the tabs 17a and 18a respectively, resulting in a radial expansion of the casing 10 (Figure 5).

The tabs 17a and 18a, thanks to the toothed profile of their outer surface, engage on the inner walls of the first and the second seat 4, 5
10 respectively.

Note that, advantageously, the oscillation of the tabs 17a and 18a takes place in the opposite mutual rotating direction, in a way as to stress the first and the second panel 2 and 3 mutually approaching, and tighten them.

- 15 To decouple the first and second panel 2 and 3, it is sufficient to rotate the eccentric element 30 in the opposite direction. Due to this rotation, the abutment element 35 pushes the tie rod 20 away from the locking position bringing it back in the release position. The tabs 17a and 18a are thus free to oscillate towards the longitudinal axis Y, so as to disengage the inner
20 walls respectively of the first and the second seat 4 and 5.

With reference to Figures 7 and 8, 100 is generally referred as a second example of the connecting device made in accordance with the present invention, while with reference to Figure 9 a third example of device is indicated with 200.

- 25 Components of the connecting devices 100, 200 similar to those described in detail in the example of the previous connecting device, are indicated with the same reference number or they are not mentioned, if not necessary (such as the flange 16).

The connecting devices 100, 200 differ from the connecting device 1 for a
30 different configuration of some parts of the casing, while the tie rod and the eccentric element are substantially similar.

Each connecting device 100 or 200 comprises a casing 110, 210 including a first component 111, 211 (or first portion 111, 211) and a second component 112, 212 (or second portion 112, 212), which, in certain operational conditions, have limited mutual movement capabilities along the longitudinal axis Y in order to obtain the clamping of the first and of the second component of the piece of furniture 2 and 3.

Note that the expressions "first component" and "second component" do not mean that the casing 110, 210 is made of two distinct or separate bodies, but the aim is to define the different functionality of the two components which, in fact, may be made of one single component and be two separate bodies.

The first component 111, 211 is associated with the first radially expandable region 17 and includes the first end 11 of the casing 110, 210 which is intended to be received in the first seat 4 of the first component 2 of the piece of furniture.

The first component 111, 211 includes several tabs 17a, in a similar way to the casing 10, as well as one end 113, 213, axially opposite to the first end 11, not expandable.

The second component 112, 212 is associated with the second region 18 and includes the second end 12 and the median region 15 of the casing 110.

The second component 112, 212, in correspondence of one end 114 longitudinally opposed to the second end 12, an axial seat 115, 215 is obtained which is susceptible to receive the end 113, 213 of the first component 111, 211 having limited possibilities of sliding. The axial seat 115, 215 is open toward the end 114, 214 and is bounded on the opposite side by a shoulder 116, 216.

The first component 111, 211 is axially translatable with respect to the second component 112, 212 between a mounting position (shown in Figures 8 and 9), in which the first component 111, 211 is axially spaced from the second component 112, 212, and a clamping position in which

the first component 111, 211 is approached to the second component 112, 212, at an axial distance lower than the first measurement.

In particular, in the mounting position, the end 113, 213 of the first component 111, 211 is received in the seat 115, 215 at a default measure H, for example in the range of 1.5 and 2 mm, from the shoulder 116, 216 while in the clamping position, the end 113, 213 of the first component 111, 211 is abutted against the shoulder 116, 216.

The casing 110, 210 further includes a provisional restraining element 117, 217 arranged between the first component 111, 211 and the second component 112, 212 to allow the displacement along the longitudinal axis Y of the first component 111, 211 compared to the second component 112, 212 from the mounting position to the clamping position.

According to a preferred aspect of the invention, the provisional restraining element 117, 217 is arranged in order to allow the translation only when the first component 111, 211 is stressed towards the second component 112, 212 with a minimum predefined axial force.

Preferably, this minimum axial force is defined by the axial force exerted by the tie rod 20 to obtain the radial expansion of the first region 17.

In other words, the provisional restraining element 117, 217 is configured to preserve the mutual axial position between the first 111, 211 and the second component 112, 212 during the expansion of the first radially expandable region 17.

Preferably, the provisional restraining element 117, 217 is configured to preserve the mutual axial position between the first 111, 211 and the second component 112, 212 until the complete expansion of the first radially expandable region 17.

Therefore, the provisional restraining element 117, 217 is a resilient spacer element, i.e. deformable, following the achievement of a predetermined axial force (i.e. thrust).

In the preferred version herein described and illustrated, the provisional restraining element 117, 217 includes one or more resilient tabs 118, 218,

extending radially from the first component 111, 211 in an intermediate position between the end 113, 213 and the first region 17.

These tabs 118, 218 are thus interposed between the first 111, 211 and the second component 112, 212, preferably between the end 113, 213
5 and the first region 17, and configured to maintain said first 111, 211 and second component 112, 212 in a predetermined axial position.

The term "resilient" indicates, in the spirit of the present invention, that the structure and/or composition of the tabs 118, 218 is such that upon reaching a predetermined axial force acting between the first 111, 211 and
10 the second component 112, 212, mutually approaching, said tab deforms or breaks, allowing a displacement of the second component 112, 212 approaching the first 111, 211.

Therefore, the tabs 118, 218 can be either flexible or frangible.

In the preferred embodiment, said tabs 118, 218 are flexible, which allows
15 to obtain a complete reversibility of the axial movement between the first 111, 211 and the second component 112, 212.

Alternatively, however, tabs 118, 218 may be frangible, resulting also functional and conceptually similar to the previous, at least for the first use. Structurally, the resilient tabs 118, 218 have an increased diameter of the
20 seat 115, 215 so that, in the mounting position, they are abutted against the end 114, 214 of the second component 112, 212, preventing the further insertion of the first component 111, 211 inside the seat 115, 215. In particular, the axial distance between the tabs 118, 218 and the end 113, 213 is lower than the axial distance between the end 114, 214 and the shoulder 116, 216, so that in the assembly position, the end 113, 213
25 is spaced from the shoulder 116, 216 of the extent desired H, as previously explained.

In the embodiment of Figure 8, the housing 110 further comprises a closing sleeve 119, coupled via screwing or snap or any other type of
30 coupling, on the second component 112, in order to retain the resilient tabs 118 against the end 114.

In assembly of the first and of the second component of the piece of furniture 2 and 3, the connecting devices 100, 200 operate in the following manner.

5 The positioning of the connecting device 100, 200 occurs in a similar way to that of the connecting device 1 previously described.

In this configuration the tie rod 20 is moved to the release position, with the first and the second region 17, 18 in non-expanded configuration, and with the first component 111, 211 in the assembly position, with the resilient tabs 118, 218 abutted against the end 114, 214 of the second
10 component 112, 212 and the end 113, 213 spaced from the shoulder 116, 216.

When the tie rod 20 is moved towards the locking position by the action of the eccentric element 30, the first and the second region 17 and 18 of the casing are radially expanded respectively by the action of the first and the
15 second segment 23, 24 of the tie rod 20.

In this first phase of the displacement of the tie rod, the axial force exerted by the tie rod 20 on the first component 111, 211 is lower than the minimum axial force necessary to deform the resilient tabs 118, 218, therefore maintaining the distance H between the first 111, 211 and the
20 second component 112, 212.

When the radial expansion, in particular of the first region 17 is substantially completed, with the tabs 17a engaged against the inner wall of the first seat 4, the further axial displacement of the tie rod 20 is obtained with a greater axial force which causes the deformation (bending
25 or breaking) of the resilient tabs 118, 218 and the axial translation of the first component 111, 211 within the seat 115, 215 until the end 113, 213 abuts against the shoulder 116, 216.

Thanks to this operation, the first component of the piece of furniture 2, anchored by the first region 17, is also moved closer to the second
30 component of the mobile 3, anchored to the second region 18, obtaining an effective clamping of the elements.

It will be noted, advantageously, that the provision in the casing 110, 210 of the two components 111, 211 and 112, 212 having limited mutual movement capabilities and of the provisional restraining element 117, 217 that prevents said displacement until the overcoming of a certain minimum axial force, allows to obtain an effective clamping between components of furniture even in traditional connecting devices, in which the casing features a single radially expandable region, typically defined at the opposite end to the eccentric element.

The present invention thus solves the aforementioned problem with reference to the prior art, while offering several other benefits, including the fact of allowing a more rapid and safer use, with less possibilities of loss of parts, with excellent performance in terms of tensile strength, and with a net improvement of the aesthetics of the assembled piece of furniture.

15

CLAIMS

1. A connecting device between components of a piece of furniture, including

5 - An extended casing (10, 110, 210) along a longitudinal axis (Y) between a first end (11) capable of being received in a first seat (4) obtained in a first component (2) of said piece of furniture and a second end (12) capable of being received in a second seat (5) obtained in a second component (3) of said piece of furniture, said casing comprising a first region (17) radially expandable in order to engage said first component in
10 correspondence of said first seat,

- A extended tie rod (20) along said longitudinal axis (Y) and received inside said casing with axial sliding power towards and from a locking position, said tie rod comprising a first section (23) in enlarged section susceptible of engagement with said first region (17) to determine a radial
15 expansion of said casing when said tie rod is moved to said locking position,

- An eccentric element (30) housed in said casing (10, 110, 210) and arranged to engage a head (21) of said tie rod so as to axially move said tie rod towards said locking position when said eccentric element rotates
20 around its main axis (X),

characterized in that said casing (10, 110, 210) comprises a second radially expandable region (18) to engage said second component (3) in correspondence of said second seat (5) and said tie rod comprises a second segment (24) in enlarged section susceptible of engagement with
25 said second region (18) to determine a radial expansion of said casing when said tie rod is moved to said locking position.

2. A connecting device according to claim 1, wherein said casing (110, 210) comprises:

30 - A first component (111, 211) associated with said radially expandable first region (17),

- A second component (112, 212) associated with said radially expandable

- second region (18), said first component being axially translatable with respect to said second component between a mounting position, in which said first component is axially spaced from said second component, and a clamping position in which said first component is axially approached to said second component,
- 5 - A provisional restraining element (117, 217) arranged between said first component and said second component and configured to preserve the mutual axial position between the first (111, 211) and the second component (112, 212) during an initial expansion phase of the radially expandable first region (17), preferably until the complete expansion of the first radially expandable region (17).
- 10 3. A connecting device according to claim 2, wherein the provisional restraining element (117, 217) is a resilient spacer element.
4. A connecting device according to claim 2 or 3, wherein said first component (111, 211) is received having limited possibilities of axial sliding in a seat (115, 215) obtained in said second component.
- 15 5. A connecting device according to any of claims 2 to 4, wherein said provisional restraining element (117, 217) comprises at least one flexible tab (118, 218) radially extending from said first component and abutted against said second component in said mounting position.
- 20 6. A connecting device according to any of the previous claims, wherein each of said first (17) and said second regions (18) comprises at least one tab (17a; 18a), and wherein, when said tie rod is moved in said locking position, the tab (17a) of said first region (17) is swung in the opposite direction with respect to the tab (18a) of said second region (18), in order to mutually clamp said first and second component (2, 3).
- 25 7. A connecting device according to claim 6, wherein said at least one tab (17a) of said first region (17) is articulated oscillating around one of its ends (17b) facing the opposite side to said first end (11).
- 30 8. A connecting device according to claim 6 or 7, wherein said at least one tab (18a) of said second region (18) is articulated oscillating around one of

its ends (18b) facing said first end (11).

9. A connecting device according to any of the previous claims, wherein said first region (17) is defined in correspondence of said first end (11) of said casing (10, 110, 210) and said second region (18) is defined in a median region (15) of said casing (10, 110, 210).

10. A connecting device according to any of the previous claims, in which said eccentric element (30) is housed inside said casing (10, 110, 210) in correspondence of said second end (12).

11. A connecting device according to any of the previous claims, in which said eccentric element (30) defines internally a reversible guide for the head (21) of the tie rod (20) and is shaped to act reversibly in thrust on said head (21) of the tie rod (20) both in a first direction, towards the locking position, and in a second direction opposite to the first, towards the release position.

12. Connecting device according to any of the previous claims, in which inside the eccentric element (30) there is a seat for receiving the head (21) delimited by a first segment (33) and a second active segment (35) obtained by opposite sides of the head (21) of the tie rod (20) and configured to encounter said head respectively as a result of a rotation of the eccentric element (30) around the axis X in a first direction or in a second direction, opposite to the first.

13. Connecting device according to any one of the preceding claims, wherein said eccentric element (30) comprises

- A cam surface (33) susceptible to encounter said head (21) of said tie rod when rotated around said main axis (X) in a first rotating direction to axially move said tie rod towards said locking position;

- An abutment element (35), capable of encountering said head 21 on the opposite side of said cam surface (33), in order to axially move said tie rod (20) away from said locking position when said eccentric element (30) is rotated around said main axis (X) in the direction opposite to said first rotating direction.

14. A connecting device according to any of the previous claims, wherein said head (21) of said tie rod (20) has a U-shape with a concavity facing said main axis (X) and/or an axial countersink (21a).

5 15. A connecting device according to any of the previous claims, wherein said casing (10; 110) has an elliptical section with a minor axis parallel to said main axis (X) of the eccentric element (30).

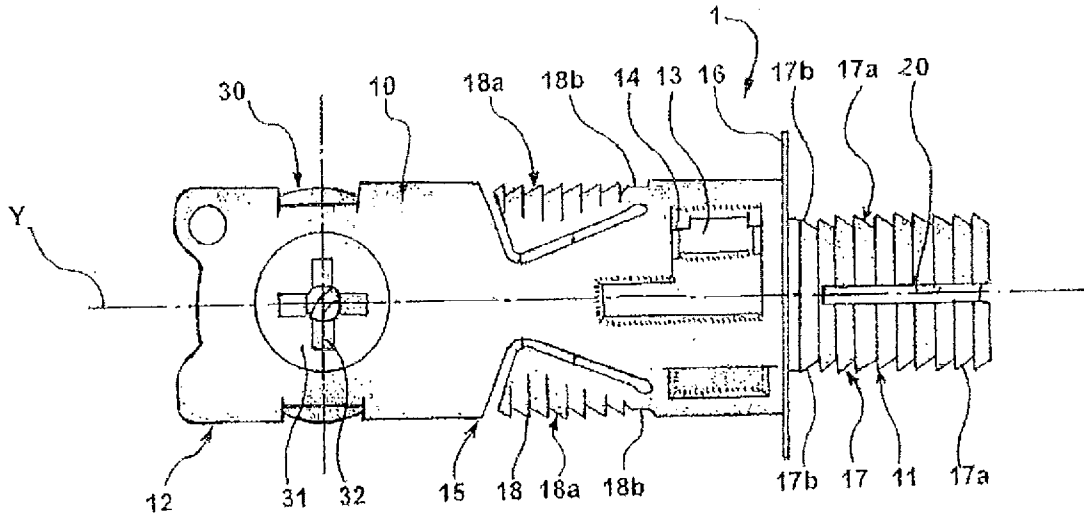


FIG. 1

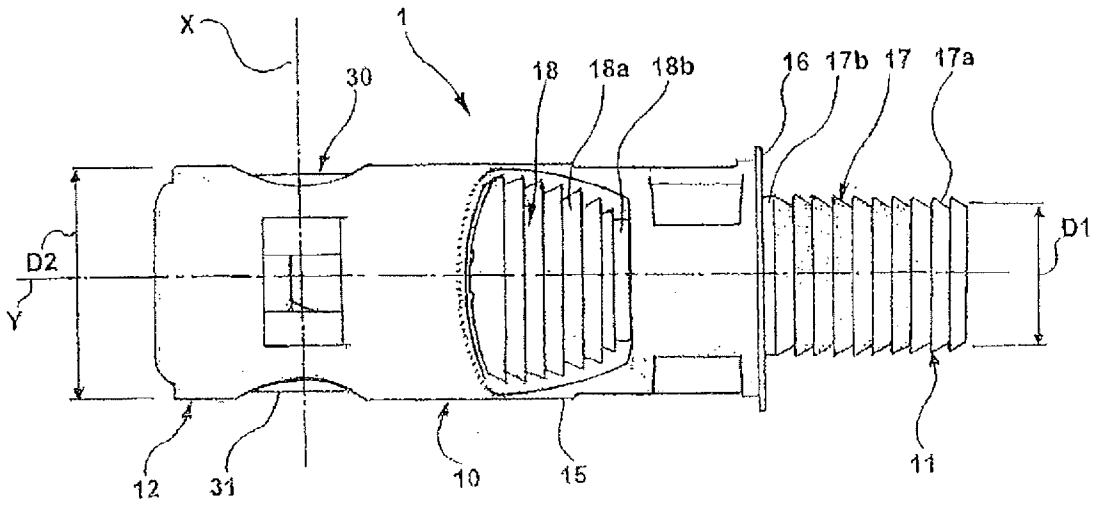


FIG. 2

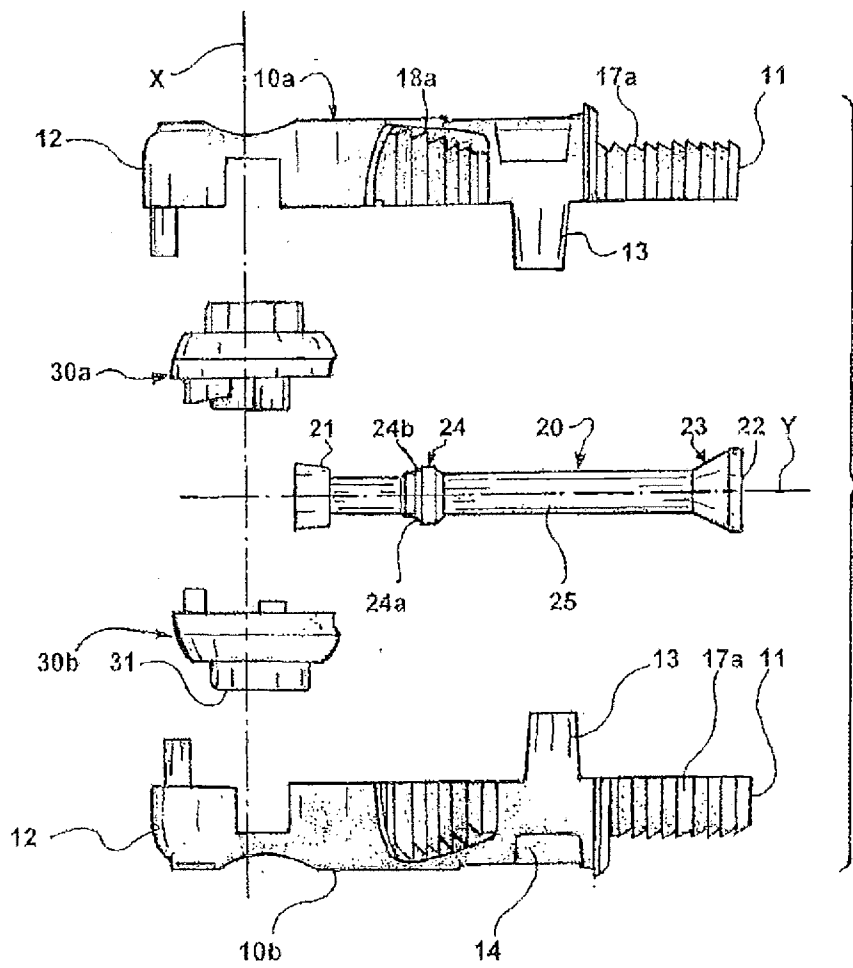


FIG.3

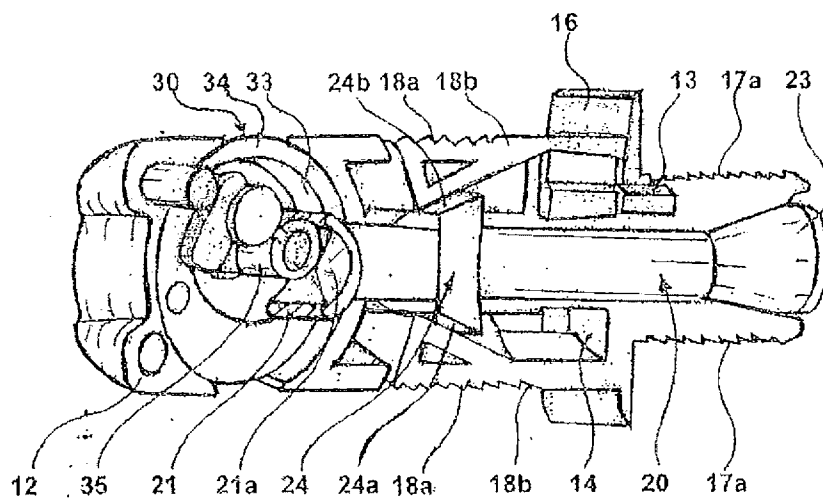


FIG.4

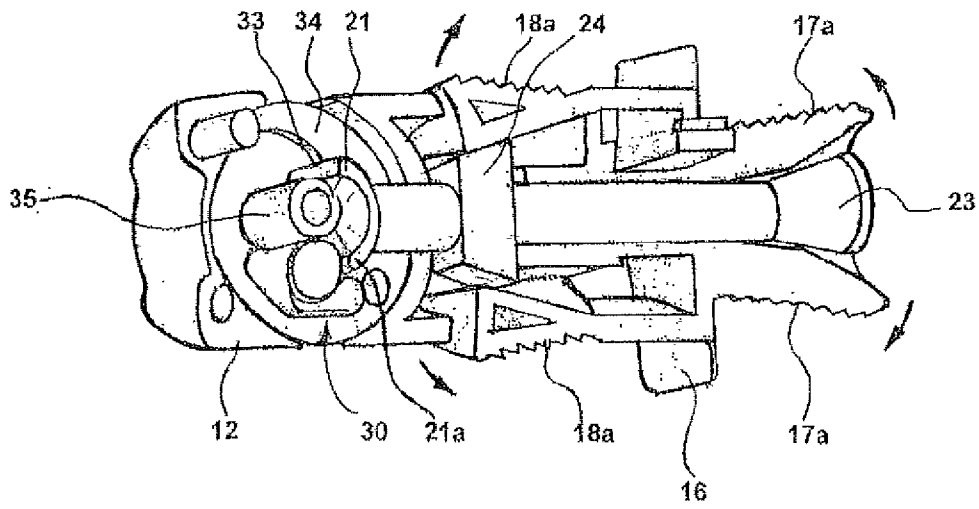


FIG. 5

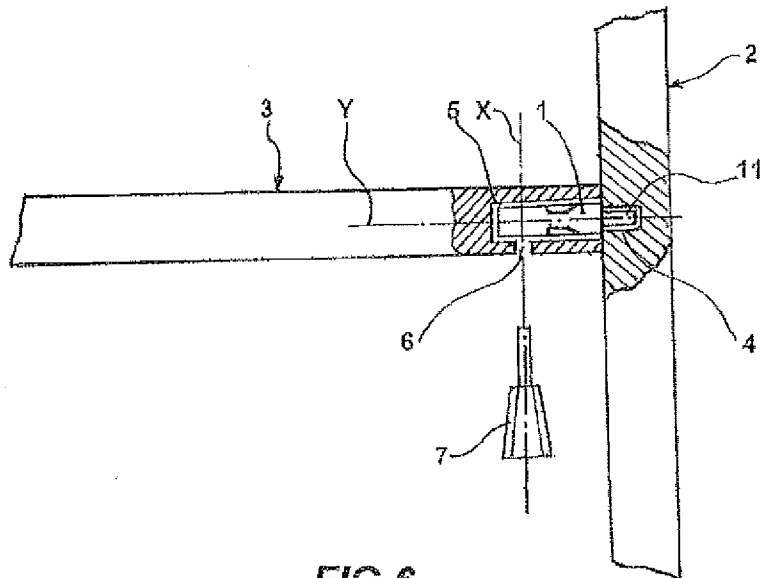


FIG. 6

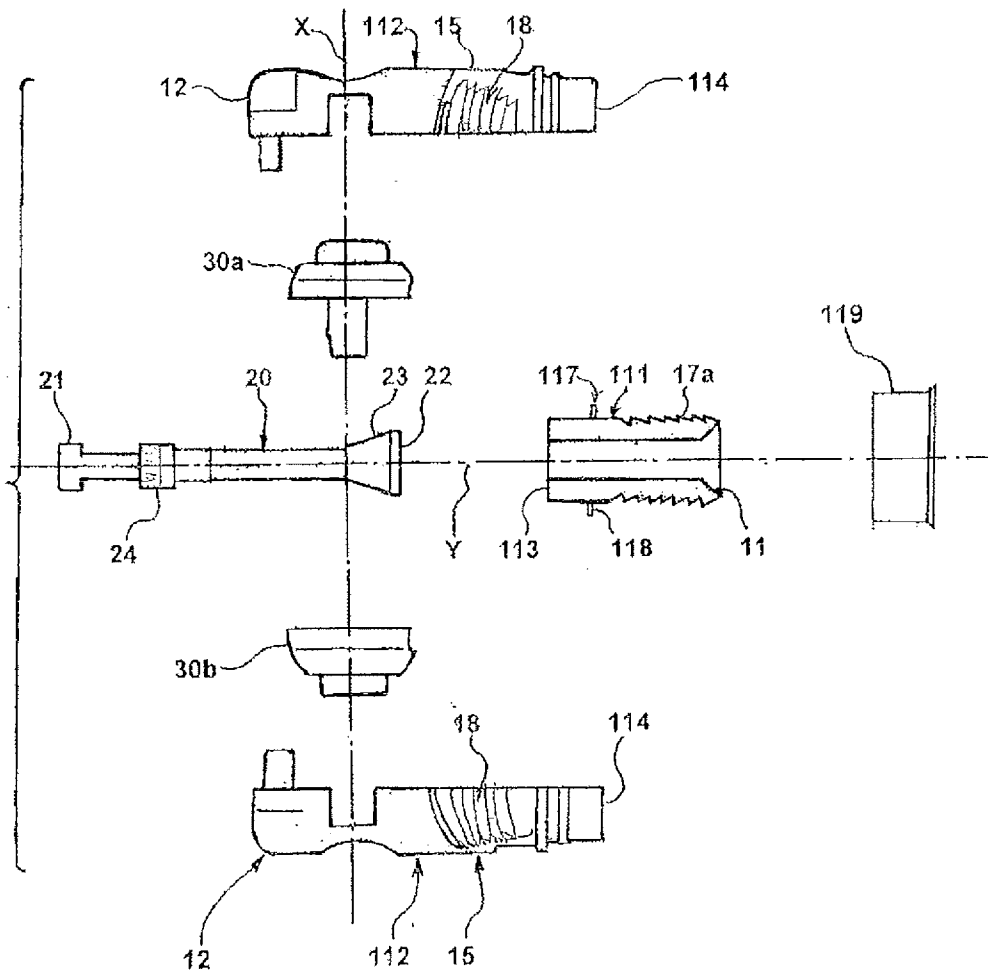


FIG. 7

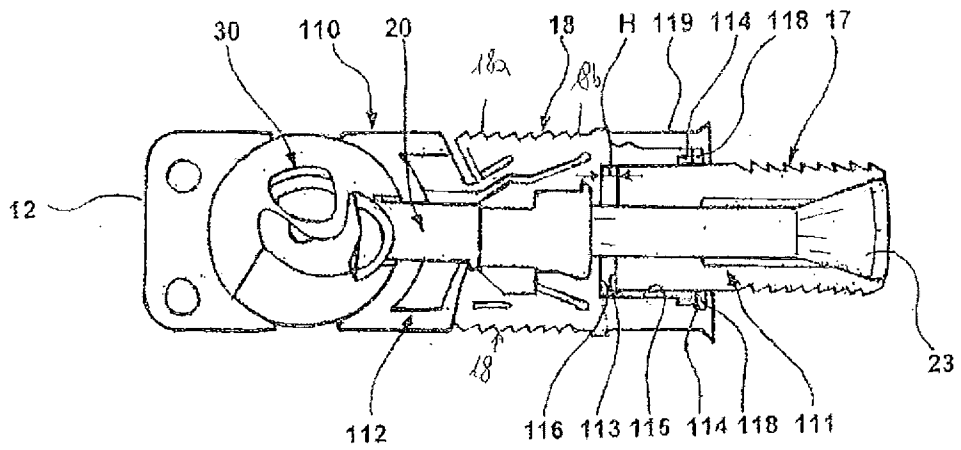
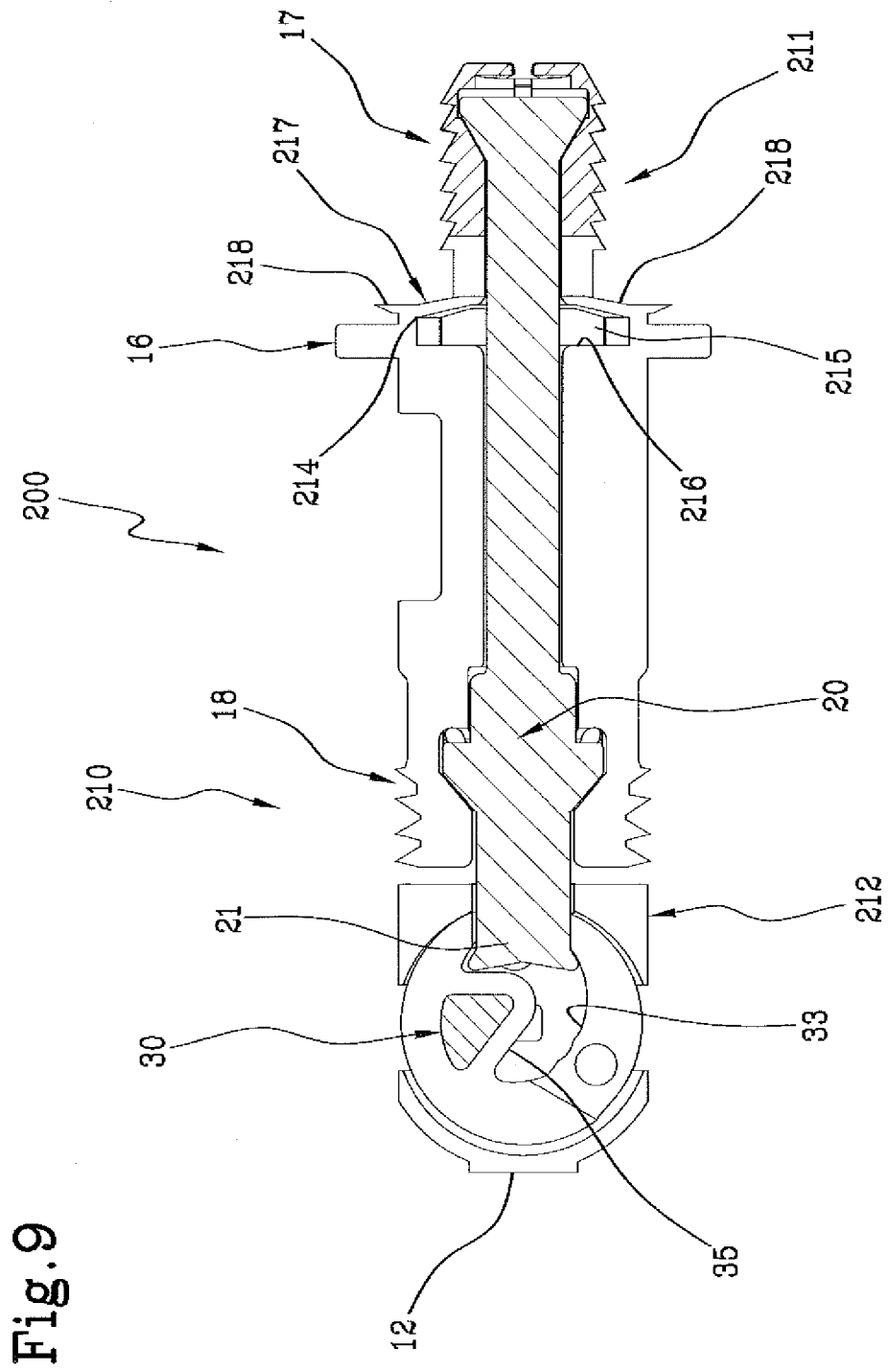


FIG. 8



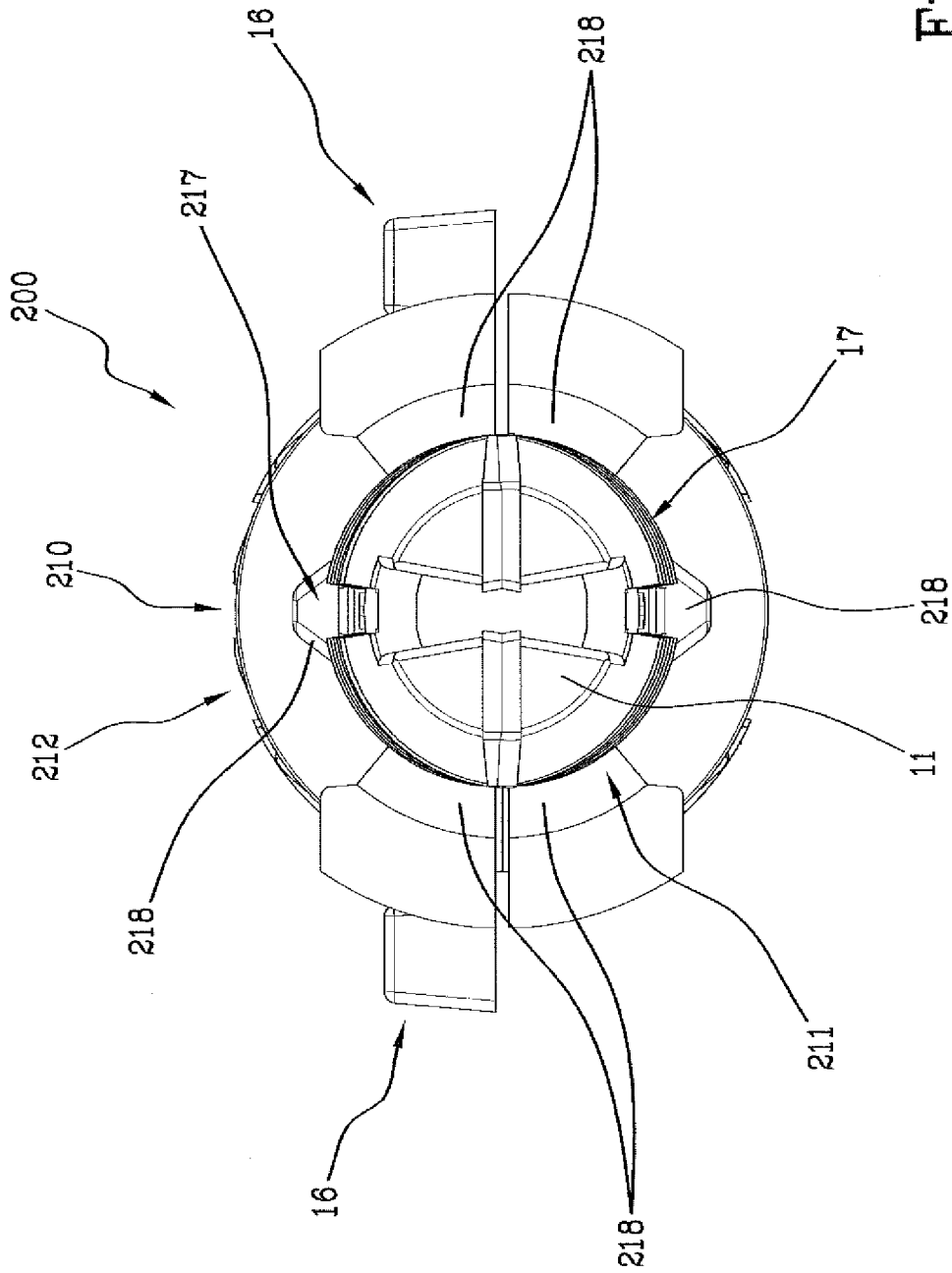


Fig.10

INTERNATIONAL SEARCH REPORT

International application No PCT/IB2016/053330

A. CLASSIFICATION OF SUBJECT MATTER
 INV. A47B96/06 F16B12/20 F16B12/46 F16B13/06
 ADD. F16B12/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
 Minimum documentation searched (classification system followed by classification symbols)
 A47B F16B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
 EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 298 04 267 U1 (HAEFELE GMBH & CO [DE]) 15 July 1999 (1999-07-15) page 11, lines 10-18; figures 1-9 -----	1-3,9, 10,13,15
X	DE 10 2009 043179 A1 (BAUR FRANZ [DE]; HASER FRANZ [DE]; LAMELLO AG [CH]) 15 September 2011 (2011-09-15) figures 13-20 -----	1,6-8, 10,14,15

Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 2 September 2016	Date of mailing of the international search report 13/09/2016
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Martinez Valero, J
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2016/053330

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 29804267 U1	15-07-1999	DE 29804267 U1 EP 0949424 A2	15-07-1999 13-10-1999

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