

METHOD AND DEVICE FOR THE RIGID CONNECTION OF TWO THIN ELEMENTS

The present invention relates to a method and a device for the rigid connection, via the
5 opposing edges thereof, of two thin elements which are, for example, planar or cylindrical.

Although not exclusively, the present invention is most particularly appropriate for use with
thin elements, of which at least one is produced from a composite fibre/resin material.

10 In order to assemble in a rigid manner, via the edges thereof, thin elements of composite
fibre/resin material, it is known to provide the edges with flanges by means of adhesive
bonding or by means of machining. In the first instance, the adhesive constitutes a weak point
of the assembly whilst, in the second instance, the machining brings about the sectioning of
fibres of the composite material and therefore also local weakening of the assembly.

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An object of the present invention is to overcome these disadvantages.

To this end, according to the invention, the method for the rigid connection, via the opposing
edges thereof, of two thin elements, which are, for example, planar or cylindrical, is
20 remarkable in that:

- a flange is prepared which has a cavity having a flared cross-section which is at least
approximately trapezoidal;

- a counter-flange is prepared which has a protrusion which has a convergent cross-section which is at least approximately trapezoidal and which has a shape which complements that of the cavity of the flange;

- the edges of the thin elements are at least partially formed to the shape of the protrusion of the counter-flange;

- the flange and the counter-flange are moved closer to each other with the formed edges being interposed between the cavity of the flange and the protrusion of the counter-flange; and

- the flange and the counter-flange are clamped in the direction of each other so that they press between them the formed edges of the elements, the depth of the cavity of the flange and the thickness of the edges of the elements being selected so that, at the end of clamping of the flange and the counter-flange, there is a gap between the base of the cavity of the flange and the edges of the elements.

In this manner, owing to the present invention, it is possible to assemble together in a rigid manner two thin elements, simply by clamping the opposing edges thereof which have been previously formed, without any weakening adhesive bonding or machining operation. Furthermore, it is ensured that the clamping is optimal, without being limited by any abutment contact between the edges of the elements and the base of the cavity of the flange.

The present invention further relates to a device for the rigid connection, via the opposing edges thereof, of two thin elements which may be planar or cylindrical, which is remarkable in that it comprises:

- a flange which has a cavity having a flared cross-section which is at least approximately trapezoidal;

- a counter-flange which has a protrusion which has a convergent cross-section which is at least approximately trapezoidal and which has a shape which complements that of the cavity

5 of the flange; and

- clamping means for clamping the flange and the counter-flange in the direction of each other so that they can press, between the cavity of the flange and the protrusion of the counter-flange, the edges of the elements which are at least partially formed to the shape of the protrusion of the counter-flange.

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Preferably, the protrusion of the counter-flange comprises an abutment face at the side of the small base of the convergent, at least approximately trapezoidal cross-section. In this manner, at least one of the formed edges can abut the abutment face in order to strengthen the connection and to prevent any tilting of one of the elements relative to the other.

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In an embodiment of the present invention, the counter-flange is an integral portion of the edge of one of the elements.

Advantageously, the clamping means are screws which are either supported on the counter-

20 flange and screwed into the flange, or are supported on the flange and screwed into the counter-flange.

The screws may comprise heads which are accommodated in recesses which are formed in the counter-flange or the flange, respectively, and on which the heads are supported.

When the counter-flange is an integral portion of the edge of one of the elements, it may comprise a partial housing for the flange.

5 A particularly advantageous implementation of the present invention is the end-to-end assembly of two cylindrical portions of a container, the container portions being able to be produced from a composite fibre/resin material.

The Figures of the appended drawings will provide a good understanding of how the invention can be produced. In these Figures, identical reference numerals refer to elements
10 which are similar.

Figures 1 to 4 are schematic cross-sections of four embodiments of the present invention, respectively.

15 Each of these four embodiments I to IV comprises:

- a flange 1 which has a cavity 2 having a flared trapezoidal cross-section with a base 2A,
- a counter-flange 3 which has a protrusion 4 which has a convergent trapezoidal cross-section and which has a shape which complements that of the cavity 2 of the flange 1, the protrusion 4 having a small base 4A, and
- 20 - clamping means, for example, screws 5 for clamping the flange 1 and the counter-flange 3 in the direction of each other.

Furthermore, each of the four embodiments I to IV is intended to assemble in a rigid manner two thin elements 6 and 7 which are, for example, planar or cylindrical, via the opposing

formed edges 6A and 7A thereof. In a specific embodiment of the invention, the elements 6 and 7 are cylindrical portions of a container which are produced, for example, from a composite fibre/resin material.

5 In the embodiments I, II and III, the head 5A of the screws 5 is accommodated in a recess 8 of the counter-flange 3 and the screws 5 are supported on the counter-flange 3 and are screwed into the flange 1. In the embodiment IV, however, the head 5A of the screws 5 is accommodated in a recess 9 of the flange 1 and the screws 5 are supported on the flange 1 and are screwed into the counter-flange 3.

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The edges 6A and 7A of the embodiment I of Figure 1 are formed in an identical manner, each of them comprising an oblique portion 6A1, 7A1 having the same shape as the oblique edges of the protrusion 4, and a portion 6A2, 7A2 corresponding to the base 4A of the protrusion 4. In this manner, when the opposing edges 6A and 7A are arranged between the
15 flange 1 and the counter-flange 3, the oblique portions 6A1, 7A1 thereof may be in contact with the oblique portions of the flange 1 and the counter-flange 3, whilst the portions 6A2, 7A2 thereof may be in contact with the base 4A. After the screws 5 have been positioned and screwed, the edges 6A and 7A are assembled together in a rigid manner by means of clamping between the flange 1 and the counter-flange 3. So that this clamping can be
20 optimal, the depth of the cavity of the flange 1 and the thickness of the edges 6 and 7 are such that, at the end of the clamping operation, there is a gap 10 between the base 2A of the cavity 2 of the flange 1 and the portions 6A2, 7A2 of the edges 6A and 7A. This situation of optimal clamping is what is illustrated in Figure 1.

In the production variant II of Figure 2, the edge 7A of the element 7 is formed to correspond to the entire shape of the protrusion 4 of the counter-flange 3 and the edge 6A of the element 6 has a shape which is similar to that illustrated in Figure 1, but it is applied to the edge 7A, instead of being applied directly to the counter-flange 3. In this instance again, at the end of
5 clamping using the screws 5 (situation illustrated in Figure 2), there is a gap 10 between the base 2A of the cavity 2 and the edges 6A.

The embodiment III of Figure 3 is similar to the embodiment I of Figure 1, with the exception that the counter-flange 3 is an integral portion of the edge 7A of the element 7. Consequently,
10 in this embodiment, the base 4A is a part of the element 7 and only the edge 6A of the element 6 presses thereon.

In the same manner, in the embodiment IV of Figure 4, the counter-flange 3 is an integral portion of the edge 7A of the element 7. Furthermore, the flange 1 is accommodated in a
15 partial recess 11 of the edge 7A. This results in a thinning of the edge and the formation of a hollow portion at the side of the edge 6A of the element 6, which hollow portion can be closed by means of a filling 12.

Of course, although it has not been illustrated in the drawings, sealing joints (of any type)
20 may be arranged, anywhere it is necessary, between the flange 5, the counter-flange 3, the screws 5 and the formed edges 6A and 7A.

CLAIMS

1. Method for the rigid connection of two thin elements (6, 7) comprising the steps of:

- preparing a flange (1) which has a cavity (2) having a flared cross-section;
 - preparing a counter-flange (3) which has a protrusion (4) which has a convergent cross-section and which has a shape which complements that of the cavity (2) of the flange (1);
 - forming at least partially the edges (6A, 7A) of the two thin elements (6, 7) to the shape of the protrusion (4) of the counter-flange (3) and
 - moving the flange (1) and counter-flange (3) closer to each other and clamping in the direction of each other with said edges (6A, 7A) of said elements interposed therebetween, wherein, in order to rigidly connect the two thin elements via the opposing edges (6A,7A) thereof:
 - the cavity (2) of the flange (1) and the protrusion (4) of the counter-flange (3) are prepared with a cross-section which is at least approximately trapezoidal;
 - said opposing edges (6A, 7A) of the two thin elements (6, 7) are at least partially formed to the trapezoidal shape of the protrusion (4) of the counter-flange (3); and
- said opposing edges (6A, 7A) are both interposed between the cavity (2) of the flange (1) and the protrusion (4) of the counter-flange (3) being pressed between them, the depth of the cavity (2) of the flange (1) and the thickness of the opposing edges (6A, 7A) of the elements (6, 7) being selected so that, at the end of clamping of the flange (1) and the counter-flange (3), there is a gap (10) between the base (2A) of the cavity (2) and the opposing edges (6A, 7A).

2. Device for implementing the method of claim 1,

characterised in that it comprises:

- a flange (1) which has a cavity (2) having a flared cross-section which is at least approximately trapezoidal;
- a counter-flange (3) which has a protrusion (4) which has a convergent cross-section which is at least approximately trapezoidal and which has a shape which complements that of the cavity (2) of the flange (1), wherein the protrusion (4) further comprises an abutment face (4A) at the side of the small base of the convergent, at least approximately trapezoidal cross-section; and
- clamping means (5) for clamping the flange (1) and the counter-flange (3) in the direction of each other so that they can press, between the cavity of the flange and the protrusion of the counter-flange, the edges (6A, 7A) of the elements which are at least partially formed to the shape of the protrusion (4) of the counter-flange (3).

3. Device according to either claim 2,
characterised in that the counter-flange (3) is an integral portion of the edge (7A) of one of the elements.

4. Device according to any of claims 2 to 3,
characterised in that the clamping means (5) are screws which are supported on the counter-flange (3) and screwed into the flange (1).

5. Device according to any of claims 2 to 3,
characterised in that the clamping means (5) are screws which are supported on the flange (1) and screwed into the counter-flange (3).

6. Device according to either claim 4 or claim 5,

characterised in that the screws (5) comprise heads (5A) which are accommodated in recesses (8, 9) on which they are supported.

7. Device according to claim 3,

characterised in that the counter-flange (3) which is an integral portion of the edge (7A) of one of the elements comprises a partial housing (11) for the flange (1).

8. Container comprising at least two cylindrical portions which are assembled end-to-end, characterised in that the portions are assembled using the connection device which is specified in any of claims 2 to 7.