

NON-DEMOUNTABLE CLOSURE SYSTEM

The invention concerns a system for assembling two parts such that the assembly cannot be demounted.

5 There exists a requirement to render the assembly of two parts non-demountable and not to allow the closure system to show. Various solutions for assembling two parts exist in the prior art. Most of the known solutions utilize screws, nuts, etc.

10 The patent application WO 2007/085881 describes a system for rapidly assembling two parts. The principle consists notably in inserting a first element fastened to the first part into an opening of the second part and immobilizing the assembly by means of an appropriate immobilizing element. The two parts are therefore clipped to each other. This necessitates an element accessible from the outside to hold the two parts in position and it
15 suffices to remove this exterior element to demount the assembly.

 The document WO 2012/006481 describes a system for rapid fixing of two elements that is accessible once the elements have been joined.

 The patent application DE 10 2008 042 759 concerns a clip for fixing a fixed bearing inside a motor.

20 The idea of the present invention is based on a new approach that does not necessitate the use of an exterior element and makes it possible to render the closure system invisible.

 In the description the expression "interlocking means" and "clip" are used to designate the same object.

25 The invention concerns a system for interlocking a first part and a second part, characterized in that:

- the first part comprises at least two openings,
- the second part comprises at least two interlocking means, an
30 interlocking means is composed of a part of elongate "S" shape, the dimension of an interlocking means being adapted to the opening in which it is inserted during a movement in translation of the first part

relative to the second part, a branch of the first interlocking means being disposed on one side of a line As and one branch of the second interlocking means being disposed on the opposite side of said line, in order to immobilize the two parts in the interlocking position.

5 For example, the first part is shell comprising a retaining rim and the second part is a shell comprising on at least one of its walls at least two interlocking means.

For example, the first shell comprises a wall comprising a strip, at least two lugs attached to the strip, two lugs being separated by a distance
10 dc, each of the lugs comprising an aperture in order to form a clip

The system comprises, for example:

- each lug comprising a right-hand edge, a left-hand edge, a lower edge, an upper edge,
- an aperture of inverted "U" shape delimited by a first upper edge, a
15 lower edge following the shape of the branches of the U, a first right-hand edge, a second middle right-hand edge, a first left-hand edge, a second left-hand middle edge.

Other features and advantages of the present invention will become more apparent on reading the following description given by way of
20 nonlimiting example of one embodiment, with the appended figures, in which:

- Figure 1 is a general view of the non-demountable system,
- Figure 2 shows a detail of the positioning of the two parts and the clips enabling assembly,
- Figure 3 shows a detail of the interlocking means,
- 25 • Figure 4 shows the arrangement and the dimension of the openings associated with the interlocking means.

The word shell is used to designate a part that comprises a bottom and a wall forming a rim.

Figure 1 shows one example of assembling an upper shell 10 to
30 be nested in a lower shell 20 in such a manner as to interlock them and to prevent demounting without degrading the system. In this example, the upper

shell comprises a plurality of interlocking means 11, 12 formed in part by the material constituting the shell and comprising clips (Figure 2) disposed on respective opposite sides of an axis A_s that is substantially vertical in the figure and that also corresponds to an axis passing through the openings 21
5 formed in the lower shell 20, which may be but is not necessarily an axis of symmetry. The assembly of the two shells 10, 20 is effected by the use of at least one pair of interlocking means 11, 12 as explained hereinafter.

Figure 2 is a sectional view of the assembly of the two shells from Figure 1 once assembled.

10 In this Figure 2, the lower shell 20 comprises a bent sheet metal rim 22 that makes it possible to confer some stiffness on it, despite the presence of openings 21 that may be close to one another and receive the interlocking means or clips.

The upper shell 10 comprises the interlocking means or clips 11,
15 12 that for the purposes of explanation are distinguished according to whether the clips 11, 12 are positioned to the left of the axis A_s when looking at the sectional view or on the right of that same axis. In this example the interlocking means are formed in a wall 10p of the shell.

Thus an interlocking means 11 of elongate "S" shape includes, for
20 example, a first part 11a, a second part 11b, and a third part 11c joined to a support part 11s in turn joined to the upper shell 10. Once the two shells have been assembled, the elements constituting an interlocking means are located inside the volume formed by the assembled two shells and are therefore not accessible from the outside.

25 In this example, the choice has been made to divide the S-shaped clip into three parts for the purposes of the explanation given by way of example. The interlocking means 12 will also have an elongate S-shape composed of a first part 12a, a second part 12b, a third part 12c joined to a support part 12s (not shown on the figure) in turn joined to the wall of the
30 upper shell (Figure 3) provided with the clip.

Once the two parts have been assembled, this makes it possible to provide EMC electromagnetic screening in the context of use with electronic elements inside them.

Figure 3 shows diagrammatically one example of a set of two adjacent clips. The base of a clip has a substantially rounded shape for the edges, in order to facilitate its entry into an opening 21. The two interlocking means 11, 12, represented have their part 11a, 11b, 12a, 12b alternately on respective opposite sides of a line As (quincunx), as shown in Figure 2.

Figure 3 explains the shape and the dimensions of the clips. The wall 10_p of the shell 10 in which the attachment means 11, 12 are to be produced may be divided into a strip 10_b including a first upper edge 10_{bs}, a second lower edge 10_{bi}. The strip comprises a plurality of lugs 30 spaced from one another by a distance d_c, referred to the middle of a lug, each lug comprises a right-hand edge 30_d and a left-hand edge 30_g, a lower edge 30_i and an upper edge 30_s, which coincides with the lower portion of the strip. An aperture 40 of inverted "U" shape enables the formation of a clip 11, 12. The aperture 40 is delimited by a first upper edge 40_s, a lower edge 40_i made up of three parts 40_{i1}, 40_{i2}, 40_{i3} following the shape of the branches of the U, in this example, as seen in Figure 3, first right-hand edge 40_d, a second right-hand middle edge 40_{dm}, a first left-hand edge 40_g, a second left-hand middle edge 40_{gm}. The edges of the U-shape are rounded to facilitate manipulation of the clip 11 and its placement. The clip 11 may be formed by using a laser to produce a cut-out in the corresponding lug substantially corresponding to the U-shaped aperture or any other cut-out enabling it to remain joined to the lug.

An example of the dimension and the inter-relationship of the various elements forming the clip is given in Figure 3 by way of illustration without limiting the scope of the invention.

For the dimensions/inter-relationships of the elements constituting the subject matter of the invention, it is possible to choose the following relationships:

let a = thickness of the sheet metal,

$b = 3 \times$ thickness of the sheet metal,

$da = dh \times 0.7$: distance between the right-hand middle edge 40_{dm} and the left-hand middle edge 40_{gm} of the U-shaped aperture,

5 $db = a \times 25$: distance between the left-hand edge 30_g and the right-hand edge 30_d of the lug 30 supporting the clip 11,

$dc = d_b \times 2$: distance between the middle of a first clip 11 and the middle of an adjacent second clip 12,

10 $dd = d_b \times 0.6$: distance between the upper edge 10_{bs} of the strip 10_b and the lower edge 30_i of the lug 30,

$de = d_b \times 0.35$: distance between the lower edge 30_i of the lug 30 and the upper edge 11_s of the clip,

$df = d_b \times 0.18$: the height of the strip 10_b between 10_{bi} and 10_{bs} ,

15 $dg = d_b \times 0.14$: height of the lug forming the support of the clip of "S" shape between 30_i and 40_{i1} or 40_{i2} ,

$dh = d_b \times 0.6$: distance between the first right-hand edge 40_d and the second left-hand edge 40_g of the aperture,

$L_o = d_b \times 1.2$: distance between the left-hand edge 21_g and the right-hand edge 21_d of the slot 21 receiving the clip, Figure 4,

20 $l_o = a \times 2$: width of the slot receiving the clip.

The upper part 11a, 12a of a clip serves to prevent the opening movement, along an axis Z, when the two shells are assembled. The thickness "a" of a clip is equal to the thickness of the sheet metal used to form the interlocking means, for example. The value of the thickness is also
25 chosen to enable the clip to enter an opening 21 and is therefore less than the width of an opening.

By way of simplified relationships it is possible to choose the following relationships: a = sheet metal thickness, $b = 3a$, opening width $l_o = 2a$ (Figure 4).

30 For example, choosing the length for 11a + 11b substantially equal to the value of the part 11c may be envisaged.

The second part 11b, 12b of a clip is deformed locally to enable entry into an opening 21 of the lower shell 20.

The third part 11c, 12c of a clip, the base of the clip function, serves to guide insertion of the clip into the opening of the part.

5 Figure 4 is a plan view of the lower shell 20 with a first opening 21_1 for the passage of the first clip 11 and a second opening 21_2 for the passage of the second clip 12. An opening has a width l_0 and a length L_0 that are chosen as a function of the thickness of a clip and the width d_b of a clip. In this example the opening has an oblong shape to facilitate the passage of a
10 clip. The dimension l_0 is equal to twice the thickness a of the sheet metal used to form a clip, for example. The rim 22 notably has the function of stiffening the lower shell at the level of an opening, which may be located very close to the edge and risk being deformed on insertion of the upper part, or the distance between two openings may be very small.

15 Referring to Figure 1, during assembly of the first shell with the second shell, the first interlocking means 11 and the second interlocking means 12 are inserted in the opening 21_1 and the opening 21_2 on moving the two parts toward each other by a movement V in translation, for example vertical or horizontal as a function of the position of the shells to be
20 assembled, or generally speaking substantially parallel to the movement with which the two shells are moved to assemble them. The parts 11a, 11b, 12a, 12b of the S-shapes move towards each other toward the axis As , the interlocking means then assuming a substantially straight shape, after which, when the two shells touch each other, the clips revert to their elongate
25 S-shape. In the closed position, Figure 2, it is seen that the part 11a of the clip 11 no longer faces the opening 21_1 , but is located under the wall of the upper shell. The same applies to the second clip, the clips being located inside the volume formed by the assembled two shells.

30 The number and the distribution of the interlocking means, clips will be chosen as a function of the parts to be assembled.

In this example the clips are made from the same material as the shell or the envelope. It will be possible to use a material that is deformed when the clip enters the opening and resumes its shape afterwards, for example a steel that has properties of plasticity, plastics materials, etc. DC04 and S235JR steel may be used, for example, or otherwise any types of materials having a good compromise between elasticity (flexibility of the clips) and stiffness (retention of the shape of the parts).

A clip will be produced by cutting the required shape into sheet metal, for example, and the part cut-out will be shaped on at least three sides to obtain an elongate "S".

The example given above involves a shell or envelope or part comprising a bottom and four walls. The interlocking means may be disposed on one or more of the walls of a part.

The example give above shows an upper shell equipped with closure means and a lower shell equipped with openings. Without departing from the scope of the invention, the invention may be applied to two parts regardless of their positioning in space and regardless of the direction of movement for inserting the clips in the openings. The device will preferably have two pairs of clips to guarantee a firm assembly.

The system in accordance with the invention is a simple solution for assembling two parts in such a manner that they cannot be demounted, with only one movement in translation. This is a solution of relatively low cost, usable in various technical fields, with a small volume.

CLAIMS

- 1 – Arrangement for interlocking a first part (20) and a second part (10), characterized in that:
- 5 • the first part (20) comprises at least two openings (21_i),
 - the second part (10) comprises at least a first interlocking means (11) and a second interlocking means (12), each interlocking means (11, 12) is composed of a part (11a, 11b, 11c; 12a, 12b, 12c) of elongate “S” shape, the dimension of each interlocking means being adapted to the opening (21_i) in which it is inserted during a movement in translation of the first part (20) relative to the second part (10), a branch (11a, 11b) of the first interlocking means being disposed on one side of a line (As) and one branch (12a, 12b) of the second interlocking means being disposed on the opposite side of said line, in order to immobilize the two parts in an interlocking position, the first interlocking means and the second interlocking means being inside the volume formed by the two parts when assembled and inaccessible from the outside of the volume formed by the two parts.
- 20 2 – Interlocking arrangement according to Claim 1 characterized in that the first part (20) is a shell comprising a bent retaining rim (22) and in that the second part (10) is a shell comprising on at least one of its walls at least two interlocking means.
- 25 3 – Interlocking arrangement according to Claim 2 characterized in that the shell of the second part comprises a wall (10_p) comprising a strip (10_b), at least two lugs (30) attached to the strip (10_b), two lugs being separated by a distance (d_c), each of the lugs comprising an aperture (40) in order to form a clip (11, 12).
- 30 4 – Interlocking arrangement according to Claim 3 characterized in that it comprises:

- each lug (30) comprising a right-hand edge (30_d), a left-hand edge (30_g), a lower edge (30_i), an upper edge (30_s),
- each aperture (40) of inverted “U” shape delimited by a first upper edge (40_s), a lower edge (40_i) following the shape of the branches of the U, a first right-hand edge (40_d), a second middle right-hand edge (40_{dm}), a first left-hand edge (40_g), a second left-hand middle edge (40_{gm}).