

(19) **DANMARK**



Patent- og
Varemærkestyrelsen

(12)

Oversættelse af europæisk patentskrift

(10) **DK/EP 2957685 T3**

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- (51) Int.Cl.: **E 04 B 1/61 (2006.01)** **F 16 B 5/00 (2006.01)** **E 04 B 2/74 (2006.01)**
F 16 B 12/46 (2006.01)
- (45) Oversættelsen bekendtgjort den: **2017-04-10**
- (80) Dato for Den Europæiske Patentmyndigheds
bekendtgørelse om meddelelse af patentet: **2017-01-25**
- (86) Europæisk ansøgning nr.: **15001770.5**
- (86) Europæisk indleveringsdag: **2015-06-16**
- (87) Den europæiske ansøgnings publiceringsdag: **2015-12-23**
- (30) Prioritet: **2014-06-16 AT 4782014**
- (84) Designerede stater: **AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV
MC MK MT NL NO PL PT RO RS SE SI SK SM TR**
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- (54) Benævnelse: **FORBINDELSE MELLEM VÆGELEMENTER**
- (56) Fremdragne publikationer:
WO-A1-2009/000003
AT-B- 86 578
JP-A- 2004 116 107
US-A- 3 874 804
US-A1- 2004 253 051

CONNECTION BETWEEN WALL ELEMENTS

The invention relates to a connection between wall elements of prefabricated buildings.

In the context of this document, "prefabricated buildings" refers to buildings in which flat wall elements are prefabricated without connection to other wall elements and are then placed as one piece at the construction site and connected to adjacent wall elements.

There is a plethora of proposals for connecting a second wall element or a comparable element to an adjacent first element, wherein a part projecting obliquely downwards from the second element and a respective corresponding part of the first element projecting obliquely from below projects into the downwardly open groove or bay between the second element and the parts projecting obliquely downwards therefrom. In this approach, interlocks are formed between the elements, wherein the interlocks on the first element are open upwards and the interlocks on the second element are open downwards. In order to establish the connection, the first element is first placed in the appropriate position on the ground and then the second element is brought obliquely upwards, so that the interlocks engage in one another. The elements remain fixed to one another as a result of gravity. By appropriate dimensioning and aligning of the interlocks, it is possible to pull the elements together into a precisely defined relative position and remain fixed to one another. In the example of wall elements of prefabricated houses, the interlocking parts of the wall elements are already pre-assembled in the factory. The wall elements may then be fixed together very quickly at the construction site. Examples from the literature include:

According to CH 249576 A, two wooden profiles arranged between adjacent wall elements and projections on the end faces of the wall elements are clamped together by the above-described interlocking. The interlocking pulls the two wood profiles horizontally towards each other in the direction normal to the wall plane. There are two metal parts at the interlocking, which are connected to one of the wood profiles by screws, and lie adjacent to one another.

DE 1980373 U shows interlocking of the described type by means of which wall elements in the common wall plane are pulled together in the horizontal direction. On one side, the interlocked parts are tongues which are unstressed and bent upwards from a

metallic edge profile of the second wall element, while the lower edge regions have perforations on a metallic edge profile of the first wall element. Very similar proposals are made in DE 3820684 A1, US 3087586 A as well as WO 9533898 A1.

According to EP 1718812 B1, the interlocking is formed by pairs of mutual complementarily-shaped sheet metal bent parts, wherein the parts of the pair are screwed to different, mutually-facing, grooved end faces of different wall elements. The mutual complementarily-shaped sheet metal bent parts each have a plurality of pairs of mutually aligned contact surfaces, against which the sheet metal bent parts interlock with each other. In this case, the different pairs of contact surfaces are not aligned parallel to one another. This ensures that the wall elements are guided into the appropriate relative position in the horizontal plane parallel as well as normal to the common wall surface to be formed.

The object of the invention is to provide a novel connection for wall elements of prefabricated houses, wherein a second wall element may be fixed on an already-erected first wall element, and wherein the second wall element is lifted up against the first wall element, so that the two wall elements contact each other at the two contact surfaces as intended according to the invention, and then the second wall element is lowered to the same height as the first wall element.

In contrast to the solutions already known from the prior art discussed above, the novel connection should be better in that:

- the wall elements do not have to be guided so precisely during assembly
- the connection is less sensitive with respect to production tolerances, in particular to deviations of the dimensions of individual parts from the theoretical ideal dimensions.

Document W02009/000003 discloses a connection with the features of the preamble of claim 1.

The solution according to the invention is achieved by a connection according to claim 1. The connection has the combination of the following features:

- a) On the two wall elements to be connected, in each case a profile, which is also referred to as a "connecting profile", is permanently anchored on the surface facing the respective other wall element.

- b) The two connecting profiles each bear against a clamping surface of the other connecting profile with a surface area which is also referred to as a "clamping surface", wherein each clamping surface encloses an acute angle with respect to the surface of the wall element which is connected to the connecting profile.
- 5 c) At least one of the two connecting profiles comprises a groove into which a profile wall of the other connecting profile protrudes.
- d) Wherein the connecting profile having a groove has a clamping surface on the side of the profile wall which laterally delimits the groove on the side facing the groove.
- 10 e) The width of the groove on the one connecting profile is greater than the width of the profile wall of the other connecting profile projecting into this groove. The remaining width area of the groove of the other connecting profile is bridged by blocks which are each fixedly connected to one of the two connecting profiles.
- f) A block has an inclined surface which encloses an acute angle with respect to the face of the connecting profile with which the block is connected and with the profile direction of the connecting profile.
- 15

The invention is illustrated by means of somewhat stylized drawings of exemplary embodiments:

20 Fig. 1 shows a horizontal sectional view through the connecting region of two wall elements, which, according to the invention, are connected to one another on two mutually facing vertical end faces. Parts which are shaded in the same direction are fixedly-connected to one another.

Fig. 2 shows a vertical sectional view of the two wall elements of Fig. 1 during assembly, wherein the cutting plane is that which is indicated in Fig. 1.

25 Fig. 3 shows a top view of a connecting region of two wall elements which are connected to each other on two mutually facing vertical end faces according to the invention.

30 Fig. 4 shows a vertical sectional view of the wall elements of Fig. 3 during assembly, wherein the cutting plane is that which is indicated in Fig. 3. Parts which are shown hatched in the same direction are fixedly-connected to one another.

Fig. 5 shows a top view of a third example of a connecting region of two wall elements, which according to the invention are connected to one another on two mutually facing vertical end faces.

Fig. 6 shows the wall elements of Fig. 5 separately in a perspective view. The wall element 2 shown above is indicated for the connection according to the invention with the wall element 1 shown below, as indicated by the curved arrow depicted by the dot, in order to pivot 180°.

Fig. 7 shows a vertical sectional view through the interconnected wall elements according to the invention, illustrating an optionally applicable inventive detail. Parts which are shown hatched in the same direction are fixedly-connected to one another.

In the example according to Fig. 1 and 2, the wall element 1 is provided with a connecting profile 3 extending along its vertical end face which faces the wall element 2. The wall element 2 is provided on its vertical end face facing the wall element 1 with a connecting profile 4 extending along this end face. The wall elements may, for example, consist of glued wooden planks. The connecting profiles 3, 4 are typically wood profiles. The connection between the wall element 1, 2 and the respective connecting profile 3, 4 is rigid and, ideally, already prefabricated in the factory. Typically, this rigid connection is formed by gluing and additional screws.

The connecting profile 3 rigidly connected to the wall element 1 has a profile groove which is open towards the wall element 2. The connecting profile 4, which is parallel to the connecting profile 3, protrudes from the wall element 2 into the profile groove on the connecting profile 3 and is enclosed on three sides by the profile groove. In the direction normal to the plane of the wall elements 1, 2, the connecting profile 4 is narrower than the groove on the connecting profile 3 and also narrower than the opening width of this profile groove. The "encompassed" connecting profile 4 rests with two circumferential surface sides on the limiting surfaces of the groove in the "encompassing" connecting profile 3. The lateral surface of the connecting profile 4 facing away from the wall element 2 rests against the base surface of the groove in the connecting profile 3.

A lateral surface of the connecting profile 4, also referred to as "clamping surface 4.1", abuts a surface of the connecting profile 3, which is also referred to as "clamping surface 3.1", which is the inner side of a lateral profile wall delimiting the groove on the

connecting profile 3. The clamping surfaces 3.1, 4.1 are arranged parallel to one another and rest against each other. It is essential that the clamping surfaces 3.1 and 4.1 respectively enclose an acute angle α with the surface of the wall element 1 or 2 associated with them.

5 At each of the ends of the connecting profiles 3, 4, a block 5 is arranged next to the connecting profile 4 in the groove in the connecting profile 3, which precisely bridges the difference in the width of the groove from the width of the connecting profile 4. Since the blocks 5 are arranged in the groove in the connecting profile 3 on the side of the connecting profile 4 facing away from the clamping surfaces 3.1, 4.1, they force the
10 clamping surfaces 3.1, 4.1 to bear against one another. The blocks 5 also typically consist of wood; Their width is such that they are somewhat compressed in the elastic region in the groove between the two connecting profiles and thus exert a force on the connecting profile 4 by means of elastic prestressing, by means of which the latter is pressed against the clamping surface 3.1 of the connecting profile 3 in the plane normal to the profile directions
15 with its clamping surface 4.1.

 Wherein the clamping surface 3.1 of the connecting profile 3 with which the surface of the wall element 1 connected to the connecting profile 3 and facing the connecting profile 3, encloses the acute angle α , and wherein the clamping surface 4.1 of the connecting profile 4 with which is the surface of the wall element 2 connected with the
20 connecting profile 4 facing the connecting profile 4, encloses the acute angle α , are pressed against each other by the pressing together of the two wall elements 1, 2 by the clamping surfaces 3.1, 4.1 until the connecting profile 4 rests against the base surface of the groove in the connecting profile 3 and/or until the surfaces of the connecting profile 3 facing the wall element 2 rest against the wall element 2. This results in a clearly defined,
25 well-fixed position of the two wall elements 1, 2 relative to each other.

 The more precise arrangement of the blocks 5 and the assembly process of two wall elements 1, 2 with one another is illustrated with reference to Fig. 2 (and also with reference to Fig. 4 and Fig. 6).

 The wall element 1, which comprises the connecting profile 3, is appropriately
30 erected on the construction site as the first of the two wall elements 1, 2. A block 5 is fixed at the lower end of the groove in the connecting profile 3, typically by being screwed to the connecting profile 3 with countersunk screws. This lower block 5 has a clamping surface

5.1 with which, according to its intended purpose, it rests against the connecting profile 4 after completion of the assembly and presses against it. Furthermore, the lower block 5 has an inclined surface 5.2 which is aligned in such a way that, a horizontal displacement is connected with a decreasing height coordinate, which is connected to the connecting profile 4 by the lateral limitation of the groove in the connecting profile 3, which is located at a distance from the connecting profile 4. In the lower block 5, this inclined surface 5.2 is a steep slope surface.

The wall element 2, which comprises the connecting profile 4, is placed on the construction site as the second of the two wall elements 1, 2. A block 5 is fixed at the upper end of the groove in the connecting profile 4, typically by being screwed to the connecting profile 4 with countersunk screws. This upper block 5 has a clamping surface 5.1 with which, according to its intended purpose, it rests against the connecting profile 3 after completion of the assembly and presses against it. Furthermore, the upper block 5 comprises an inclined surface 5.2, which is aligned in such a way that a horizontal displacement is connected with a decreasing height coordinate, which is connected to the connecting profile 4 by the lateral limitation of the groove in the connecting profile 3, which is located at a distance from the connecting profile 4. In the upper block 5, this inclined surface 5.2 is a steep overhang surface.

In the typical mounting of the wall element 2 on the already-erected wall element 1, the wall element 2 is first lifted up against the wall element 1 to a raised state with respect to the wall element 1 in such a way that the lower longitudinal region of the connecting profile 4 is formed by the upper longitudinal region of the connecting profile 3, while the lower block 5 is still completely below the wall element 2 and the upper block 5 is still completely above the wall element 1.

Then the wall element 2 is lowered. The connecting profiles 4, 3 effect loose guidance of the movement. Towards the end of the lowering, a lower edge region of the connecting profile 4 reaches the inclined surface 5.2 of the lower block 5, and the inclined surface 5.2 of the upper block 5 reaches an upper edge region of the connecting profile 3. The block 5 and connecting profile 3 and 4, respectively, slide with respect to one another on the inclined surface 5.2 in such a way that the connecting profile 4 "automatically" comes into the defined position shown in Fig. 1 relative to the connecting profile 3 in the plane normal to the profile direction. Finally, the connecting profiles 3, 4 come to the end of

the oblique surfaces 5.2 of the blocks 5, wherein the oblique surfaces 5.2 respectively merge into the clamping surface 5.1. Under friction between clamping surfaces 5.1 and the connecting profile 4 or the connecting profile 3, the wall element 2 still slides downwards until it bears with its lower end face, as already in the case of the wall element 1, against the underlying part of the structure. Since the connection between the wall elements 1, 2 is not very rigid with respect to the rotation of the wall elements about the vertical axis of the connection, the wall element 2 should be pivoted about this axis into the correct position before it is actually placed on the ground.

It is obvious that this type of assembly may be carried out very simply and quickly, without the need for great craftsmanship or complex equipment. If necessary (e.g. in areas with an earthquake hazard), the wall elements may be additionally connected to each other by means of additional connecting elements, e.g. obliquely inserted from the upper end surfaces, after the described installation.

In the embodiment according to Fig. 1 and 2, the construction according to the invention is explained by way of example. With respect to the construction approach of Fig. 1 and Fig. 2, one may criticize the fact that two different connecting profiles 3, 4 have to be used, which may represent a logistical outlay in comparison with mutually identical connecting profiles. In the construction according to the drawings in Fig. 3 to Fig. 6, this (possible) disadvantage is remedied.

In the case of the designs according to Fig. 3 to 6, the two connecting profiles 13, 14 or 23, 24 to be coupled to each other are exactly identical to one another. They are swiveled with respect to each other through 180° about an axis parallel to the profile and slightly displaced laterally (normal to the plane of the wall elements to be connected). The connecting profiles 13, 14 and 23, 24 each have a groove and two lateral limiting walls of the groove. When the connection is completed, a lateral limiting wall of one connecting profile respectively projects into the groove of the other connecting profile.

In the example of Fig. 3 and Fig. 4, the wall element 1 is provided with the connecting profile 13 and the wall element 2 with the connecting profile 14. The clamping surfaces 13.1, 14.1, which are essential according to the invention, function in the same way as in the case of the clamping surfaces 3.1, 4.1, and respectively lie on the inner side of the lateral groove limiting wall of the connecting profile 13, 14, which projects into the groove on the other connecting profile. Each width area of the two grooves, which is not

covered by the profile wall of the respective other connecting profile projecting into the respective groove, is again constituted by lower and upper blocks 15 (Fig. 4) which are identical in function, construction and arrangement to the blocks 5 according to Fig. 1 and Fig. 2. The blocks 5 respectively extend between the profile wall of a connecting profile 13, 14, which is formed by the groove on the other connecting profile 14, 13 on one side and the profile wall on the other connecting profile 14, 13 which faces away from the first connecting profile on the other side. This construction requires that two pairs of blocks 15, respectively comprising an upper and a lower block 15, are required for each wall connection.

In the example of Fig. 5 and Fig. 6, the wall element 1 is provided with the connecting profile 23 and the wall element 2 with the connecting profile 24. The clamping surfaces 23.1, 24.2 and 24.1, 23.2 according to the invention are functionally the same as in the case of the clamping surfaces 3.1, 4.1, lie on the one hand on the outer side of the lateral groove limiting wall of the connecting profile, which projects into the groove on the other connecting profile, and, on the other hand, on the inner side of the profile wall of a connecting profile which does not project into the groove on the other connecting profile. This results in two pairs of clamping faces 23.1, 24.2, and 24.1, 23.2 which are adjacent to one another and which are laterally offset relative to one another (normal to the plane of the wall surfaces). The width area of the two grooves, which is not covered by the profile wall of the respective other connecting profile projecting into the respective groove, is again constituted by an upper and a lower block 25 (Fig. 6), which are identical in function, configuration and arrangement to the blocks 5 according to Fig. 1 and Fig. 2. The blocks 25 respectively extend between the two profile walls of the two connecting profiles 23, 24, which are encompassed by the groove on the other connecting profile. This construction requires that each wall connection is provided with a pair of blocks 25, which is located precisely in the wall-parallel symmetry plane with respect to the wall elements 1, 2.

Of the three versions shown, the version according to Fig. 5 and 6 may be the most advantageous in terms of production effort and static strength.

In the drawings, Fig. 1 to Fig. 6, the blocks 5, 15, 25 were presented, each of which bridges the bridging gap between two connecting profiles. This means that these blocks 5, 15, 25 may only be arranged at the upper or lower end of a connecting profile, if they are not intended to render assembly impossible. However, this means that the

connection between the wall elements 1, 2 is not fixed at medium height and that there may be gaps (over time) there.

Fig. 7 shows a construction and arrangement for blocks 35, by means of which this disadvantage may be eliminated. A pair of blocks 35 are used, which are arranged at the same height and adjacent to one another in the case of completely assembled wall elements and jointly bridge the gap to be bridged between two connecting profiles 3, 4.

In the example illustrated in Fig. 7, the connecting profile 3 belongs to the wall element which is erected first. The block 35, which is connected to the connecting profile 3, has its inclined surface on the top side. The connecting profile 4 belongs to the wall element, which is erected as a second wall and is lowered during erection along the wall element which has been previously positioned. The inclined surface of the block 35 connected to the connecting profile 4 overhangs on the underside. When the second wall element is lowered, the blocks 35 slide against the two oblique surfaces 35.2 and finally come to rest against the clamping surfaces 35.1.

Two pairs of blocks 35 may be provided at a vertical distance from each other on two wall elements to be connected together, wherein these pairs may also be arranged at a distance from the upper and lower ends of the connecting profiles. For optical reasons, it is advantageous to use one-piece blocks 5, 15, 25 at the upper and lower ends of the connecting profiles as described above.

In the case of the connection according to the invention, the wall elements are always located on the ground, since adjacent wall elements, with the exception of movement relative to each other, can not be held in the form of a form-locking joint in the vertical direction. The wall elements are held by connecting profiles and wooden blocks against lateral relative movement. Since wood has a relatively low modulus of elasticity (in particular transversely to the direction of the fiber), connecting profiles and blocks may press against each other in a well-pressed connection under good elastic stress. This results in a very good balance of possible production tolerances by elastic deformation of the connecting parts. Due to the above-described construction of the clamping surfaces and the fact that the groove in a connecting profile in which a wall of the other connecting profile has to be introduced, may be very much wider than the inserted wall, it is also possible to join wall elements without it being difficult to obtain precise movements of the wall elements relative to each other. (The required exact relative movements of the wall

elements with respect to one another are automatically guided by the type of connection.) Furthermore, the connection according to the invention does not cause any disturbing cold bridges between the two wall sides.

5 In addition, it should be mentioned that the connection according to the invention not only allows end-face to end-face connections between wall elements, but also L- and T-connections. It only depends on which surface area of a wall element a connecting profile is provided.

FORBINDELSE MELLEM VÆGELEMENTER**PATENTKRAV**

- 5 1. Forbindelse mellem vægelementer (1, 2) af bygninger, hvor der på de to vægelementer (1,2), der skal forbindes, altid på den flade, som ligger vendt ind mod det pågældende andet vægelement (2, 1), er fast forbundet en forbindelsesprofil (3, 4, 13, 14, 23, 24),
- 10 - den første forbindelsesprofil (3, 13, 23) med hver en klemmeplade (3.1, 13.1, 23.1, 23.2) ligger an mod en dermed parallel klemmeplade (4.1, 14.1, 24.2, 24.1) på den anden forbindelsesprofil (4, 14, 24),
- hvor hver klemmeplade (3.1, 13.1, 23.1, 4.1, 14.1, 24.1) med den flade på vægelementet (1, 2), som er forbundet med forbindelsesprofilen (3, 13, 23, 4, 14, 24), omfatter en spids vinkel (a),
- 15 - hvor mindst en af de to forbindelsesprofiler (3, 4, 13, 14, 23, 24) har en not, ind i hvilken der rager en profilvæg af den pågældende anden forbindelsesprofil,
- hvor der ved forbindelsesprofilen (3, 13, 14, 23, 24) med noten findes klemmepladen (3.1, 13.1, 14.1, 23.1, 24.1) på den side af en profilvæg, der vender ind mod noten, og som begrænser noten sideværts,
- 20 - hvor bredden af noten, ved hvilken en forbindelsesprofil (3, 13, 14, 23, 24) er større end bredden af den profilvæg på den anden forbindelsesprofil (4, 13, 14, 23, 24), der rager ind i denne not,
- kendetegnet ved, at
- 25 - notens resterende breddeområde forbindes af klodser (5, 15, 25, 35), der hver er fast forbundet med en af de to forbindelsesprofiler (3, 4, 13, 14, 23, 24).
2. Forbindelse ifølge krav 1, kendetegnet ved, at klodsen (5, 15, 25, 35) har en skrå flade (5.2, 15.2, 25.2, 35.2), som på klodsen ligger bortvendt fra den flade på forbindelsesprofilen (3, 4, 13, 14, 23, 24), med hvilken klodsen (5, 15, 25, 35) er
- 30 forbundet, og som med forbindelsesprofilens profilretning omfatter en spids vinkel.
3. Forbindelse ifølge krav 1 eller 2, kendetegnet ved, at forbindelsesprofilen (3) er en U-profil, og at dens not omslutter forbindelsesprofilen (4) på tre sider.

4. Forbindelse ifølge krav 1 eller 2, kendetegnet ved, at begge forbindelsesprofilerne (13, 14; 23, 24) hver har en not, og at hver forbindelsesprofil (13, 14, 23, 24) fra hver en profilvæg, som begrænser noten sideværts ved denne forbindelsesprofil (13, 14, 23, 24), rager ind i noten i den pågældende anden forbindelsesprofil.
- 5
5. Forbindelse ifølge krav 4, kendetegnet ved, at parrene af forbindelsesprofiler (13, 14; 23, 24), som samvirker med hinanden, består af to ens profiler, der i indbygningsposition, i forhold til hinanden, fra den samme position er svinget 180° ud om en profilparallel akse og forskudt på tværs af profilretningen.
- 10
6. Forbindelse ifølge krav 4 eller 5, kendetegnet ved, at de mod hinanden liggende klemmeblade (13.1, 14.1) altid ligger på indersiden af den sideværts notbegrænsningsvæg af forbindelsesprofilen (13, 14), som rager ind i noten i den pågældende anden forbindelsesprofil (14, 13).
- 15
7. Forbindelse ifølge krav 4 eller 5, kendetegnet ved, at klemmebladet (23.1, 24.1) på forbindelsesprofilen (23, 24) ligger på indersiden af den sideværts notbegrænsningsvæg af forbindelsesprofilen (23, 24), som ikke rager ind i noten i den pågældende anden forbindelsesprofil (24, 23), og at den klemmeblade (24.2, 23.2), der ligger an mod denne klemmeblade på den pågældende anden forbindelsesprofil (24, 23), ligger på ydersiden af den sideværts notbegrænsningsvæg på forbindelsesprofilen (24, 23), som rager ind i noten i den pågældende anden forbindelsesprofil (23, 24).
- 20
- 25
8. Forbindelse ifølge et af kravene 1 til 7, kendetegnet ved, at to af klodserne (35) ligger an mod hinanden i samme højde ved siden af hinanden og sammen forbinder spalten mellem to forbindelsesprofiler (3, 4), som skal forbindes.

Fig. 1

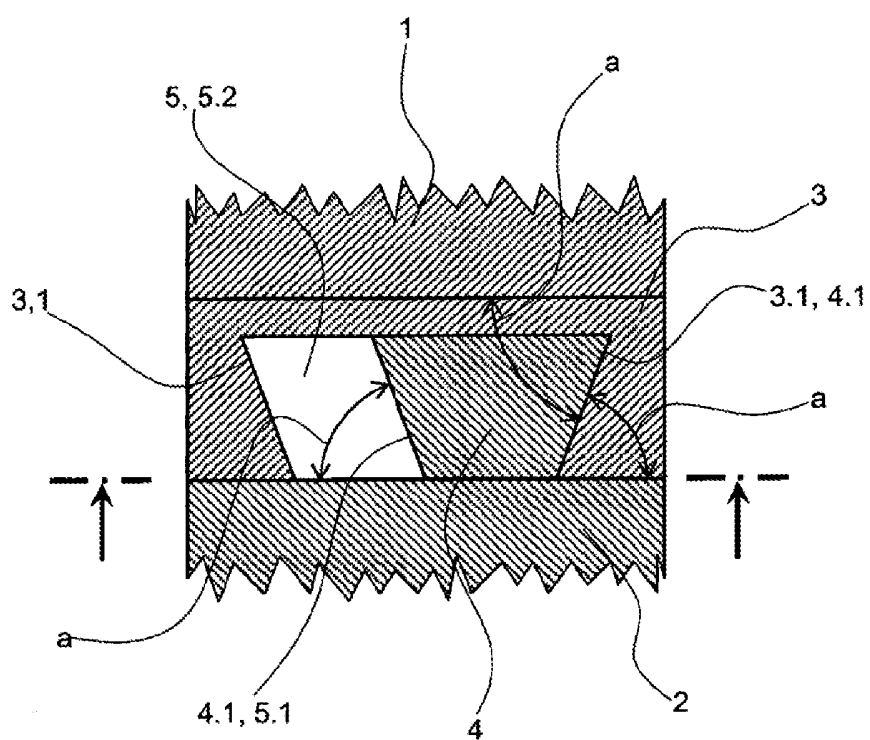


Fig. 2

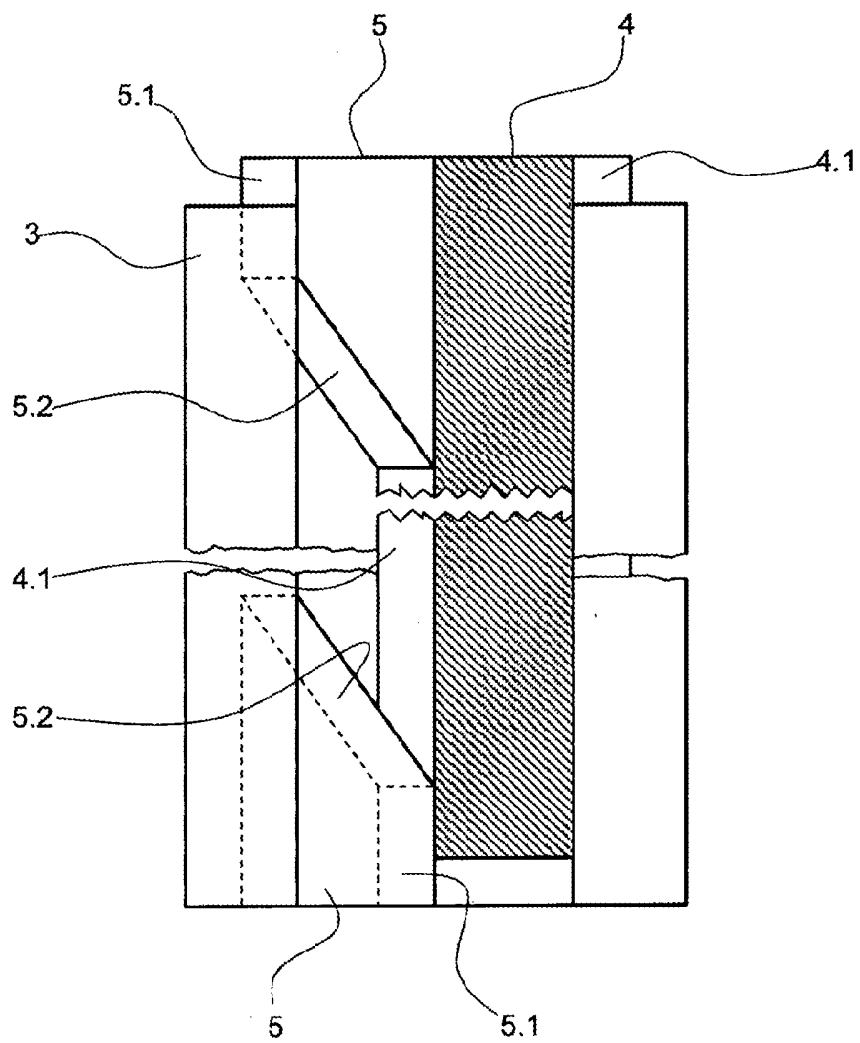


Fig. 3

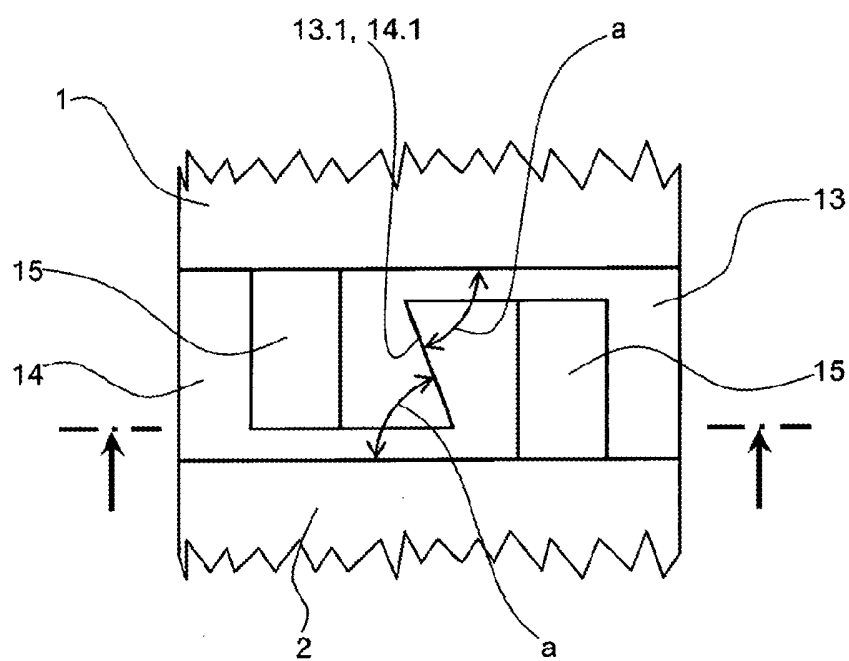


Fig. 4

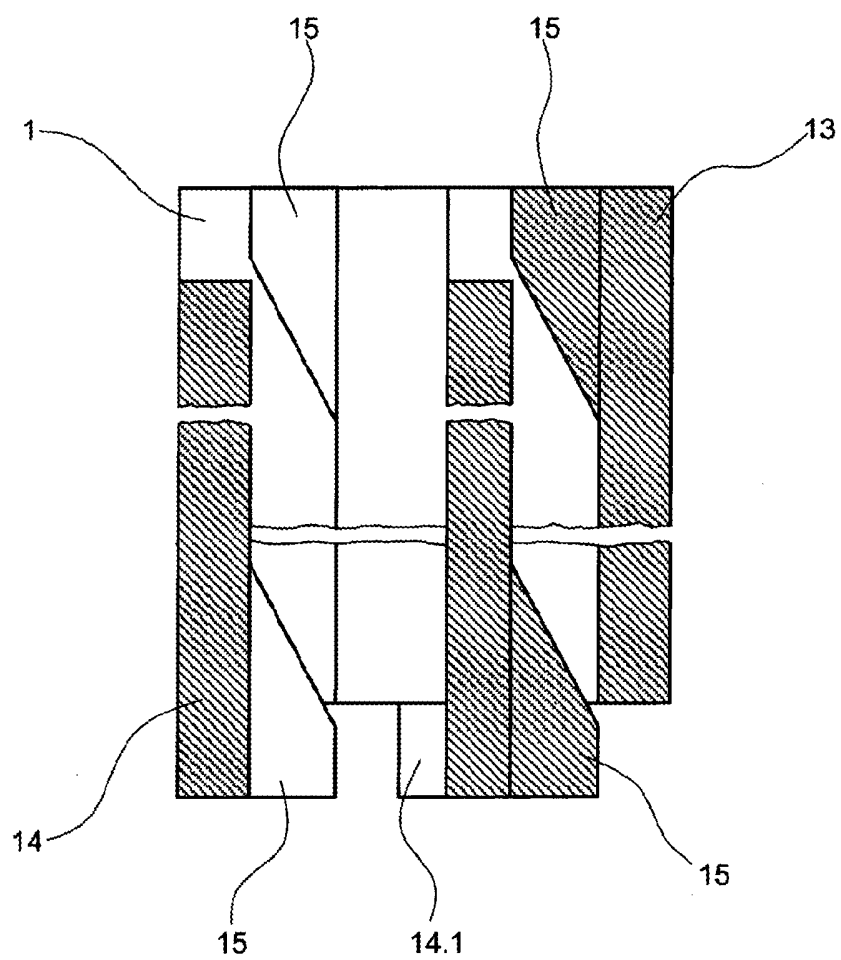


Fig. 5

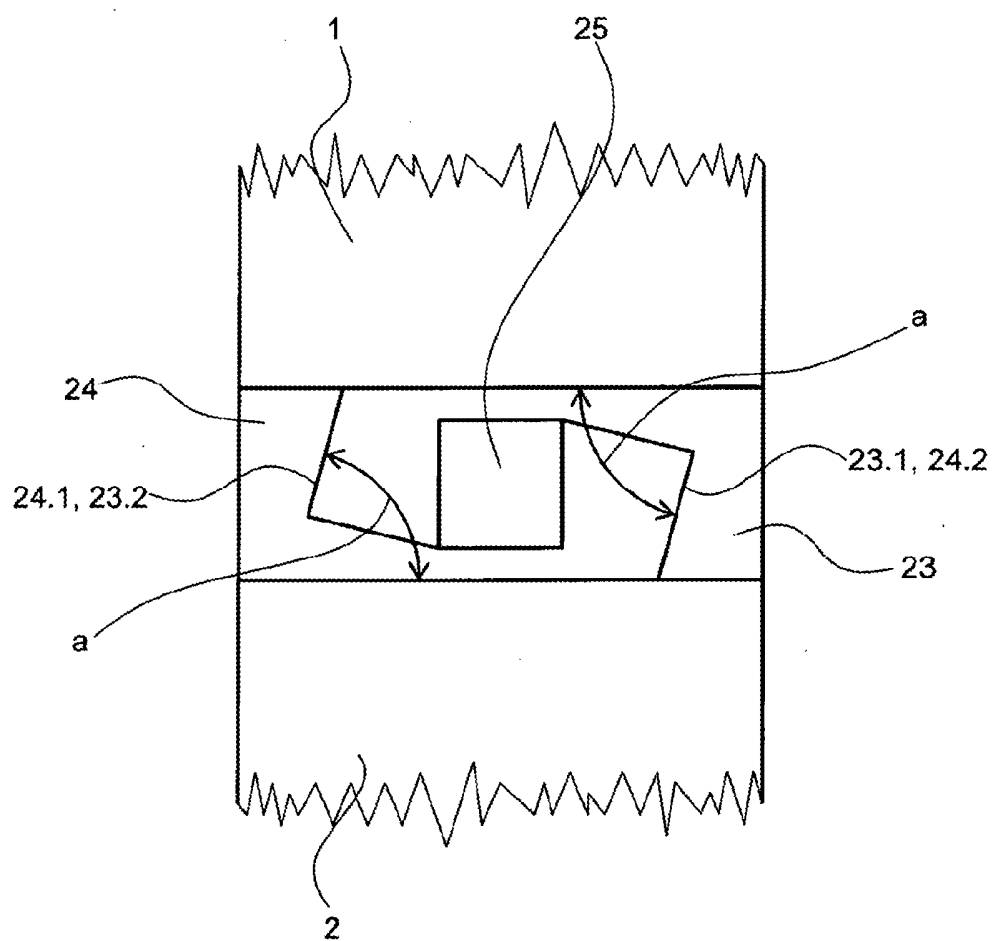


Fig. 6

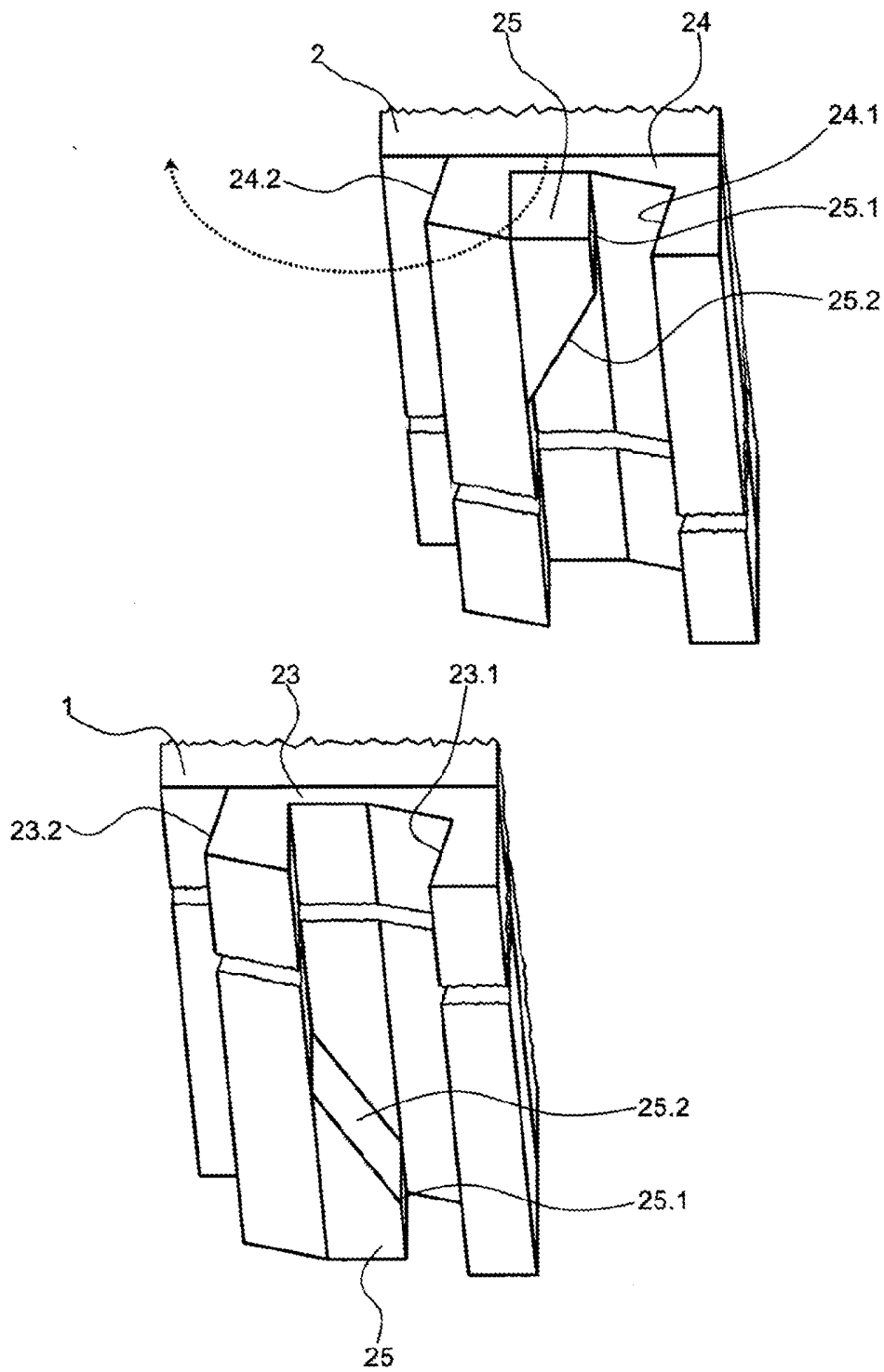


Fig. 7

