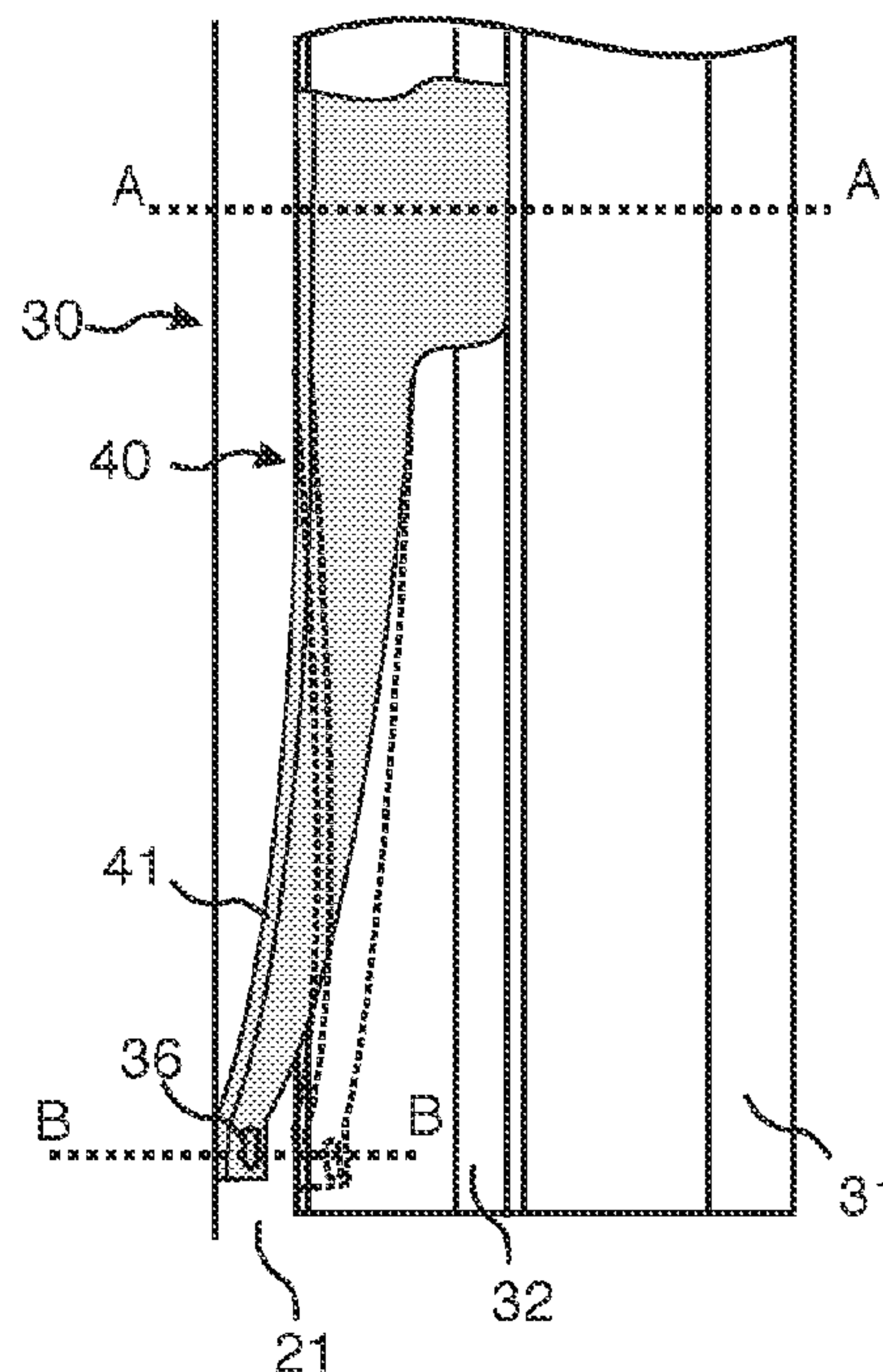




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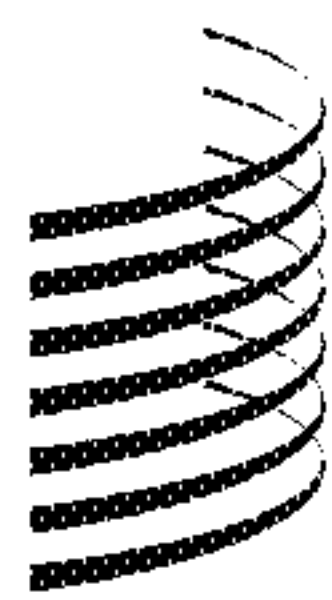
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(57) Abrégé/Abstract:

Building panels, especially floor panels are shown, which are provided with a vertical locking system on adjacent edges including a displaceable tongue that has a main tongue body and separate spring parts attached to the body.

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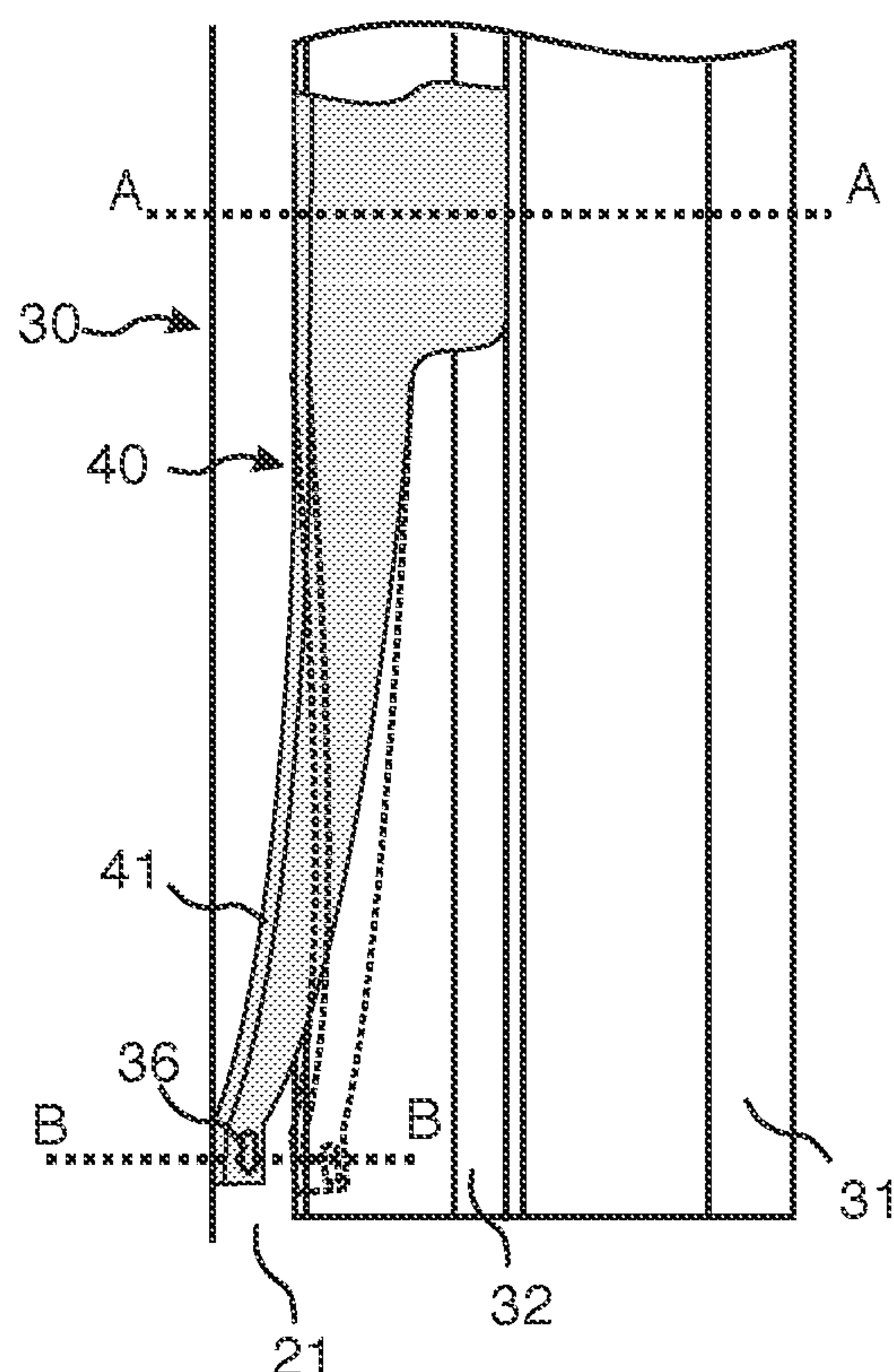
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(54) Title: MECHANICAL LOCKING SYSTEM FOR FLOOR PANELS

Fig. 4a

(57) Abstract: Building panels, especially floor panels are shown,
which are provided with a vertical locking system on adjacent edges
including a displaceable tongue that has a main tongue body and sep-
arate spring parts attached to the body.

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MECHANICAL LOCKING SYSTEM FOR FLOOR PANELSTECHNICAL FIELD

The disclosure generally relates to the field of mechanical locking systems for floor panels and building panels. The disclosure shows floorboards, locking
5 systems, installation methods and production methods.

FIELD OF APPLICATION OF THE INVENTION

Embodiments of the present invention are particularly suitable for use in floating floors, which are formed of
10 floor panels which are joined mechanically with a locking system integrated with the floor panel, i.e. mounted at the factory, are made up of one or more upper layers of wood or wood veneer, decorative laminate, powder based surfaces or decorative plastic material, an intermediate
15 core of wood-fibre-based material or plastic material and preferably a lower balancing layer on the rear side of the core. Floor panels with a surface layer of cork, linoleum, rubber or soft wear layers, for instance needle felt glued to a board, printed and preferably also var-
20 nished surface and floors with hard surfaces such as stone, tile and similar materials are included.

Embodiments of the invention may also be used for joining building panels which preferably contain a board material for instance wall panels, ceilings, furniture components
25 and similar.

The following description of known technique, problems of known systems and objects and features of the invention will therefore, as a non-restrictive example, be aimed
30 above all at this field of application and in particular at panels formed as rectangular floor panels with long and short edges intended to be mechanically joined to each other on both long and short edges.

The long and short edges are mainly used to simplify the description of embodiment of the invention. The panels may be square. Embodiments of the invention are preferably used on the short edges. It should be emphasised that embodiments of the invention may be used in any floor panel and it may be combined with all types of known locking system formed on the long edges, where the floor panels are intended to be joined using a mechanical locking system connecting the panels in the horizontal and vertical directions on at least two adjacent sides.

BACKGROUND OF THE INVENTION

Laminate flooring usually comprises a core of a 6-12 mm fibre board, a 0,2-0,8 mm thick upper decorative surface layer of laminate and a 0,1-0,6 mm thick lower balancing layer of laminate, plastic, paper or like material. A laminate surface comprises of melamine-impregnated paper.

The most common core material is fibreboard with high density and good stability usually called HDF - High Density Fibreboard. Sometimes also MDF - Medium Density Fibreboard - is used as core.

Traditional laminate floor panels of this type have been joined by means of glued tongue-and-groove joints. In addition to such traditional floors, floor panels have been developed which do not require the use of glue and instead are joined mechanically by means of so-called mechanical locking systems. These systems comprise locking means, which lock the panels horizontally and vertically. The mechanical locking systems are usually formed by machining of the core of the panel. Alternatively, parts of the locking system may be formed of a separate material, for instance aluminium or HDF, which is integrated with the floor panel, i.e. joined

with the floor panel in connection with the manufacture thereof.

The main advantages of floating floors with mechanical
5 locking systems are that they are easy to install. They
may also easily be taken up again and used once more at a
different location.

DEFINITION OF SOME TERMS

10 In the following text, the visible surface of the
installed floor panel is called "front side", while the
opposite side of the floor panel, facing the sub floor,
is called "rear side". The edge between the front and
rear side is called "joint edge". By "horizontal plane"
15 is meant a plane, which extends parallel to the outer
part of the surface layer. Immediately juxtaposed upper
parts of two adjacent joint edges of two joined floor
panels together define a "vertical plane" perpendicular
to the horizontal plane. By "inner vertical tongue plane"
20 is meant a plane, which is parallel with a vertical plane
that intersects the outer and most inner part of the main
tongue body. By "vertical locking" is meant locking
parallel to the vertical plane. By "horizontal locking"
is meant locking parallel to the horizontal plane.

25 By "up" is meant towards the front side, by "down"
towards the rear side, by "inwardly" mainly horizontally
towards an inner and centre part of the panel and by
"outwardly" mainly horizontally away from the centre part
of the panel.

30 By "locking systems" are meant co acting connecting
elements, which connect the floor panels vertically
and/or horizontally.

RELATED ART AND PROBLEMS THEREOF

35 For mechanical joining of long edges as well as short
edges in the vertical and in the first horizontal
direction perpendicular to the edges several methods may

- be used. One of the most used methods is the angle-snap method. The long edges are installed by angling. The panel is then displaced in locked position along the long side. The short edges are locked by horizontal snapping.
- 5 The vertical connection is generally a tongue and a groove. During the horizontal displacement, a strip with a locking element is bent and when the edges are in contact, the strip springs back and a locking element enters a locking groove and locks the panels
- 10 horizontally. Such a snap connection is complicated since a hammer and a tapping block usually needs to be used to overcome the friction between the long edges and to bend the strip during the snapping action.
- 15 Similar locking systems may also be produced with a rigid strip and they are connected with an angling-angling method where both short and long edges are angled into a locked position.
- 20 Recently new and very efficient locking systems have been introduced with a separate flexible or displaceable integrated tongue on the short edge that allows installation with only an angling action, generally referred to as "vertical folding". Such a system is
- 25 described in WO 03/083234 and WO 2006/043893 (Välinge Innovation AB)

Several versions are used on the market. Figure 1a-1c show a locking system comprising a displaceable tongue 30 that is displaced inwardly into a displacement groove 21 and outwardly into a tongue groove 20 when the edges of adjacent panels 1,1' are displaced vertically against each other. Such systems are referred to as vertical snap systems and they provide an automatic locking during

35 the folding action. The displaceable tongue 30 locks the panels vertically parallel to a vertical plane VP perpendicular to a main horizontal plane of the panels. A

locking strip 6 with a locking element 8 that cooperates with a locking groove 14 in the adjacent panel 1' locks the edges horizontally parallel to a main horizontal plane HP.

5

Figures 2a-2e show one of the most used flexible tongues 30 the so-called bristle tongue, which is formed in one piece. Such a displaceable tongue 30 comprises a main tongue body 31 that is strong and rather rigid, flexible protrusions 38 that provides the necessary flexibility and friction connections 36 that prevents the tongue to fall out from the displacement groove 21 during transport and installation of the floor panels. Bristle tongues are made of high quality plastic material reinforced with glass fibres. The flexibility must be considerable and allow that a flexible tongue is displaced in two directions about 1-2 mm during locking. The tongues are injection moulded and formed into tongue blanks 50 that may comprise up to 32 tongues. The tongues are connected to rails 51 which are used to feed the tongues during production when they are separated from the tongue blank and inserted into an edge of a panel.

Although such locking systems and one-piece bristle tongues are very efficient and provide a strong and reliable locking, there is still a room for improvements.

One disadvantage is that the whole tongue blank 50 is made of a high quality plastic material that is rather costly. Such high quality material is only needed in those parts of the tongue that form the flexible protrusions 36. High quality plastic material reinforced with glass fibres is not required in the parts of the tongue that comprises the main tongue body 31 and the rails 51. About 60% of a tongue blank is made of a material that is of a higher quality than required for its specific function.

A second disadvantage is that each tongue blank 50 must be individually designed for a specific width of a floor panel and this requires a wide range of expensive
5 injection moulding tongues for each width.

A third disadvantage is that glass fibre reinforced plastic material is difficult to recycle and the scrap from the rails has a very low material value.

10

It would be a major advantage if the tongues could be made in a more cost efficient way regarding material costs and different tongue lengths.

15 It is known from the above-mentioned publications that a displaceable tongue may be formed from a sheet shaped materials such as HDF. This may decrease the material costs with about 80% compared to high cost plastic materials. The flexibility may be obtained by a flexible
20 rubber strip that is inserted into an inner part of a displacement groove or attached to an inner part of an extruded plastic section. Such a two-piece tongue will not provide sufficient strength and flexibility since the compression takes place outside the displaceable tongue
25 between the inner part of a displacement groove and the inner edge of the tongue body. The groove must be rather deep and this will have a negative effect on the joint stability. It is not shown how the flexible material should be attached to tongues in a tongue blank and how
30 friction connections should be formed that allow the tongue to slide in the groove without the risk that the tongue will fall out from the groove after production. The cost of the flexible material is still rather high since the flexible part extends along the whole tongue
35 length.

SUMMARY OF THE INVENTION

An overall objective of embodiments of the present invention is to provide an improved and more cost efficient locking system for primarily rectangular floor panels with long and short edges installed in parallel rows, which allows that the short edges may be locked to each other automatically with a vertical snap action caused by a tongue that is displaced in a groove. More specifically the objective is to provide a locking system with a separate displaceable tongue that is formed of different materials such that the cost and function may be optimised.

Another specific objective is to provide a tongue that may be produced in different lengths without the need of individual injection moulding tools specially designed for each tongue length.

The above objects of embodiment of the invention may be achieved wholly or partly by locking systems and floor panels according to the disclosure. Embodiments of the invention are evident from the description and drawings.

A first aspect of the invention is building panels provided with a locking system for vertical locking of a first and a second building panel by a vertical displacement of the panel relative each other. A displaceable tongue is attached into a sidewardly open displacement groove provided at an edge of the first panel. Said tongue cooperates with a tongue groove provided at an adjacent edge of the second panel for locking the edges vertically. A strip protrudes below the displacement groove and outwardly beyond the upper part of the edge or below the tongue groove and outwardly beyond the upper part of the adjacent edge. The displaceable tongue comprises a main tongue body

extending along the edge of the first panel and a separate flexible spring part attached to the main tongue body. The separate spring part is located in an inner part of the displacement groove

5

The tongue may comprise two or more spring parts that are spaced from each other in the length direction of the main tongue body.

10 The spring parts may be asymmetric in a direction along the edge.

The main tongue body and the spring parts may be made of different materials

15

The tongue may comprise an upwardly or downwardly open fixing groove.

20 The spring parts may comprise an upwardly or downwardly extending fixing connection part.

The spring part may during locking be displaced or compressed horizontally beyond a vertical tongue plane that comprises an inner part of the tongue body.

25

The spring part may overlap a part of the tongue body during locking.

30 The spring part may be located in a vertically open flexing cavity formed in the tongue body.

The building panels are preferably floor panels.

35 A second aspect of the invention is a tongue blank comprising at least two tongues which are each designed to be inserted into a groove of a building panel and lock the building panel to an adjacent building panel. A part

of the tongue is configured to be displaced during locking. The tongues are of an elongated shape and each tongue comprises a separate spring part connected to a main body of the tongue.

5 The separate spring part may be asymmetric in the length direction of the tongue.

Each tongue may comprise two or more spring parts that are spaced from each other in the length direction of the tongue.

10 In another aspect, there is provided building panels provided with a locking system for vertical locking of a first and a second building panel by a vertical displacement of said first and second building panel relative each other, a displaceable tongue is attached into a sidewardly open displacement groove provided at an edge of the first building panel, said displaceable tongue cooperates with a tongue groove provided at
15 an adjacent edge of the second building panel for locking the edge and the adjacent edge vertically, a strip protrudes: below the displacement groove and outwardly beyond an upper part of the edge; or below the tongue groove and outwardly beyond the upper part of the adjacent edge, wherein the displaceable
20 tongue comprises a main tongue body extending along the edge of the first building panel and separate flexible spring parts attached to the main tongue body, wherein the separate spring parts are located in an inner part of the displacement groove and spaced from each other in a length direction of the main
25 tongue body, and wherein said separate spring parts comprise an upwardly or downwardly extending fixing connection part.

In another aspect, there is provided a tongue blank comprising at least two tongues, which are each designed to be inserted

into a groove of a building panel and lock the building panel to an adjacent building panel, a part of each tongue is configured to be displaced during locking wherein the tongues are of an elongated shape, wherein each tongue comprises a
5 separate spring part connected to a main body of the tongue, and wherein said separate spring parts comprise an upwardly or downwardly extending fixing connection part.

In another aspect, there is provided building panels including at least a first building panel and a second building panel
10 that are provided with a locking system for vertical locking of the first building panel and the second building panel by a vertical displacement of the first and second building panels relative each other, the locking system comprising a displaceable tongue attached into a sidewardly open
15 displacement groove provided at an edge of the first building panel, said displaceable tongue cooperates with a tongue groove provided at an adjacent edge of the second building panel for locking the edge and the adjacent edge vertically, and the locking system further comprising a strip that protrudes from
20 the edge or the adjacent edge: below the displacement groove and outwardly beyond an upper part of the edge; or below the tongue groove and outwardly beyond an upper part of the adjacent edge, wherein the displaceable tongue comprises a main tongue body extending along the edge of the first building
25 panel and separate flexible spring parts that are detachably attached to the main tongue body, and the separate spring parts are located in an inner part of the displacement groove and spaced from each other in a length direction of the main tongue body.

In another aspect, there is provided a tongue blank comprising at least two tongues, which are each designed to be inserted into a groove of a building panel and lock the building panel to an adjacent building panel, a part of each tongue is
5 configured to be displaced during locking wherein the tongues are of an elongated shape, wherein each tongue comprises a separate spring part that is configured to be detachably attached to a main body of the tongue, and wherein said separate spring parts comprise an upwardly or downwardly
10 extending fixing connection part.

In another aspect, there is provided building panels including at least a first building panel and a second building panel that are provided with a locking system for vertical locking of the first building panel and the second building panel by a
15 vertical displacement of the first and second building panels relative each other, the locking system comprising a displaceable tongue attached into a sidewardly open displacement groove provided at an edge of the first building panel, said displaceable tongue cooperates with a tongue groove
20 provided at an adjacent edge of the second building panel for locking the edge and the adjacent edge vertically, and the locking system further comprising a strip that protrudes from the edge or the adjacent edge: below the displacement groove and outwardly beyond an upper part of the edge; or below the
25 tongue groove and outwardly beyond an upper part of the adjacent edge, wherein the displaceable tongue comprises a main tongue body extending along the edge of the first building panel and separate flexible spring parts attached to the main tongue body, the separate spring parts are located in an inner
30 part of the displacement groove and spaced from each other in a

length direction of the main tongue body, and the main tongue body and the spring parts are made of different materials.

In another aspect, there is provided building panels including at least a first building panel and a second building panel
5 that are provided with a locking system for vertical locking of the first building panel and the second building panel by a vertical displacement of the first and second building panels relative each other, the locking system comprising a displaceable tongue attached into a sidewardly open
10 displacement groove provided at an edge of the first building panel, said displaceable tongue cooperates with a tongue groove provided at an adjacent edge of the second building panel for locking the edge and the adjacent edge vertically, and the locking system further comprising a strip that protrudes from
15 the edge or the adjacent edge: below the displacement groove and outwardly beyond an upper part of the edge; or below the tongue groove and outwardly beyond an upper part of the adjacent edge, wherein the displaceable tongue comprises a main tongue body extending along the edge of the first building
20 panel and separate flexible spring parts that are adapted to be attached to the main tongue body, the separate spring parts are located in an inner part of the displacement groove and spaced from each other in a length direction of the main tongue body; and wherein said separate spring parts comprise an upwardly or
25 downwardly extending fixing connection part.

BRIEF DESCRIPTION OF THE DRAWINGS

The disclosure will in the following be described in connection to exemplary embodiments and in greater detail with reference to the appended exemplary drawings, wherein:

Figs 1a-c illustrate locking systems according to known technology.

Figs 2a-e illustrate a flexible and displaceable tongue according to known technology.

- 5 Figs 3a-3g illustrate a displaceable tongue according to an embodiment of the invention.

Figs 4a-d illustrate the function of a spring part according to an embodiment of the invention.

- 10 Figs 5a-g illustrate forming and separation of a tongue blank according to an embodiment of the invention.

Figs 6a-e illustrate preferred embodiments of displaceable tongues.

- Figs 7a-c illustrate vertical locking of two panels comprising a displaceable tongue according to an embodiment of the invention.
- 5 Figs 8a-f illustrate forming and fixing of a displaceable tongue according to an embodiment of the invention.
- 10 Figs 9a-g illustrate forming of a tongue blank according to an embodiment of the invention.
- Figs 10a-g illustrate embodiments of the invention.
- 15 Figs 11a-g illustrate spring parts made of a compressible material according to embodiments of the invention.
- 20 Figs 12a-i illustrate spring parts connected into cavities according to embodiments of the invention.
- Figs 13a-f illustrate separate friction connections according to embodiments of the invention.
- 25 Figs 14a-d illustrate spring parts connected into a groove according to embodiments of the invention.
- 30 Figs 15a-f illustrate different embodiments of the invention.
- 35 Figs 16a-g illustrate spring parts connected into a groove according to embodiments of the invention.
- Figs 17a-g illustrate different embodiments of the invention.

Figs 18a-e illustrate different embodiments of the invention.

5 DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

To facilitate understanding, several locking systems in the figures are shown schematically. It should be emphasised that improved or different functions may be achieved using combinations of the embodiments.

10

All embodiments may be used separately or in combinations. Angles, dimensions, rounded parts, spaces between surfaces etc. are only examples and may be adjusted within the basic principles of the invention.

15

Figures 3a - 3g show a first preferred embodiment of a displaceable tongue 30 which is intended to be used to lock two adjacent edges of two floor panels by a vertical displacement of the panels relative each other.

20

Figure 3a show a displaceable tongue 30 with a main tongue body 31, a length direction L along the joint, a width W perpendicular to the length and parallel to a horizontal plane and a thickness perpendicular to the width. An inner vertical tongue plane Tp1 and an outer vertical tongue plane Tp2 parallel with the length direction of the tongue intersects the outer edges of the tongue.

25

30 Figure 3b shows a displaceable tongue 30 comprising a separate spring part 40 attached to the main tongue body 31. The spring part comprises a spring part body 41, a friction connection 36, preferably formed as a small local protrusion extending vertically from the spring part body 41 and a fixing connection part 42 that is
35 fixed into a fixing groove 32 formed in the main tongue body 31.

Figure 3c shows a spring part blank 60 seen from above comprising several spring parts 40 connected to each other in parallel rows and to spring part rails 61.

5

Figure 3d shows the spring part blank seen from below. Each spring part 40 comprises a fixing connection part 42 that in this embodiment is formed as a protrusion extending vertically from the main spring part body 41 and in opposite direction to the extension of the friction connection 36.

10

Figure 3e shows a main tongue body 31 that in this embodiment is formed as a two dimensional profile with the same cross section along the tongue body. Such a tongue body may be formed by for example linear machining, extrusion or by injection moulding where rather simple moulding tools are used.

15

Figure 3f shows a displaceable tongue in an outer locked position, which tongue comprises a main tongue body 31 and two separate spring parts 40, 40' mechanically connected to the tongue body 31 and spaced from each other in the length direction of the tongue 30.

20

Figure 3g shows the displaceable tongue in an inner unlocked position when the tongue 30 is pressed into a sidewardly open displacement groove 21. The spring part is displaced inwardly beyond the first vertical tongue plane Tp1 but also above a part of the main tongue body 31. The thickness of the spring part is smaller than the thickness of the tongue body 31. This embodiment offers the advantage that the spring part may be easily connected to a tongue body that has a rather simple cross section and that the depth of the displacement groove may be reduced since the main tongue body 31 and the spring

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30

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part body 41 may overlap each other in locked and unlocked position.

Any type of polymer materials may be used to form spring parts such as PA (nylon), POM, PC, PP, PET or PE or similar having the properties described above in the different embodiments. These plastic materials may be, when injection moulding is used, reinforced with for instance glass fibre, Kevlar fibre, carbon fibre or talk or chalk. A preferred material is glass fibre, preferably extra long, reinforced PP or POM. Such materials may also be used to form the main tongue body.

The tongue body preferably comprises a low cost material that preferably may be machined. Suitable materials are wood fibre based materials combined with thermoplastic or thermosetting binders.

Figures 4a shows a part of a displaceable tongue 30 comprising a spring part 40 connected to an upper part of a main tongue body 31. Figure 4b shows the spring part 40 from below with a fixing connection part 42 that is flexible and adapted to be connected vertically into a vertically open fixing groove 32 formed on the upper part of the tongue body 31. The fixing connection part 42 comprises a horizontal friction protrusion 43 that presses against a vertical wall of the fixing groove 32.

Figure 4c shows the flexible tongue 30 in outer position and figure 4d shows the flexible tongue 30 in an inner position. A-A shows the cross section of a middle part of the main tongue body. B-B shows the cross section of an outer part of the main tongue body. The figures show that a part of the spring part body 41 is located above an upper part of the tongue body 31 and displaced beyond the first vertical tongue plane Tp1 during locking such that it overlaps the main tongue body.

Figure 5a shows a cross section of a tongue blank 50 comprising several displaceable tongues that comprise of a main tongue body 31 and separate flexible parts 40
5 connected to the tongue body. Figure 5b shows a tongue body blank 70 comprising several tongue bodies 31 that are connected with tongue body rails 71. Such rails may for example be formed by punching away material from the tongue bodies. Figure 5f shows a spring part blank 60
10 where the spring parts are positioned with essentially the same distance D between each other as the distance between the tongue bodies 31. This facilitates the fixing of the spring parts to the tongue bodies since the spring parts may be displaced after separation, shown in figure
15 5g, mainly parallel with the tongue bodies over the tongue bodies and pressed vertically such that the fixing connection part 42 enters the fixing groove 32. A tongue blank 50 may be formed as shown in figure 5c. Such forming may be made as a separate operation and tongue
20 blanks are delivered as integrated blanks. The connection may also be made in line with the inserting of the tongue into the displacement groove. The tongues 30 are separated from the blank as shown in figure 5d and inserted into the displacement groove 21 as shown in
25 figure 5e. The tongues may be inserted in a groove of the strip panel comprising the strip or into a groove formed in the other adjacent panel.

Figure 6a- 6d shows alternative methods to connect the
30 spring parts 40 to a main tongue body 31. One or several holes 34a or cavities 34b may be formed. Figure 6e shows that different lengths of the displaceable tongues may be formed by combining several spring parts that are positioned along the main tongue body 31.

35

Figures 7a-7c show locking of two panels 1,1'. Figure 7a shows that the tongue 30 tilts downwards during locking

and figure 7c shows that the tongue 30 tilts upwards in locked position such that an outer part of the rigid tongue body forms an upper contact surface 22 with the displacement groove 21 and that an inner part forms a lower contact surface 23. This means that it is an advantage to connect the spring part to an upper part of the main tongue body. The spring part may of course be connected to a lower part into a fixing groove that is open downwards.

10

Figures 8a - 8e shows a method to form and insert displaceable tongues into an edge of a panel that may be used for example when tongue bodies are delivered as loose element or as extruded sections that are cut into defined lengths. The tongue bodies 31 are displaced, for example, parallel with their lengths and spring part blanks 60 are displaced towards the tongue bodies where the spring parts 40 are separated and connected to the tongue body when the tongue body 31 is displaced in its length direction. The displaceable tongues 30 are thereafter inserted into the displacement groove 21.

20

Figures 9a -9c show that a tongue body blank may be formed as an extruded section, figure 9a,b, or by, for example, machining a panel from a machined wood, wood/plastic or plastic panel, figure 9b, or by injection moulding, figure 9c.

25

Figure 9d and 9f show that tongue blanks may be formed by displaceable tongues that are connected with rails that may be comprise extrudes section, figure 9e, or moulded parts, figure 9g.

30

Figures 10a-10d show preferred embodiments of displaceable tongues 30. Figure 10a shows overlapping spring parts 40. Figure 10b shows a spring part that is glued to a tongue body. Figure 10c show spring parts with

35

a spring part body that is only flexible at one edge. Figure 10d shows spring parts that are connected to each other.

5 Figure 10e shows a tongue 30 with a spring part that is connected into an inclined displacement groove 21 in the strip panel comprising the locking strip 6. Figure 10f shows a displaceable tongue 30 inserted into an edge of a groove panel comprising the locking groove 14. Figure 10g
10 shows a locking system that only locks vertically. The strip 6 has no locking element. The horizontal locking may be accomplished with for example friction between the long edges.

15 Figures 11a - 11g shows that the spring part may also be formed from a flexible material such as, for example, rubber. The flexible parts are even in this embodiment positioned with a distance between each other along the main tongue body and the separate parts may be compressed
20 and displaced beyond the first vertical tongue plane Tp1 as shown in figure 11c. Preferably flexing cavities 33 are formed in the main tongue body to allow such compression. The spring parts 40 are preferably asymmetric in the length direction of the displaceable
25 tongue 30.

Figures 12a - 12i show that several fixing cavities 33 and flexing cavities 34 may be formed in the main tongue body 31 in order to fix spring parts and to allow
30 compression or flexing displacement within beyond the vertical tongue plane Tp1. The figures show that the tongue bodies 31 and the spring parts 40 are asymmetric in the length direction of the tongue.

35 Figures 13a-13f show that also other parts of the displaceable tongue may be connected as separate parts, for example, friction connection 36 that may be attached

to a main tongue body 31 as shown in figure 13d. Figure 13e shows that a friction connection 36 may be formed and attached to the main tongue body 31 such that it may be displaced with a turning. Such turning device may be used
5 as a link in order to displace a tongue outwardly from the displacement groove when the tongue is pushed sideways along the joint with a side pressure.

Figures 14a-14d show an alternative method to form a
10 displaceable tongue that comprises separate spring parts 40. The spring parts are inserted into the displacement groove 21. A main tongue body 31 is thereafter inserted into the displacement groove and connected to the spring parts 40.

15 Figures 15a-15f shows a preferred embodiment of a spring part that is suitable to be inserted into a displacements groove 21. Figure 15a shows the spring part 40 from above and figure 15b is a side view. The spring part comprises
20 a frictions connection 36, a snapping connection 44 and a holding connection 45 located vertically at opposite upsides of the spring part. The snapping and holding connections are displaced along the spring part body 41. The main tongue body 31 is automatically snapped to the
25 spring part that is connected with the friction connection 36 to the displacement groove. Figure 15e and 15f shows cross sections during locking. The snapping connection 44 is fixed to the main tongue body and the holding connections slides against the tongue body 31
30 during locking. The spring part 41 may of course also be attached to the main tongue body prior to the fixing into the displacement groove 21.

Figures 16a-g shows a spring part 40 that is only
35 possible to snap to a main tongue body 31 when the spring part is already in the displacement groove 21 since the spring part only comprises a snapping connection 44 and

no holding connection. Figure 16a shows the spring part seen from above and figure 16b shows a side view. It is preferred that the snapping connection 44 is located on the upper part of the spring part 40.

5

Figures 17a-g shows that a flexing cavity 33 may be formed in the main tongue body 31 and this embodiment allows that a major part of the spring part body 41 may be displaced beyond the vertical tongue plane Tpl

10

Figure 18a -18e shows that tongue body 31 may be formed as a three-dimensional moulded component and optimized to be snapped to a spring part. The material savings are mainly obtained due to the fact that the plastic material of the tongue body 31 may be less costly since no flexibility is required. Figure 18e is a side view of figure 18d. The spring part protrusions 46, 46', are during locking displaced in the displacement cavities 33, 33'.

20

The described tongues are mainly intended to be used on short edges of panels comprising locking systems on long edges that may be locked by angling. However, the tongues may be used on short and/or long edges.

25

The principles of the invention may also be used to form two-piece tongues that are not flexible and that are, for example, used to be displaced along the joint during locking. Separate parts may be used as, for example, wedges that during displacement create a movement of the tongue perpendicular to the edge.

30

CLAIMS:

1. Building panels provided with a locking system for vertical locking of a first and a second building panel by a vertical displacement of said first and second building panel
5 relative each other, a displaceable tongue is attached into a sidewardly open displacement groove provided at an edge of the first building panel, said displaceable tongue cooperates with a tongue groove provided at an adjacent edge of the second building panel for locking the edge and the adjacent edge
10 vertically, a strip protrudes:

below the displacement groove and outwardly beyond an upper part of the edge; or

below the tongue groove and outwardly beyond the upper part of the adjacent edge,

15 wherein the displaceable tongue comprises a main tongue body extending along the edge of the first building panel and separate flexible spring parts attached to the main tongue body,

20 wherein the separate spring parts are located in an inner part of the displacement groove and spaced from each other in a length direction of the main tongue body, and

wherein said separate spring parts comprise an upwardly or downwardly extending fixing connection part.

2. The building panels as claimed in claim 1, wherein
25 the spring parts are asymmetric in a direction along the edge.

3. The building panels as claimed in claim 1 or 2, wherein the main tongue body and the spring parts are made of different materials.
4. The building panels as claimed in any one of the
5 claims 1-3, wherein said tongue body comprises an upwardly or downwardly open fixing groove.
5. The building panels as claimed in any one of the claims 1-4, wherein said spring parts during locking is displaced or compressed horizontally beyond a vertical tongue
10 plane Tpl that comprises an inner part of the tongue body.
6. The building panels as claimed in any one of the claims 1-5, wherein said spring parts are overlapping a part of the tongue body during locking.
7. The building panels as claimed in any one of the
15 claims 1-6, wherein said spring parts are located in a vertically open flexing cavity formed in the tongue body.
8. The building panels as claimed in any one of the claims 1-7, wherein said building panels are floor panels.
9. A tongue blank comprising at least two tongues, which
20 are each designed to be inserted into a groove of a building panel and lock the building panel to an adjacent building panel, a part of each tongue is configured to be displaced during locking wherein the tongues are of an elongated shape, wherein each tongue comprises a separate spring part connected
25 to a main body of the tongue, and wherein said separate spring parts comprise an upwardly or downwardly extending fixing connection part.

10. The tongue blank as claimed in claim 9, wherein the spring part is asymmetric in the length direction of the tongue.

11. The tongue blank as claimed in claim 9 or 10, wherein
5 each tongue comprises two or more spring parts that are spaced from each other in the length direction of the tongue.

12. Building panels including at least a first building panel and a second building panel that are provided with a locking system for vertical locking of the first building panel
10 and the second building panel by a vertical displacement of the first and second building panels relative each other, the locking system comprising a displaceable tongue attached into a sidewardly open displacement groove provided at an edge of the first building panel, said displaceable tongue cooperates with
15 a tongue groove provided at an adjacent edge of the second building panel for locking the edge and the adjacent edge vertically, and the locking system further comprising a strip that protrudes from the edge or the adjacent edge:

below the displacement groove and outwardly beyond an
20 upper part of the edge; or

below the tongue groove and outwardly beyond an upper part of the adjacent edge,

wherein the displaceable tongue comprises a main tongue body extending along the edge of the first building
25 panel and separate flexible spring parts that are detachably attached to the main tongue body, and

the separate spring parts are located in an inner part of the displacement groove and spaced from each other in a length direction of the main tongue body.

13. The building panels as claimed in claim 12, wherein
5 the spring parts are asymmetric in a direction along the edge.

14. The building panels as claimed in claim 12 or 13, wherein the separate flexible spring parts are mechanically attached to the main tongue body.

15. The building panels as claimed in any one of the
10 claims 12-14, wherein said main tongue body comprises an upwardly open fixing groove or a downwardly open fixing groove.

16. The building panels as claimed in any one of the claims 12-15, wherein said separate spring parts comprise an upwardly extending fixing connection part or a downwardly
15 extending fixing connection part.

17. The building panels as claimed in any one of the claims 12-16, wherein said spring parts during locking are displaced or compressed horizontally beyond a vertical tongue plane that comprises an inner part of the main tongue body
20 before locking of the first and second building panels.

18. The building panels as claimed in any one of the claims 12-17, wherein said spring parts overlap a part of the tongue body during locking.

19. The building panels as claimed in any one of the
25 claims 12-18, wherein said spring parts are located in a vertically open flexing cavity formed in the main tongue body.

20. The building panels as claimed in any one of the claims 12-19, wherein said building panels are floor panels.

21. The building panels as claimed in any one of the claims 12-20, wherein each of the separate flexible spring parts is detachably attached to the main tongue body via a friction protrusion that presses against an inner wall of the main tongue body.

22. A tongue blank comprising at least two tongues, which are each designed to be inserted into a groove of a building panel and lock the building panel to an adjacent building panel, a part of each tongue is configured to be displaced during locking wherein the tongues are of an elongated shape, wherein each tongue comprises a separate spring part that is configured to be detachably attached to a main body of the tongue, and wherein said separate spring parts comprise an upwardly or downwardly extending fixing connection part.

23. The tongue blank as claimed in claim 22, wherein the spring part is asymmetric in the length direction of the tongue.

24. The tongue blank as claimed in claim 22 or 23, wherein each tongue comprises two or more spring parts that are spaced from each other in a length direction of the tongue.

25. Building panels including at least a first building panel and a second building panel that are provided with a locking system for vertical locking of the first building panel and the second building panel by a vertical displacement of the first and second building panels relative each other, the locking system comprising a displaceable tongue attached into a

sidewardly open displacement groove provided at an edge of the first building panel, said displaceable tongue cooperates with a tongue groove provided at an adjacent edge of the second building panel for locking the edge and the adjacent edge
5 vertically, and the locking system further comprising a strip that protrudes from the edge or the adjacent edge:

below the displacement groove and outwardly beyond an upper part of the edge; or

below the tongue groove and outwardly beyond an upper
10 part of the adjacent edge,

wherein the displaceable tongue comprises a main tongue body extending along the edge of the first building panel and separate flexible spring parts attached to the main tongue body,

15 the separate spring parts are located in an inner part of the displacement groove and spaced from each other in a length direction of the main tongue body, and

the main tongue body and the spring parts are made of different materials.

20 26. Building panels including at least a first building panel and a second building panel that are provided with a locking system for vertical locking of the first building panel and the second building panel by a vertical displacement of the first and second building panels relative each other, the
25 locking system comprising a displaceable tongue attached into a sidewardly open displacement groove provided at an edge of the first building panel, said displaceable tongue cooperates with

a tongue groove provided at an adjacent edge of the second building panel for locking the edge and the adjacent edge vertically, and the locking system further comprising a strip that protrudes from the edge or the adjacent edge:

5 below the displacement groove and outwardly beyond an upper part of the edge; or

 below the tongue groove and outwardly beyond an upper part of the adjacent edge,

 wherein the displaceable tongue comprises a main
10 tongue body extending along the edge of the first building panel and separate flexible spring parts that are adapted to be attached to the main tongue body,

 the separate spring parts are located in an inner part of the displacement groove and spaced from each other in a
15 length direction of the main tongue body; and

 wherein said separate spring parts comprise an upwardly or downwardly extending fixing connection part.

1/18

Fig. 1a

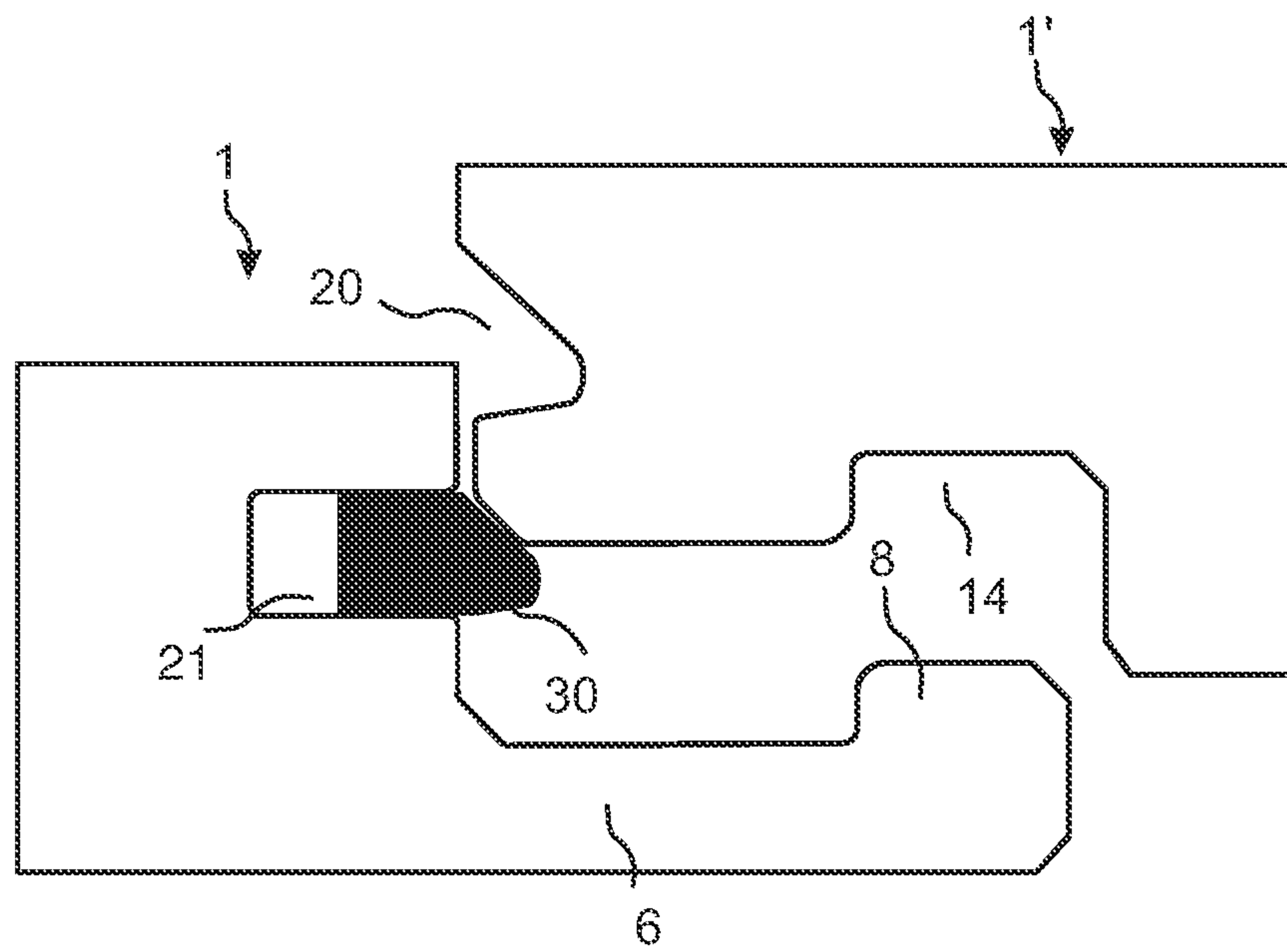


Fig. 1b

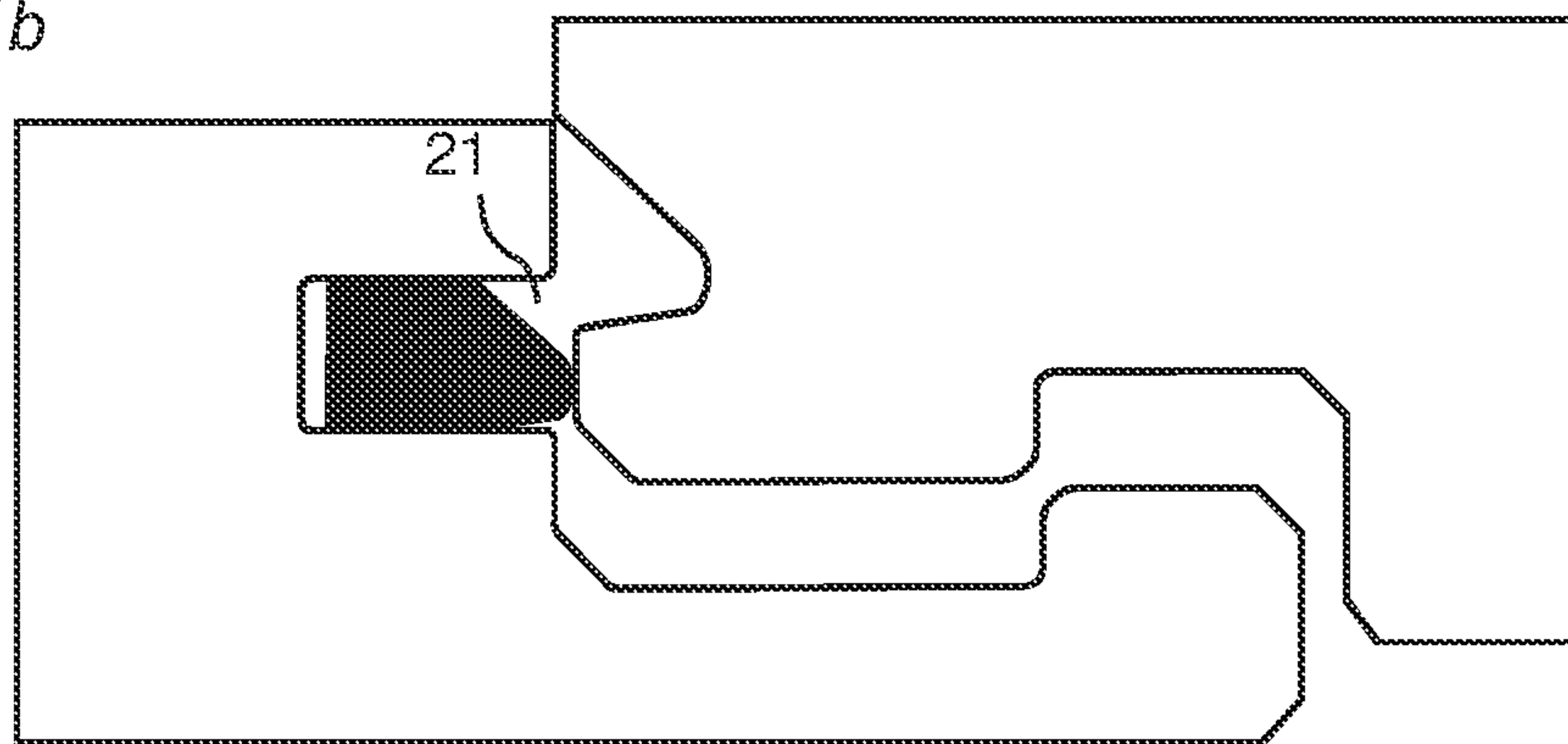
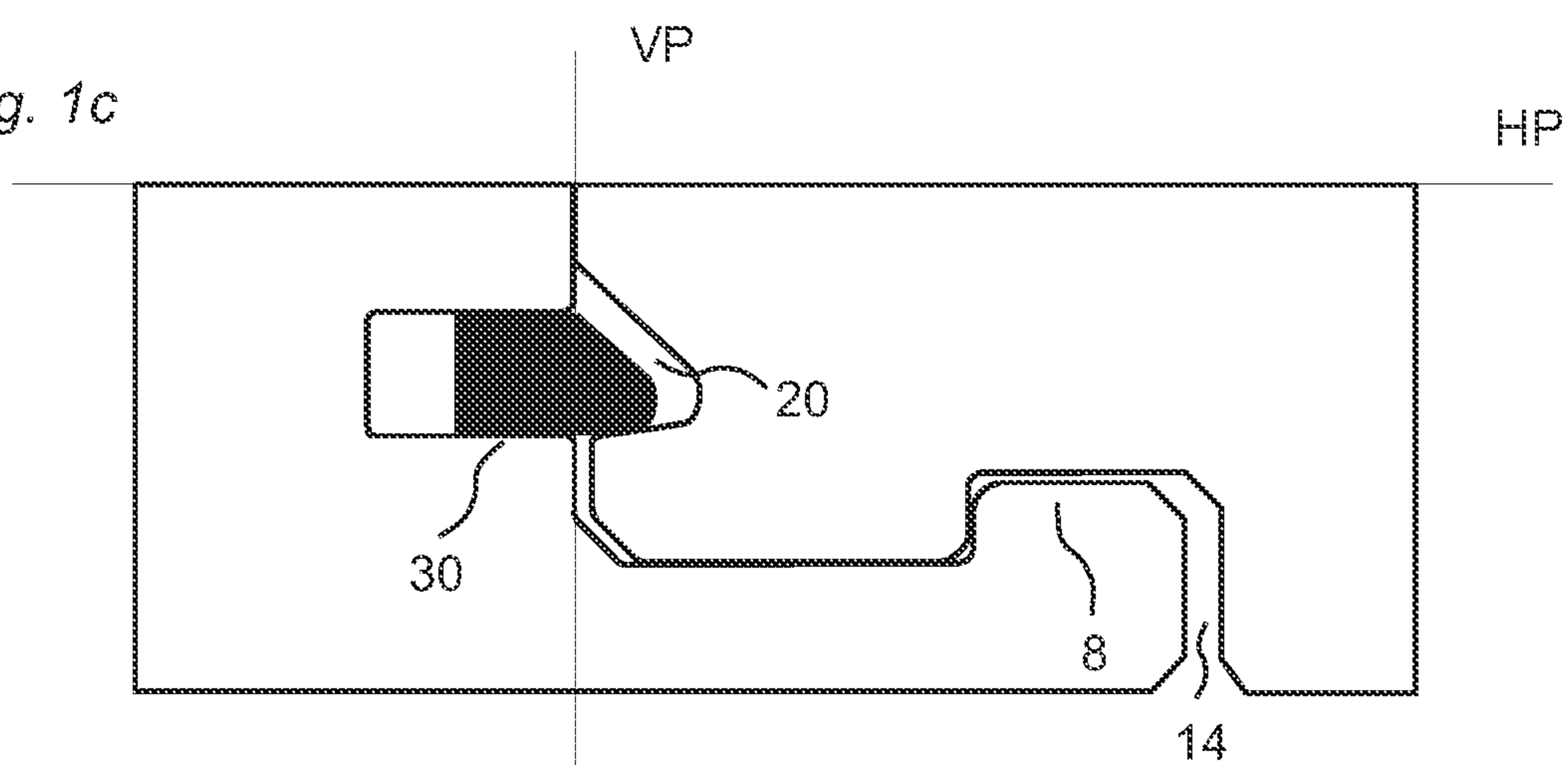


Fig. 1c



KNOWN TECHNOLOGY

2/18

Fig. 2a

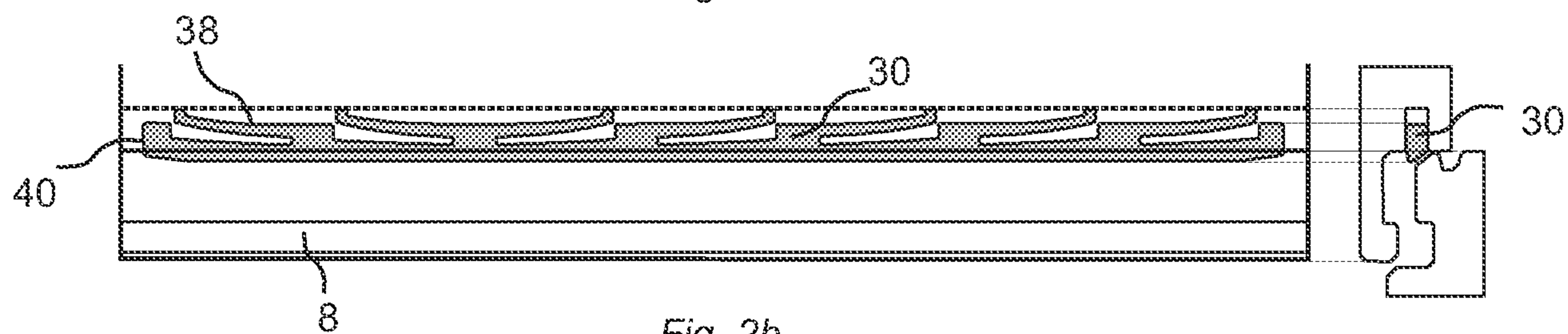


Fig. 2b

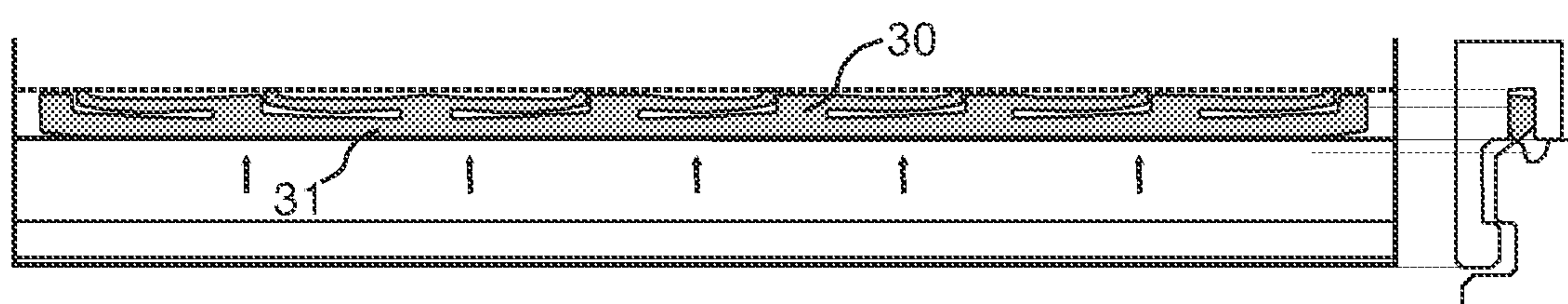


Fig. 2c

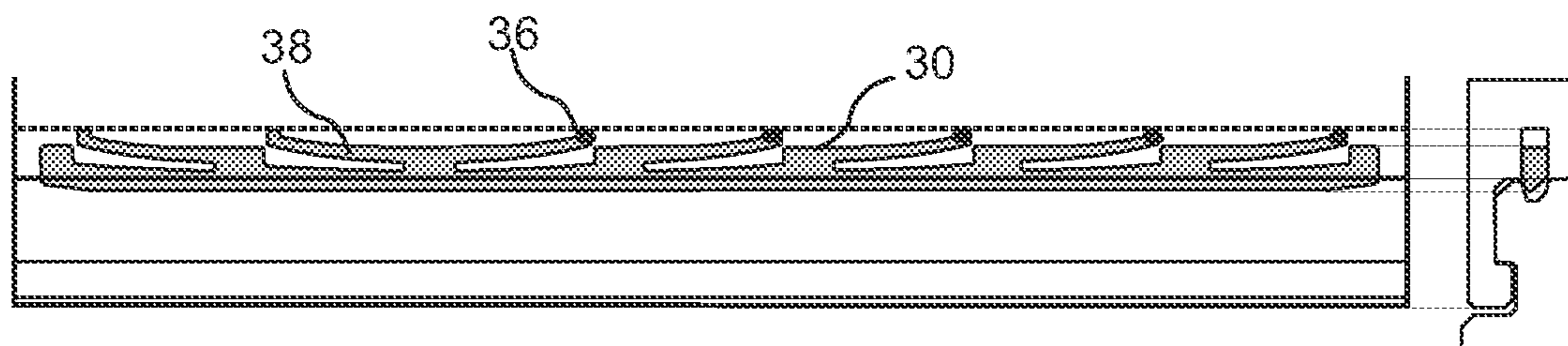


Fig. 2d

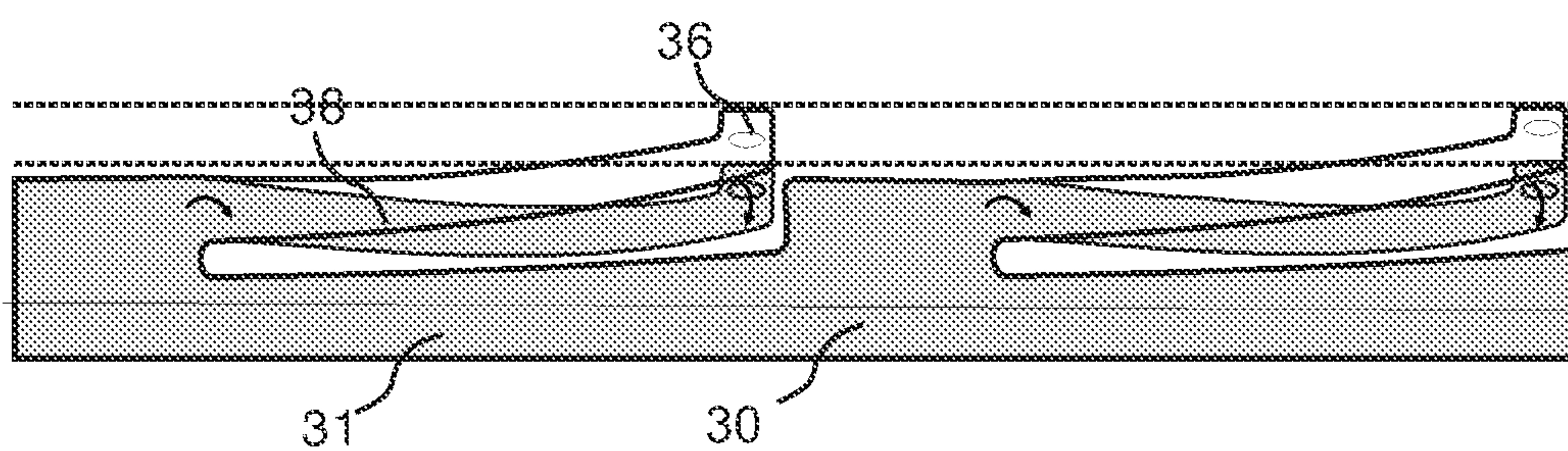
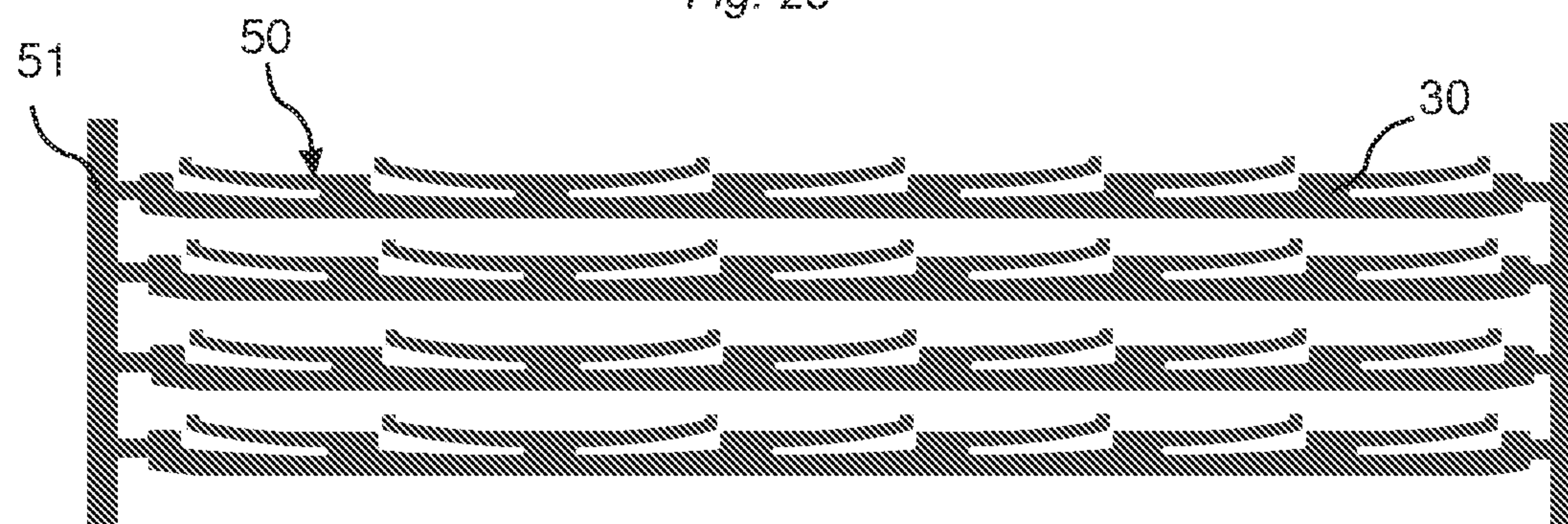


Fig. 2e



KNOWN TECHNOLOGY

3/18

Fig. 3a

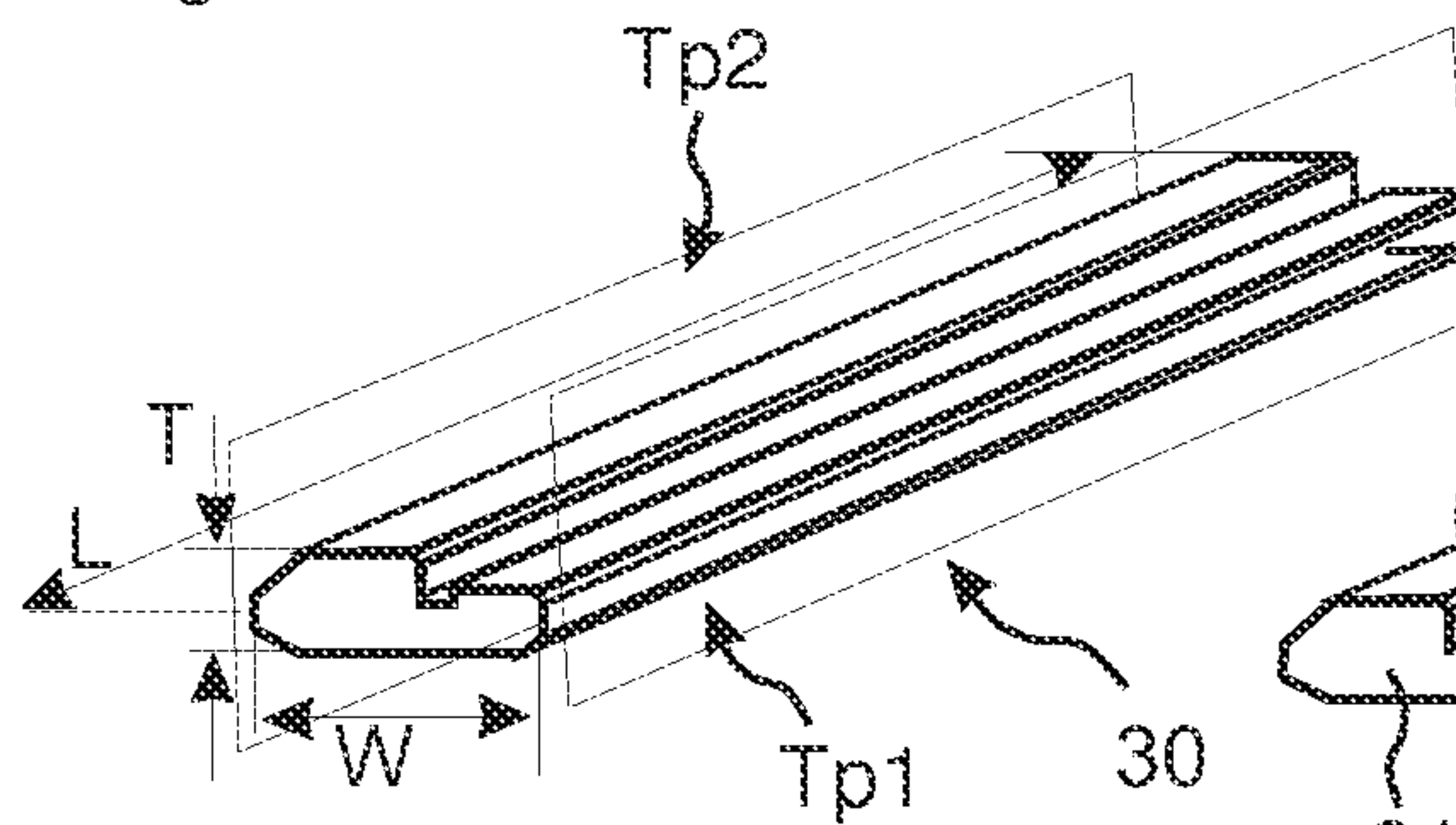


Fig. 3b

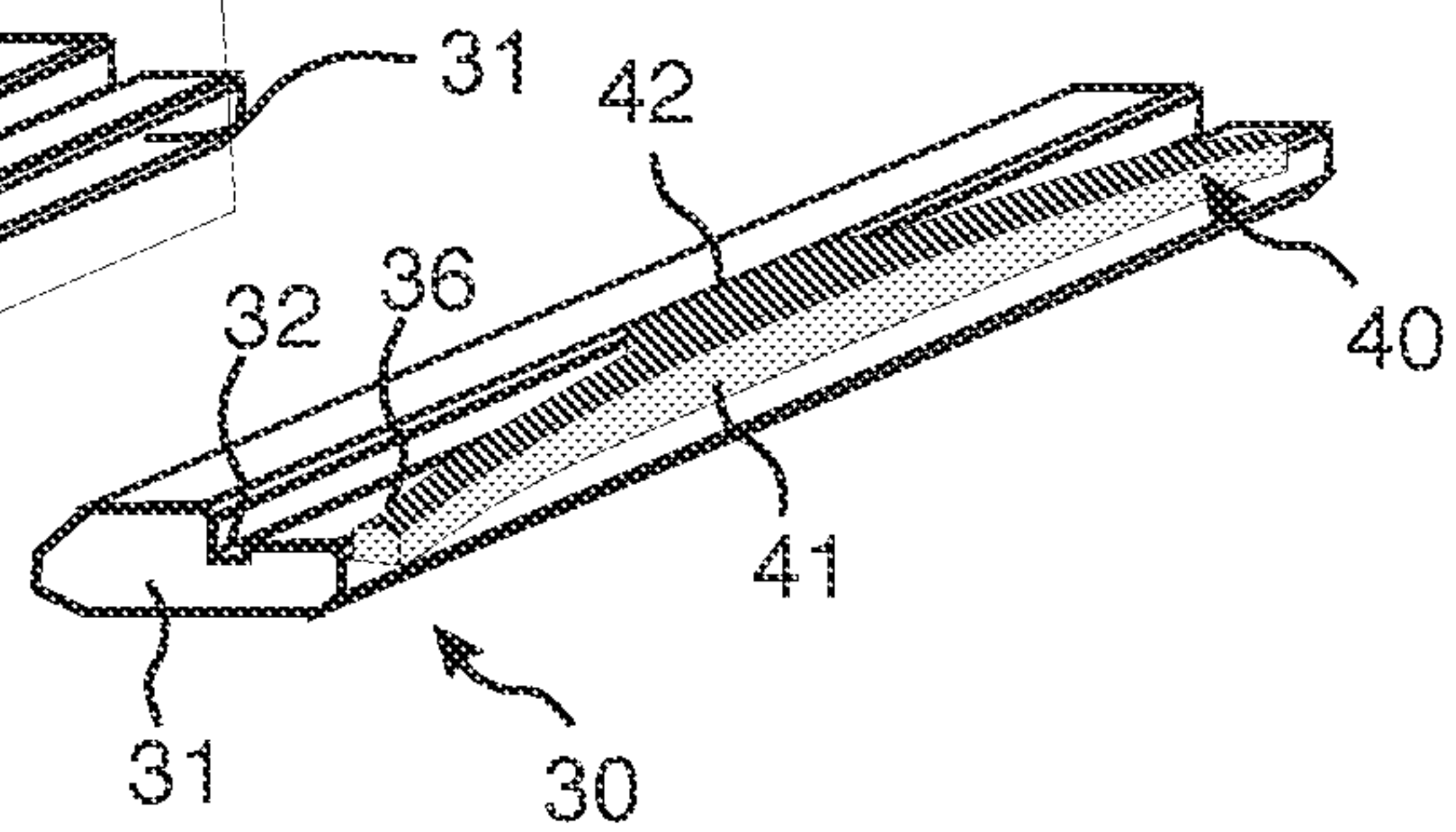


Fig. 3c

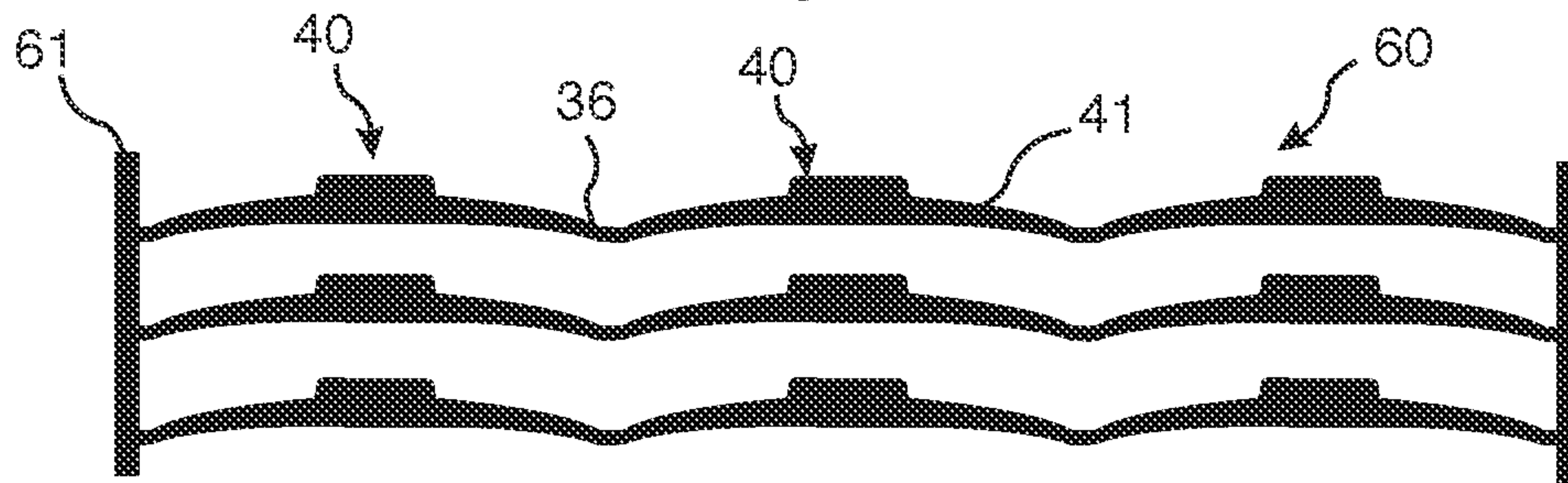


Fig. 3d

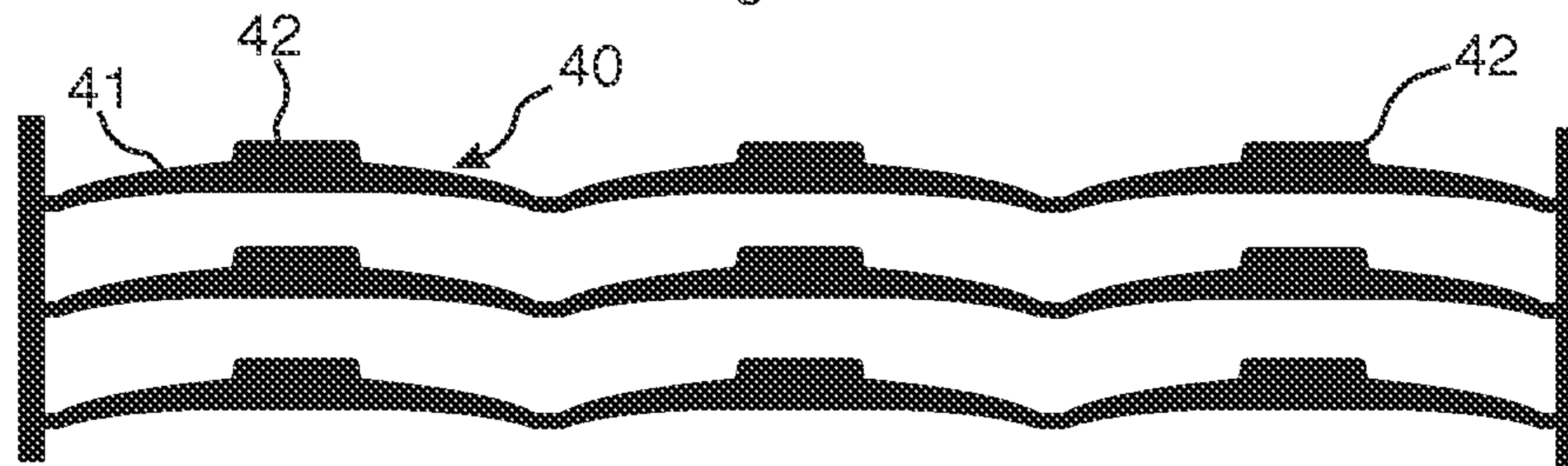


Fig. 3e

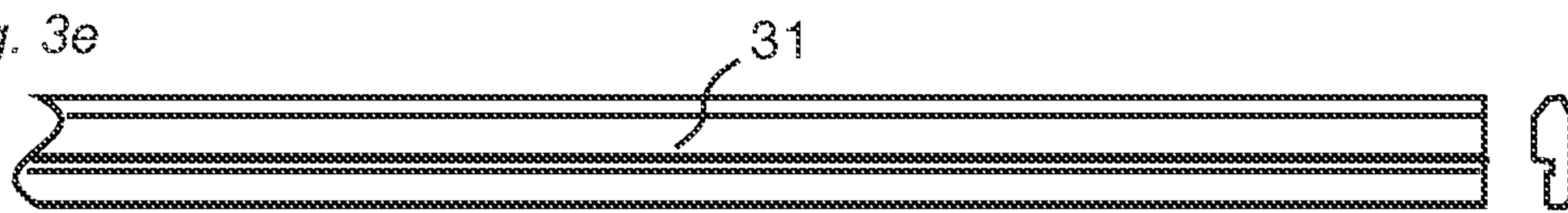


Fig. 3f

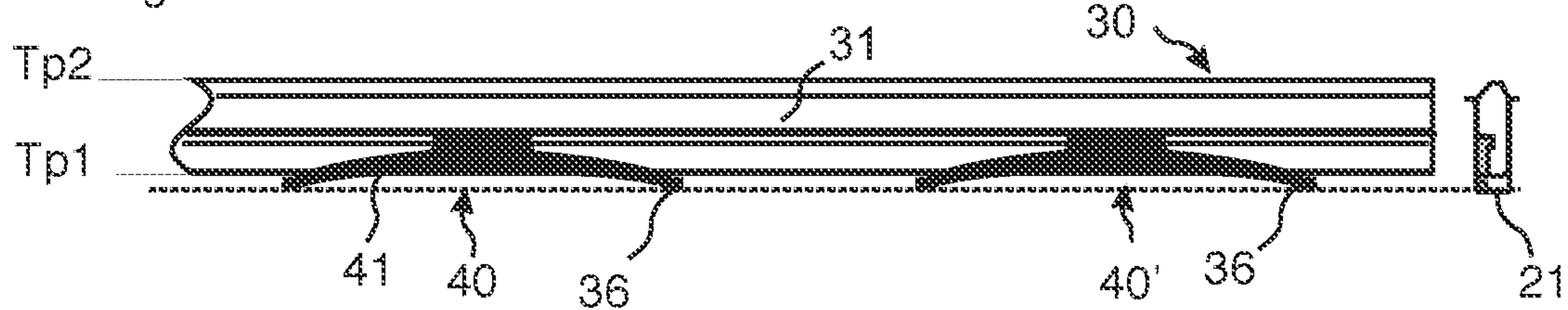
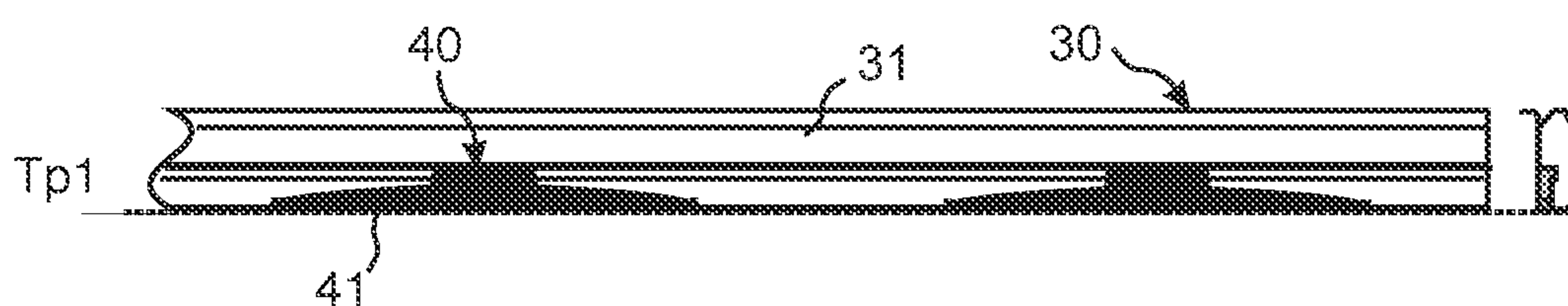


Fig. 3g



4/18

Fig. 4a

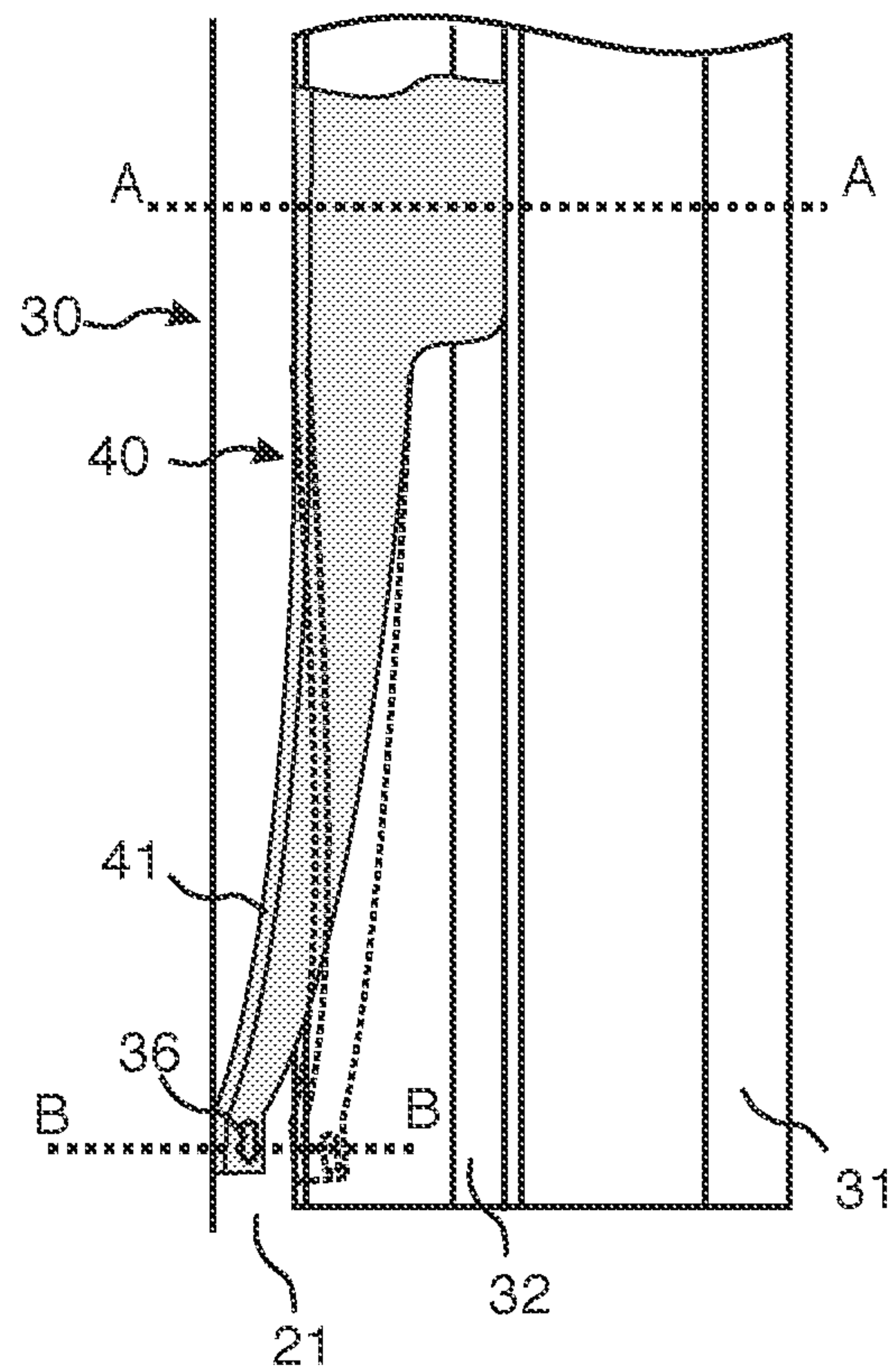


Fig. 4b

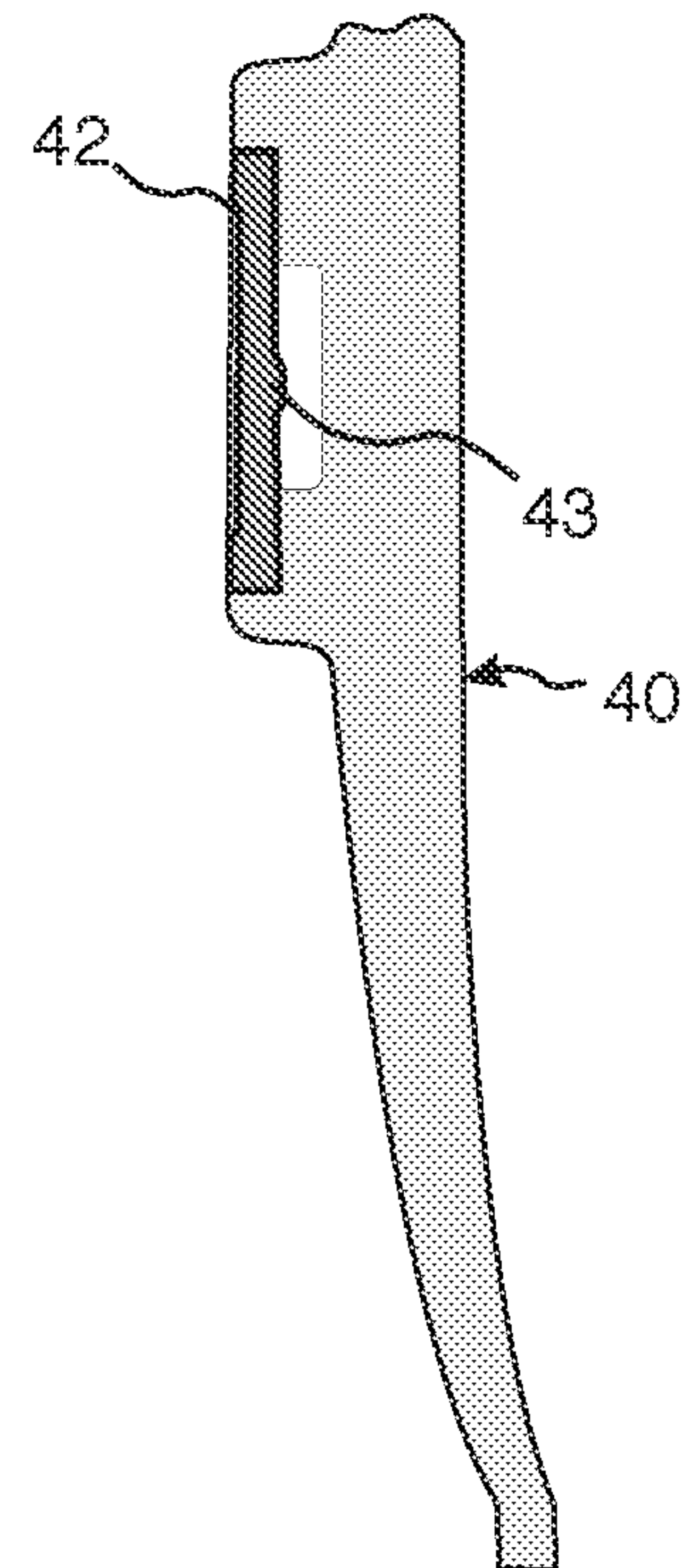


Fig. 4c

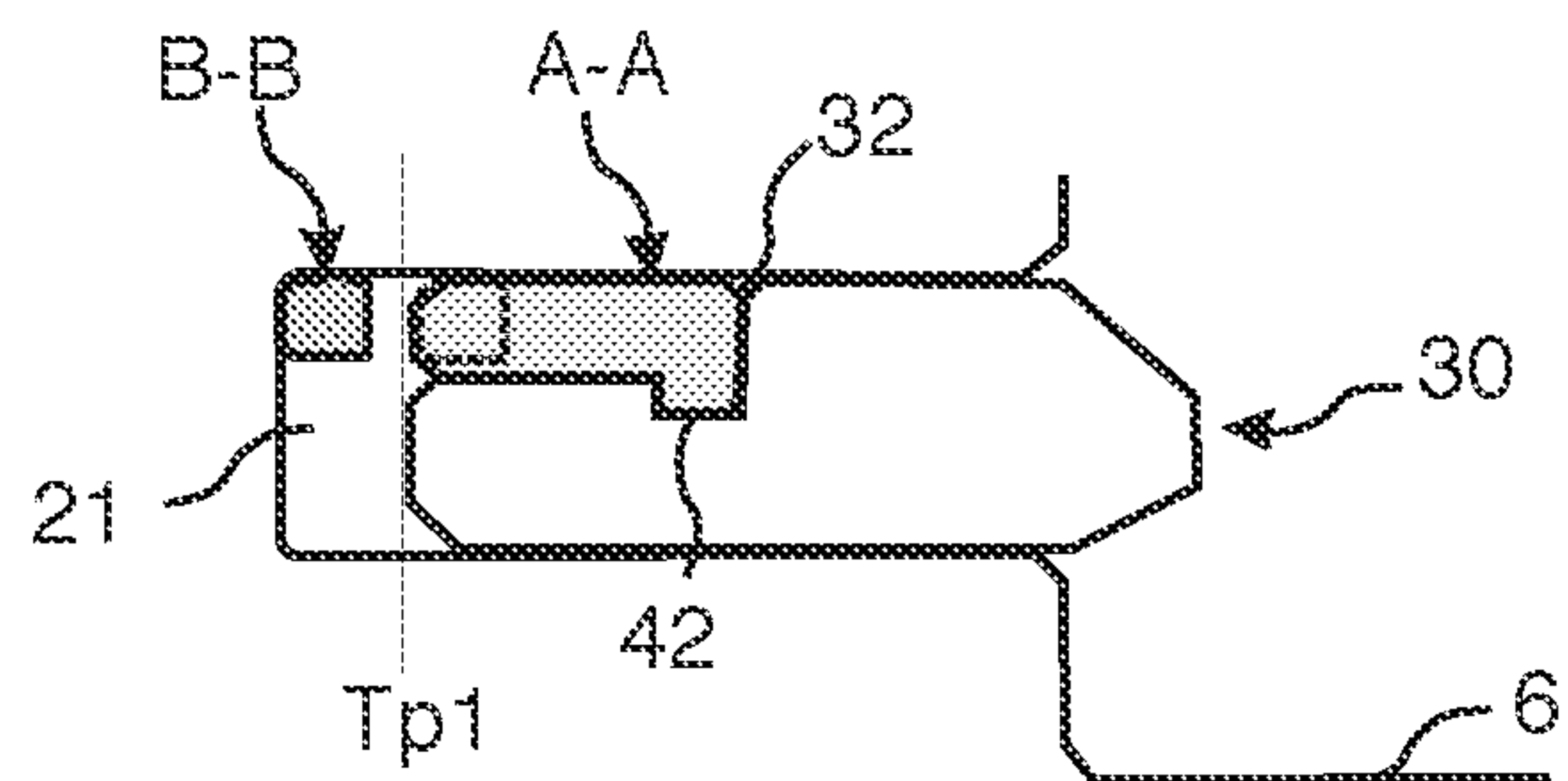
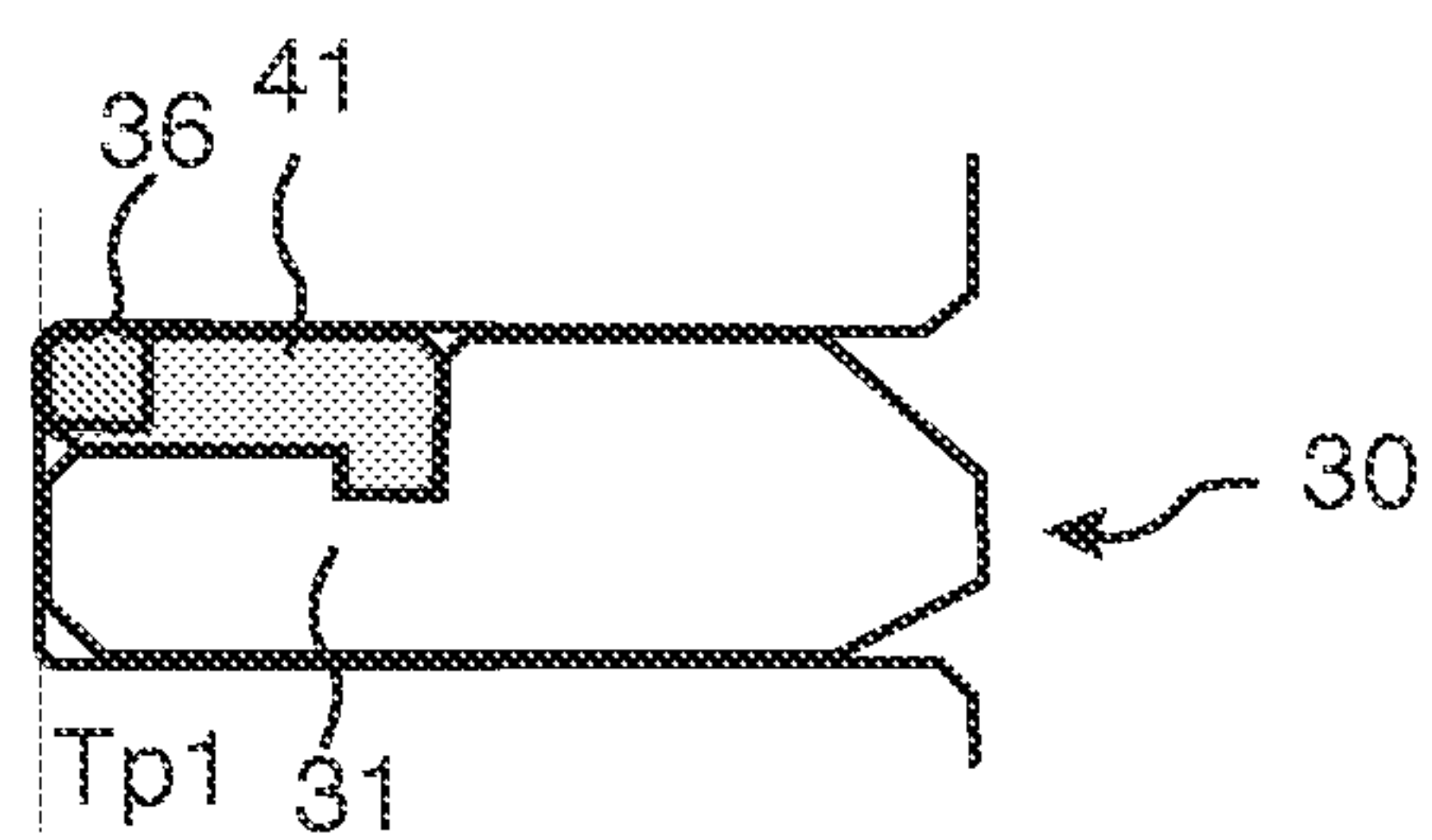


Fig. 4d



5/18

Fig. 5a

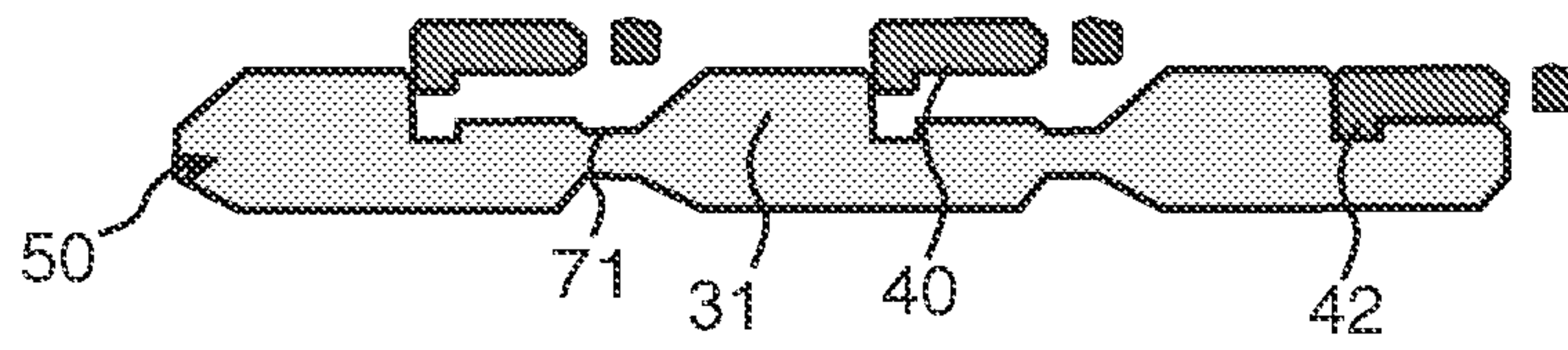


Fig. 5b

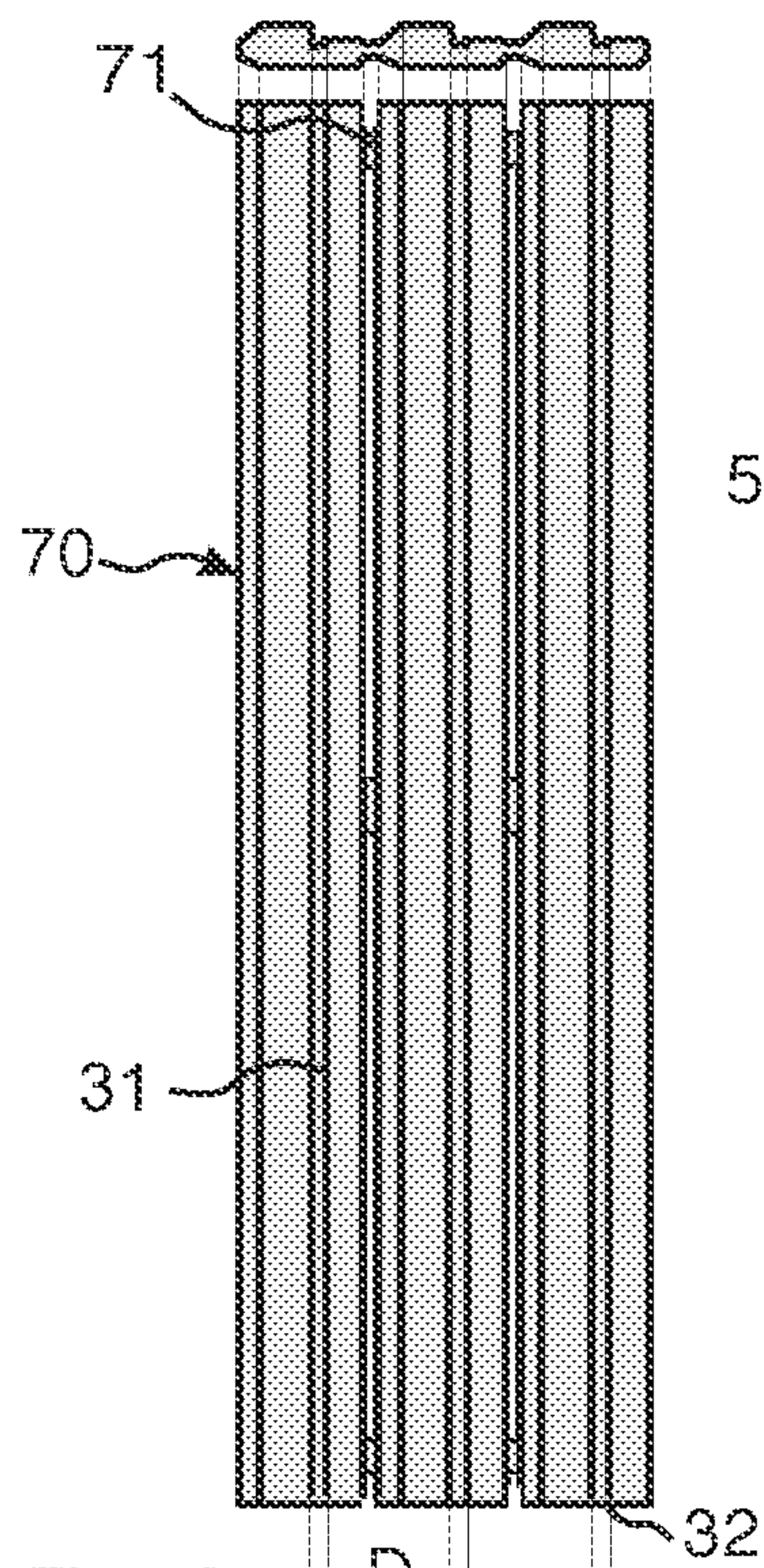


Fig. 5c

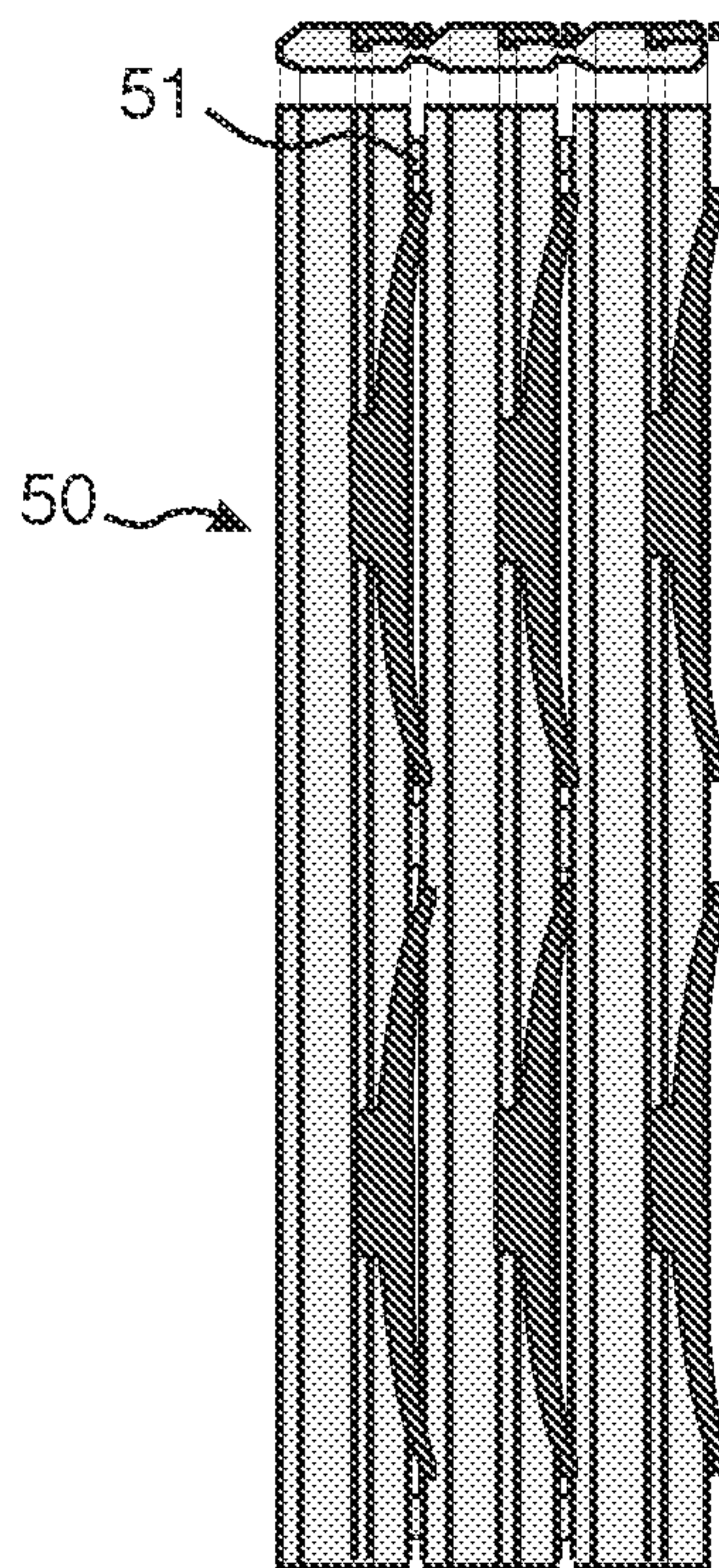


Fig. 5d

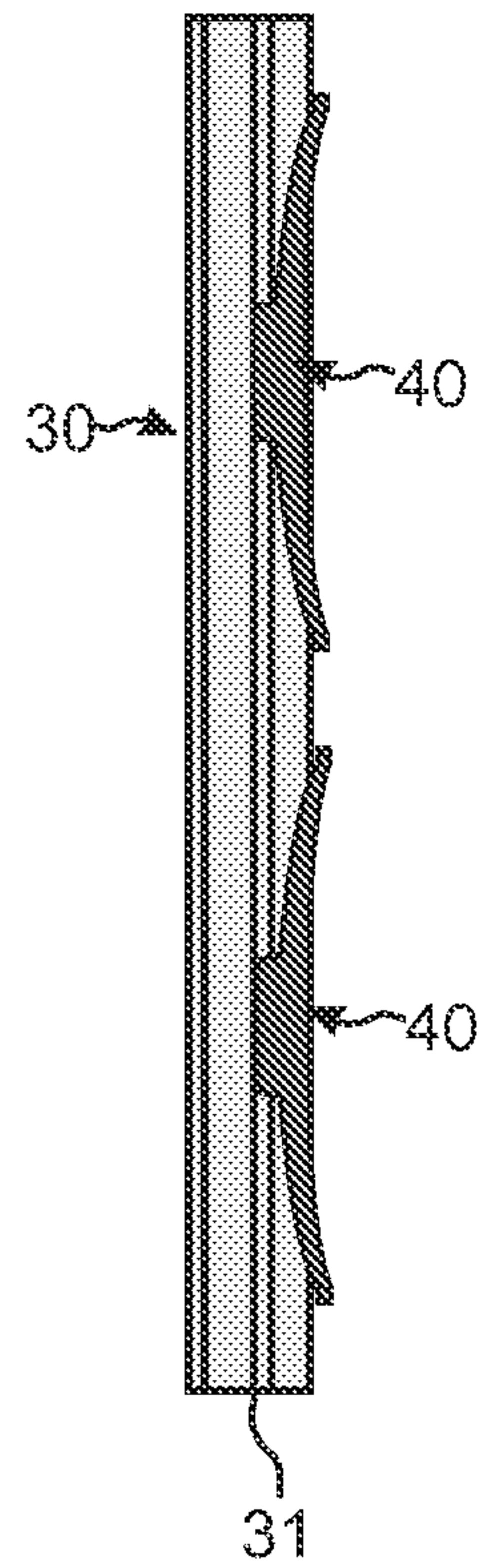


Fig. 5e

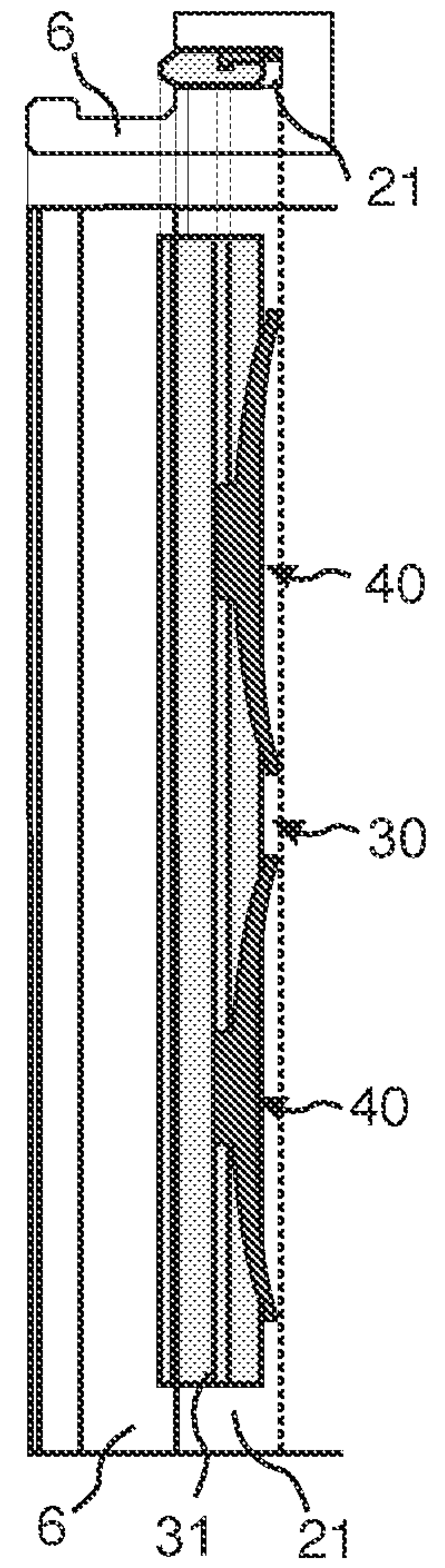


Fig. 5f

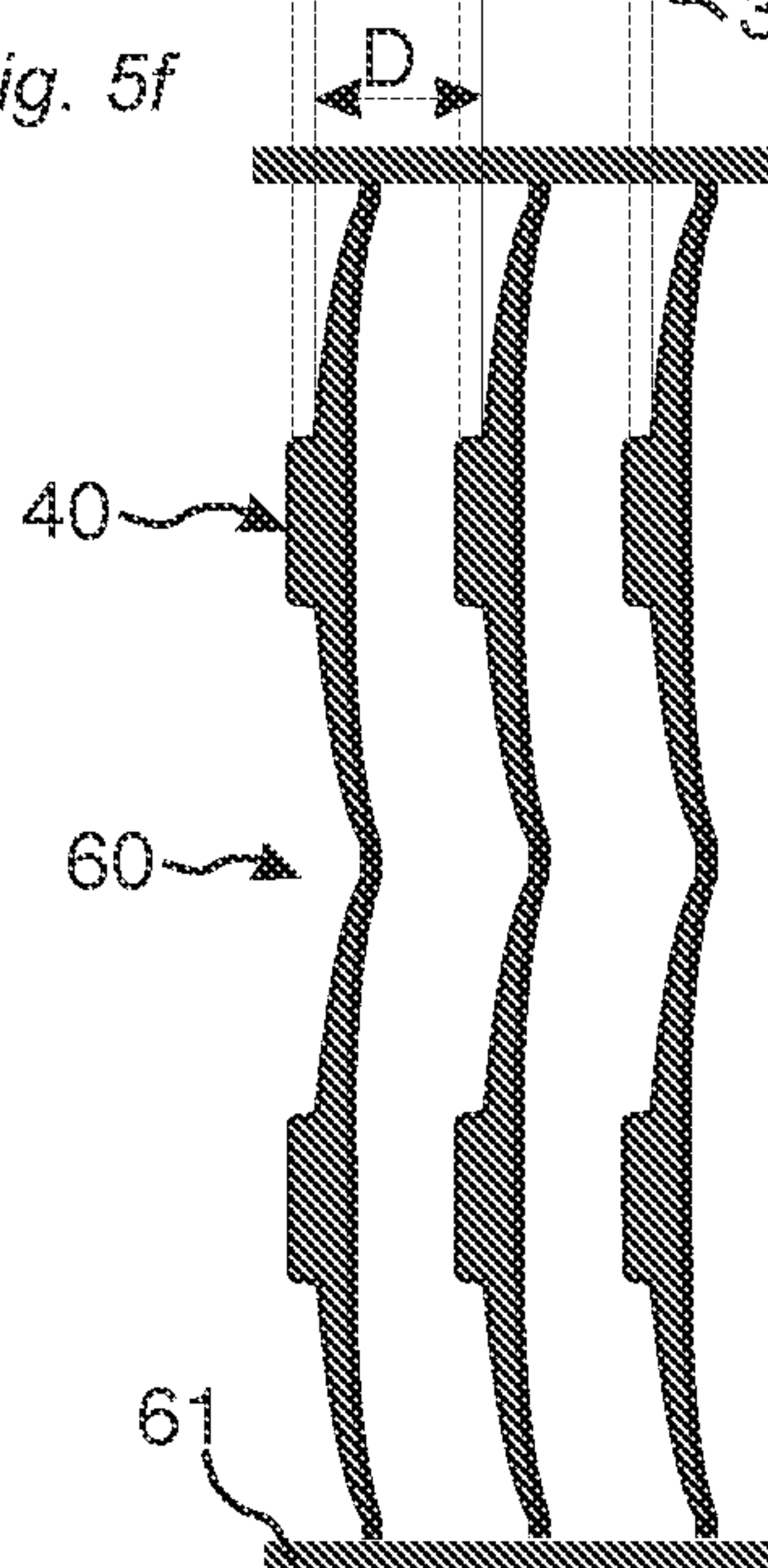
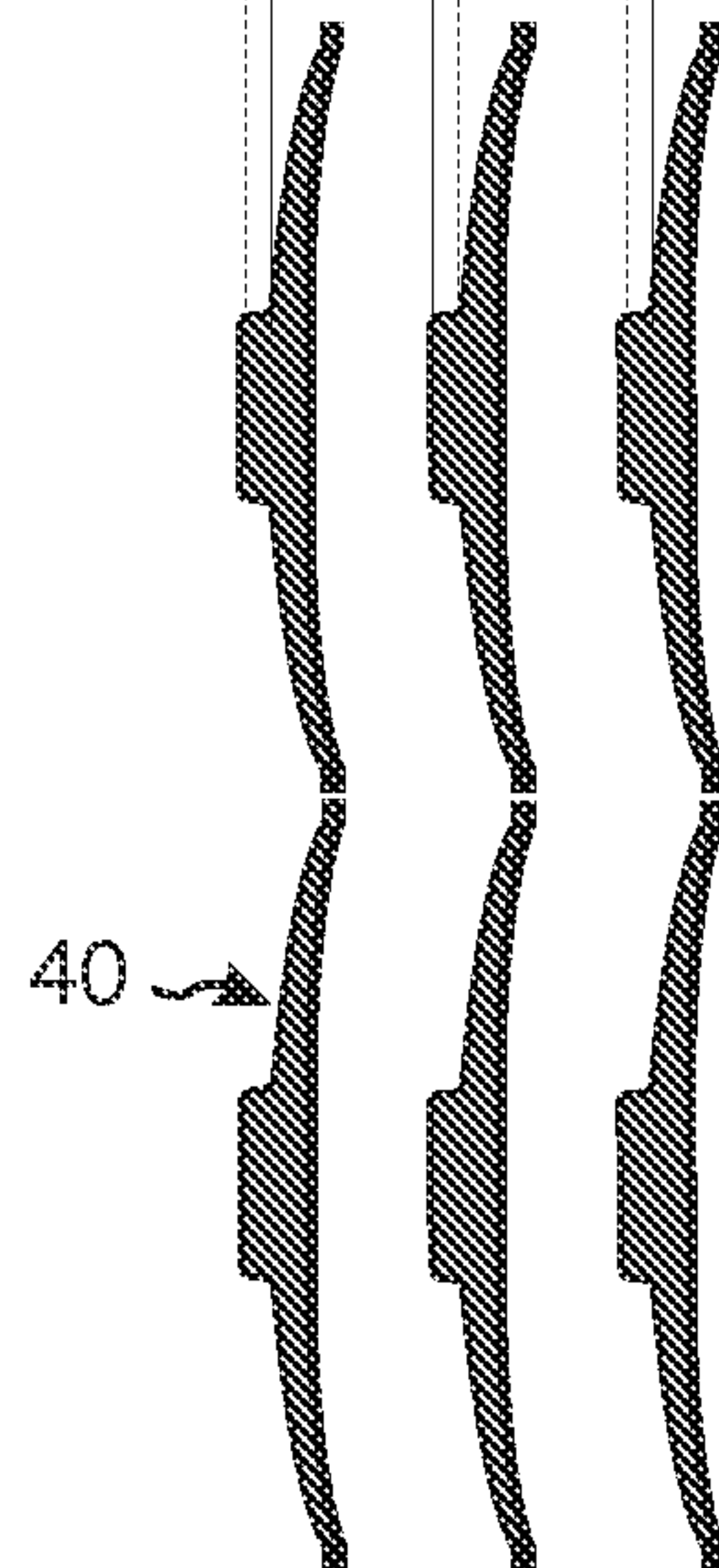


Fig. 5g



6/18

Fig. 6a

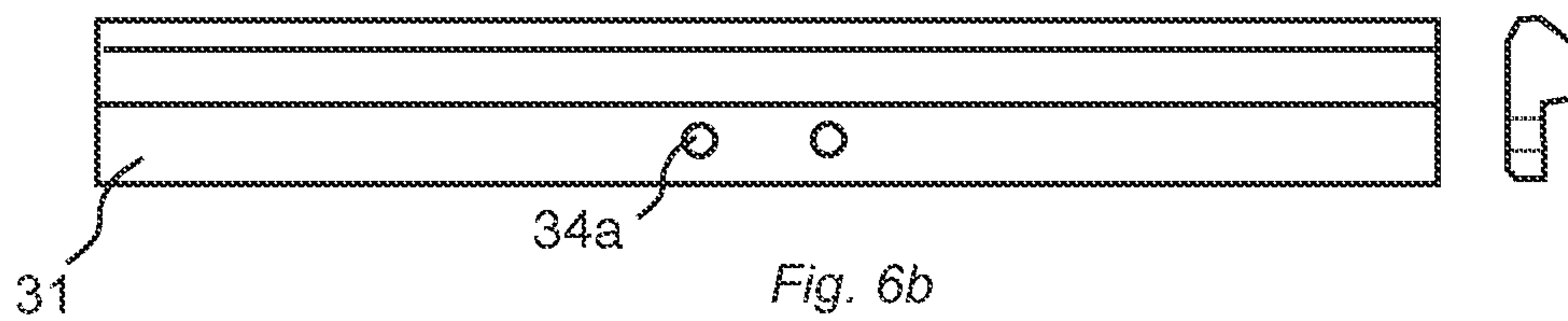


Fig. 6b

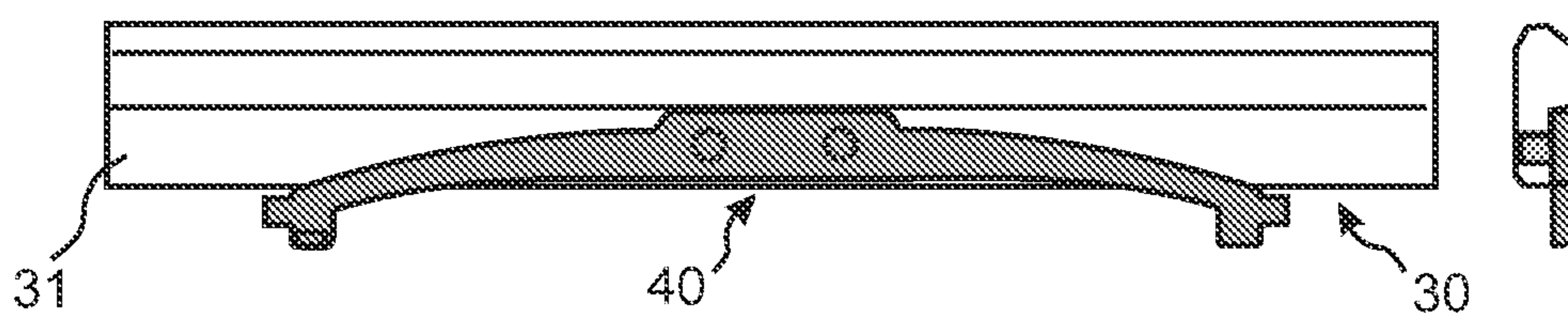


Fig. 6c

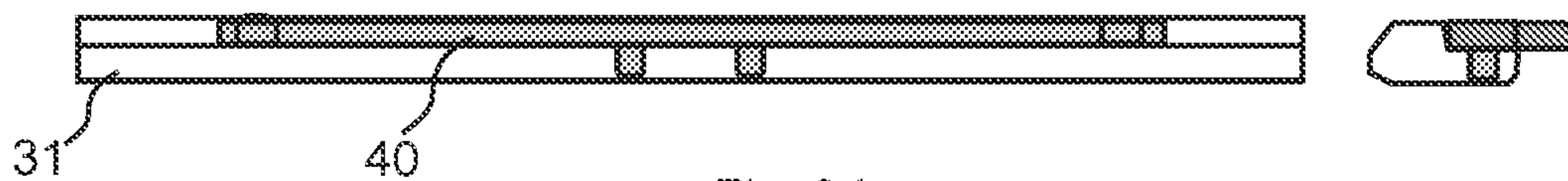


Fig. 6d

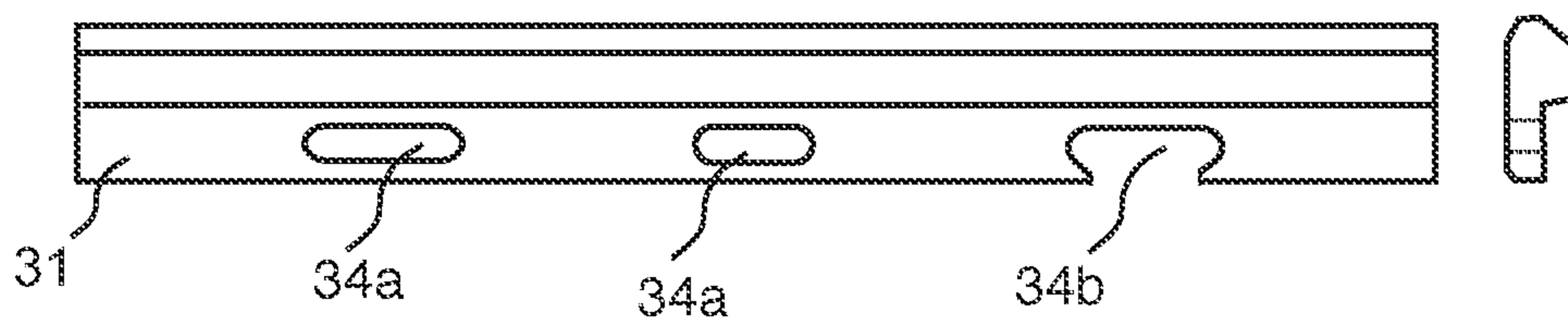
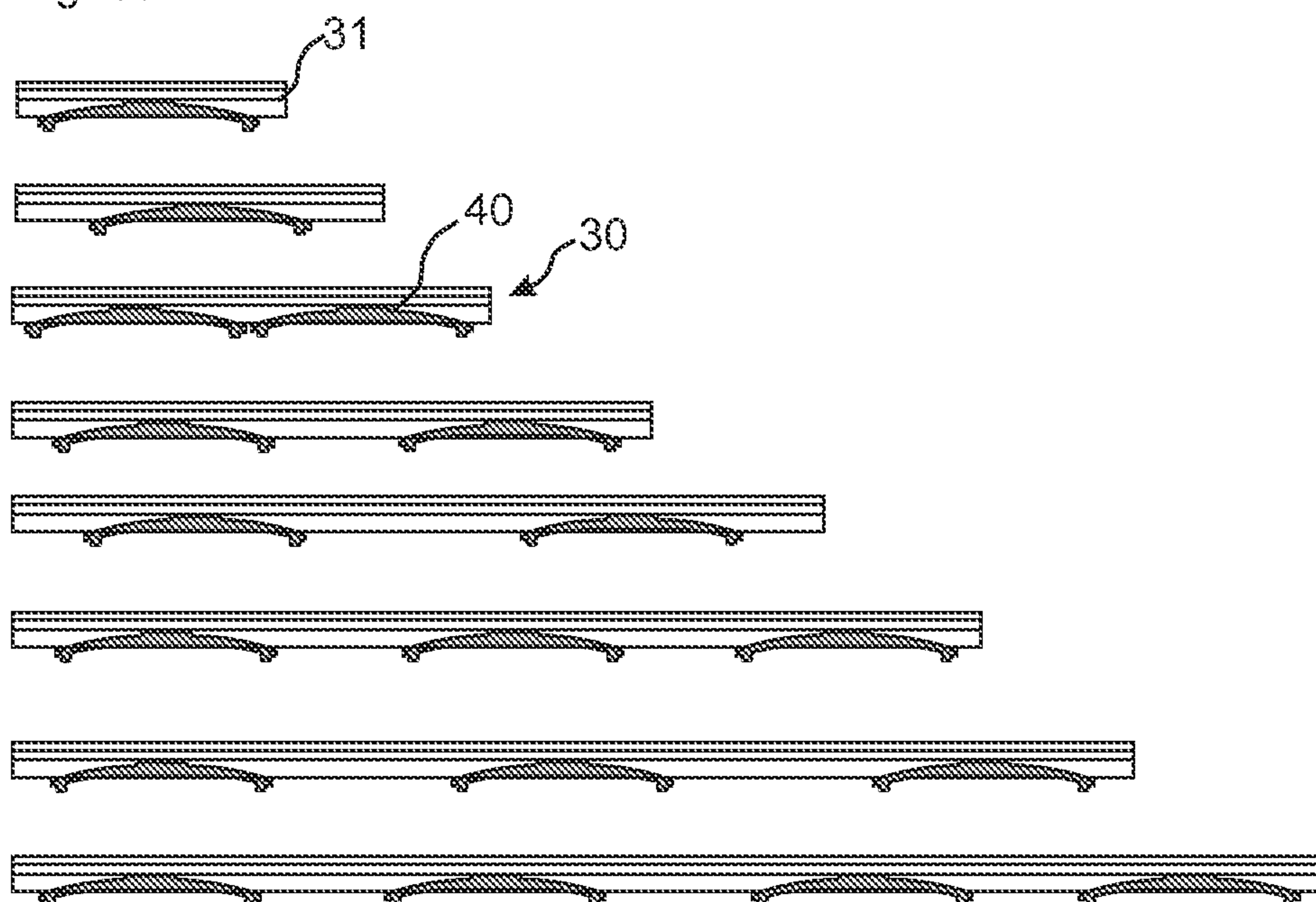


Fig. 6e



7/18

Fig. 7a

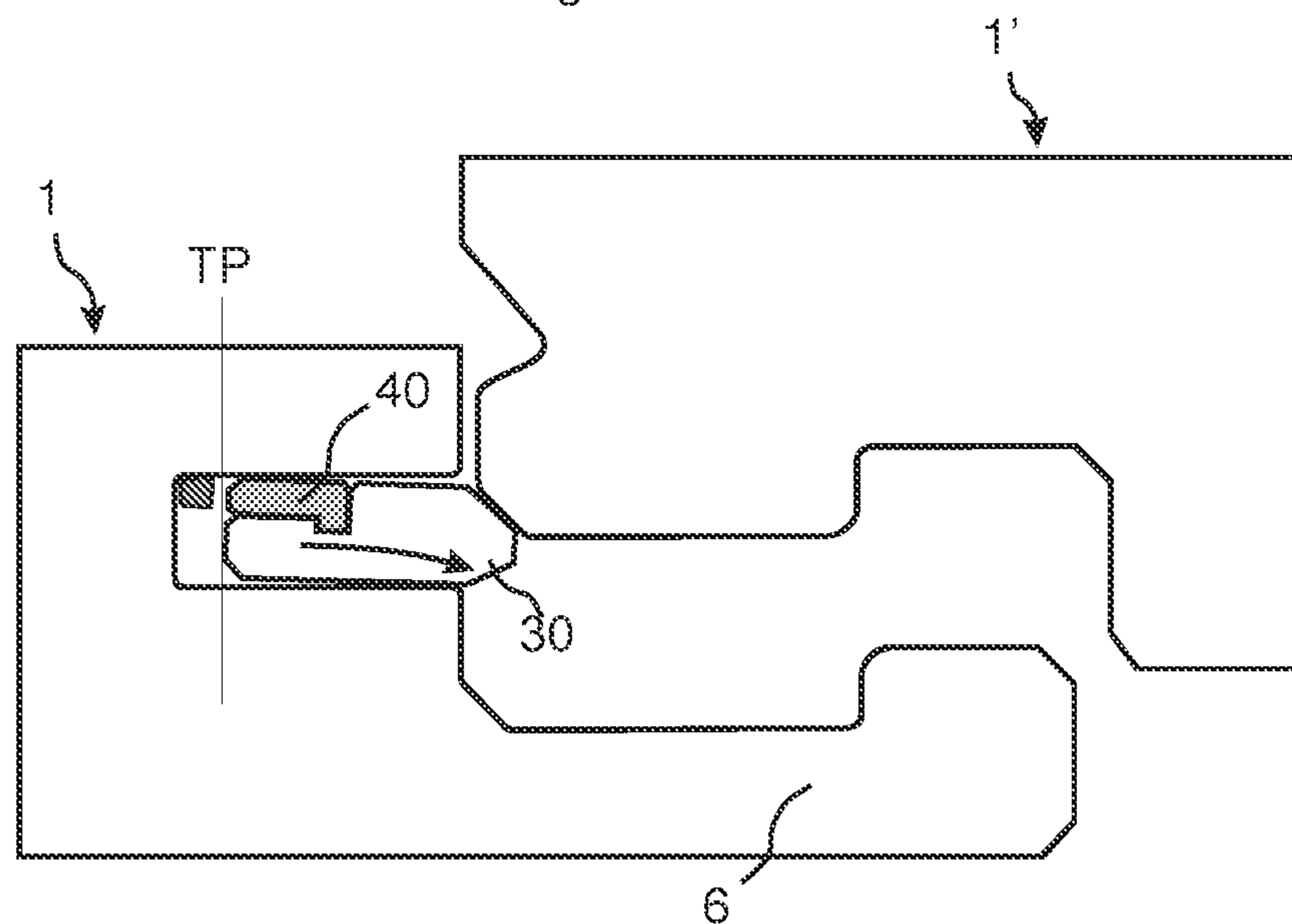


Fig. 7b

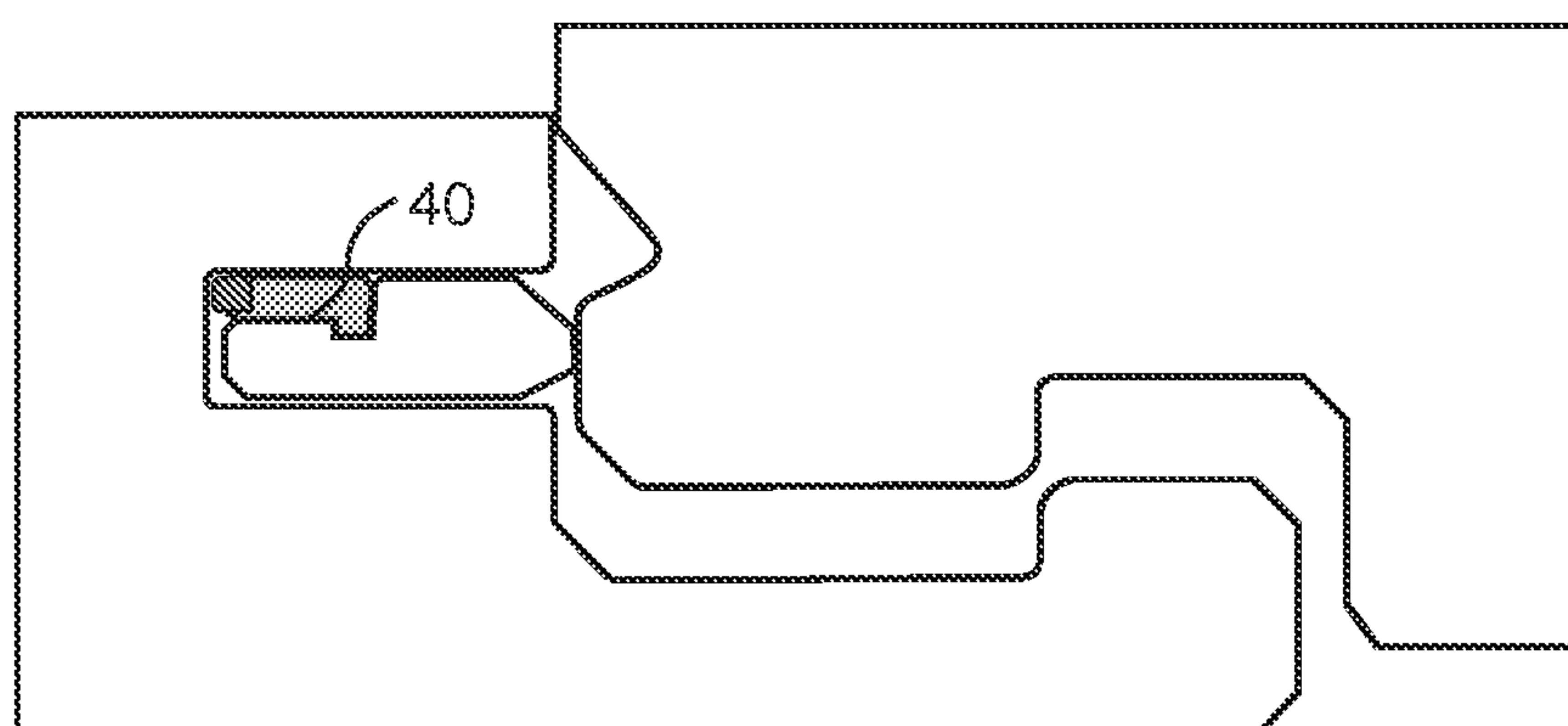
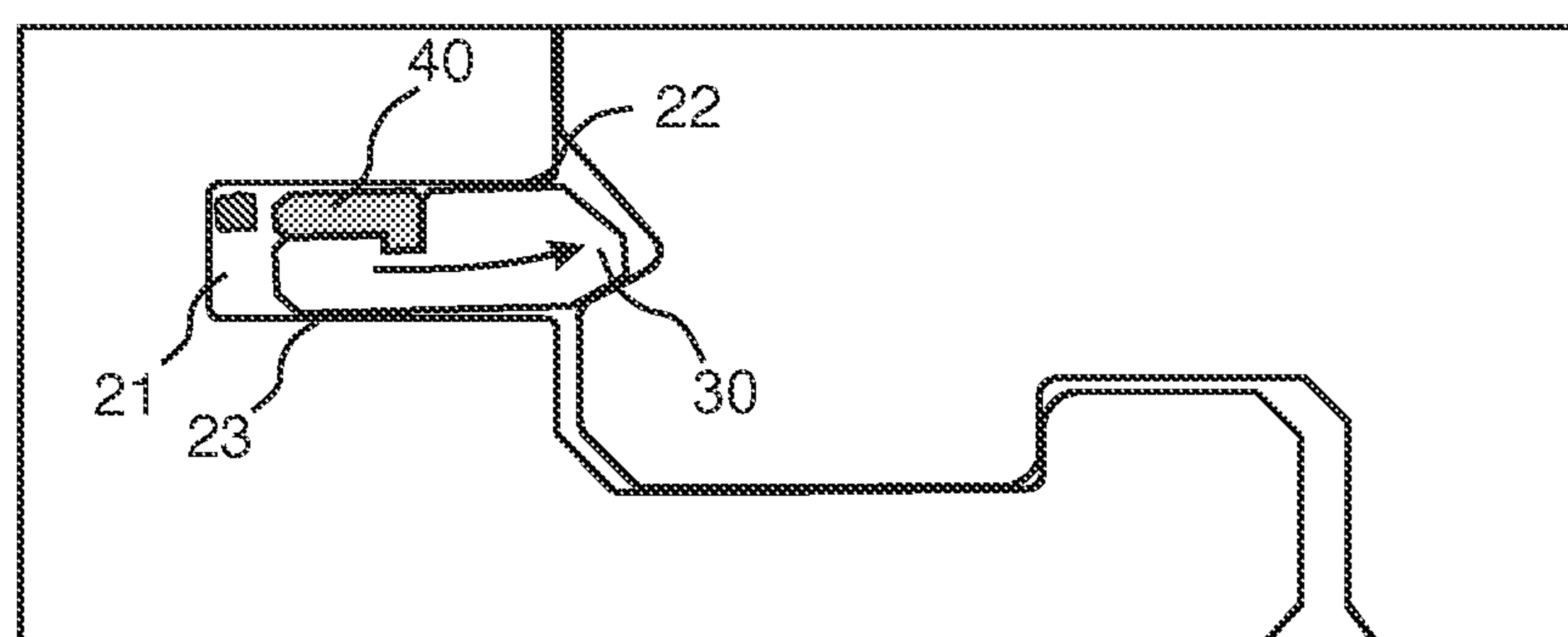


Fig. 7c



8/18

Fig. 8a



Fig. 8b



Fig. 8c

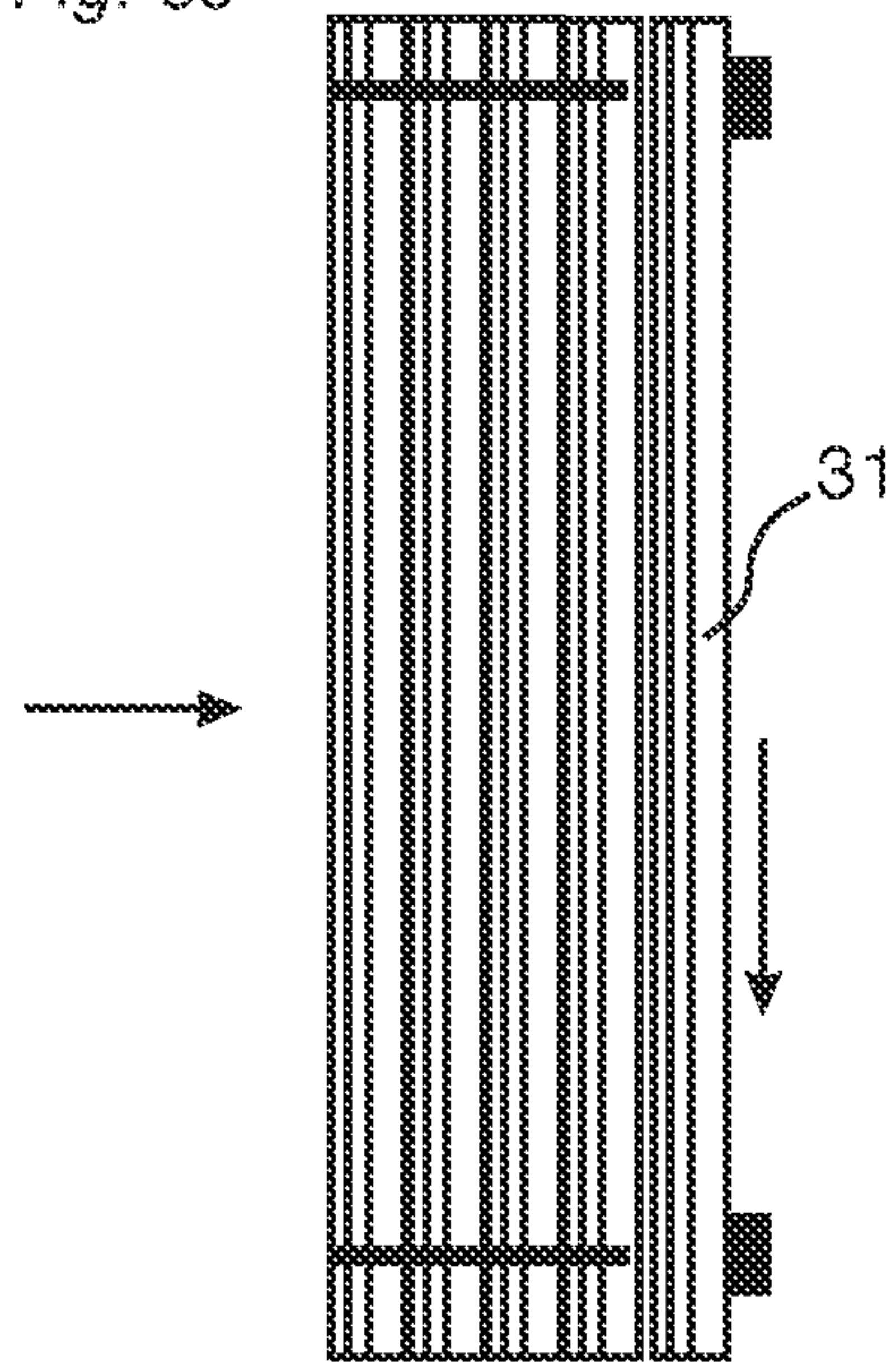


Fig. 8d

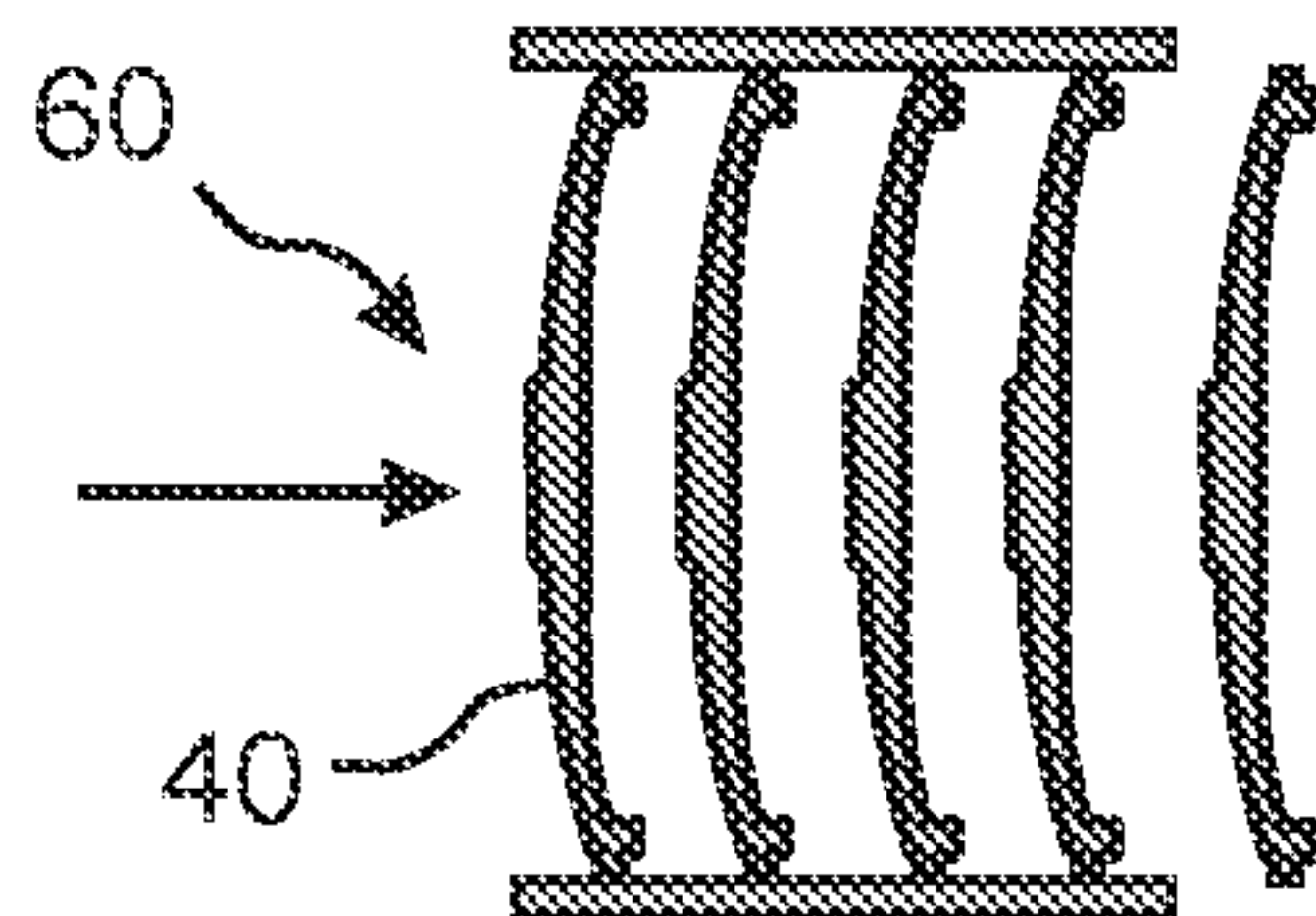


Fig. 8e

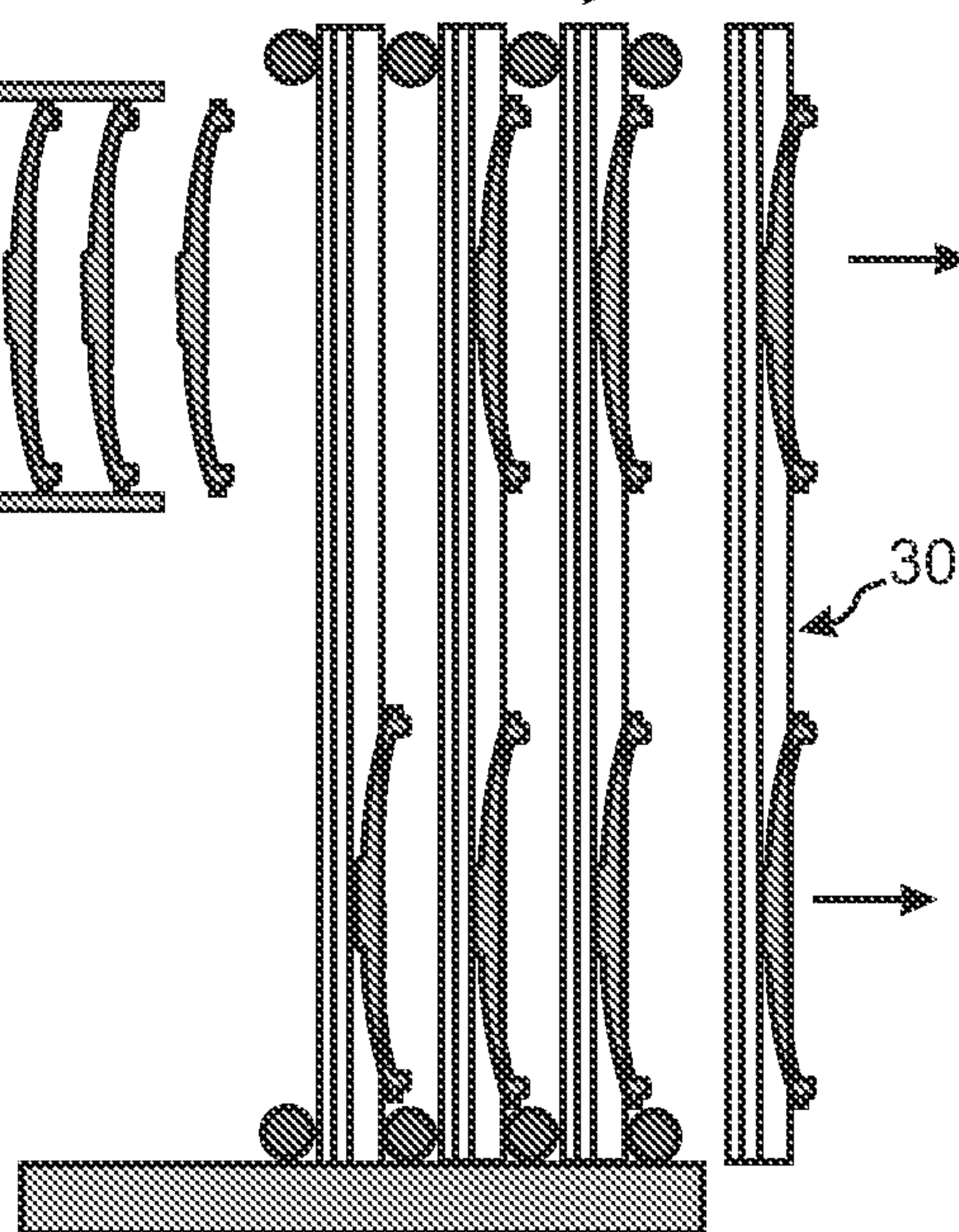
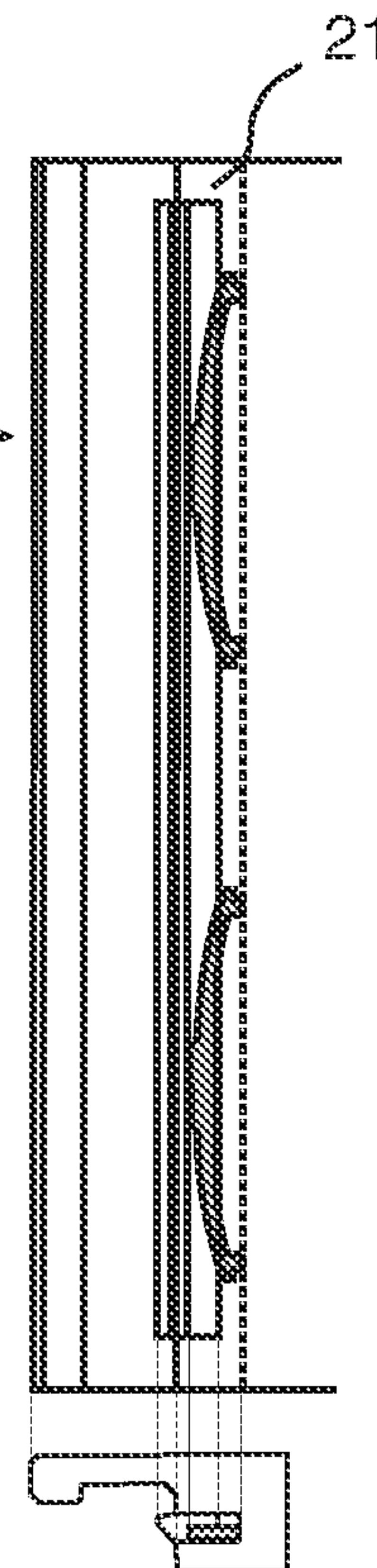


Fig. 8f



9/18

Fig. 9a

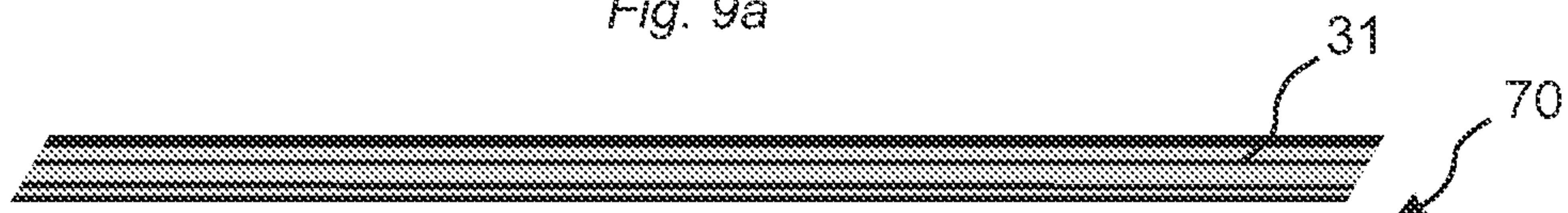


Fig. 9b

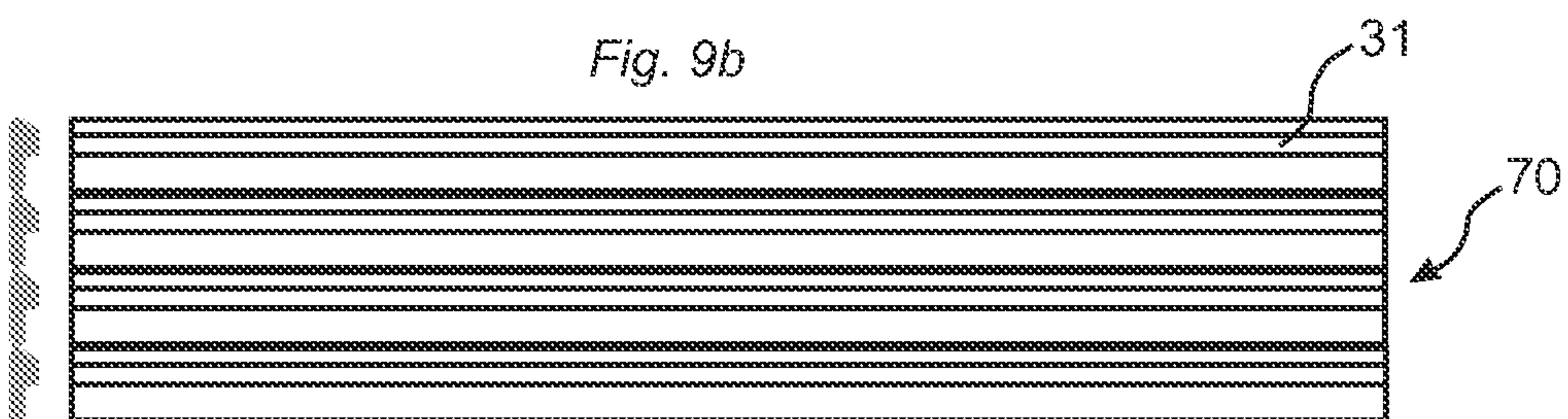


Fig. 9c

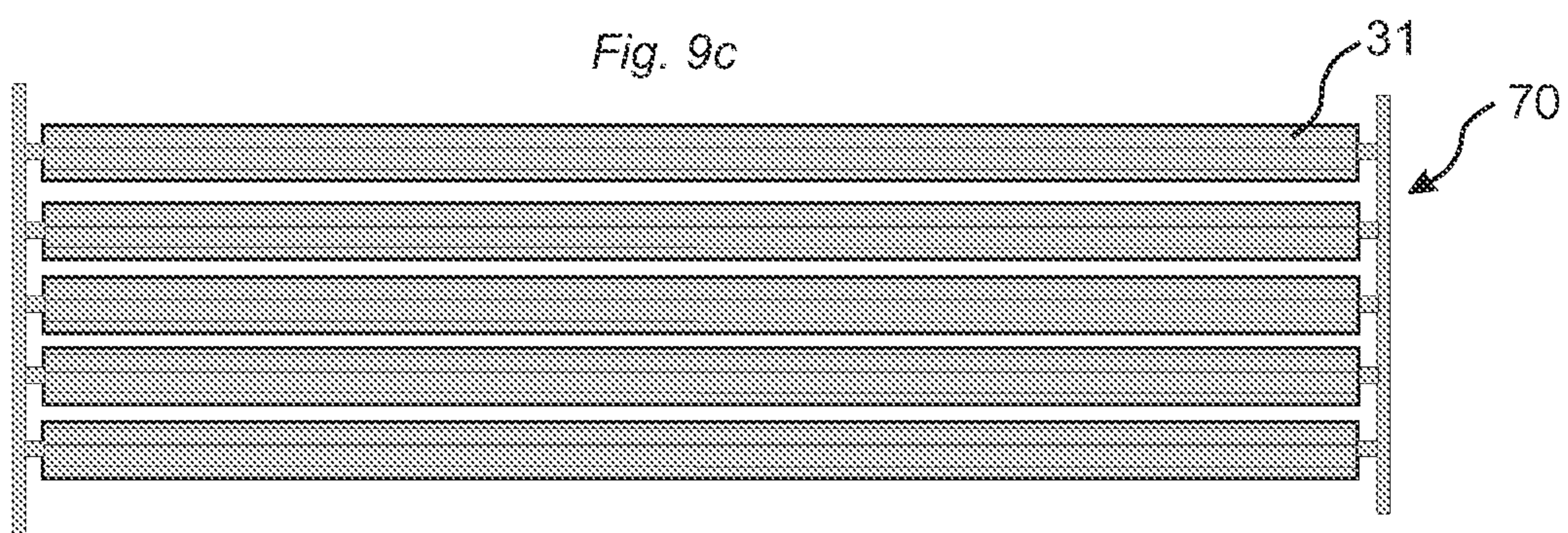


Fig. 9d

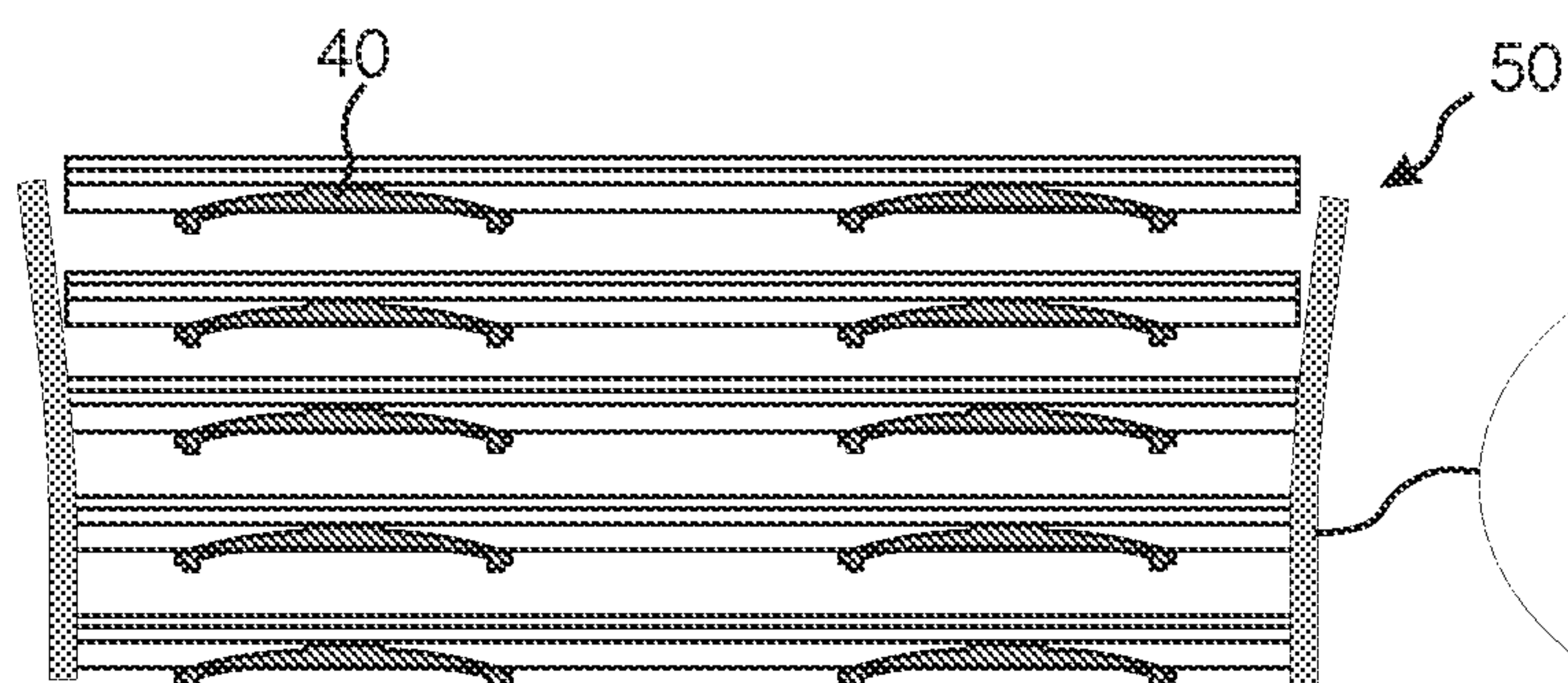


Fig. 9e

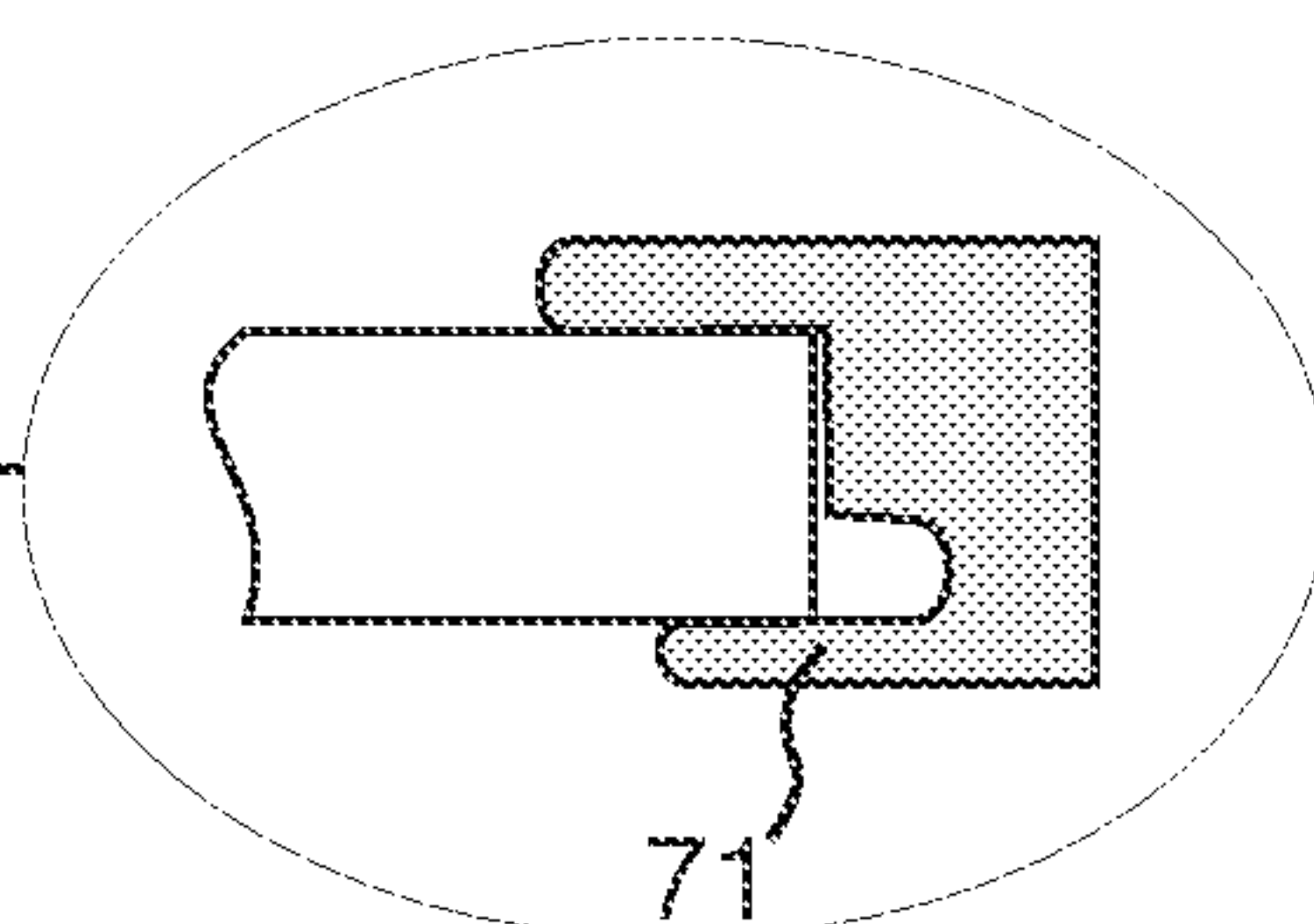


Fig. 9f

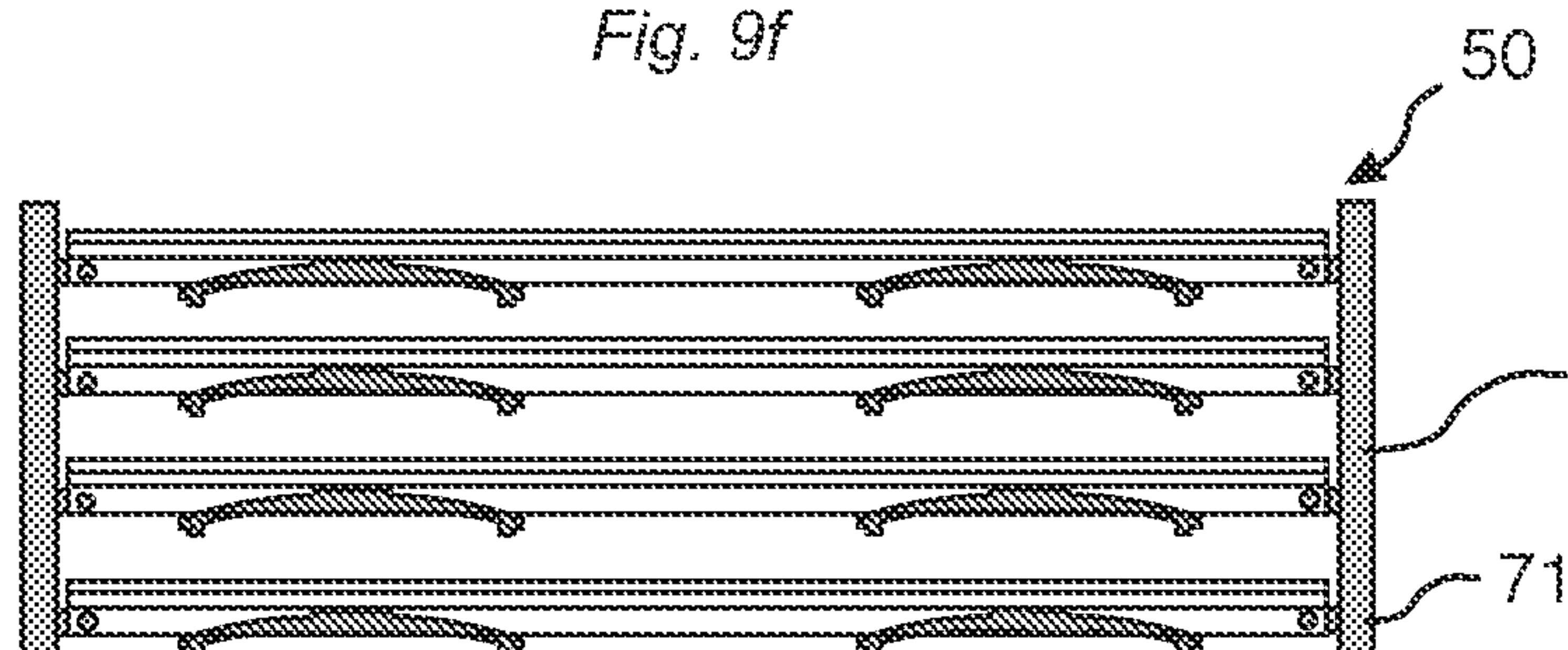
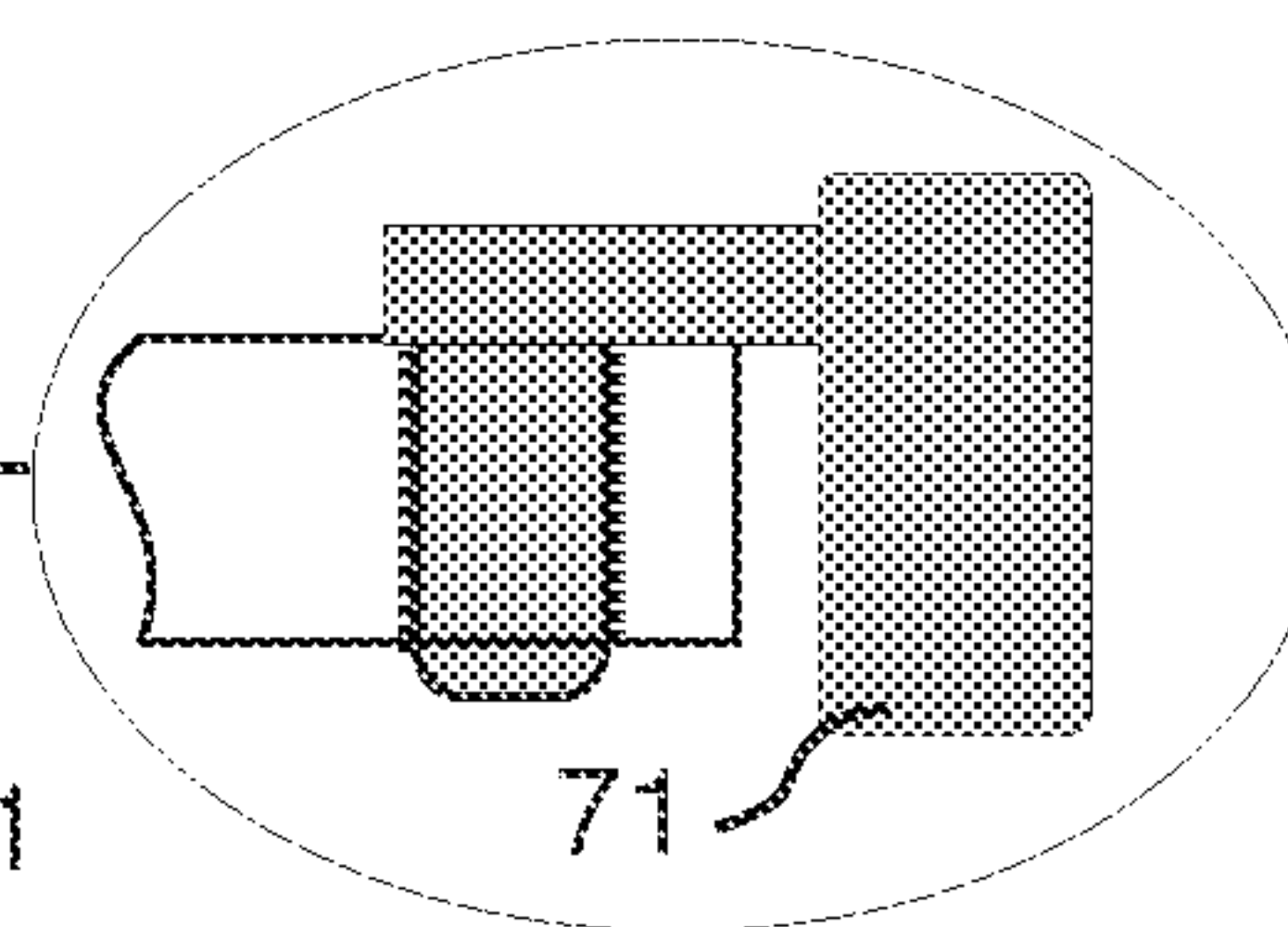


Fig. 9g



10/18

Fig. 10a

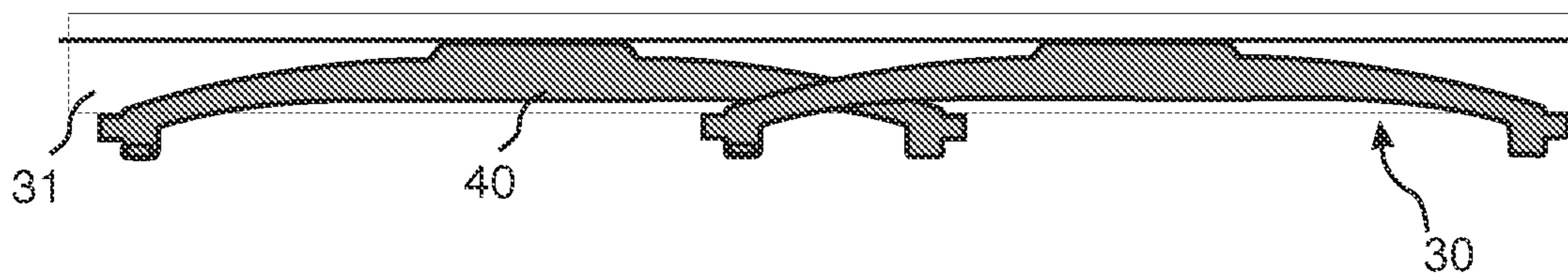


Fig. 10b

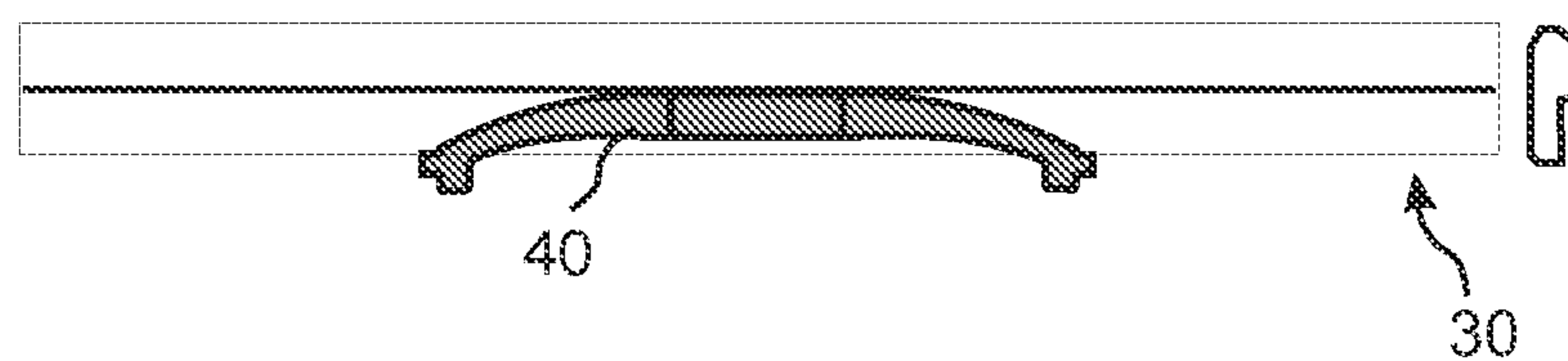


Fig. 10c

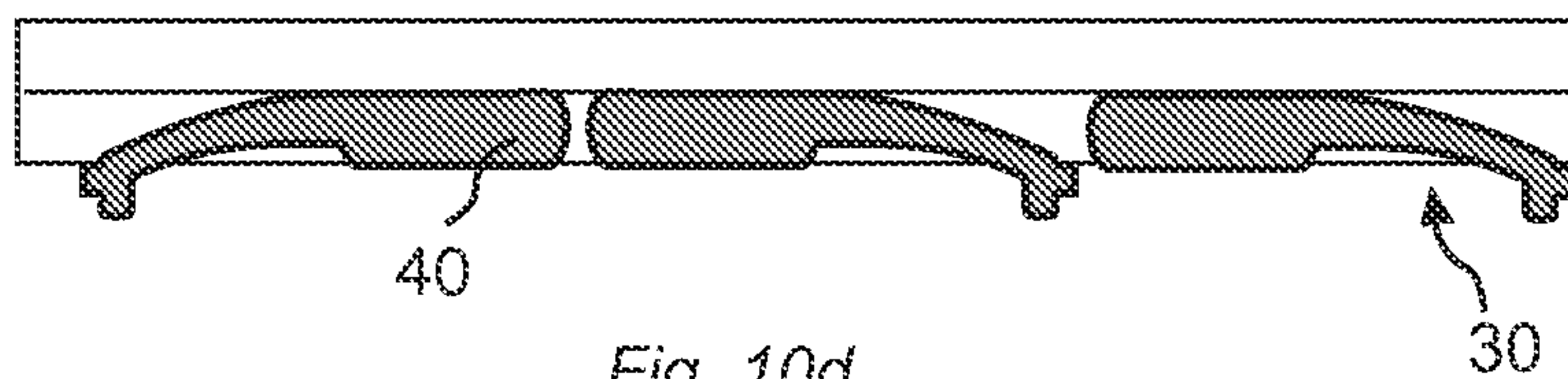


Fig. 10d

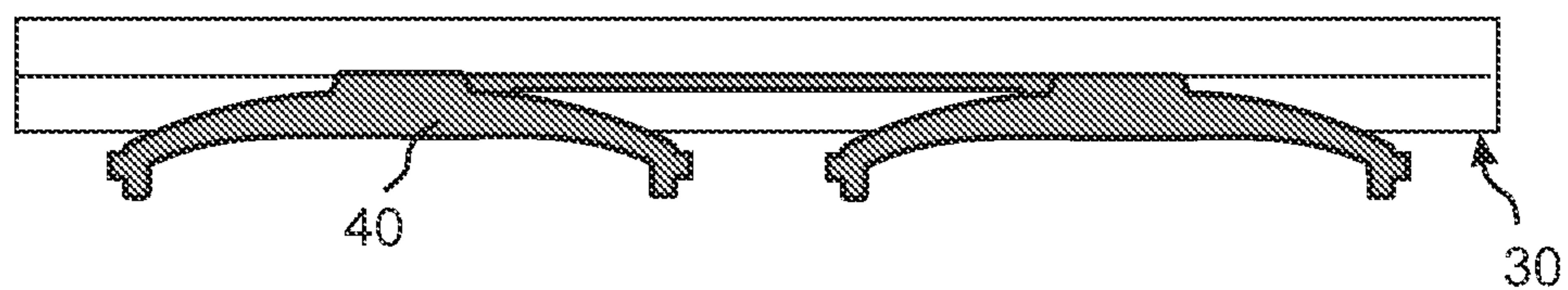


Fig. 10e

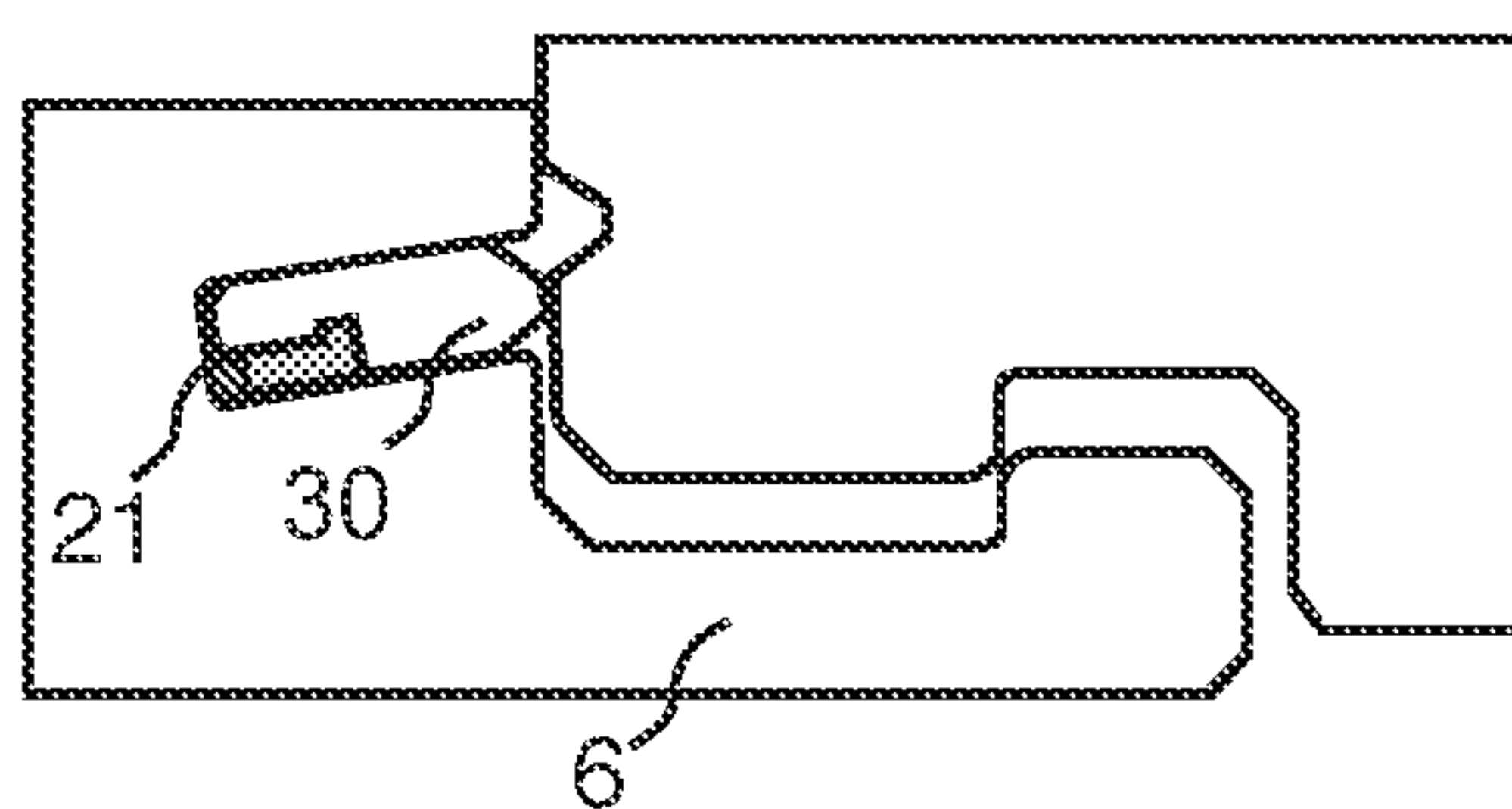


Fig. 10f

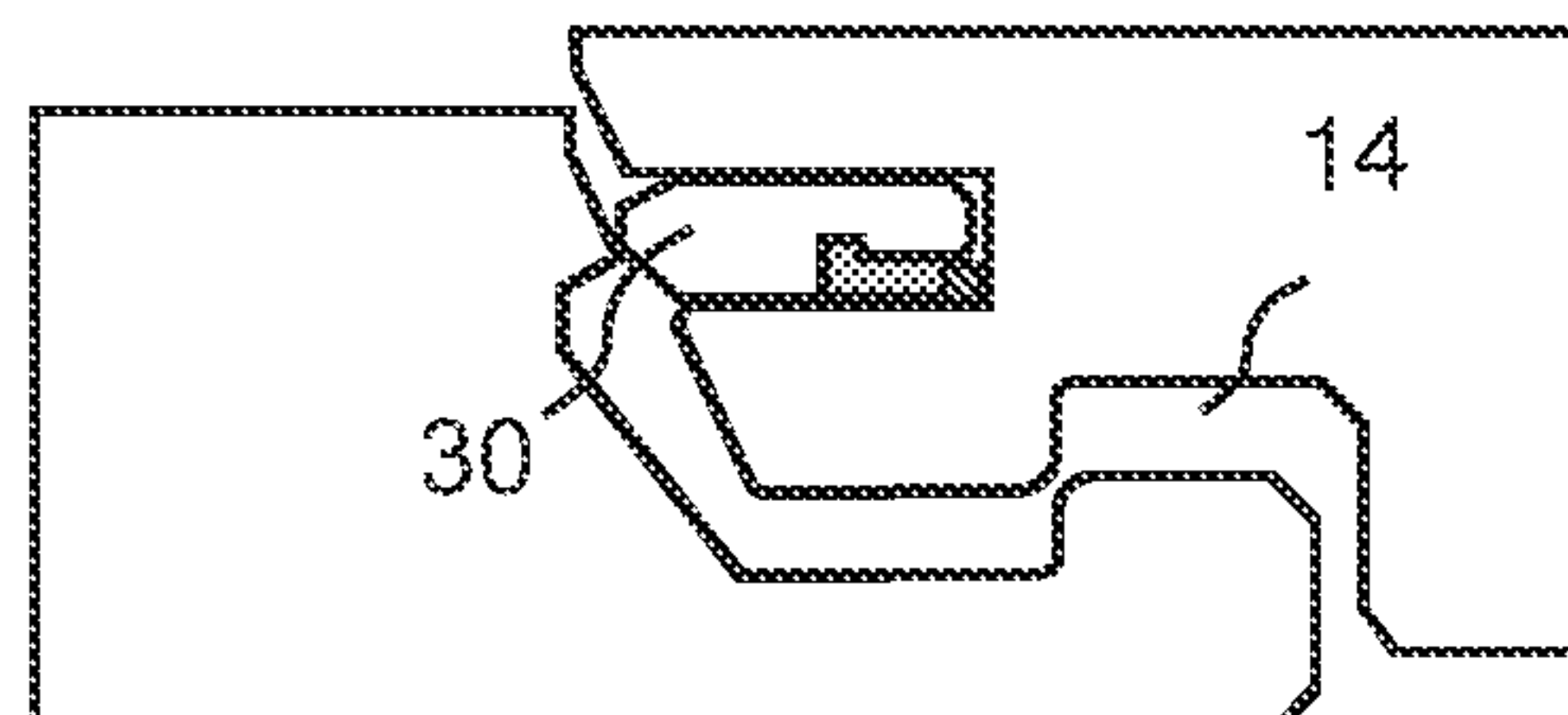
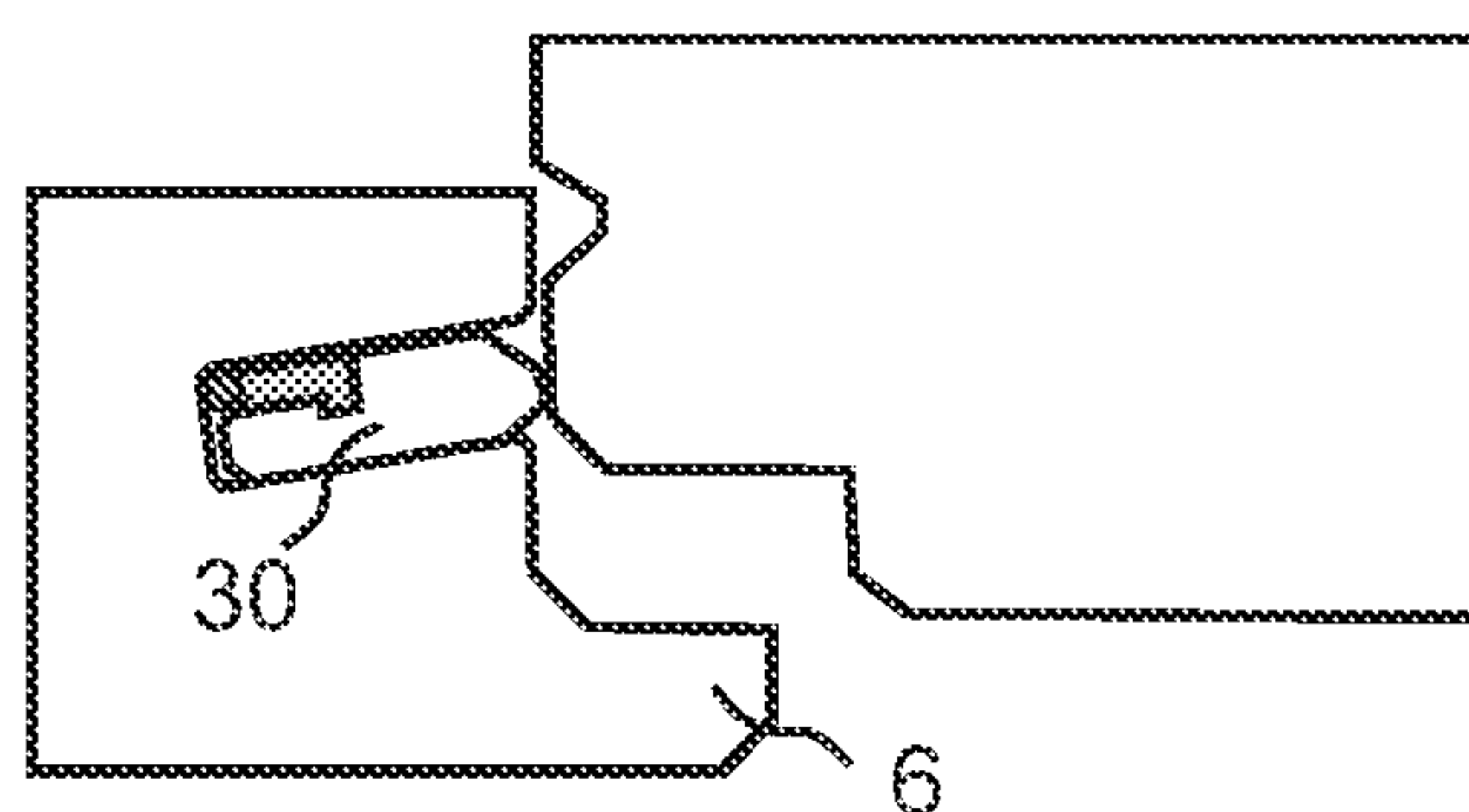


Fig. 10g



11/18

Fig. 11a

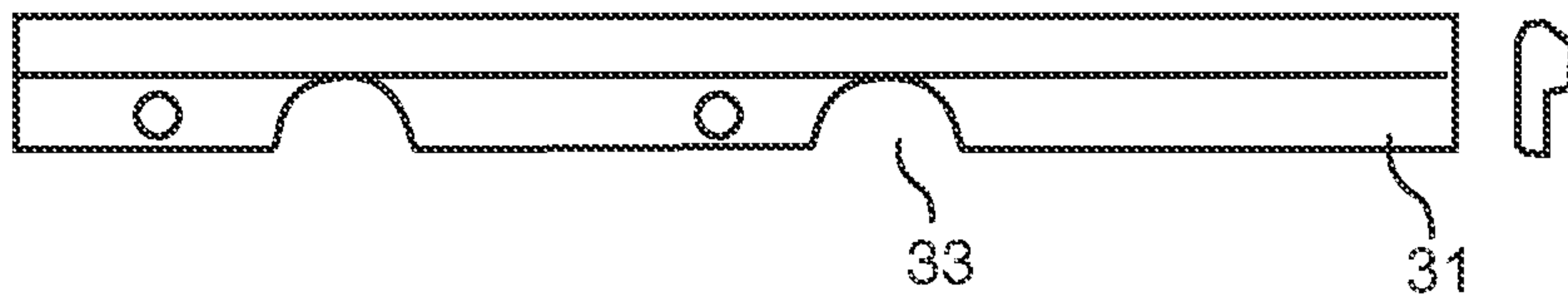


Fig. 11b

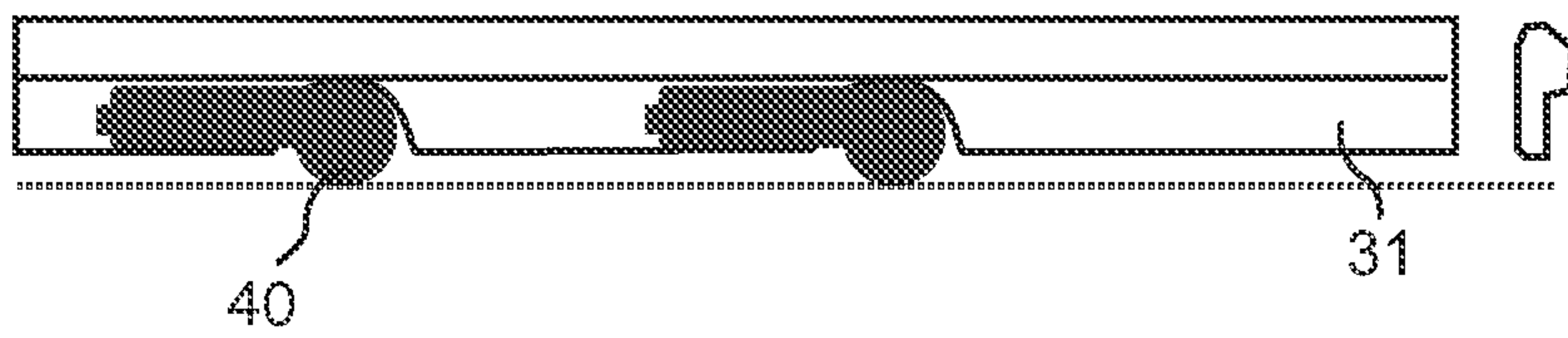


Fig. 11c

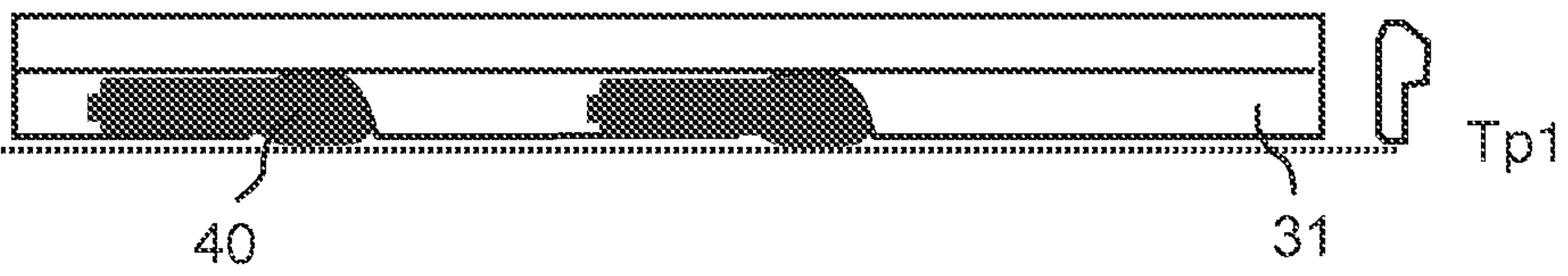


Fig. 11d

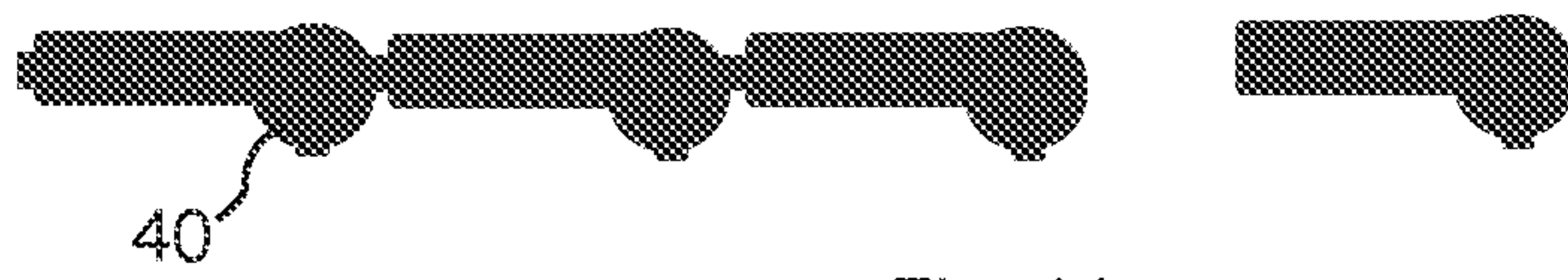


Fig. 11e



Fig. 11f

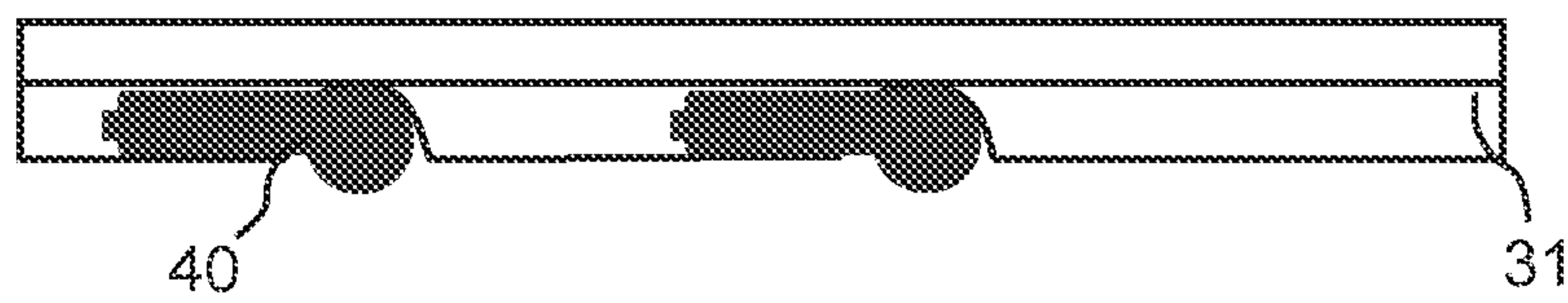
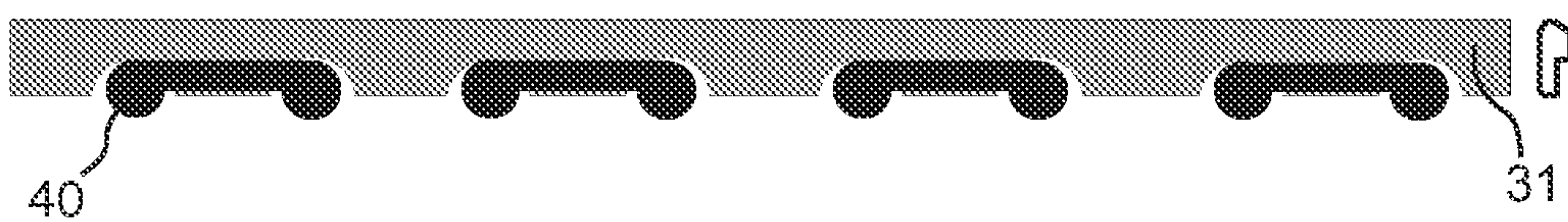


Fig. 11g



12/18

Fig. 12a

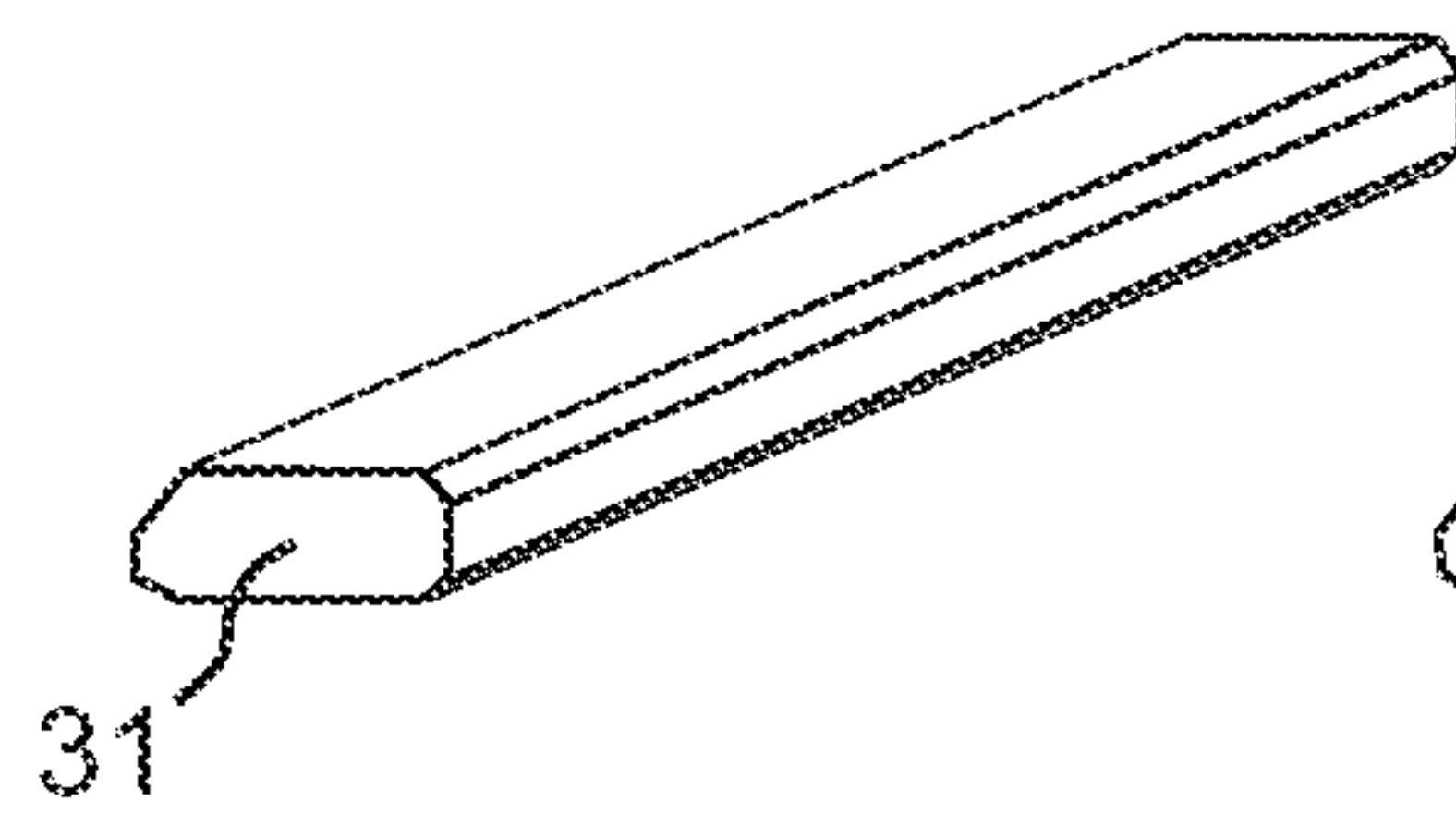


Fig. 12b

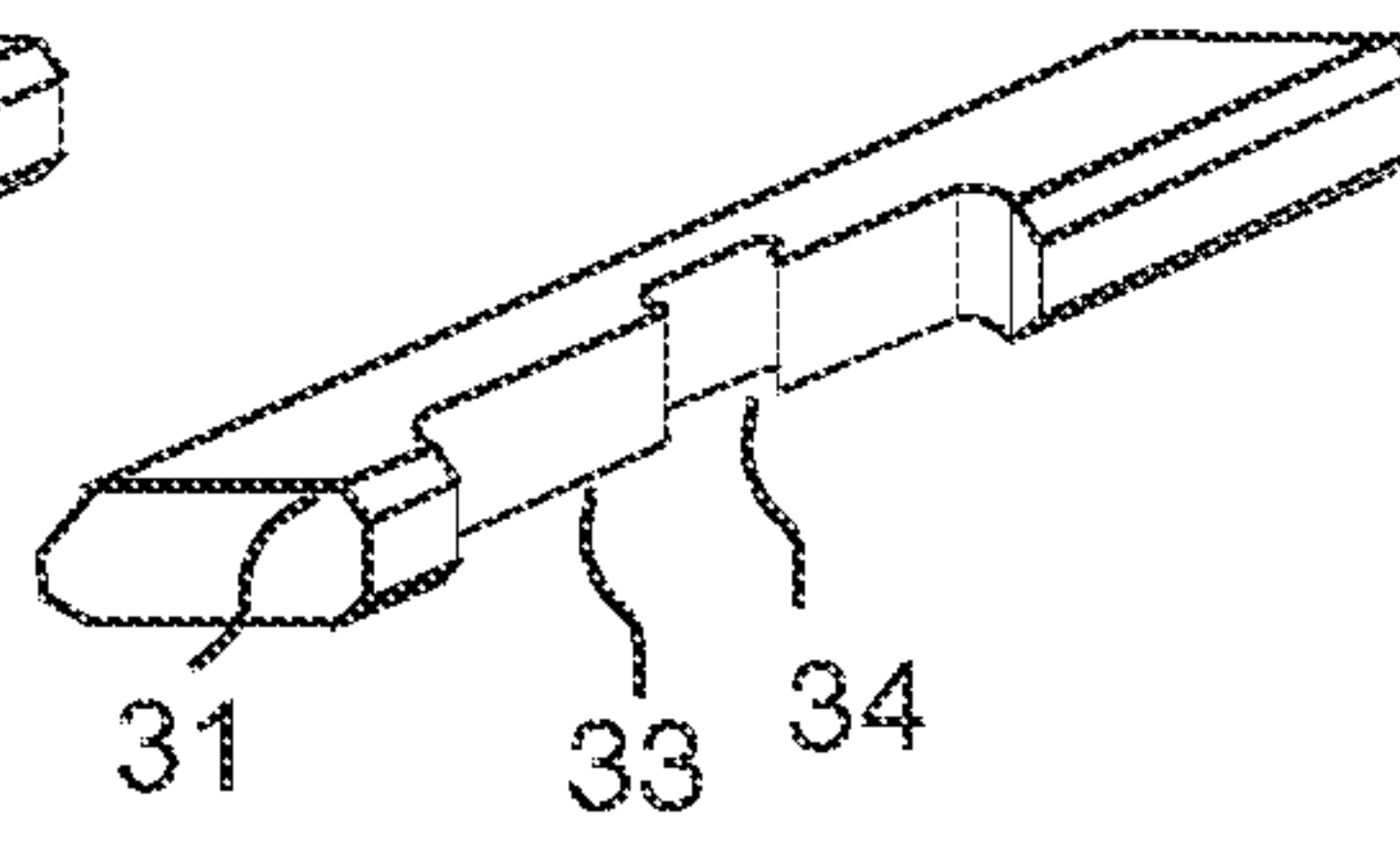


Fig. 12c

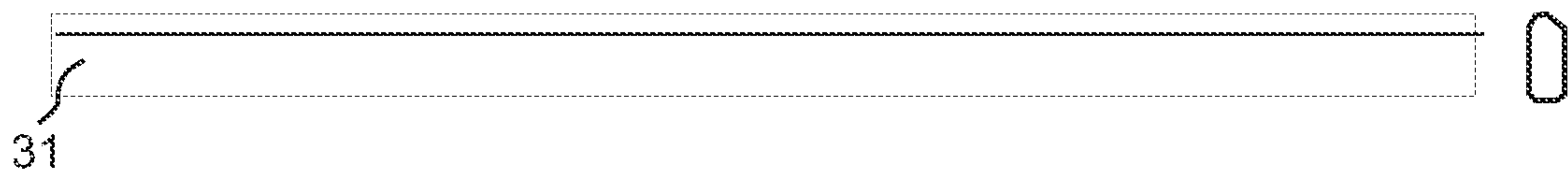


Fig. 12d

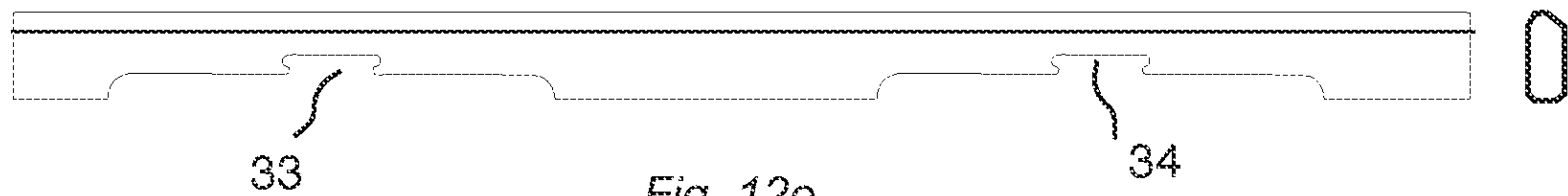


Fig. 12e

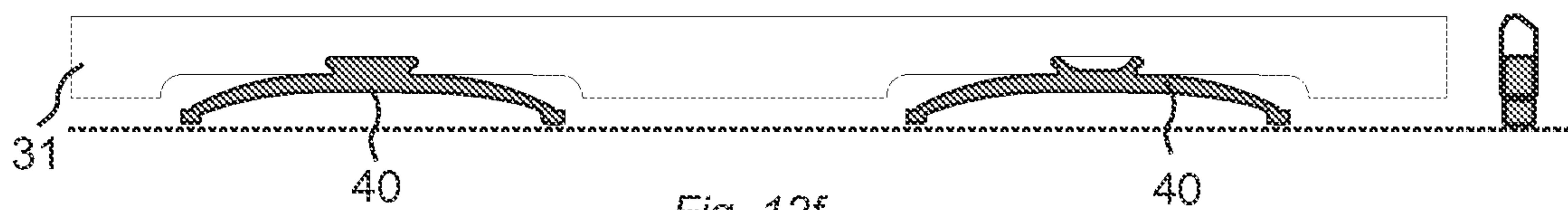


Fig. 12f

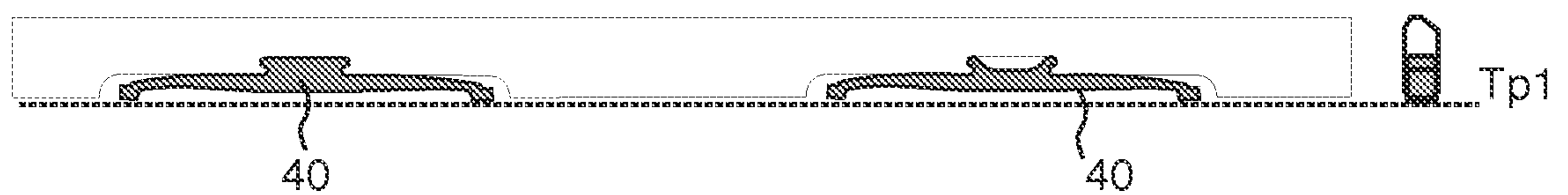


Fig. 12g

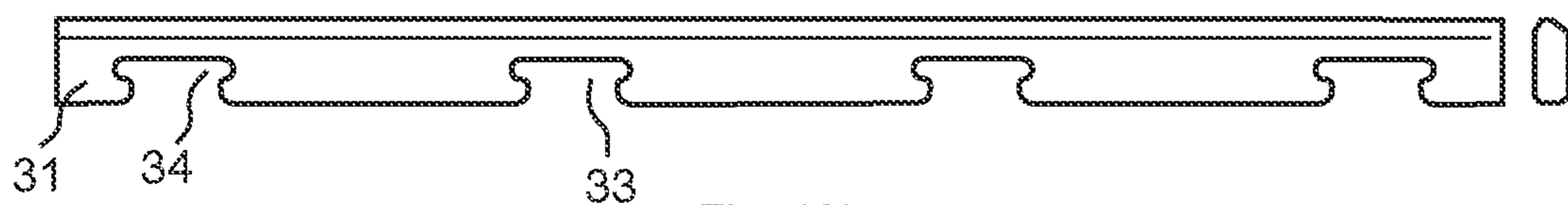


Fig. 12h

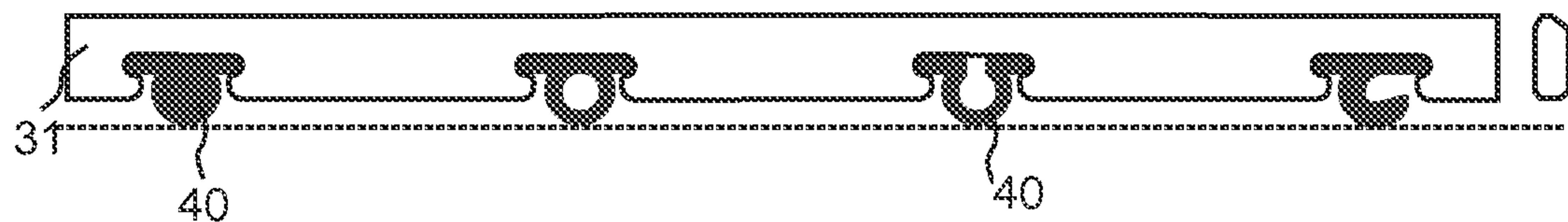
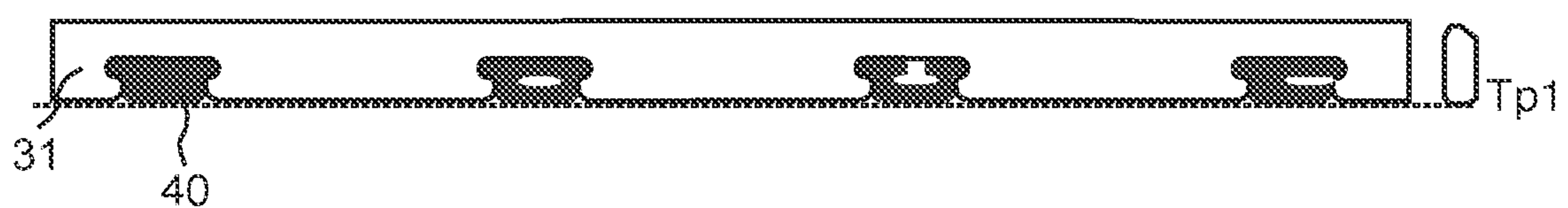


Fig. 12i



13/18

Fig. 13a

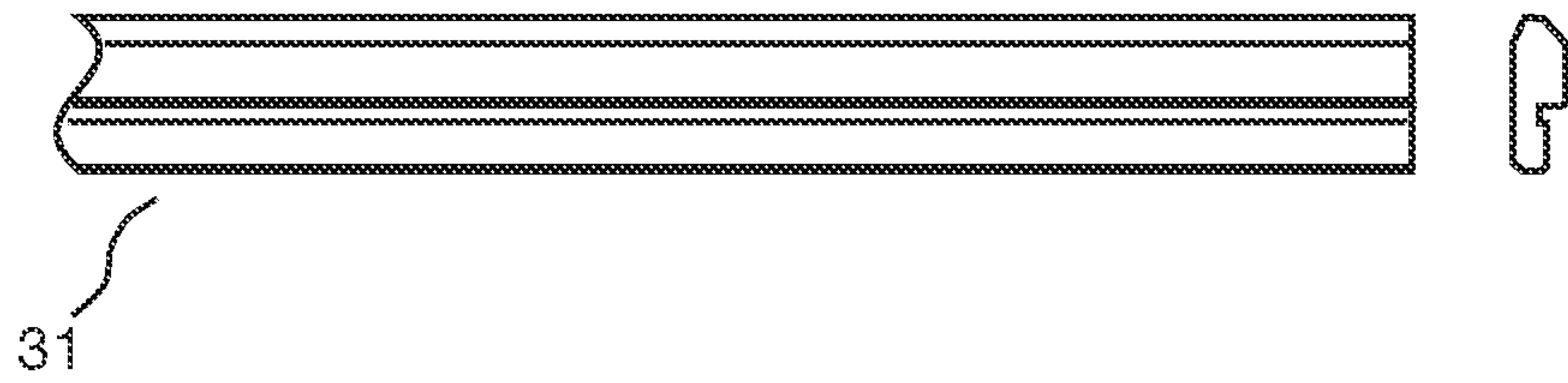


Fig. 13b

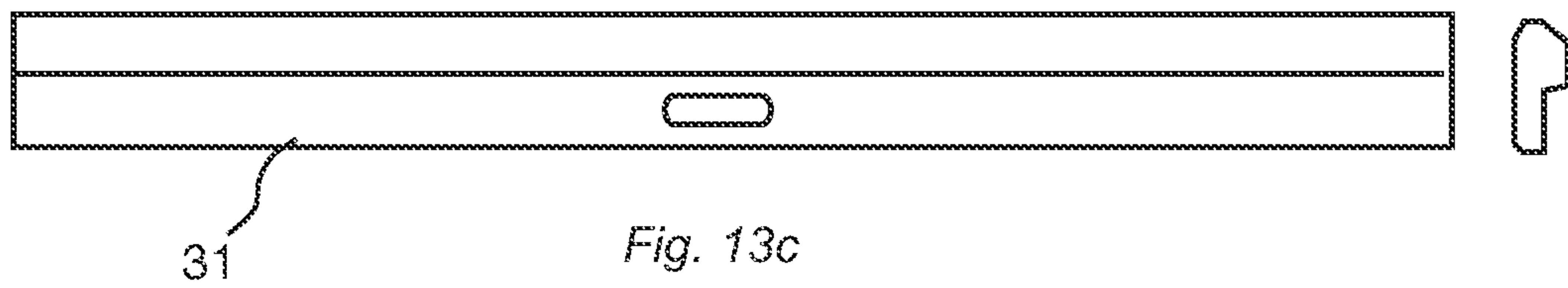


Fig. 13c

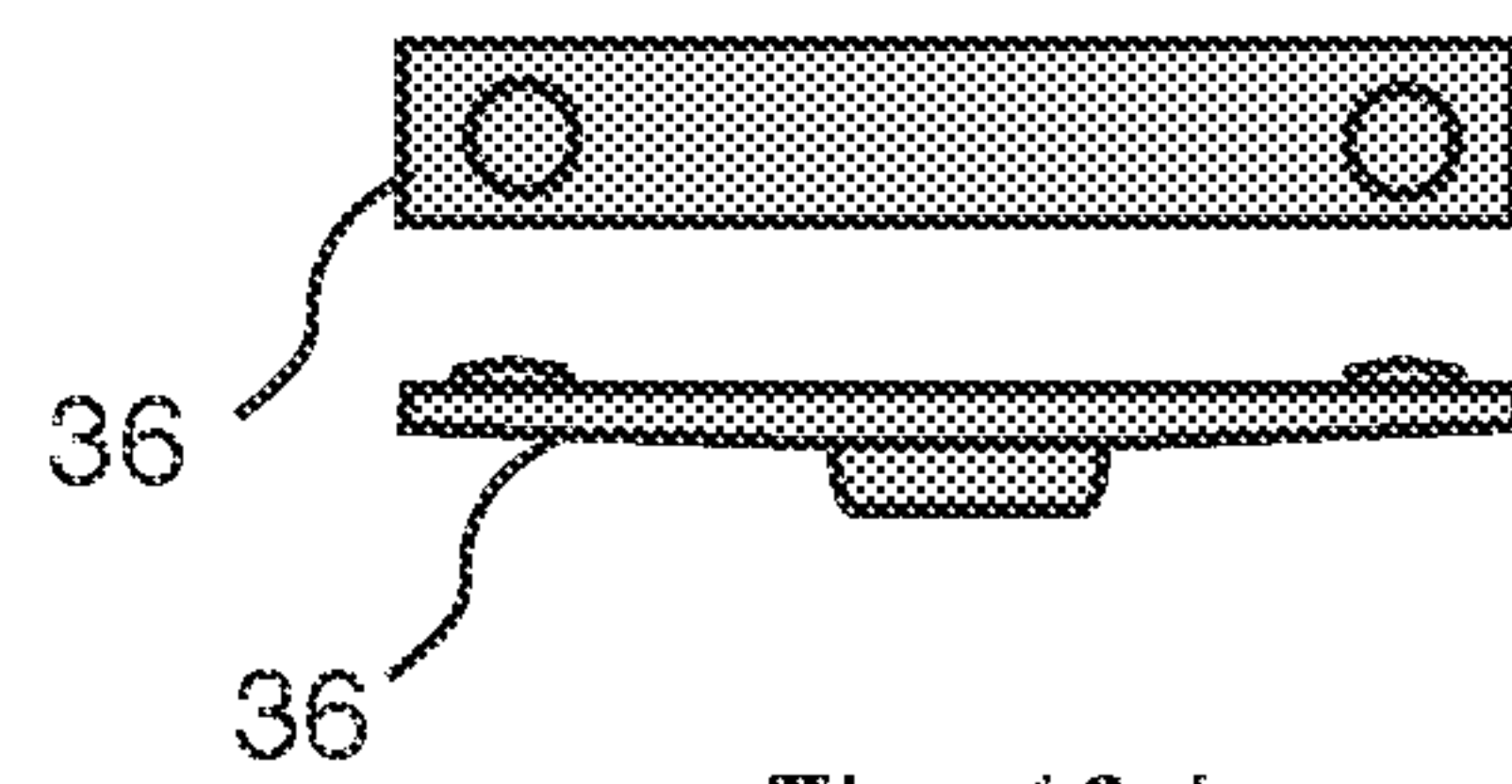


Fig. 13d

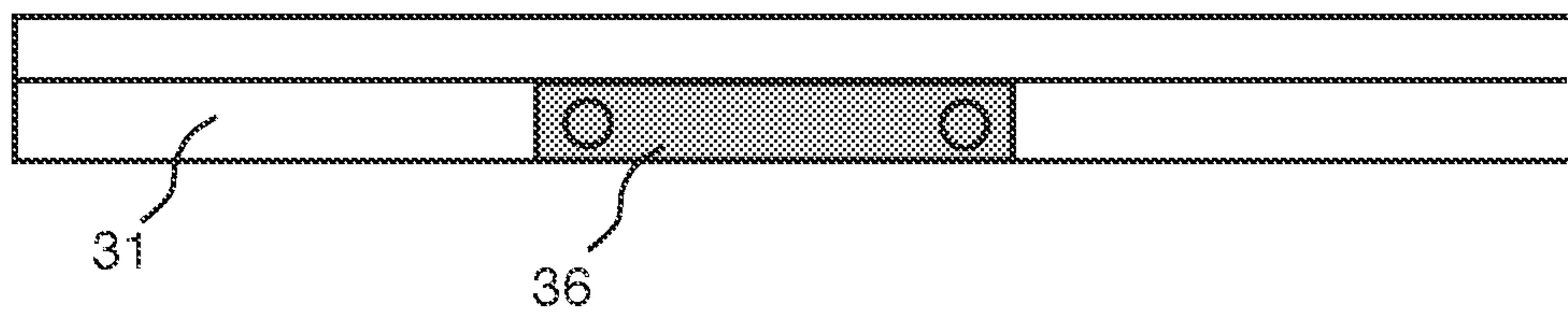


Fig. 13e

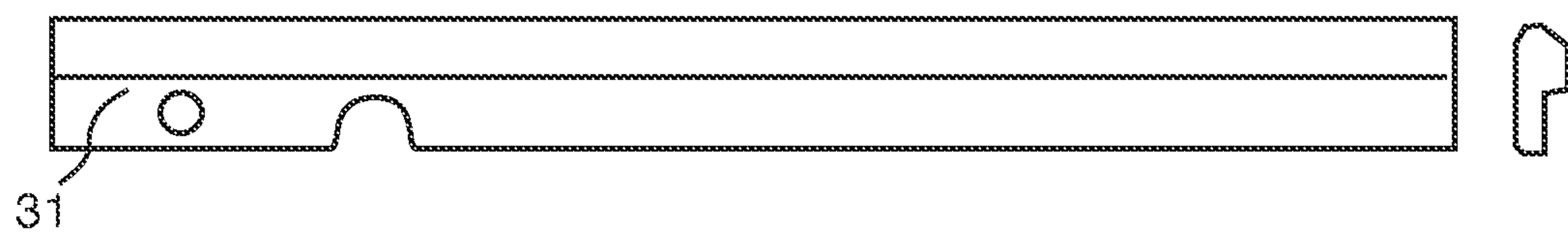
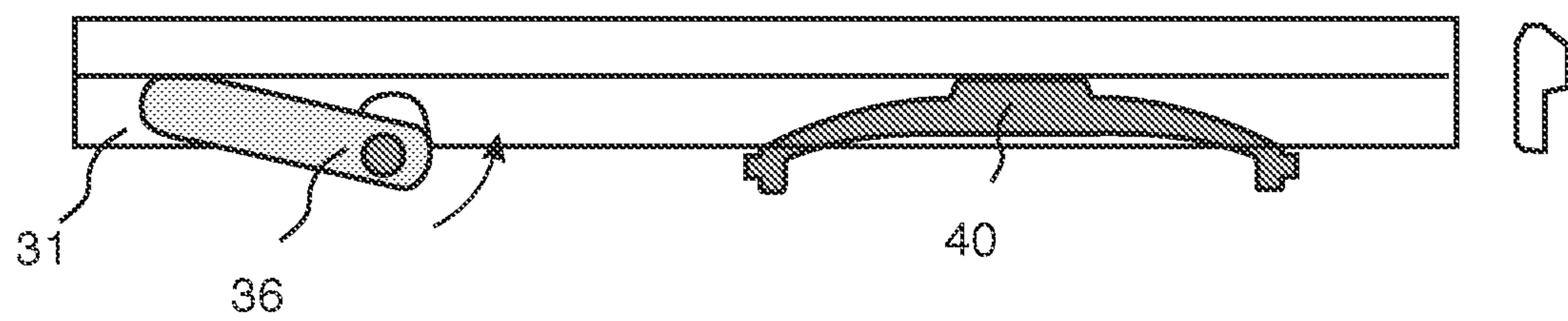
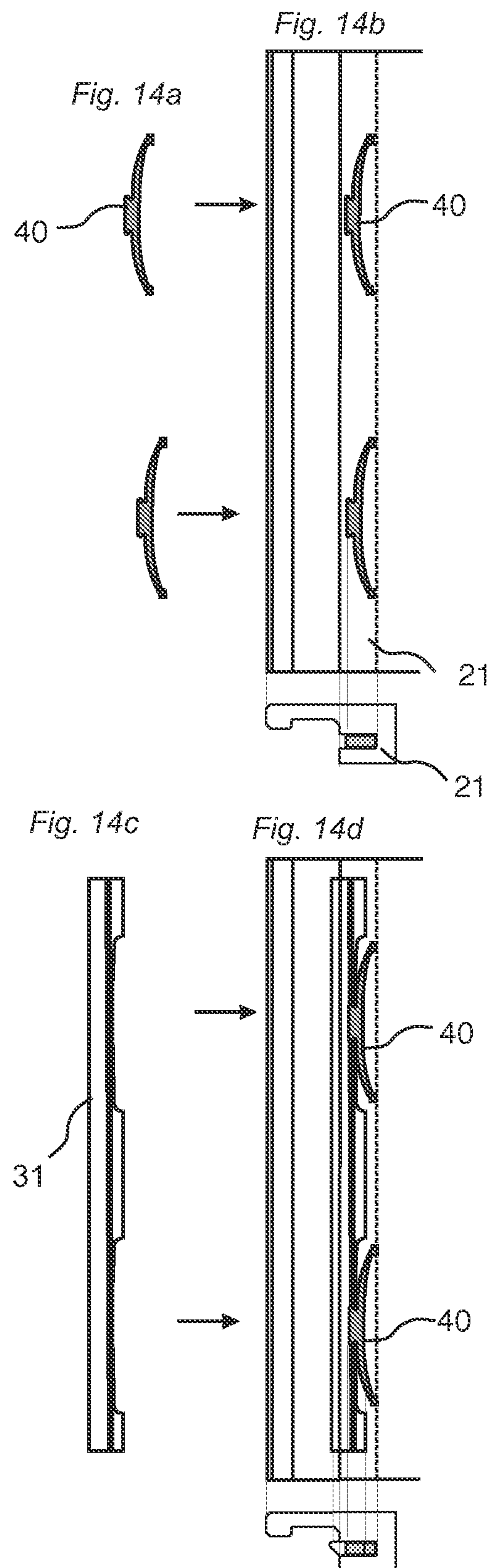


Fig. 13f



14/18



15/18

Fig. 15a

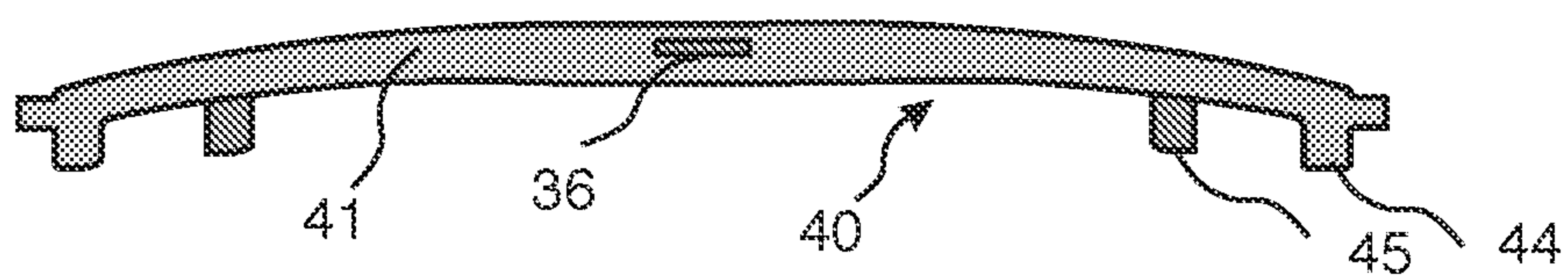


Fig. 15b

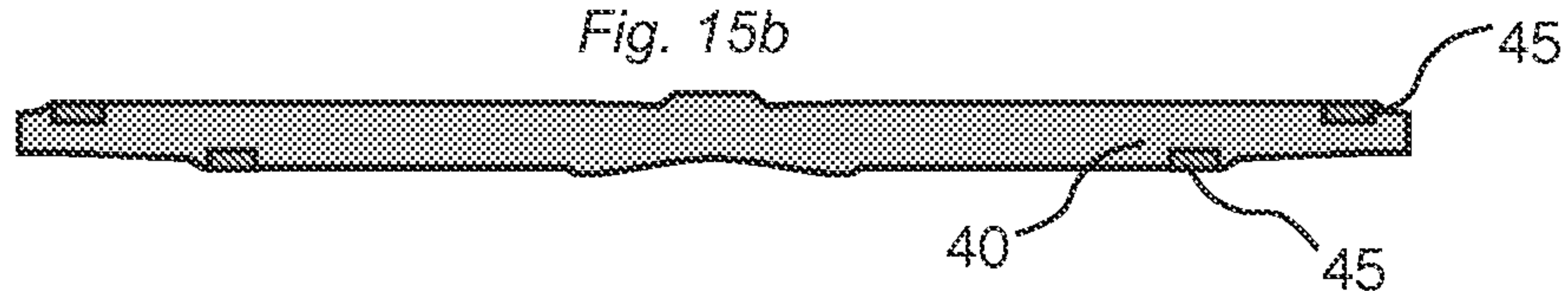


Fig. 15c

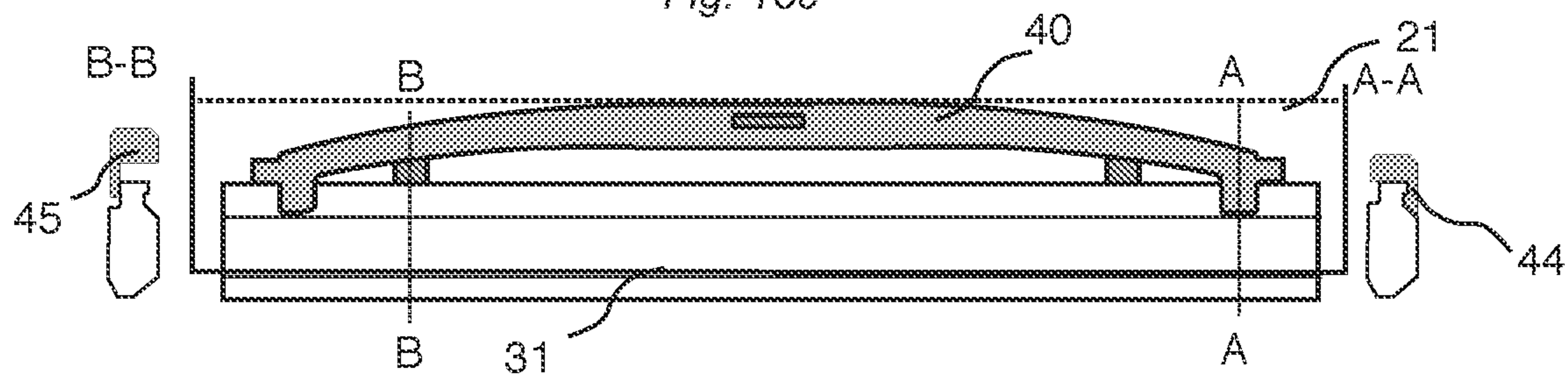


Fig. 15d

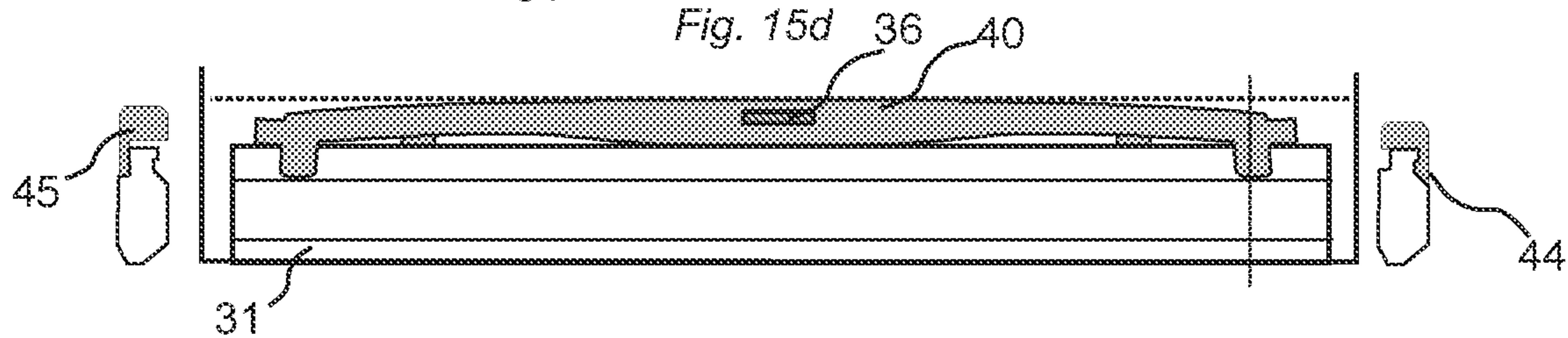


Fig. 15e

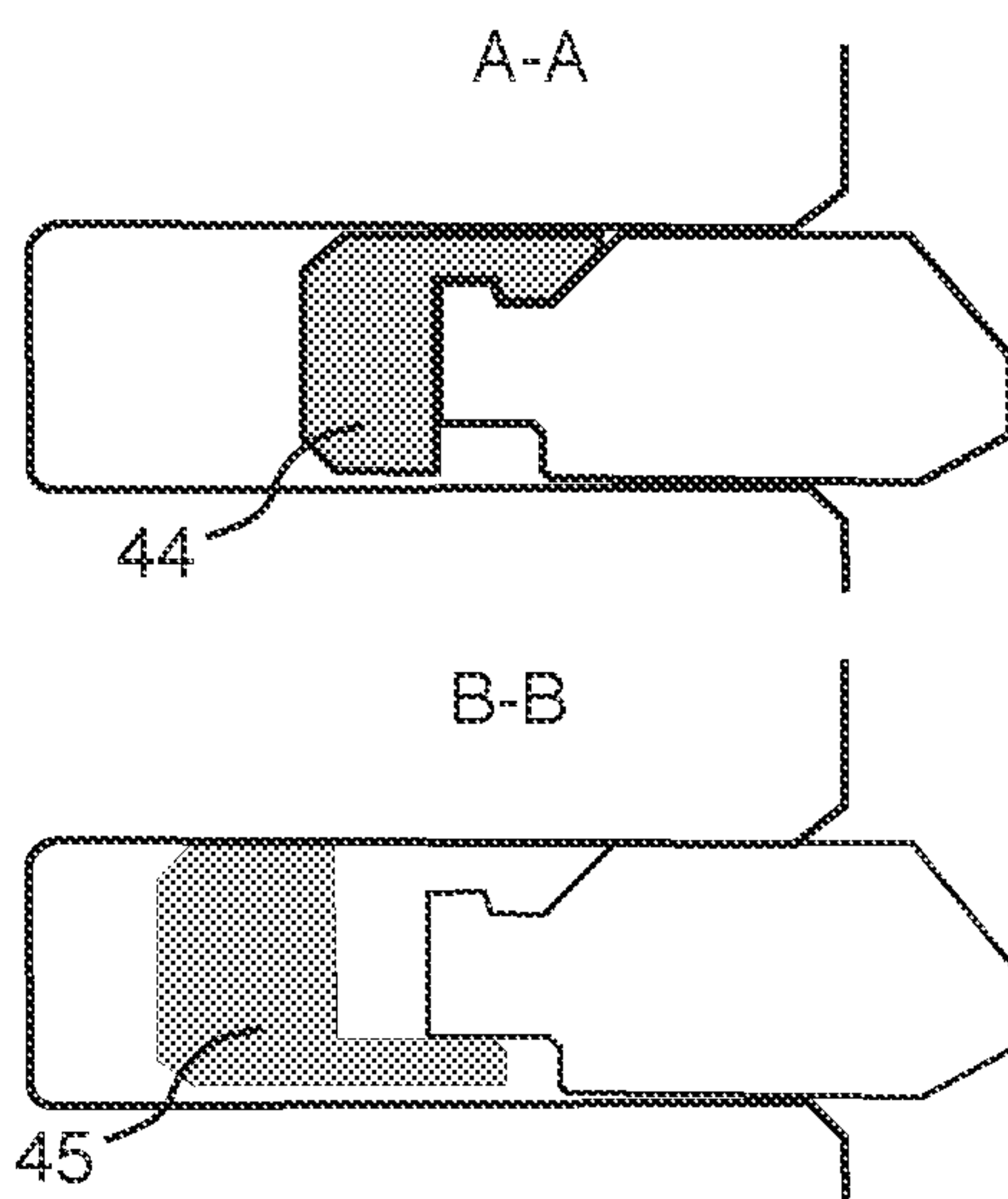
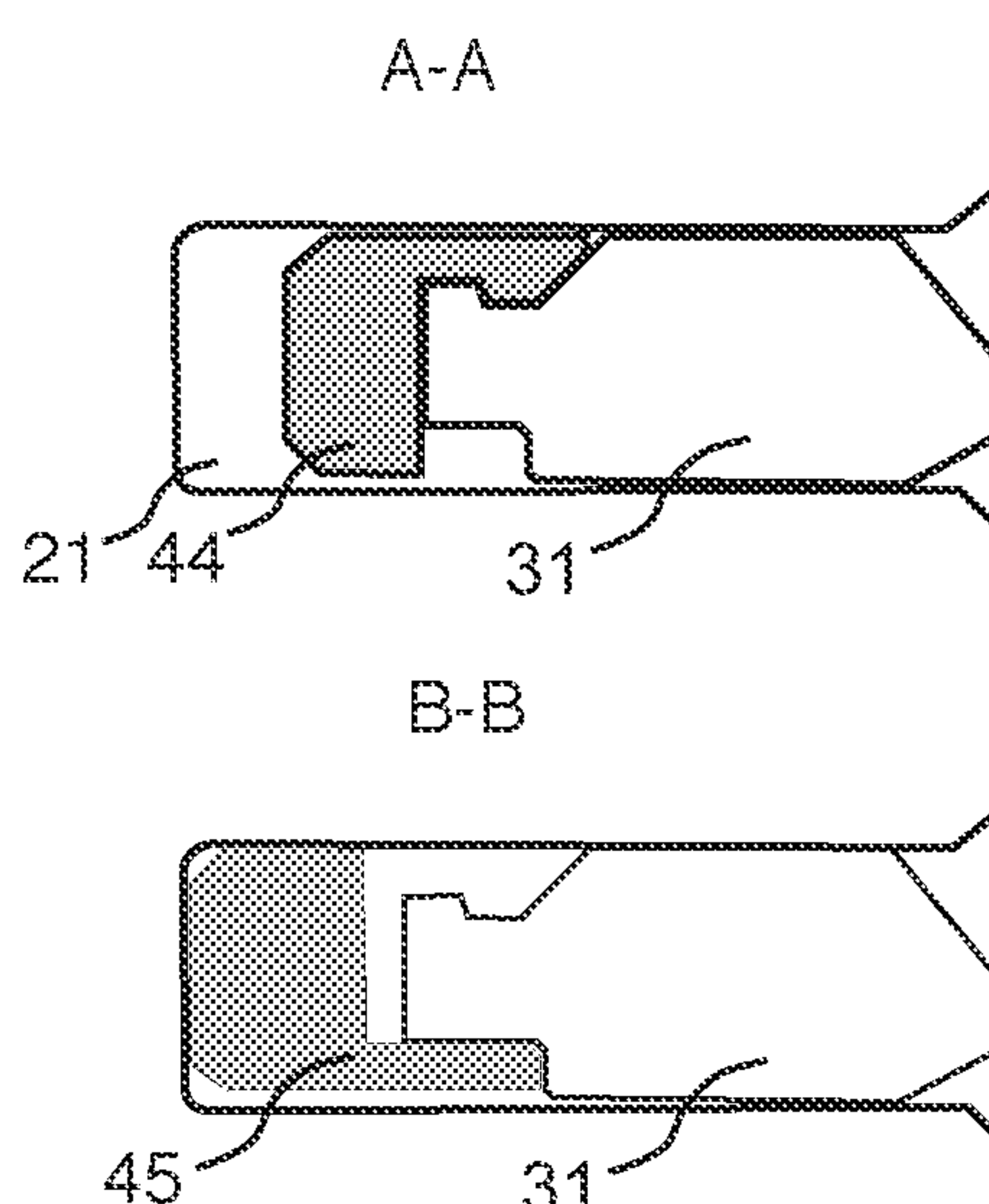


Fig. 15f



16/18

Fig. 16a

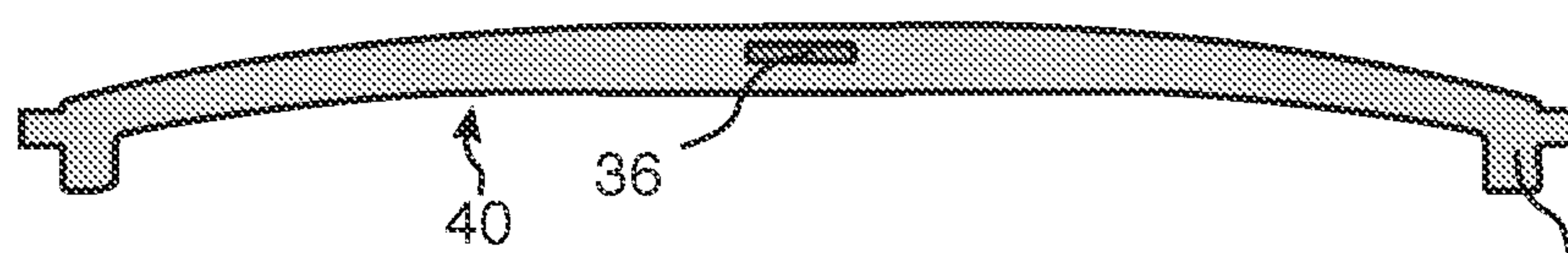


Fig. 16b

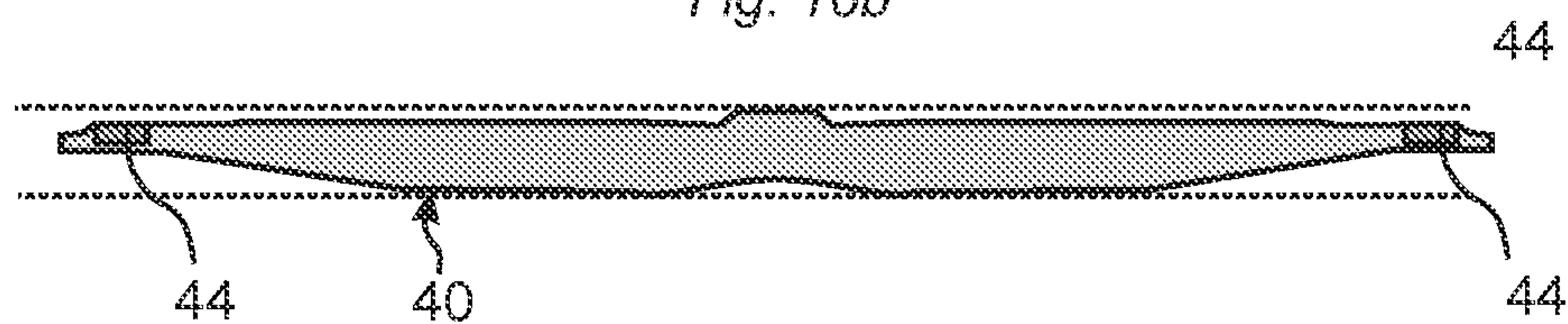


Fig. 16c

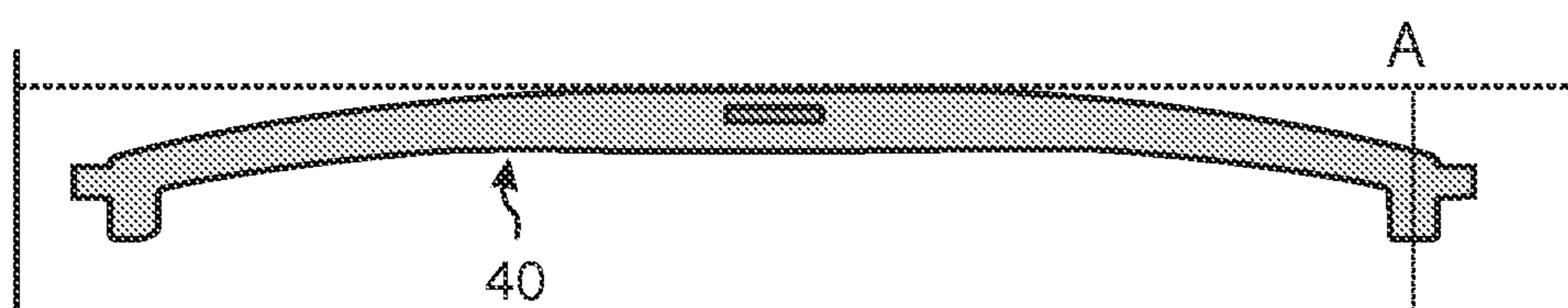


Fig. 16d

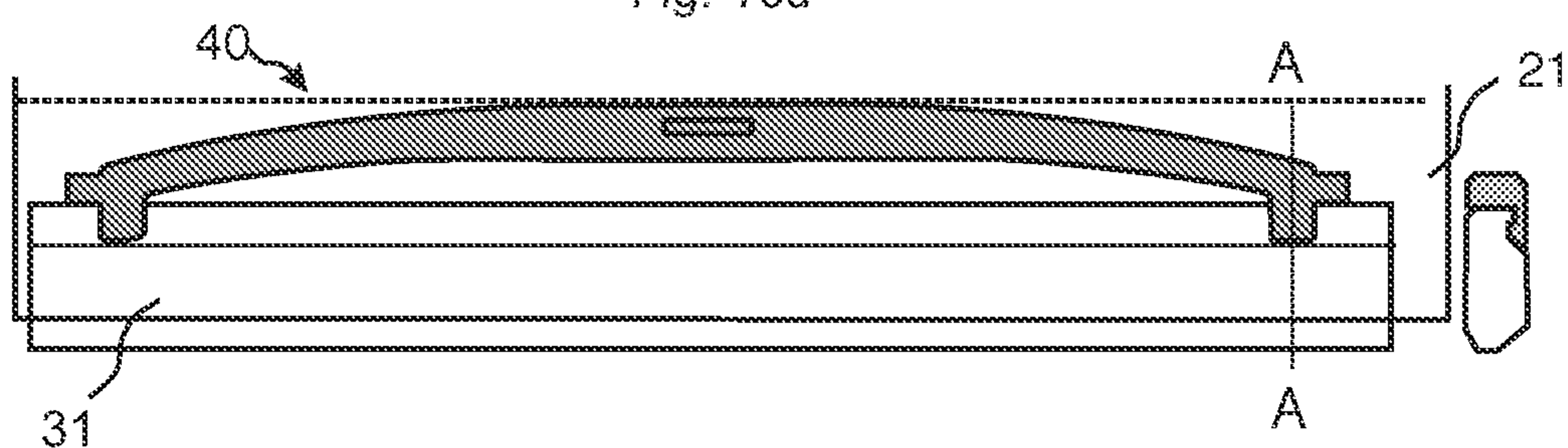


Fig. 16e

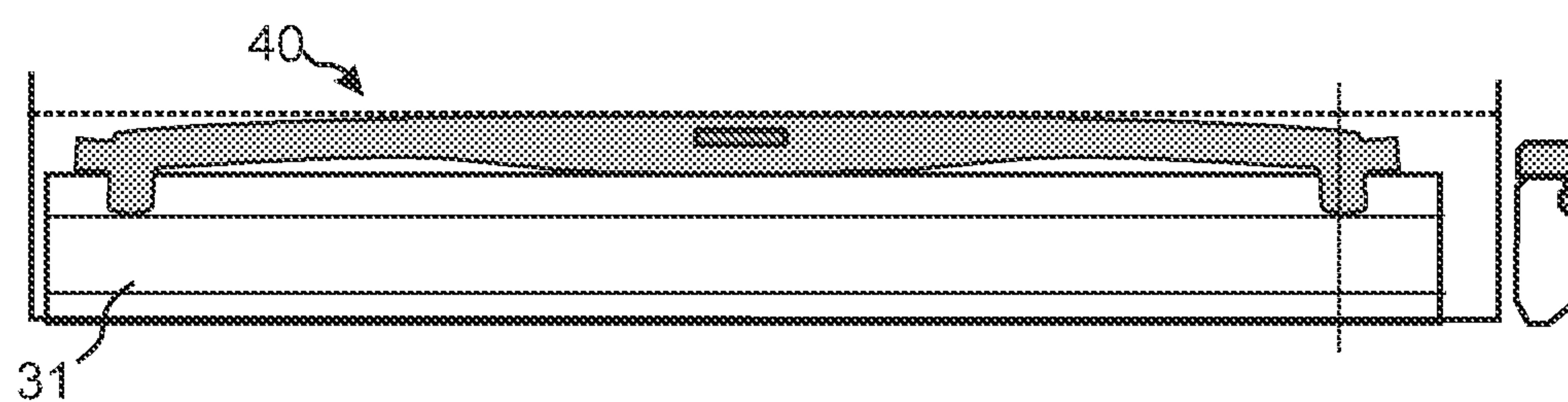


Fig. 16f

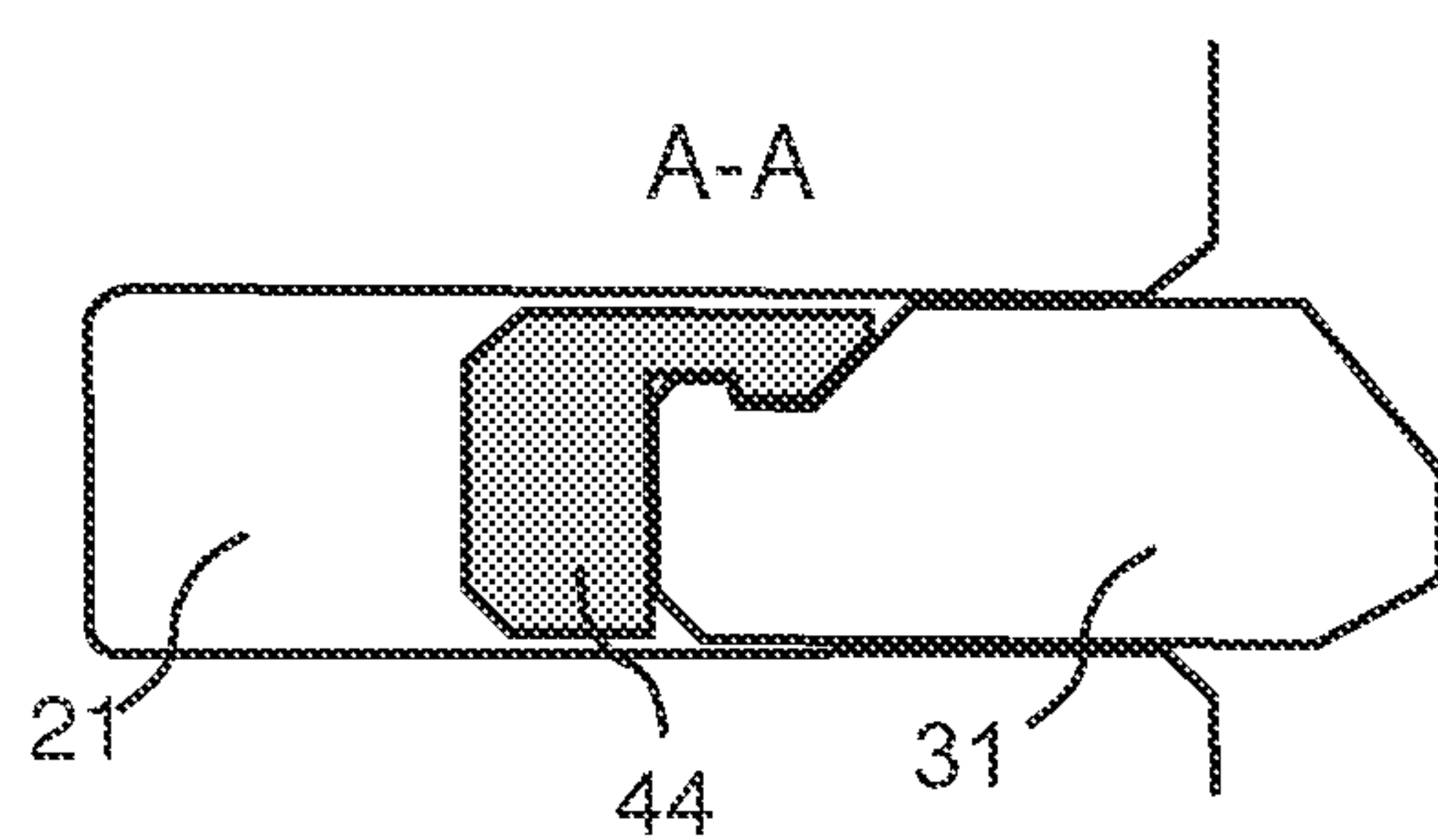
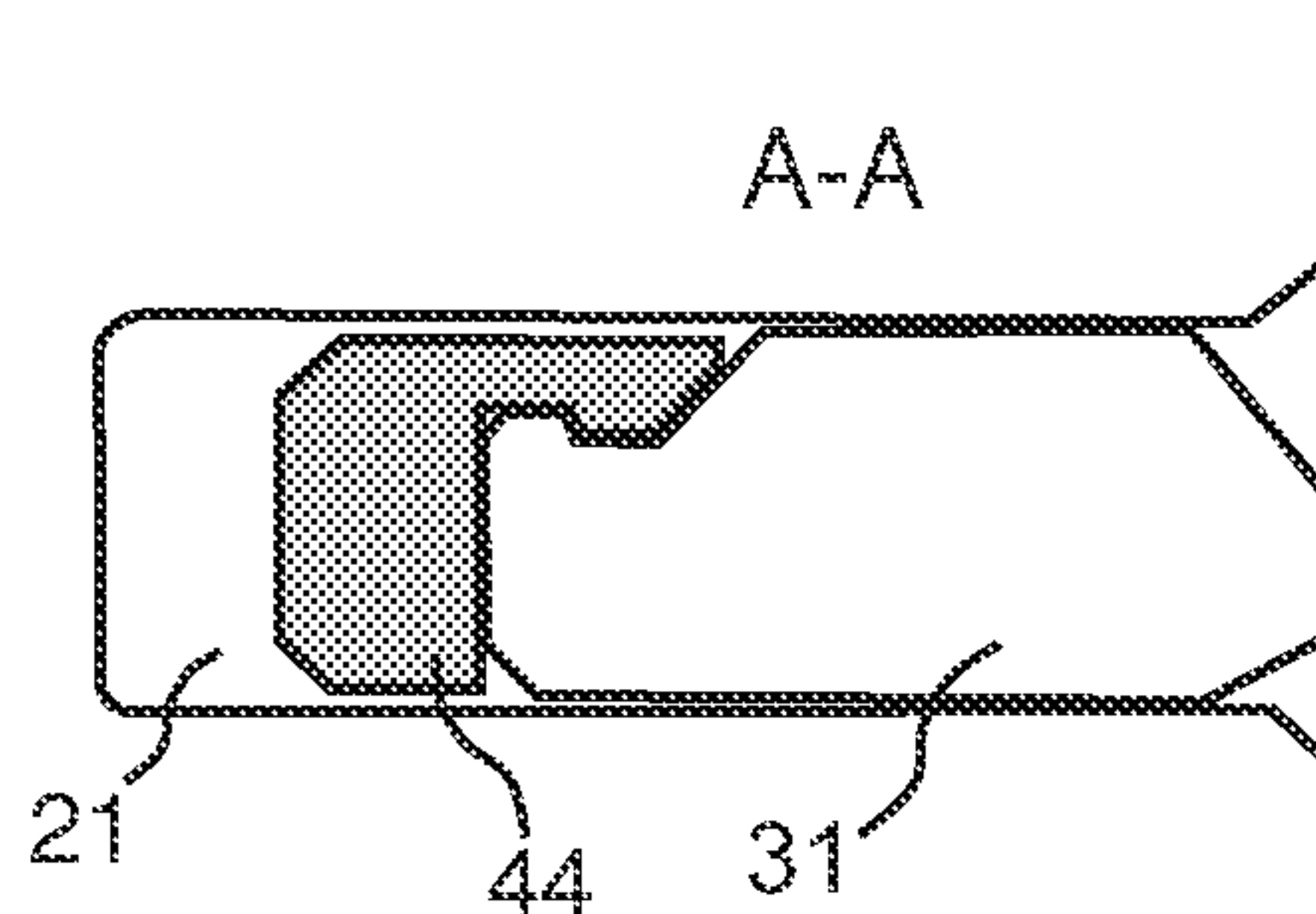


Fig. 16g



17/18

Fig. 17a

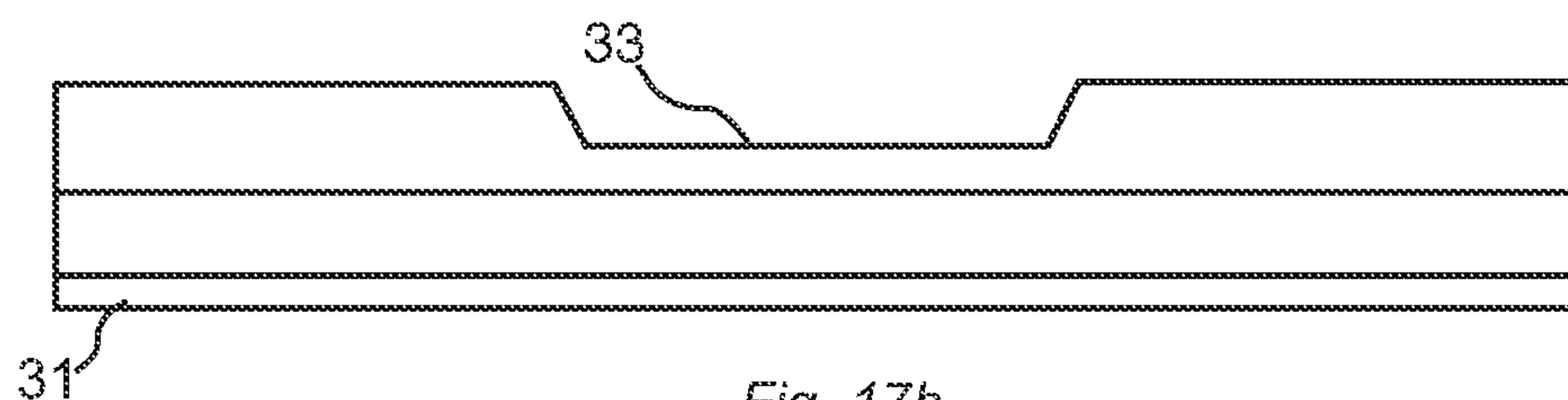


Fig. 17b

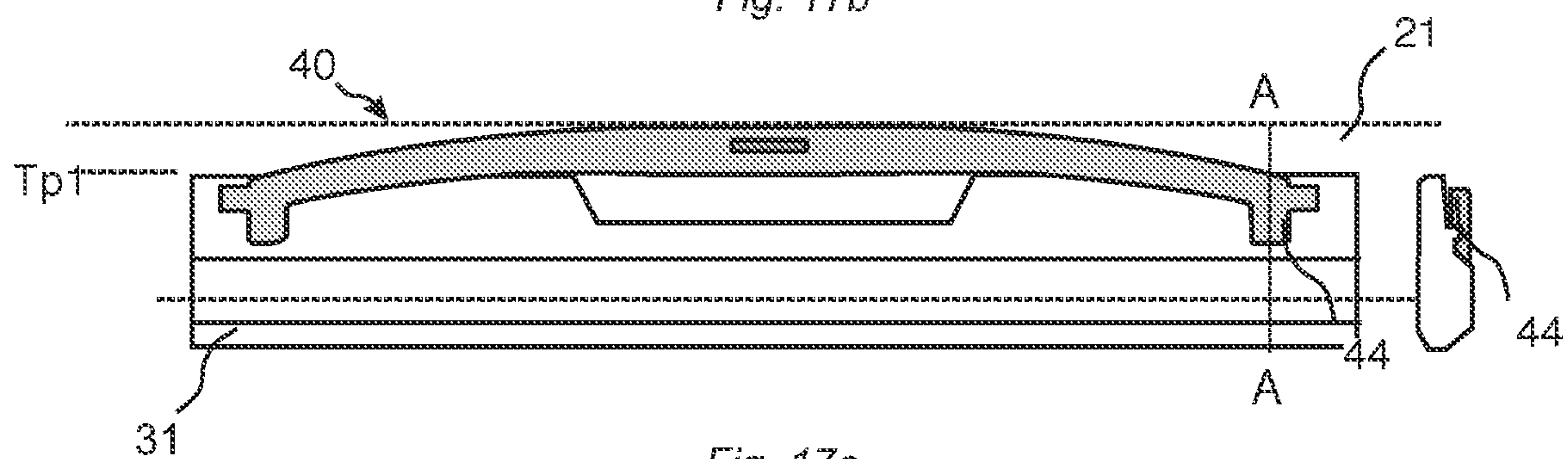


Fig. 17c

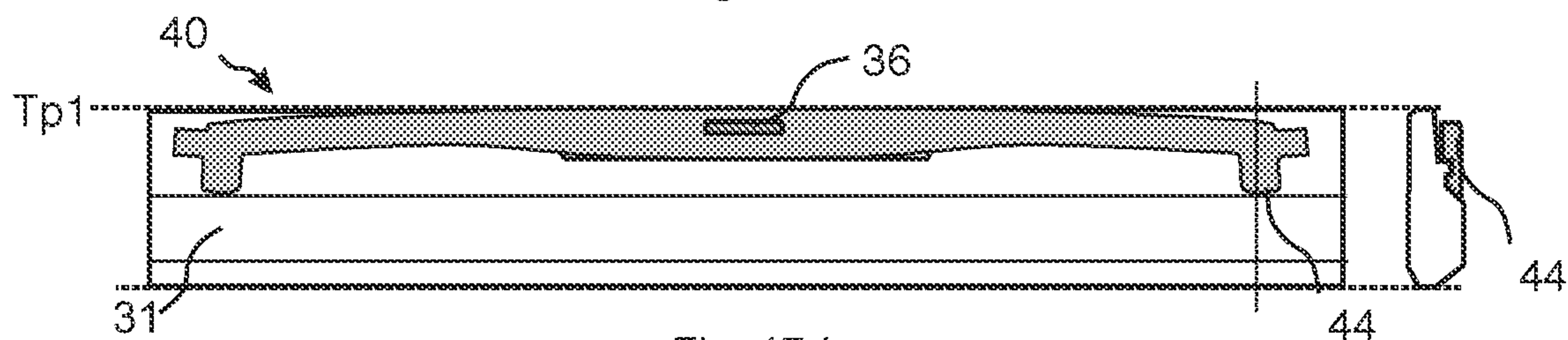


Fig. 17d

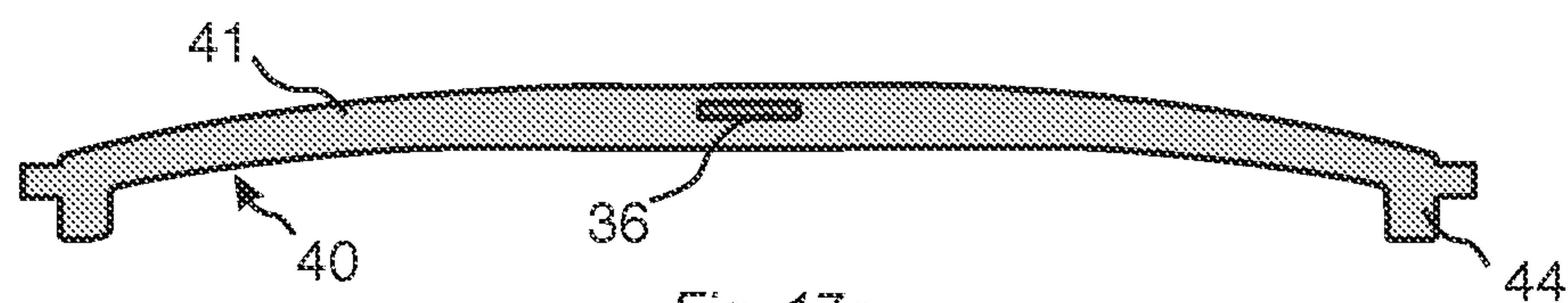


Fig. 17e

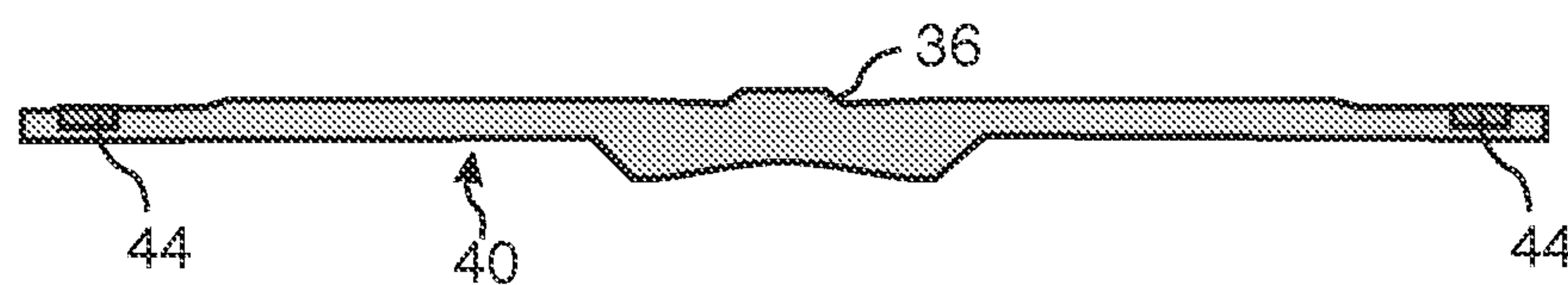


Fig. 17f

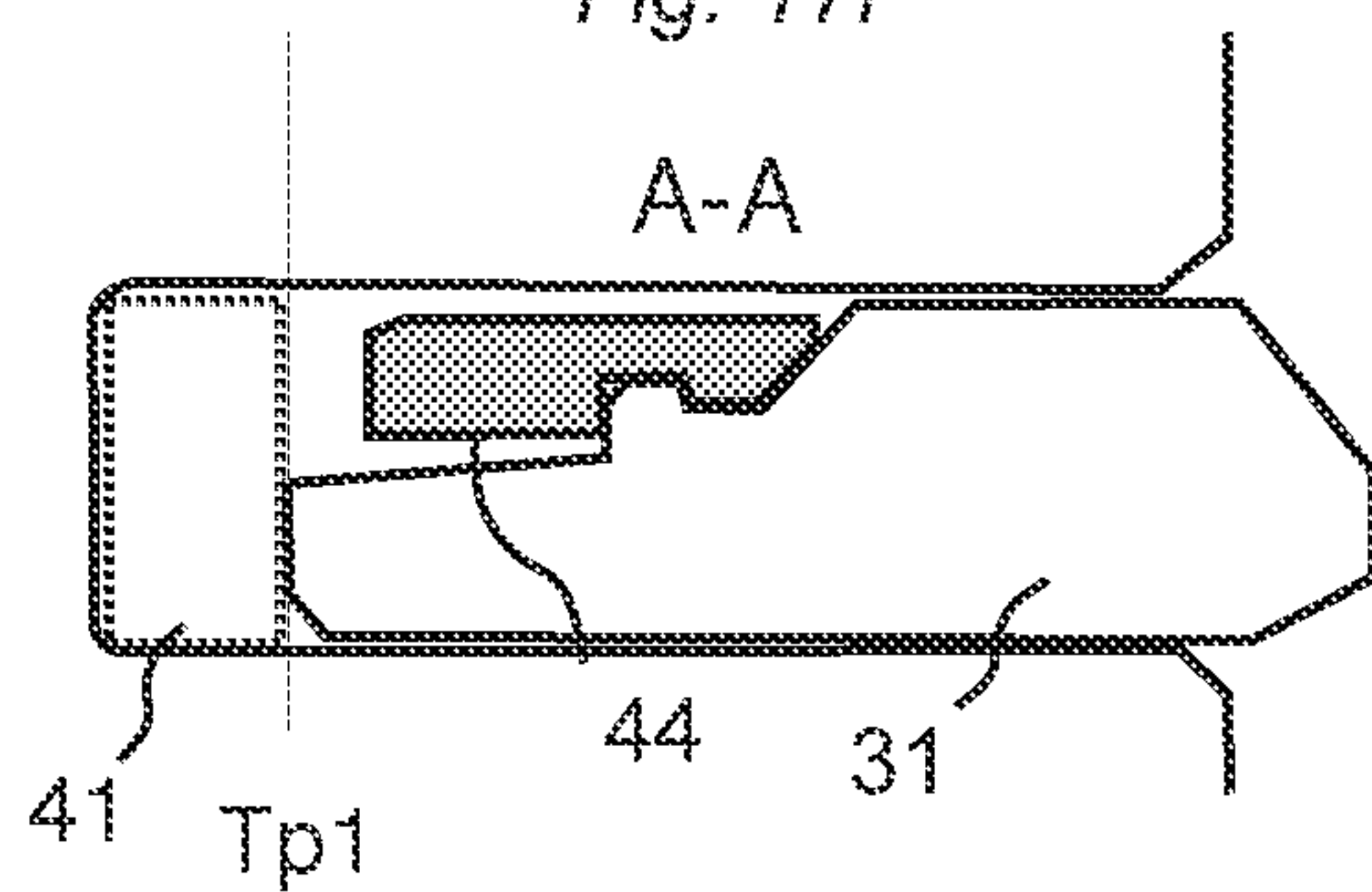
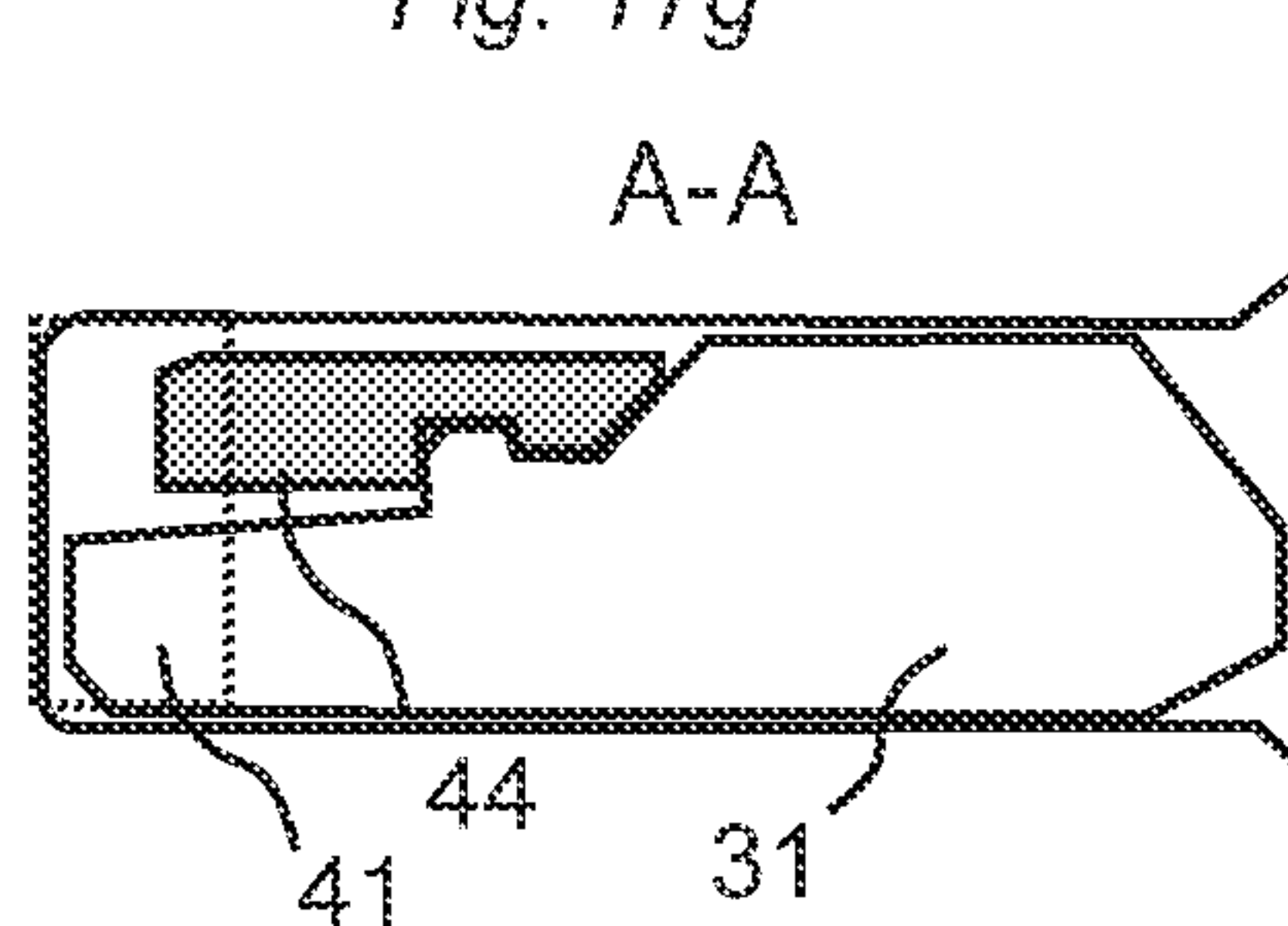


Fig. 17g



18/18

Fig. 18a

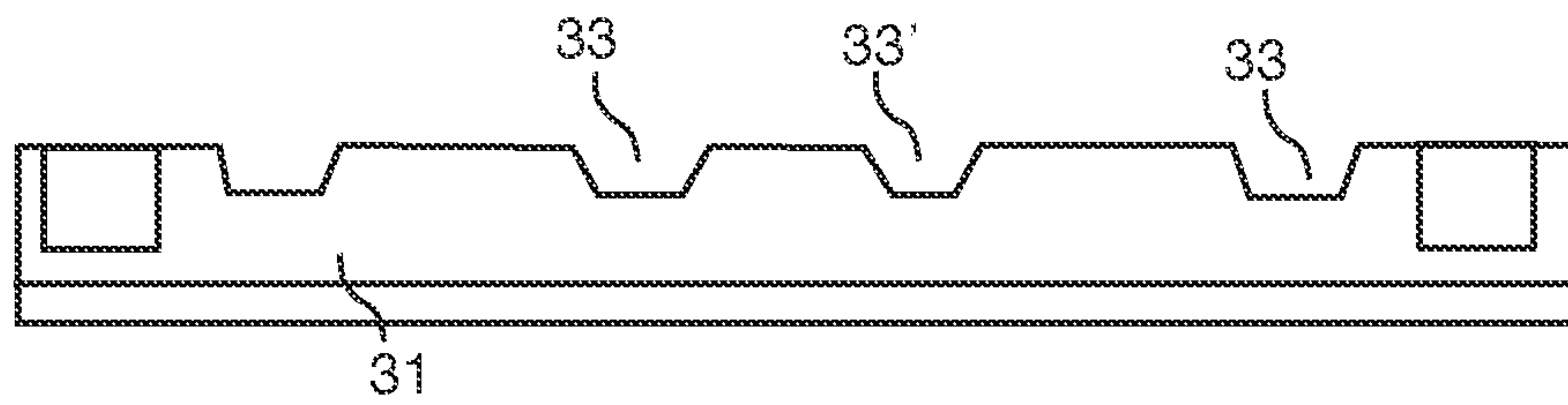


Fig. 18b

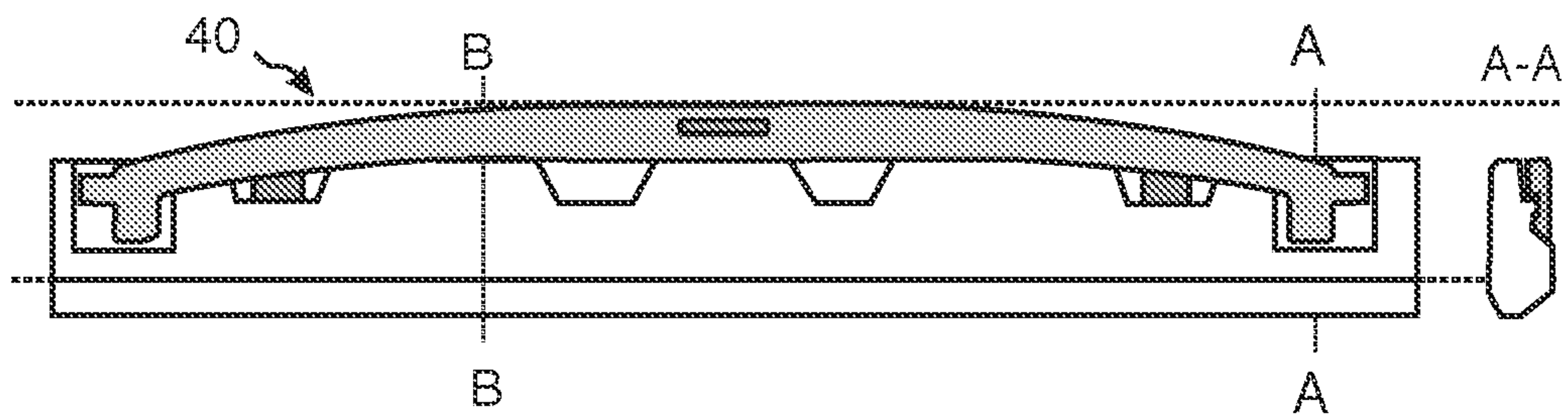


Fig. 18c

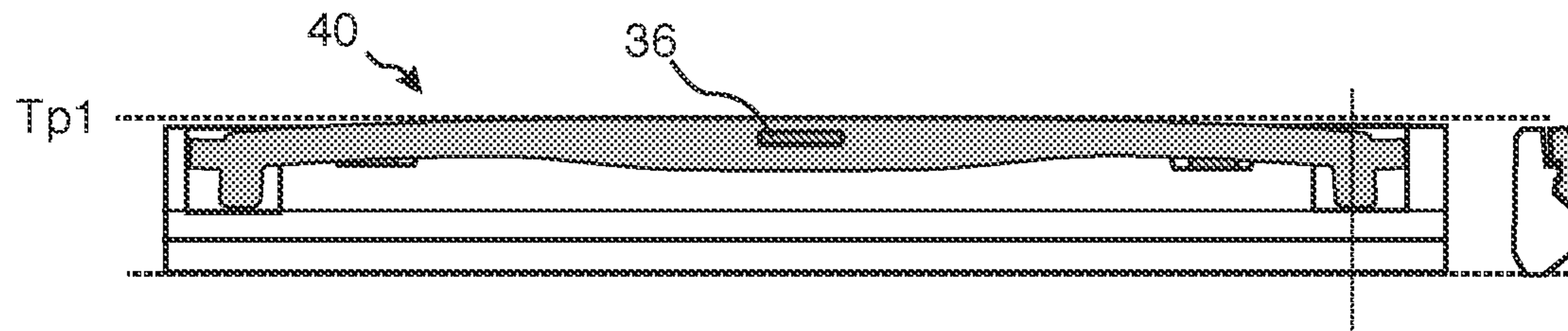


Fig. 18d



Fig. 18e

