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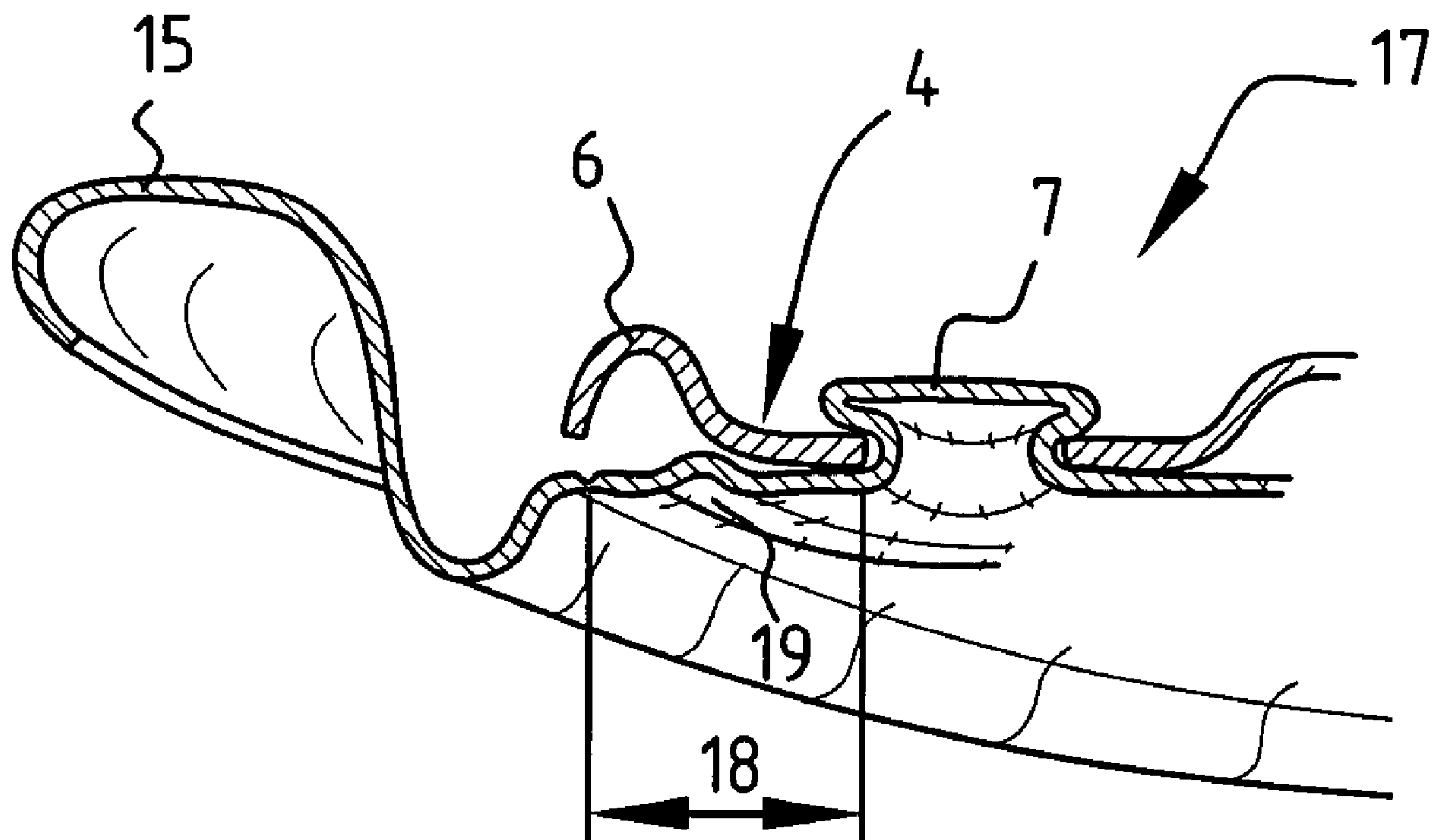
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(54) Title: CAN HAVING AN EASY OPENING PANEL, AN EASY OPENING PANEL, AND PANEL THEREFORE



(57) Abrégé/Abstract:

The invention relates to a can (1) having an easy opening panel (3) comprising tab (4) connected via a rivet structure (7) to the panel, wherein the tab comprises a tab rear part (5) for gripping and actuation, and a tab front part (6) for opening the can upon tab actuation, wherein the panel comprises at least beneath the tab front part a panel structure (21) deformable upon can internal pressure.

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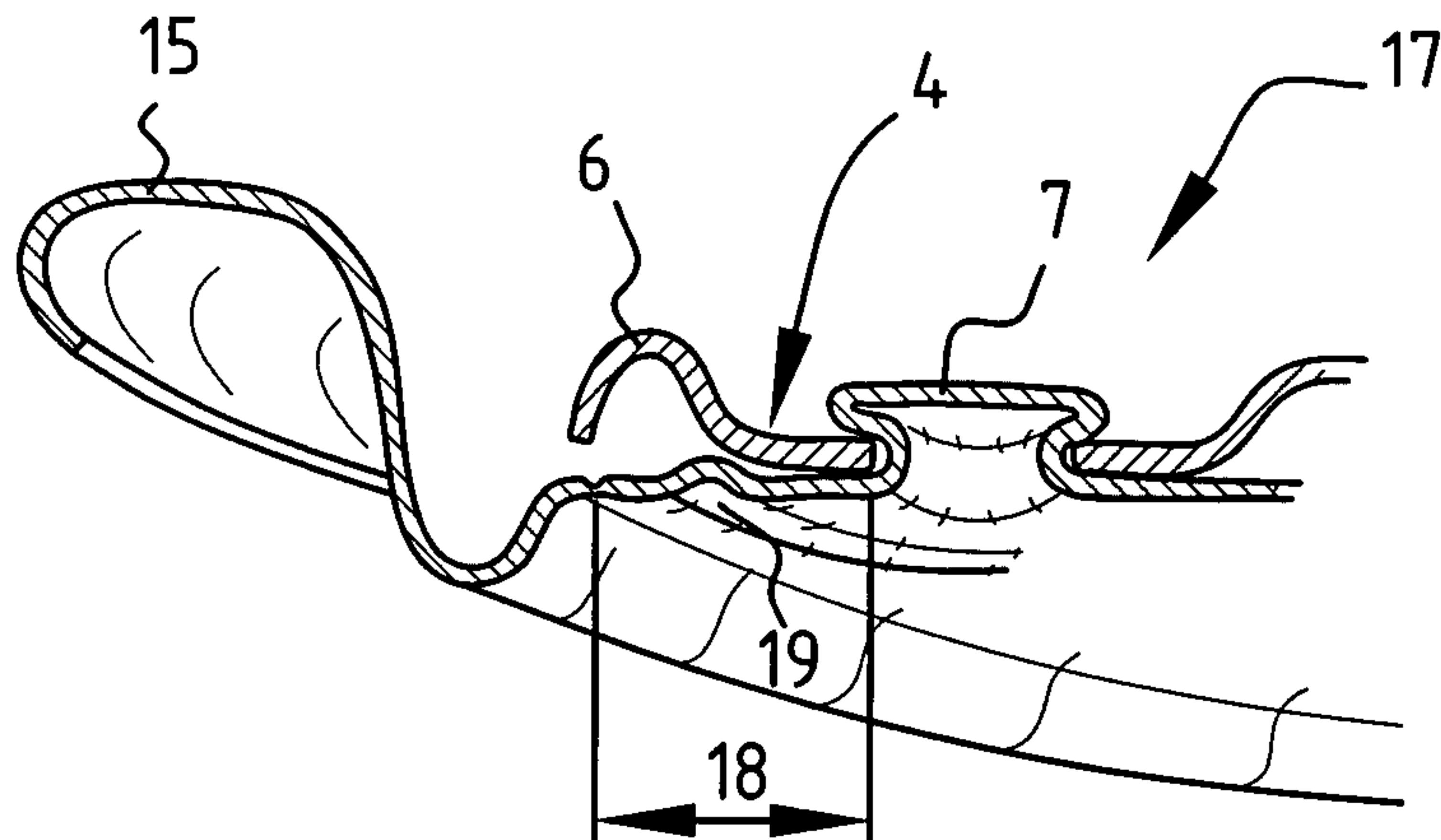


FIG. 3B

(57) Abstract: The invention relates to a can (1) having an easy opening panel (3) comprising tab (4) connected via a rivet structure (7) to the panel, wherein the tab comprises a tab rear part (5) for gripping and actuation, and a tab front part (6) for opening the can upon tab actuation, wherein the panel comprises at least beneath the tab front part (21) a panel structure (21) deformable upon can internal pressure.

**CAN HAVING AN EASY OPENING PANEL, AN EASY OPENING PANEL, AND PANEL THEREFORE**

5

The present invention relates to a can having an easy opening panel, to an easy opening panel for such can, and a panel for an easy opening panel.

An easy opening can is a can provided with an easy opening panel. Such easy opening panel comprises a tab connected via a rivet structure to the panel. The tab comprises a tab rear part for gripping by the consumer. The tab is actuated by levering the tab whereby a tab front part contacts the panel. The panel is provided with an opening defined along a score line which is provided in the panel. After popping the score line the can is provided in the panel with an opening along the score line and eventually the central part within the score line may be torn off using the tab. Accordingly, an easy opening can is a can which may be opened without the need of using a separate tool.

The can may be filled and subsequently closed by seaming or soldering the easy opening panel onto a can rim. Subsequently, the filled easy opening can may be subjected to a heating or cooking process. The temperature increase of the can content will result in an increase of the can internal pressure and an increase of the volume of the content of the can. The can internal pressure will result in a deformation of the easy opening panel. The easy opening panel will deform into a bulging or convex shape. The tab connected to the easy opening panel will change position relative to the can, and in particular relative to the can rim. The tab rear part will extend outwardly and beyond the can rim over a relatively large distance.

The outwardly projected tab rear part may contact machine components of the cooking apparatus, such as the rails of a rotary cooker or may contact the bottom of neighbouring cans. This will result in a tab scuffing and even actuation of

the tab and thereby opening of the can. The latter will result in a release of the can content and a contamination of the cooking apparatus. This will interfere with the production speed of the filled cans.

5 The objective of the present invention is to avoid as much as possible an interference of filled easy opening cans with the production process, in particular during the cooking of the filled easy opening cans in a cooking apparatus and during subsequent further handling. However, at the same time 10 it should be avoided that any changes in relation to the easy opening can may not result in an interference with the finger gripping and easy opening of the filled can by the consumer. In particular may not result in relation to a decrease in the access of the tab rear part or no increase in relation to the 15 forces required for popping and opening the easy opening can.

The present invention is based on the insight that the undesired excessive tab lift as result of an temporary internal pressure may be reduced and even minimized by including in the easy opening panel a panel structure which 20 will deform upon can internal pressure such that the tab lift beyond the easy opening can rim is reduced to within practical limits. It is even possible within the scope of the invention that after relief of the internal can pressure the panel structure reforms into a position in which the tab is lying 25 within the (hypothetical) envelop of the can rim.

Accordingly, the present invention provides a can having an easy opening panel comprising tab connected via a rivet structure to the panel, wherein the tab comprises a tab rear part for gripping and actuation, and a tab front part for 30 opening the can upon tab actuation, wherein the panel comprises at least beneath the tab front part a panel structure deformable upon can internal pressure.

Due to the presence of a panel structure deformable upon can internal pressure this structure will compensate (at 35 least partly) to a pressure induced deformation into a convex, bulging or dome shape of the easy opening panel. By this compensation an inclination angle of the rivet base is less or

not increased. Essentially, the panel structure deforms by compensation for the stress induced by the increased can internal pressure thereby such that the rising of the tab rear part is reduced. The deformable panel structure may even have 5 a compressed structure intended to compensate for the stress elongation upon increased can internal pressure.

The deformable panel structure according to the invention is at least to be located beneath the tab front part and in between the rivet structure and the can rim.

10 Obviously, the deformable panel structure according to the invention may have various different structural forms, such as a dimple, bead, wavy or slanted form.

According to one embodiment the deformable panel structure has the form of a bead partly circumventing the 15 rivet structure. Obviously, due to the increased can internal pressure the bead form may be lost temporarily but subsequently reformed at least partly.

According to a preferred embodiment according to the present invention the deformable panel bead structure extends 20 inwardly or outwardly. Such bead may be formed into the easy opening panel using traditional tooling and will not interfere with the traditional manufacturing processes for an easy opening panel. The beads may extend inwardly or outwardly. The beads may extend circumferentially around the rivet structure 25 sufficiently as to compensate for the reduction in tab lift. For instance the bead may extend circumferentially over upon 270°. Under particular circumstances the bead may circumferentially extend over 180° or even only over 120°. It is for the skilled person on the basis of routine 30 experimentation to determine the circumferential extension of the bead. The circumferential extension may be over 30-270°, such as 60-270°, more in particular 90-270°. Obviously, similar ranges could be considered by the skilled person such as 30-180°, 30-120° and any suitable upper limit in between.

35 The rising of the tab during cooking should be reduced such that there is not interference with the cooking apparatus. Generally, a tab lift to less than 4 mm beyond the

can rim is allowable. More preferably and at lower risks the tab lift is less than 3.5 mm, or even less than 3.0 mm. Obviously, the tab lift may be subjective to the residing can internal pressure. Such pressures may be within the range of 5 0.6-3.0bar, preferably within the range of 1.0-2.8bar, such as more preferably 1.5-2.5bar, such as at a diameter of 73mm at 1.5-2.5bar less than 2.5mm. Clearly, dependent on the form of the easy opening panel and the applied deformable panel structure according to the invention it is routine 10 experimentation for the skilled person to determine in relation to expected internal pressures during cooking to what extent a reduced tab rising is allowable.

Finally, it is noted that the tab rising is in particular relevant in relation to can diameters within the 15 range of 32-120 mm, or preferably for can within the range of 45-102 mm, such as more preferably cans having a diameter of 45-96 mm.

It is a preferred feature of the deformable panel structure of the easy opening panel according to the invention 20 that after relief of the can internal pressure (that is after cooking treatment and cooling) the deformable structure reforms to a structure, preferably its original structure, but at least a structure such that the tab rear part resides within the can rim and has a position relative to the easy 25 opening can that allows the consumer easy gripping and easy opening of the panel.

According to a preferred embodiment the deformation of the panel structure beneath the tab front part forms or increases a finger access gap between the tab rear part and 30 the panel. After closing and processing of the easy opening can the internal pressure is to a major extent relieved. However, there may be a slight pressure difference between the outside and content of the can. This pressure difference will be negative after a processing including closure of the easy 35 opening can comprising hot content. The design of the panel structure (form and/or the wall thickness) is such that due to this pressure difference the panel structure beneath the tab

front part is deformed or remains defomed such that the tab rear part will move upwardly or stays in an elevated position thereby providing or maintaining a space between the tab rear part and the panel for providing or increasing the finger access. Thus, the finger access at the tab rear part is improved. According to a preferred embodiment this finger access results from the negative pressure difference between the outside and content of the can. Such inward movement may result from a negative pressure difference of -0.1 to -0.9 bar, preferably -0.2 to -0.5 bar, such as -0.3 bar.

Under circumstances it is preferred that the finger access formation or increase results from a mechanical impact. Accordingly by a negative pressure difference and/or by mechanical impact the finger access is formed or improved. Obviously, by application of this mechanical impact the pressure difference may be negative (as defined above), may be zero or slightly positive up to about 0.5 bar.

After opening of the easy opening can the panel may stay in this position. However, it is possible that the easy opening panel may go back to its original position or any intermediate position. A situation in which the finger access is no longer of major importance.

Another aspect of the present invention relates to an easy opening panel to be seamed or soldered to a can. Such can comprises a tab connected via a rivet structure to the panel and has the deformable panel structure of the invention and described above.

Finally, according to another aspect the invention relates to a panel for the easy opening panel. This panel comprises the panel structure deformable upon can internal pressure but is still to be applied with a rivet structure.

Mentioned and other features of the easy opening can, easy opening panel and panel therefore will be further illustrated by various embodiments given for illustrative purposes and not intended to limit the present invention to any extent. These embodiments according to the invention are illustrated in the following figures, wherein:

Figure 1 a partly broken perspective view of a can provided with an easy opening panel;

Figures 2A and 2B a cross-sectional view according to arrow II in figure 1, showing an easy opening can according to 5 the prior art at normal can internal pressure (figure 2A) and at increased can internal pressure (figure 2B);

Figure 3A a detail according to arrow III of figure 2A;

Figures 3B-3H embodiments of easy opening panels 10 provided with a deformable panel structure according to the invention;

Figures 4A and 4B at larger scale the easy opening panel according to figure 3B seamed to a can at normal can internal pressure (figure 4A) and at increased can internal 15 pressure (figure 4B); and

Figures 5A and 5B show another embodiment comprising the additional functionality of finger access improvement.

Figure 1 shows a can 1. The can 1 comprises a body 2 provided with an easy opening panel 3. The panel 3 comprises a 20 tab 4 having a tab rear part 5 and a tab front part 6. The tab 4 is connected to the panel 3 via a rivet structure 7.

The panel 3 is provided with a central terrace type of structure 8. Between the central structure 9 and the tab rear part 5 is available a space accessible for a finger of the 25 user. By gripping the tab rear parts at or in the tab opening 10 and levering or tilting the tab 4 will result in opening the panel 3 along a score line 11. Accordingly, the can 1 or panel 3 may be opened by actuating the tab 4 without the need of a separate tool.

Figure 2A and 2B show more in detail the prior art 30 structure illustrated in figure 1.

The tab 4 is connected to the panel 3 via a rivet structure 7. The base 12 for the tab 4 has a substantially horizontal position. The tab rear part 5 resides within an 35 hypothetical envelope 13 formed by the rim 14 of the can 1.

Figure 2B shows the situation during cooking the can 1 whereby the internal pressure is increased due to the

temperature rise and thereby a volume increase. The result is that the base 12 takes a more inclined position having an angle alpha. The tab 4 will also take a more inclined position such that the tab rear part 5 with a tab lift 1 extends beyond 5 the envelope 13.

Figure 3A shows in cross-section the easy opening panel 3. The panel 3 comprises a curl 15 to be seamed on the body 2. The tab 4 is connected via a rivet structure (formed from material of the central part of the panel 3) to the panel 10 at a base 12. The free end 16 of the tab front part 6 is to contact during actuation and tilting of the tab 4 the score line 11 for popping and eventual opening.

Figure 3B shows a panel 17 according to the invention comprising a tab 4 connected via a rivet structure 7 to the panel 15. The area 18 beneath the tab front part 6 and between the rivet structure 7 and curl 15 is provided with a panel structure 19 which is deformable upon can internal pressure. This deformable panel structure 19 has the form of an outwardly extended bead encircling the rivet structure 17 over 20 about 160-200°.

Figure 3C shows another easy opening panel 20 according to the invention. The panel 20 comprises beneath the tab front part 6 and between the rivet structure 7 and the rim 15 a panel structure 21 which is deformable upon can internal pressure. This structure 21 has the form of an inwardly directed bead encircling the rivet structure 7 over about 170-25 240°.

Figure 3D shows another easy opening panel 22 according to the invention comprising the same deformable 30 panel structure 21 as the easy opening panel 20 illustrated in figure 3C. In this case the rivet structure 7 is having the form of a separate rivet 23. Furthermore, the deformable panel structure 21 extends circumferentially over about 120-180° around the rivet 23.

Figure 3E shows a panel 24 according to the invention 35 having a similar structure as shown in figures 3C and 3D. However, in the area 18 the inwardly directed bead 25 forms

the deformable panel structure according to the invention and extends over about 20-40° around the rivet structure 7.

Figure 3F shows another panel 26 according to the invention. In the area 18 beneath the tab front part 6 and between the rivet structure 7 and the curl 15 the deformable panel structure 27 has the form of an inwardly directed dimple 27.

Figure 3G shows another panel 28 according to the invention. In the area 18 beneath the tab front part 6 and in between the rivet structure 7 and curl 15 is a so called compressed panel structure having a slanted or slightly wavy form. This structure 29 is able to elongate upon stress generated by increase internal can pressure.

This structure 29 extends around the rivet structure 7 over about 130-190°. The structure 29 is slightly directed inwardly.

Figure 3H shows a panel 30 according to the invention having in the area 18 beneath the tab front part 6 and in between the rivet structure 7 and curl 15 a structure 31 extending slightly outwardly and forming a compressed panel section. Upon increased can internal pressure and volume increase the deformation of the panel may be compensated by this compressed structure 31 by elongation thereby avoiding or reducing the inclination of the panel base 32 thereby minimizing or reducing the tab lift.

Figures 4A and 4B show the effect for panel 17 of the deformable panel structure 19 in reaction to an increase of can internal pressure. This panel 17 is further described in relation to figure 3B.

Figure 4A shows the easy opening can 33 according to the invention provided with the easy opening panel 17. The base 34 to which the tab 4 is connected has a substantially horizontal position. In between the base 34 and the curl 15 is the outwardly extending bead 19 within the area 18. The free end 5 lies within the hypothetical envelope 13. At the same time there is a free space 35 in between the central area 9 of the panel 17 and the tab rear part 5. Accordingly, this tab

rear part 5 can be easily gripped and tilted for opening the easy opening can 33.

Figure 5A shows a can 36 having an easy opening panel 37 connected via a curl 15 to the body 2 at substantially no pressure difference. The rear tab part 5 of the tab 4 is contacting or almost contacting a central panel part 38 which is residing at least partly beneath the tab rear part 5.

Upon generation of a negative pressure (due to cooling of the hot content) of about -0.2 to -0.5 bar, such as -0.3 bar between the outside and the content of the can 36 the panel structure 19 becomes deformed. Also the central panel part 38 moved by deformation inwardly. These deformations result in the formation or an increase of a gap 39 (see figure 5B). This gap 39 improves the finger access of the tab 5 for the consumer intending to open the can 36. If not spontaneous the formation of the finger access gap 39 may be urged using a tool contacting the panel structure 19 temporarily and push the tab front part 6 downwardly and/or pull the tab rear part 5 upwardly.

It is noted that at a slight positive or zero pressure difference between the outside and the content of the can 36, the tab rear part 5 may be urged to move upwardly by mechanical impact using the mechanical pusher or equivalent mechanical tool. An impact preferably taking place in the area 18.

After opening of the can 36 by actuating the tab after finger access gripping the tab rear part 5, which opening resulted in relieve the negative pressure difference, the easy opening panel 37 may stay in the form illustrated by figure 5B or may return into the form illustrated by figure 5A. It is noted that due to a negative pressure difference over the can, the central panel part 38 may move to some extent inwardly, thereby contributing to the provision of the finger access.

During and shortly after cooking of the content of the closed can 33 due to internal pressure rise and volume rise the panel 17 deforms into a bulging, convex, or dome shape. At a constant diameter of the body 2 this bulging or convexity

results in an deformation of the panel 17. However, this deformation in at least the area 18 results in a deformation of the bead 19 into a less curved and more smoothly structure 19 thereby at least partly compensating for the deformation.

5 As a result the inclination angle alpha is less than according to the prior art (see figure 2B). Accordingly, the tab lift 1 is far less than according to the prior art (figure 2B).

It will be apparent to the skilled person that the other structures shown in figures 3B-3H will all have a 10 similar effect upon increase of the can internal pressure and the concomitant volume rise. The deformable panel structures according to the invention will deform thereby minimizing the panel lift 1 and thereby avoiding an excessive projection of the tab rear part beyond the hypothetical envelope 13 formed 15 by the can rim.

For practical reasons limits have been set to the allowable tab lift 1. Generally, the tab lift should be less than 4 mm, and preferably less than 3.5 mm, such as less than 3.0 mm. In a practical example the tab lift was less than 2.0 20 mm at an internal pressure of about 2.5-3.0bar. In other types of easy opening cans of 65, 73, 83 and 99 mm in diameter at pressures of 2.5-3.0bar a range for the tab-lift was in the range of 1.5-4 mm.

The panel lift 1 is also dependent on the can 25 diameters which could be within the given ranges of 32-120 mm. Most practically the panel lift should be reduced for cans within the range for a diameter of in between 45-102 mm, such as 45-99 mm.

The deformable structures are essentially such that 30 preferably also the deformed panel structure reforms to a shape after relief of the can internal pressure so that the tab rear part resides again within the hypothetical envelope 13 and that is between the can rim or curl 15.

The can could be made of metal such as steel and 35 aluminium. The can may be inwardly coated with plastic or lacquer dependent on the can content which is to be cooked prior to selling and use by the consumer.

Reading the above description it will be apparent to the skilled person that the easy opening can with the deformable panel structure will maintain its traditional manufacturing properties while use by the consumer is not hampered and that the forces required to opening the can have not been adversely affected. Finally, it is relevant that the easy opening can maintains its diameter, e.g., the unit depth and panel depth for reasons that these structural can elements influence the distance of the tab relative to the can rim.

## CLAIMS:

1. A can having an easy opening panel comprising a tab connected via a rivet structure to the panel, wherein the tab comprises a tab rear part for gripping and actuation, and a tab front part for opening the can upon tab actuation, wherein the panel comprises at least beneath the tab front part a panel structure having a compressed structure deformable for compensating stress elongation upon can internal pressure.
2. The can according to claim 1, wherein the deformable panel structure has the form of an inward or outward dimple, of wavy or slanted form.
3. The can according to claim 1, wherein the deformable panel structure has the form of a bead partly circumventing or encircling the rivet structure.
4. The can according to claim 3, wherein the deformable panel bead structure extends inwardly or outwardly.
5. The can according to claim 3 or 4, wherein the bead circumferentially extends over upon 270°, over upon 180°, over upon 120°.
6. The can according to any one of claims 1-5, wherein the deformable panel structure limits upon can internal pressure the tab lift of the tab rear part to less than 4 mm above a can rim.
7. The can according to claim 6, wherein the deformable panel structure limits upon can internal pressure the tab lift of the tab rear part to less than 3.5 mm above the can rim.
8. The can according to claim 7, wherein the deformable panel structure limits upon can internal pressure the tab lift of the tab rear part to less than 3.0 mm above the can rim.

9. The can according to any one of claims 6-8, wherein the limitation of the tab lift occurs at a can internal pressure of 0.6-3.0 bar at a diameter of 73 mm, and at 1.5-2.5 bar the tab lift is less than 2.5 mm.
10. The can according to claim 9, wherein the limitation of the tab lift occurs at a can internal pressure of 1.0-2.8 bar at a diameter of 73 mm, and at 1.5-2.5 bar the tab lift is less than 2.5 mm.
11. The can according to claim 10, wherein the limitation of the tab lift occurs at a can internal pressure of 1.5-2.5 bar at a diameter of 73 mm, and at 1.5-2.5 bar the tab lift is less than 2.5 mm.
12. The can according to any one of claims 1-11, wherein the can has a can diameter of 32-120 mm.
13. The can according to claim 12, wherein the can diameter is 45-102 mm.
14. The can according to claim 13, wherein the can diameter is 45-96 mm.
15. The can according to any one of claims 6-14, wherein upon relief of the can internal pressure the deformable panel structure reforms such that the tab rear part resides beneath the can rim.
16. An easy opening panel comprising a tab connected via a rivet structure to the panel, for a can according to any one of claims 1-15.
17. A panel for an easy opening panel according to claim 16, comprising a panel structure having a compressed structure deformable for compensating stress elongation upon can internal pressure.

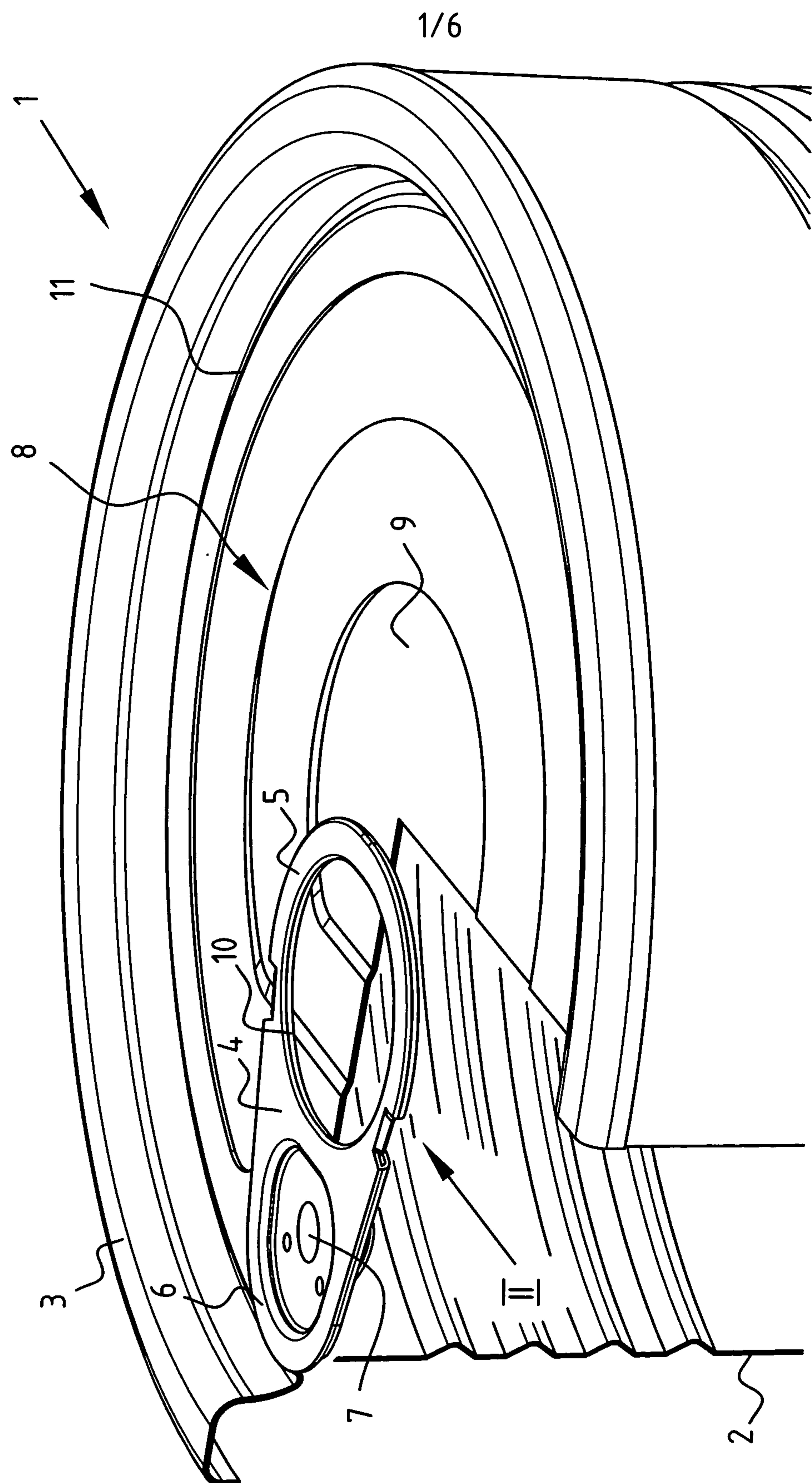


FIG. 1

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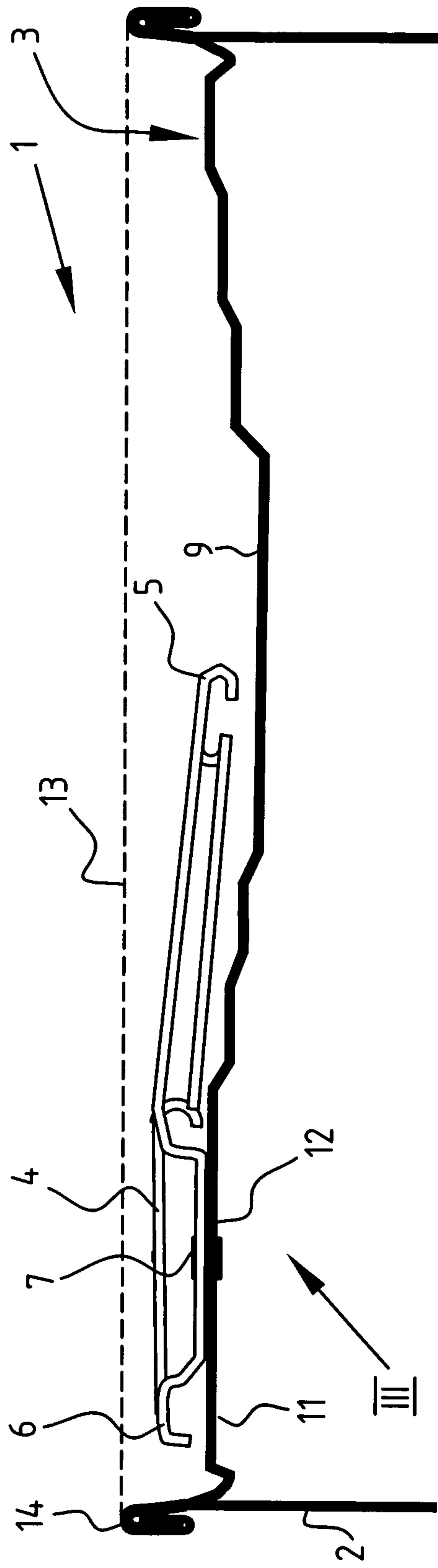


FIG. 2A (PRIOR ART)

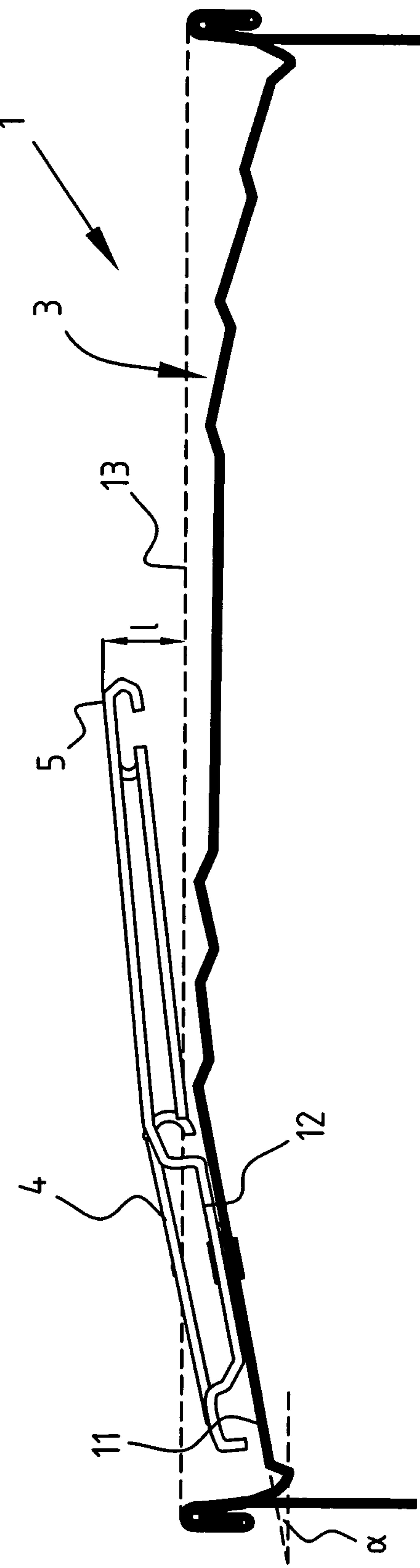
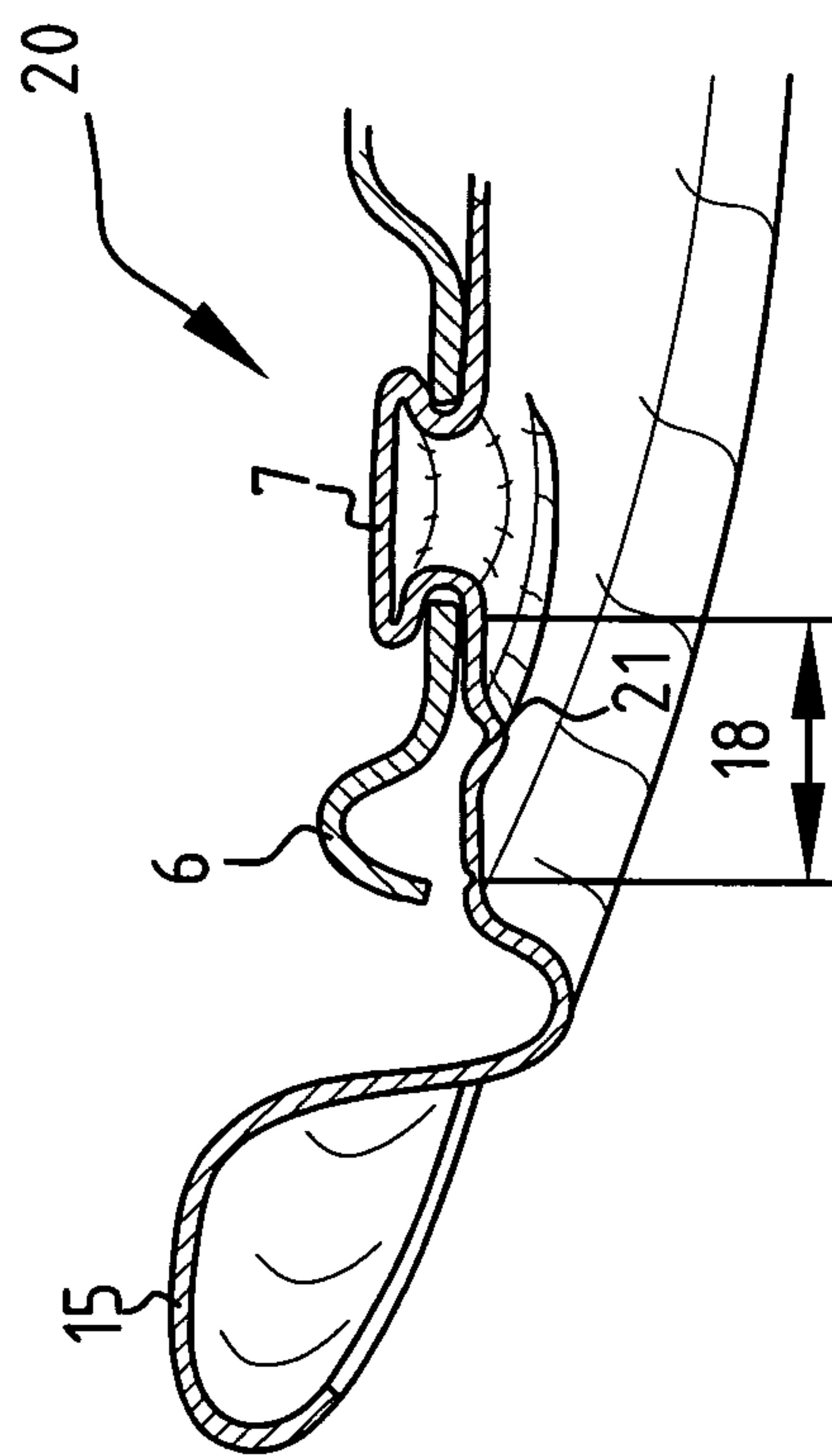
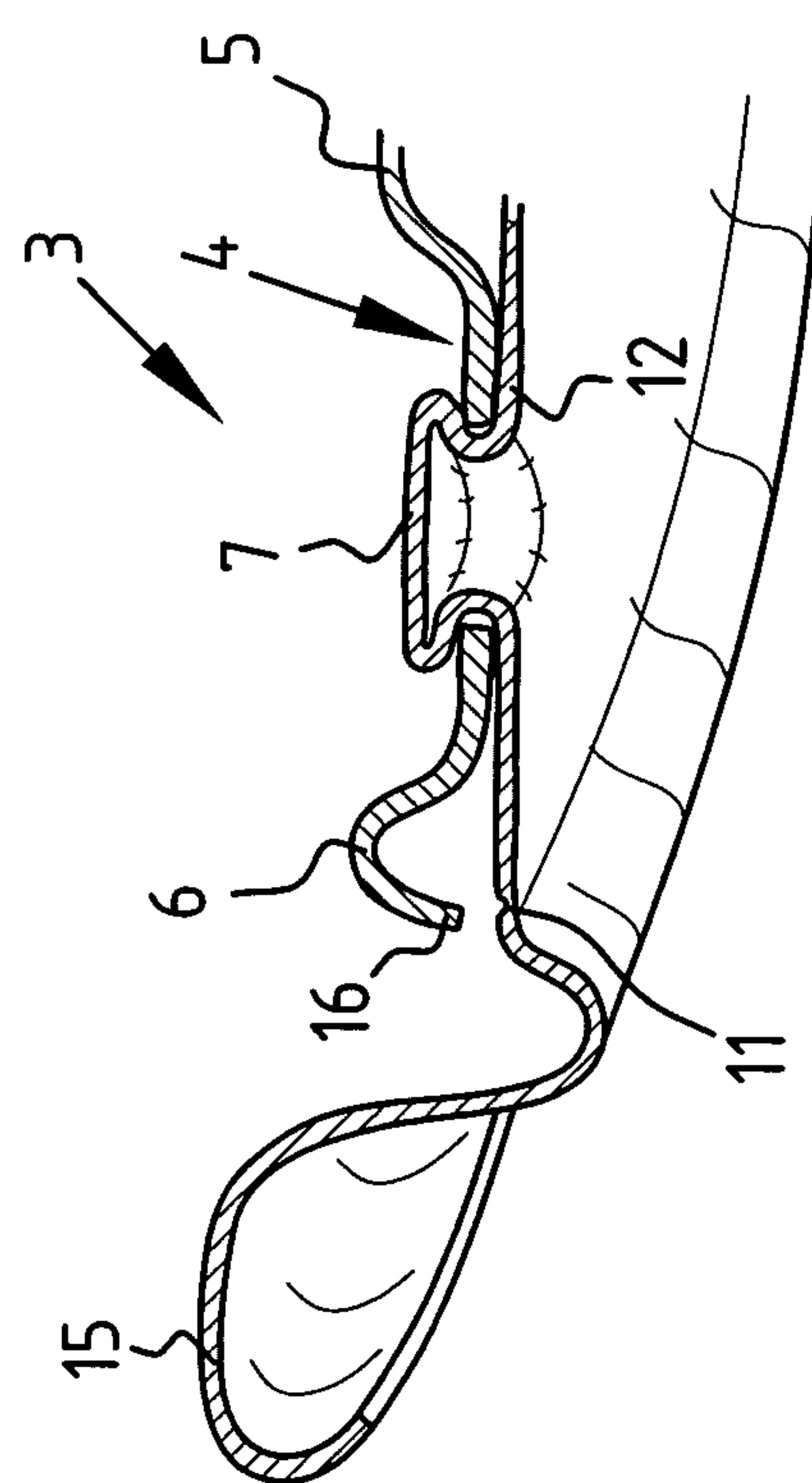
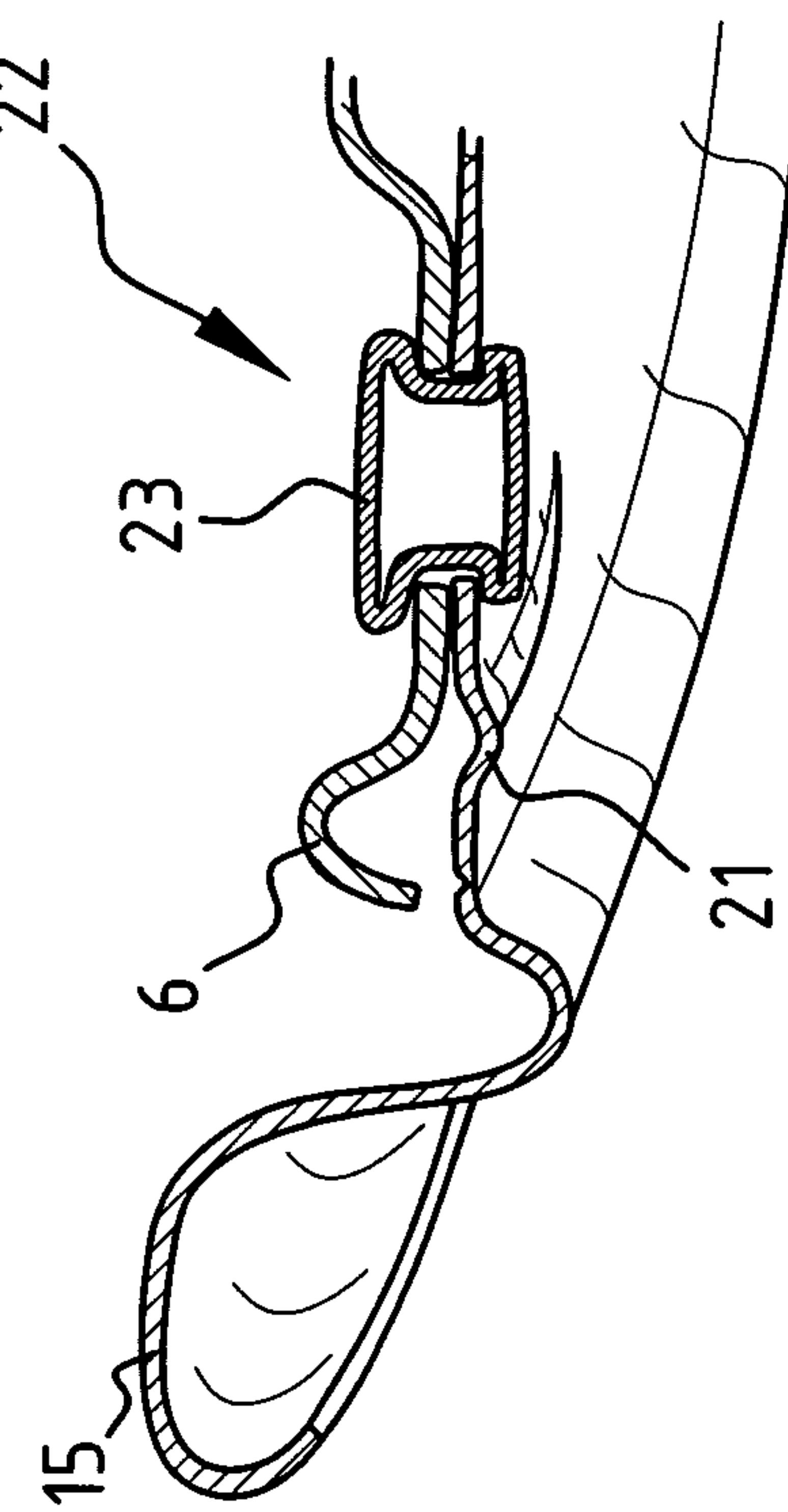
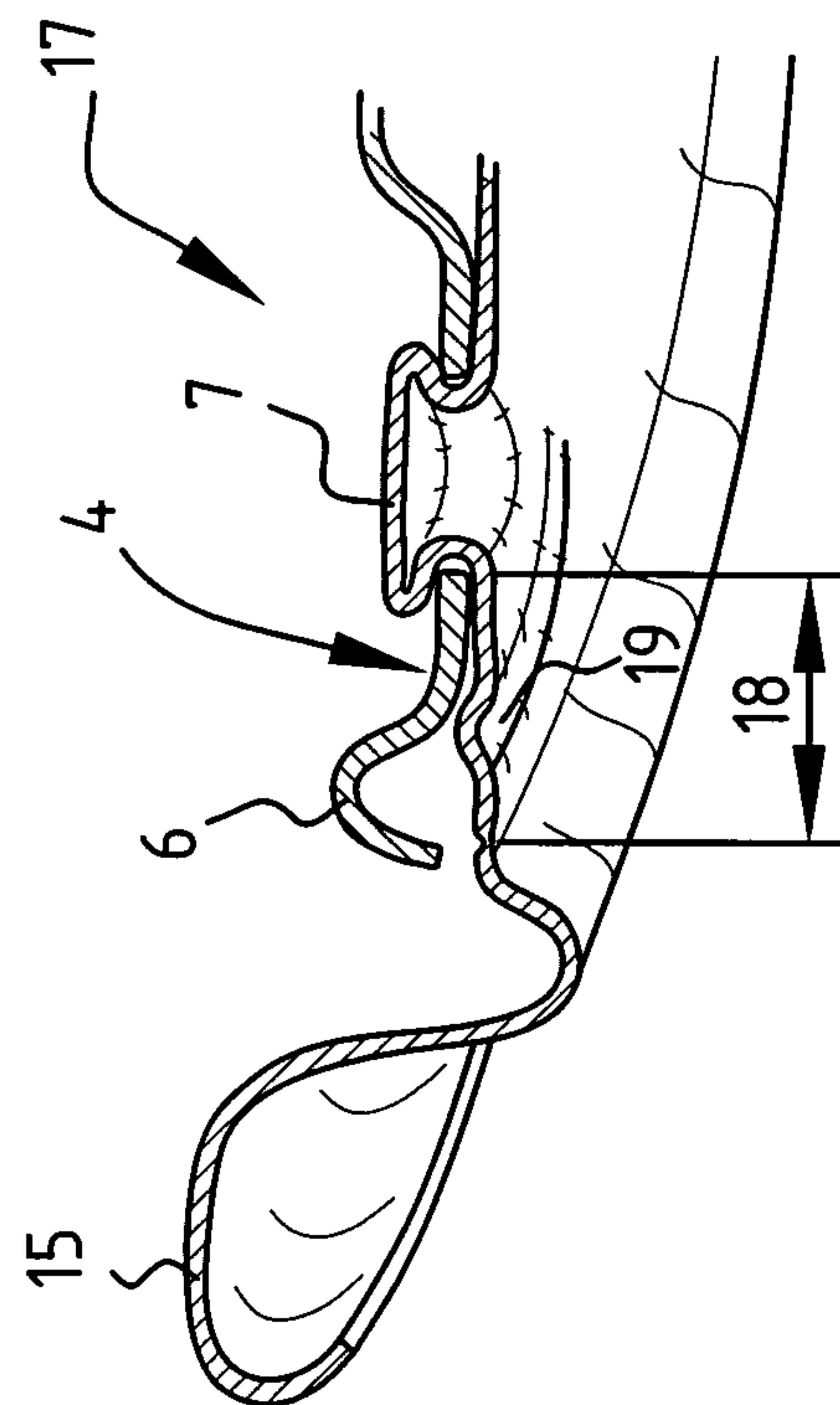
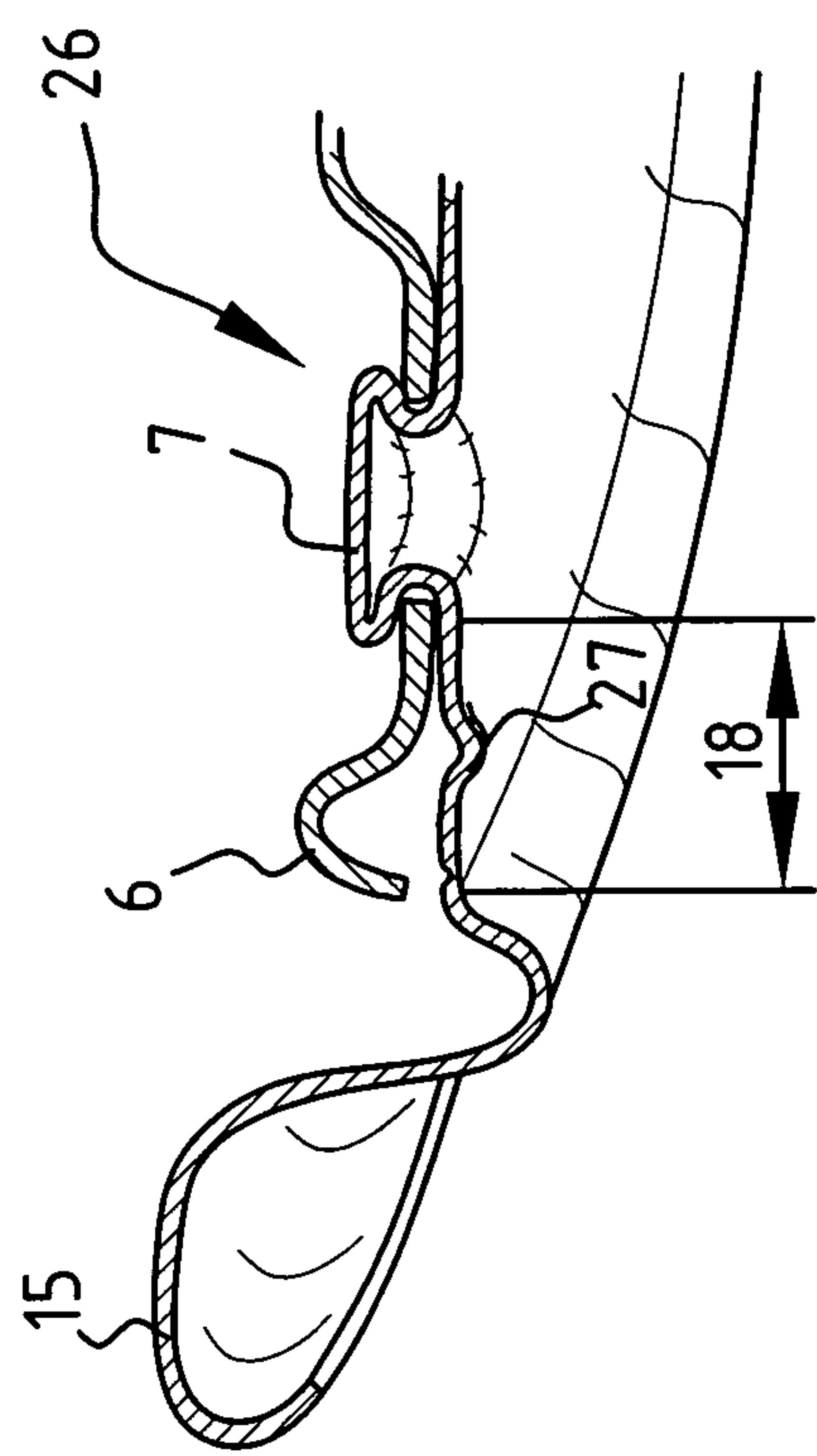


FIG. 2B (PRIOR ART)

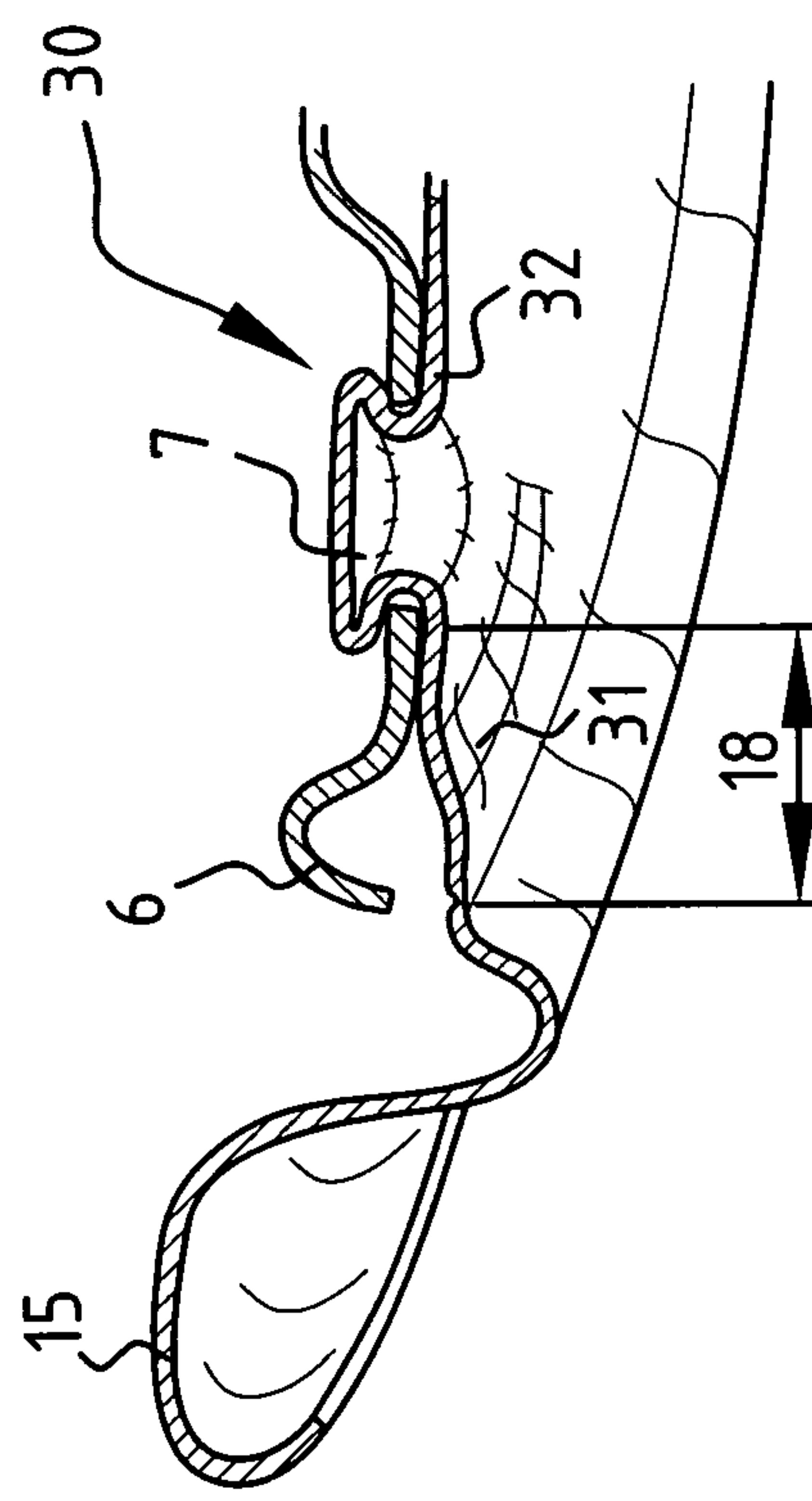
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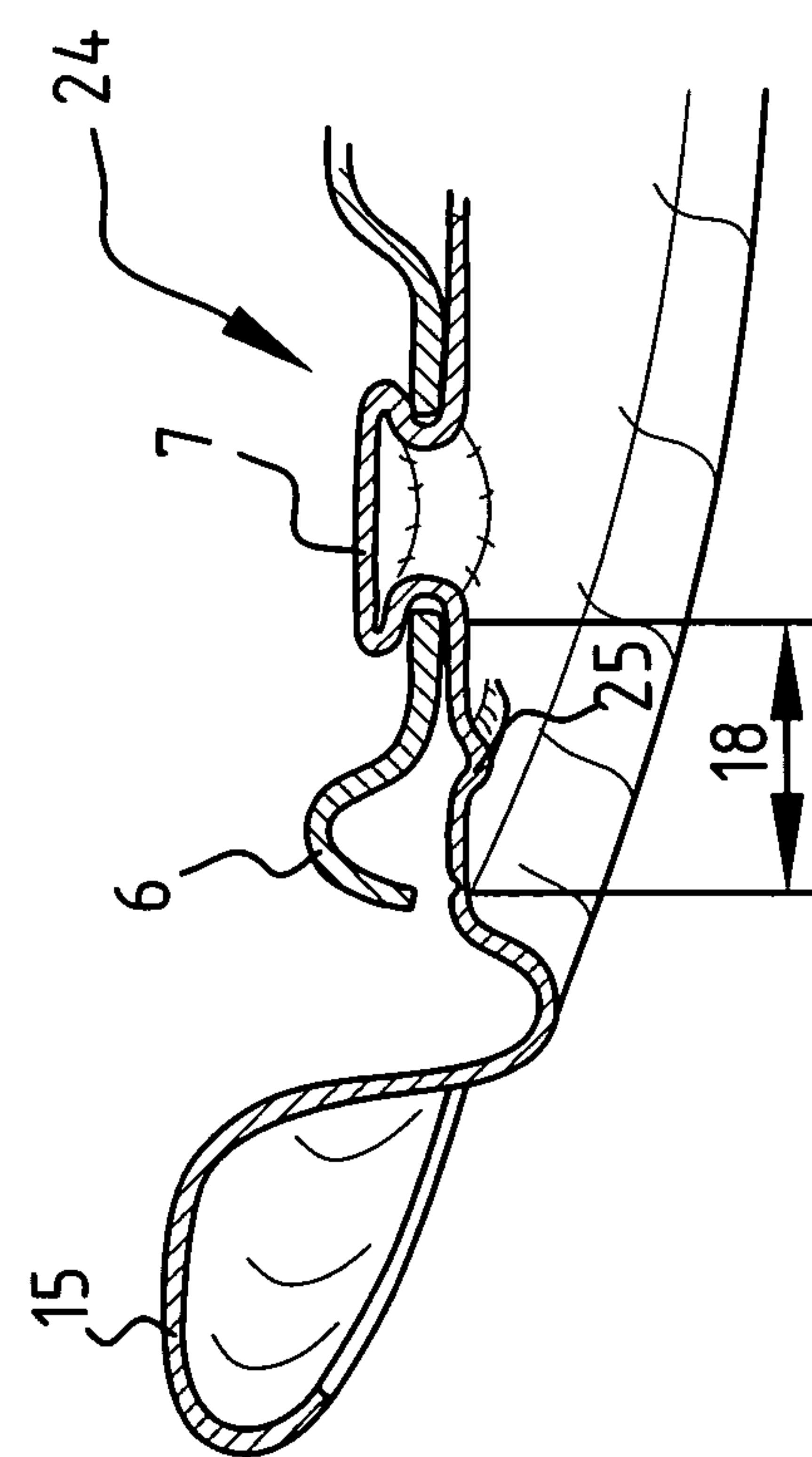
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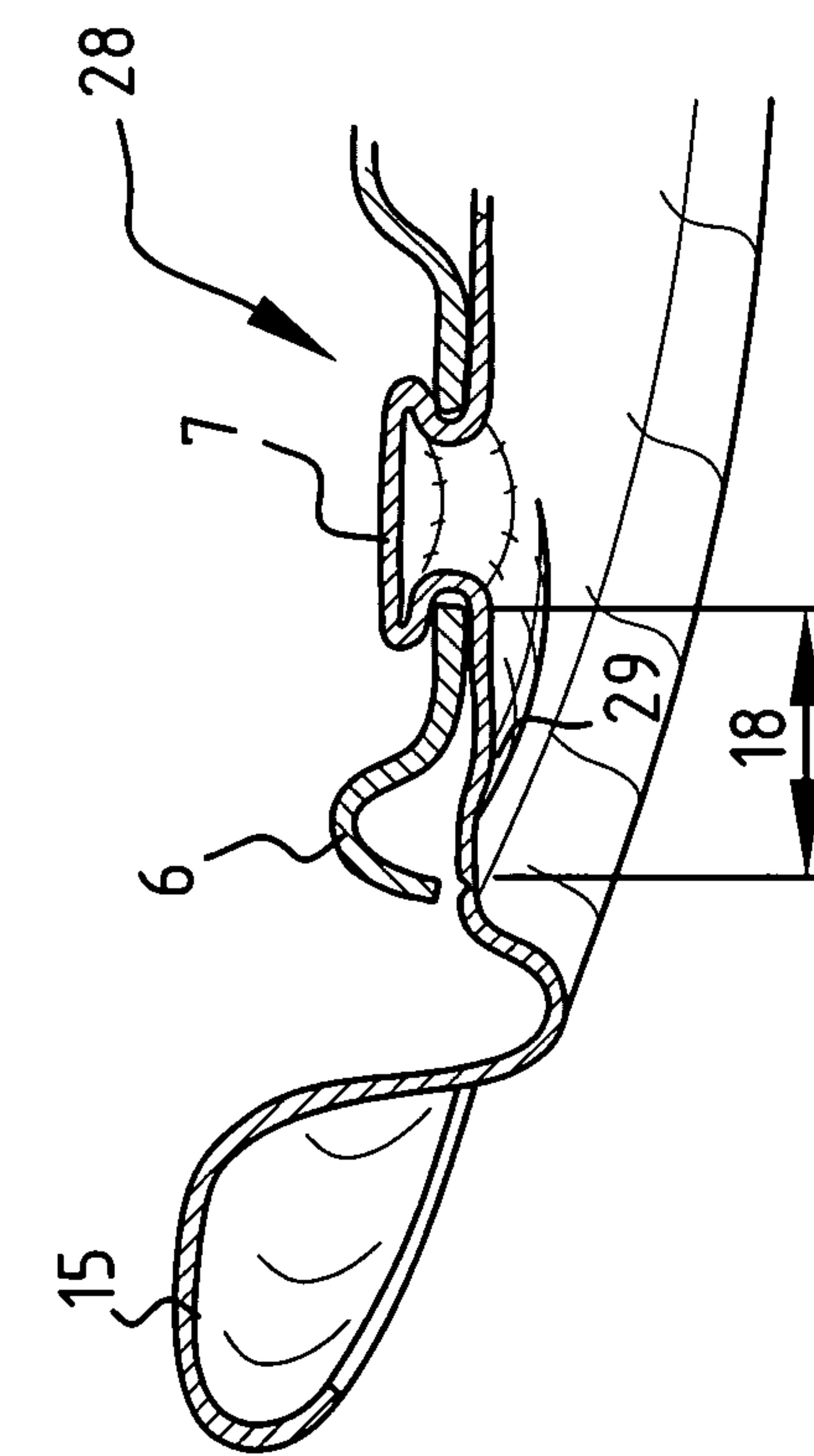
**FIG. 3F**



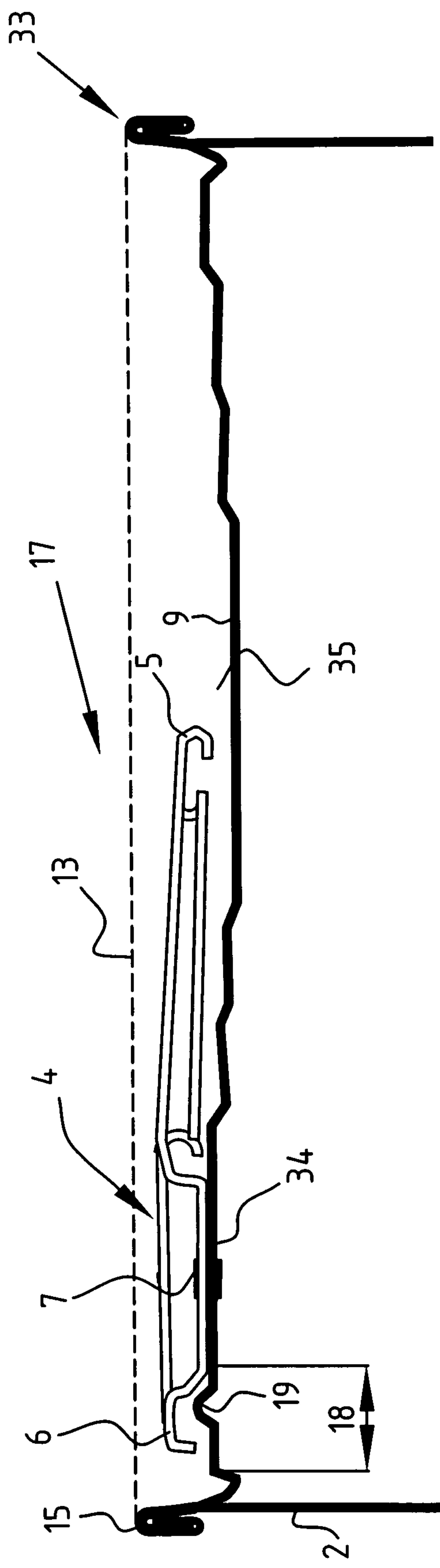
**FIG. 3H**



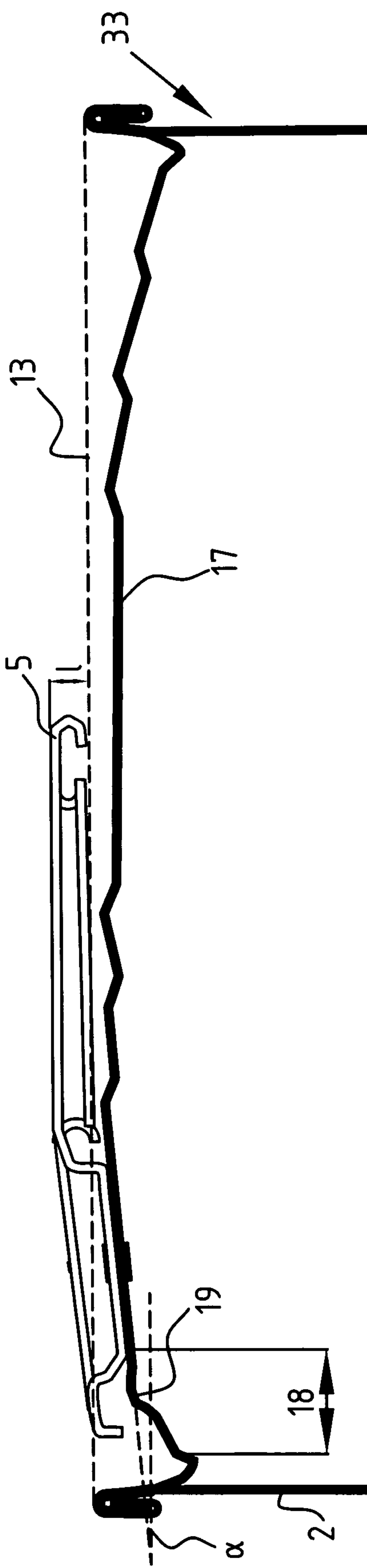
**FIG. 3E**



**FIG. 3G**



5/6



**B**  
**4**  
**E**

