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(54) **Ski-boot**

(57) A ski-boot (1) comprising a shell (2), which is arranged to accommodate the user's foot at least partially, and a sole (3), which is fixedly connected to said shell and positioned underneath it and a collar (4), which comprises a half-shell (5) that is arranged to support the user's leg at the rear and at the sides, and at least one flap (6) for wrapping round and supporting the user's leg (8) at the front. The half-shell comprises at least one flexible side region (50), which is positioned above the malleolar area (7) of the user's leg, said flexible side region being arranged to bend in a predefined and reversible way so as to favour lateral bending of the leg when the user is skiing.

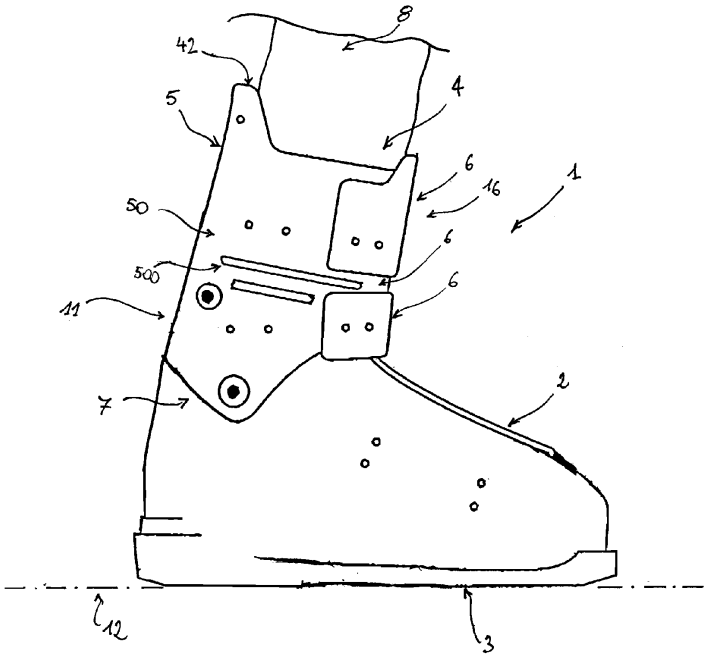

Fig. 1

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Description

[0001] The present invention regards a ski-boot having an improved structure. In particular, the present invention regards a ski-boot that is particularly suitable for use in various sports activities, such as, for example, alpine skiing, ski-mountaineering, telemark, free-ride, etc..

[0002] A ski-boot generally comprises a shell, at least partially made of plastic material, a sole, fixedly connected to the shell, and a cuff or collar, which extends from above the shell to receive, at least partially, the bottom portion of the user's leg.

[0003] It is known how the most recent skiing techniques require the skier to keep the surface of the ski parallel to the ground, preventing, as far as possible, any edging on the snow, particularly when curving. This enables, in fact, a considerable increase in the control over the ski, above all when exerting a thrust on the ski.

[0004] To achieve said purpose, the skier must be able to bend his legs properly in pre-defined directions, forwards and, especially when curving, laterally with respect to the direction of skiing.

[0005] Some ski-boots of a known type present particularly flexible structures that enable the user to bend his legs easily.

[0006] For example, the US patent No. US3945134 describes a ski-boot comprising a collar provided with a plurality of aeration holes, which are uniformly distributed over the entire surface of the collar.

[0007] The US patent No. US4825566 describes a ski-boot comprising a collar provided with a plurality of vertical slits for facilitating insertion of the user's foot.

[0008] The above boots present the common drawback of having a collar with a load-bearing structure that tends to yield too easily and hence does not provide adequate support for the user's leg.

[0009] Given that the user's leg is substantially free to move in any direction, it is somewhat difficult to obtain an efficient transfer of the forces from the user's leg to the ski. The consequence of this is less control over the ski when skiing.

[0010] Other ski-boots of a known type are provided with means for enabling the user to bend his leg easily, when skiing, only in a certain pre-defined direction.

[0011] The European patent application No. EP253306 describes a ski-boot comprising a collar provided, at the front with respect to the user's leg, with a plurality of slits, designed to facilitate bending forwards thereof.

[0012] The European patent application No. EP317798 describes a ski-boot comprising a collar provided, at the front and at the rear with respect to the user's leg, with elastic bellows-like structures, designed to facilitate bending forwards and backwards thereof.

[0013] The US patent No. US6009639 describes a ski-boot comprising a collar provided, at the rear with respect to the user's leg, with a plurality of parallel corrugations, designed to facilitate bending backwards thereof.

[0014] Even though the ski-boots just described provide more support to the user's leg, certain drawbacks may, however, be pointed out.

[0015] Said boots, in fact, facilitate bending of the user's leg only forwards or backwards, i.e., according to a pre-defined direction substantially parallel with respect to the direction of skiing. The collar of said boots laterally presents a substantially rigid structure, which enables lateral bending to be performed with some difficulty.

[0016] During skiing, particularly when curving, it may consequently be problematical to keep the surface of the ski adherent to the ground, as would be desirable. In an attempt to bend the leg laterally, the user must consequently exert a considerable effort to overcome the mechanical strength presented by the structure of the collar, which is laterally rigid.

[0017] This can cause onset of torsional stresses at the level of the user's ankle and/or knee, which are certainly at the root a reduced comfort and possible tiring.

[0018] Consequently, the main aim of the present invention is to provide a ski-boot that will enable the drawbacks highlighted previously to be overcome.

[0019] Within this aim, one of the objects of the present invention is to provide a ski-boot that is able to favour lateral bending of the user's leg during skiing, in particular when curving.

[0020] Another object of the present invention is to provide a ski-boot that, at the same time, will provide an adequate support for the user's leg and that will enable an effective transmission of the force from the user's leg to the ski to be obtained.

[0021] Not the least important object of the present invention is to provide a ski-boot that is relatively simple to industrialize, at contained and economically competitive costs.

[0022] The above aim and objects, as well as other objects that will emerge clearly from the ensuing description and from the attached drawings are provided, a ski-boot according to the following claim 1.

[0023] In a further aspect, the present invention relates also to a collar for ski-boot, according to the following claim 12.

[0024] The ski-boot, according to the invention, comprises a shell, which is designed to accommodate the user's foot, and a sole, which is fixedly connected to said shell and positioned at the bottom thereof.

[0025] A collar extends from above the shell so as to receive, at least partially, the bottom portion of the user's leg. The collar comprises a half-shell, designed to support the user's leg at the rear and at the sides, and one or more flaps designed to wrap round and support the user's leg at the front.

[0026] Said half-shell is provided with at least one flexible side region, positioned at the top of the malleolar area of the user's leg. Said flexible side region is designed to bend in a predefined and reversible way, so as to favour lateral bending of the user's leg when skiing.

[0027] The ski-boot according to the invention enables

the drawbacks of the known art to be overcome.

[0028] The presence of one or more flexible side regions on the half-shell of the collar makes it easier for the user to bend his leg laterally, in particular when he is curving. On the other hand, the remaining structure of the collar constitutes a rigid frame that enables the user's leg to be supported adequately as well as the forces to be transmitted effectively to the ski.

[0029] Further characteristics and advantages of the sole for ski-boot, according to the present invention, may be better appreciated with reference to the description provided hereinafter and to the attached plates of drawings, which are provided purely by way of illustrative and nonlimiting example and in which:

- Figure 1 is a schematic side view of the ski-boot according to the present invention, in a preferred embodiment;
- Figure 2 is a schematic rear view of the ski-boot according to the present invention, in a preferred embodiment;
- Figure 3 is a schematic side view of the half-shell of the collar of the ski-boot according to the invention, in an area corresponding to the external malleolar area of the user's foot;
- Figure 4 is a further schematic side view of the half-shell of the collar of the ski-boot according to the invention, in an area corresponding to the external malleolar area of the user's foot;
- Figure 5 is a schematic further side view of the half-shell of the collar of the ski-boot according to the invention, in an area corresponding to the external malleolar area of the user's foot;
- Figure 6 is a further schematic side view of the half-shell of the collar of the ski-boot according to the invention, in an area corresponding to the external malleolar area of the user's foot;
- Figure 7 is a further schematic side view of the half-shell of the collar of the ski-boot according to the invention, in an area corresponding to the external malleolar area of the user's foot;
- Figure 8 is a schematic further side view of the half-shell of the collar of the ski-boot according to the invention, in an area corresponding to the external malleolar area of the user's foot;
- Figure 9 is a further schematic side view of the half-shell of the collar of the ski-boot according to the invention, in an area corresponding to the external malleolar area of the user's foot;
- Figure 10 is a further schematic side view of the half-shell of the collar of the ski-boot according to the invention, in a region corresponding to the malleolar area internal of the user's foot;
- Figure 11 is a schematic side view of the half-shell of the collar of the ski-boot according to the invention, in a region corresponding to the malleolar area internal of the user's foot;
- Figure 12 is a further schematic side view of the half-shell of the collar of the ski-boot according to the invention, in a region corresponding to the malleolar area internal of the user's foot; and
- Figures 13A, 13B, 13C and 13D are schematic cross-sectional views of some preferred embodiments of cavities made in the flexible side region of the half-shell of the collar of the ski-boot according to the invention.

[0030] With reference to the aforesaid figures, the ski-boot 1 according to the present invention comprises a shell 2, designed to accommodate the user's foot at least partially. The shell 2 is preferably made of plastic material and has a substantially rigid structure.

[0031] The ski-boot 1 also comprises a sole 3, which is fixedly connected to the shell 2 and positioned underneath it, and a collar 4, which extends from above the shell 2, overlapping it at least partially.

[0032] The collar 4 is designed to receive, at least partially, the bottom portion of the user's leg 8 and it comprises a half-shell 5, designed to support the user's leg at the rear and at the sides, and one or more flaps 6 designed to wrap round and support the leg 8 at the front.

[0033] The half-shell 5 is substantially rigid but it comprises at least one flexible side region 50, positioned above the malleolar area 7 of the leg 8. As may further be noted, the side region 50 can extend partially also to one of the flaps 6.

[0034] The side region 50 is designed to bend in a predefined and reversible way so as to favour lateral bending (arrow 9 of Figure 2) of the leg 8 during skiing.

[0035] In fact, when the user bends his leg 8 laterally, for example in the direction of the arrow 14, the flexible side region 50 bends (dashed line 13), in a direction 10 substantially parallel with respect to the plane of the resting surface 91 of the user's foot and orthogonal with respect a longitudinal principal axis 12 of the ski-boot 1.

[0036] In particular, the side region 50 bends in a direction opposite with respect to the direction (indicated by the arrow 14) of the force exerted on the top edge 42 of the half-shell 5.

[0037] The side region 50 preferably comprises one or more lateral cavities (reference numbers 500, 510 and 520) made in the thickness of the wall of the half-shell 5.

[0038] The presence of the lateral cavities 500 bestows a high degree of flexibility on the flexible side region 50.

[0039] In particular, during a lateral bending of the collar 4, there is a decrease in the cross section of the lateral cavities 500. This enables an accentuation of the movement of the top edge 42 in a lateral direction given the same force exerted on the collar 4. In this way, the user can bend his leg 8 laterally more easily, particularly when curving during skiing.

[0040] On the other hand, the decrease in the cross section of the lateral cavities 500 enables accumulation of a certain amount of elastic energy in the flexible side region 50. Said accumulated elastic energy is substan-

tially proportional to the degree of lateral bending of the collar 4. At the end of the curving operation, the accumulated elastic energy is released reversibly by the flexible side region 50 and is transmitted, at least partially, to the ground. In this way, there is a significant increase in the thrust that the user can impart on the ski when coming off a curve.

[0041] The half-shell 5 advantageously comprises also rigid areas 11, for example, the rear bottom area of the collar 4, capable of supporting the leg 8 adequately and transmitting the forces from the leg 8 to the ski effectively.

[0042] It is moreover possible to envisage the presence of other flexible areas 16, for example of the type described in the patents referred to above. Said flexible areas could be, for example, localized in an area corresponding to the flaps 6 or at a top rear area of the collar 4, so as to facilitate bending of the user's leg forwards or backwards. Preferably, however, the rear area of the collar 4 is completely rigid given that it has been found that said solution enables optimization of transmission of the forces from the leg 8 to the ski.

[0043] The lateral cavities 500 can be, for example, cavities that pass through the thickness of the wall 501 of the half-shell 5, in an area corresponding to the side region 50 (Figure 13A).

[0044] A through cavity 500 can be easily obtained by using known techniques, such as, for example, processes of moulding, perforation, cutting, punching or other methods of selective removal of plastic material.

[0045] Alternatively, the lateral cavities 500 can be blind cavities made in the thickness of the wall 501 of the half-shell 5 (Figures 13B-13D).

[0046] A blind cavity 500 can be advantageously made in an area corresponding to the external surface 502 of the wall 5 or 1 (Figure 13C). The external surface 502 is, in practice, the surface of the collar 4 that faces the outside of the boot.

[0047] Alternatively, a blind cavity 500 can be made in an area corresponding to the internal surface 503, i.e., the surface of the collar 4 that faces the user's leg (Figures 13B and 13D).

[0048] A blind cavity 500 can be obtained with the known techniques described above for selective removal of plastic material. Alternatively, a blind cavity 500 can be obtained first by providing a through cavity 500 and then associating thereto an addition of material 560 (Figure 13D), so as to close it in an area corresponding to one of the two surfaces 502 or 503. The addition of the material 560 can be made using plastic material or a material, for example metal, completely different from that of the collar 4 and can be associated to the through cavity 500 according to known techniques: for example, it can be glued, riveted, screwed, soldered, or subjected to any other process designed to associate the surfaces of two components to one another.

[0049] The shape of the lateral cavities 500 can be designed according to the requirements. For example, they can assume a polygonal shape (Figure 3), a circular shape (Figure 4), or an elliptical shape (Figures 5-12).

[0050] An adequate choice of the shape of the cavities 500 enables appropriate modulation of the degree of bending of the side region 50. For example, it has been found that the use of lateral cavities 500 of an elliptical shape enables considerable increase in the lateral flexibility of the collar 4, whilst lateral cavities 500 having a circular shape bestow a lower degree of flexibility thereon.

[0051] Also positioning of the side region 50 on the half-shell 5 and/or orientation of the lateral cavities 500 are particularly important. Adequate choices in this sense enable modulation, according to the requirements, of the degree of lateral bending of the collar 4.

[0052] With reference to Figures 3-12, the half-shell 5 preferably comprises a first flexible side region 51, positioned in an area corresponding to the portion of leg 8 overlying the external malleolar area 71. The first side region 51 comprises one or more first lateral cavities 510.

[0053] Preferably, the first side region 51 is positioned in the proximity of a median lateral area of the half-shell 5, which is comprised between a flap 6 of the half-shell 5 and the fixing areas 54 for two engagement elements (not illustrated), which are associated laterally to the half-shell 5.

[0054] The first side region 51 can comprise a number of first lateral cavities 510 set aligned (Figures 3-4) and/or parallel (Figures 7 and 9) to one another.

[0055] Alternatively, the first side region 51 can comprise just one first lateral cavity 510 (Figures 5-6 and 8).

[0056] In the case where it is desired to increase further the flexibility of the collar 4, it is possible to extend the first side region 51 also to one of the external flaps 6 of the collar 4. In this case, one or more of the cavities 510 can be made on a first outer flap 6 (Figures 3-5).

[0057] Likewise, the half-shell 5 can comprise a second flexible side region 52, positioned in an area corresponding to the portion of user's leg overlying the internal malleolar area 72. Preferably, the second side region 52 comprises one or more second lateral cavities 520, positioned in the proximity of a bottom edge 43 of the half-shell 5 and of the collar 4.

[0058] The second side region 52 comprises a number of second lateral cavities 520 set aligned (Figure 10) and/or parallel (Figure 12) to one another or, alternatively, a single second lateral cavity 520 (Figure 11).

[0059] In a way similar to what has been described above, it is possible to extend the second side region 52 also to one of the internal flaps 6 of the collar 4. In this case, one or more of the cavities 520 can be made on a second internal flap 6 (Figure 10).

[0060] Also the orientation of the lateral cavities 510 and 520 can vary according to the requirements. For example, the first lateral cavities 510 are advantageously positioned according to an axis 55 (Figure 3) not orthogonal with respect to the plane of the ski. In this way, each lateral cavity 510 can vary more its own cross section during lateral bending of the leg, thus improving further

the flexibility of the side region 51.

[0061] The lateral cavities 520 are, instead, advantageously oriented so as to follow as close as possible the profile of the bottom edge 43 of the half-shell 5 and/or of the flap 6 of the collar. Is has been found that this favours further lateral bending inwards of the leg 8.

[0062] In practice, it has been seen that the ski-boot according to the present invention enables the problems of the known art to be solved and presents numerous advantages as compared therewith.

[0063] In particular, thanks to the presence of the flexible side regions 50-52, the collar 4 of the ski-boot 1 is no longer an element that is substantially undeformable laterally but is able to change its own configuration according to the direction of the forces transmitted between the user and the ski. The ski-boot can favour lateral movements of the user's leg, in particular when he is curving and/or in the presence of a non-uniform ski run.

[0064] On the other hand, given that the flexible side regions 50-52 are set in positions corresponding only to certain pre-defined portions of the half-shell 5, it is always possible to obtain an effective and non-dispersive transmission of the forces from the user's leg 8 to the ski.

[0065] The collar 4 remains laterally rigid in the case of non-lateral bending of the leg, for example. in the case of bending forwards or backwards of the leg or more in general bending of the leg in the direction of skiing. This results in a greater control over the ski during all the phases of skiing and in an improved comfort for the user.

[0066] The configuration of the ski-boot can be further modulated according to the requirements by varying the positioning, orientation and shape of the lateral cavities 500, 510 and 520. It is hence possible to obtain models of ski-boots having collars with differentiated coefficients of flexibility according to the requirements and capabilities of the user. For example, for a skilled user it is possible to provide a ski-boot with a more flexible collar, which will enable a stronger push to be exerted when curving. For a beginner, it is possible to provide a ski-boot with a more rigid collar, which will ensure a greater control over the ski.

[0067] The ski-boot according to the present invention does not present any particular aspects of difficulty from the production standpoint. In fact, it can be easily produced by means of the known techniques of moulding of plastic materials. Consequently, it has revealed relatively simple to industrialize, at contained economically competitive costs.

Claims

1. A ski-boot (1) comprising a shell (2), which is arranged to accommodate the user's foot at least partially, and a sole (3), which is fixedly connected to said shell and positioned underneath it and a collar (4), which extends from above said shell to receive, at least partially, the bottom portion of the user's leg (8), said collar comprising a half-shell (5), which is arranged to support the user's leg at the rear and at the sides, and at least one flap for wrapping round and supporting the user's leg at the front;
characterized in that said half-shell comprises at least one flexible side region (50), which is positioned above the malleolar area (71) of the user's leg, said flexible side region being arranged to bend in a predefined and reversible way so as to favour lateral bending of the leg when the user is skiing.

2. A ski-boot, according to claim 1, **characterized in that** said flexible side region bends in a direction (9) substantially parallel to the plane of the resting surface of the user's foot and orthogonal to the longitudinal principal axis of said ski-boot.

3. A ski-boot, according to claim 2, **characterized in that** said flexible side region bends in a direction (10) substantially opposite with respect to the direction (14) of the force exerted on said half-shell during lateral bending of the user's leg.

4. A ski-boot, according to one or more of the preceding claims, **characterized in that** said flexible side region comprises at least one lateral cavity (500) made in the thickness of the wall of said half-shell, in an area corresponding to said flexible side region.

5. A ski-boot, according to one or more of the preceding claims, **characterized in that** said half-shell comprises a first flexible side region (51), positioned in an area corresponding to the portion of the user's leg overlying the external malleolar area (71), said first flexible side region comprising at least one first lateral cavity (510).

6. A ski-boot, according to claim 5, **characterized in that** said first flexible side region is positioned in the proximity of a median side area of said half-shell, comprised between two engagement elements associated laterally to said half-shell, and a flap of said collar.

7. A ski-boot, according to one or more of the claims from 6 to 7, **characterized in that** a first flap (6) of said collar comprises a portion of said first flexible side region.

8. A ski-boot, according to one or more of the claims from 6 to 8, **characterized in that** said first flexible side region comprises one or more first lateral cavities set aligned and/or parallel to one another.

9. A ski-boot, according to one or more of the preceding claims, **characterized in that** said collar comprises a second flexible side region (52), positioned in an area corresponding to the portion of the user's leg

overlying the internal malleolar area (72), said second flexible side region comprising at least one second lateral cavity (520).

10. A ski-boot, according to claim 9, **characterized in that** said second flexible side region is positioned in the proximity of a bottom edge (43) of said half-shell, said second lateral cavity being aligned so as to follow the profile of said bottom edge.

11. A ski-boot, according to one or more of the claims from 10 to 11, **characterized in that** a second flap (6) of said collar comprises a portion of said second flexible side region.

12. A collar for a ski-boot, **characterized in that** it comprises a flexible side region, designed to bend in a predefined and reversible way so as to favour lateral bending of the user's leg when he is skiing.

13. A collar for a ski-boot according to claim 13, **characterized in that** said flexible region comprises at least one cavity made in the wall of said collar, in an area corresponding to said flexible side region.

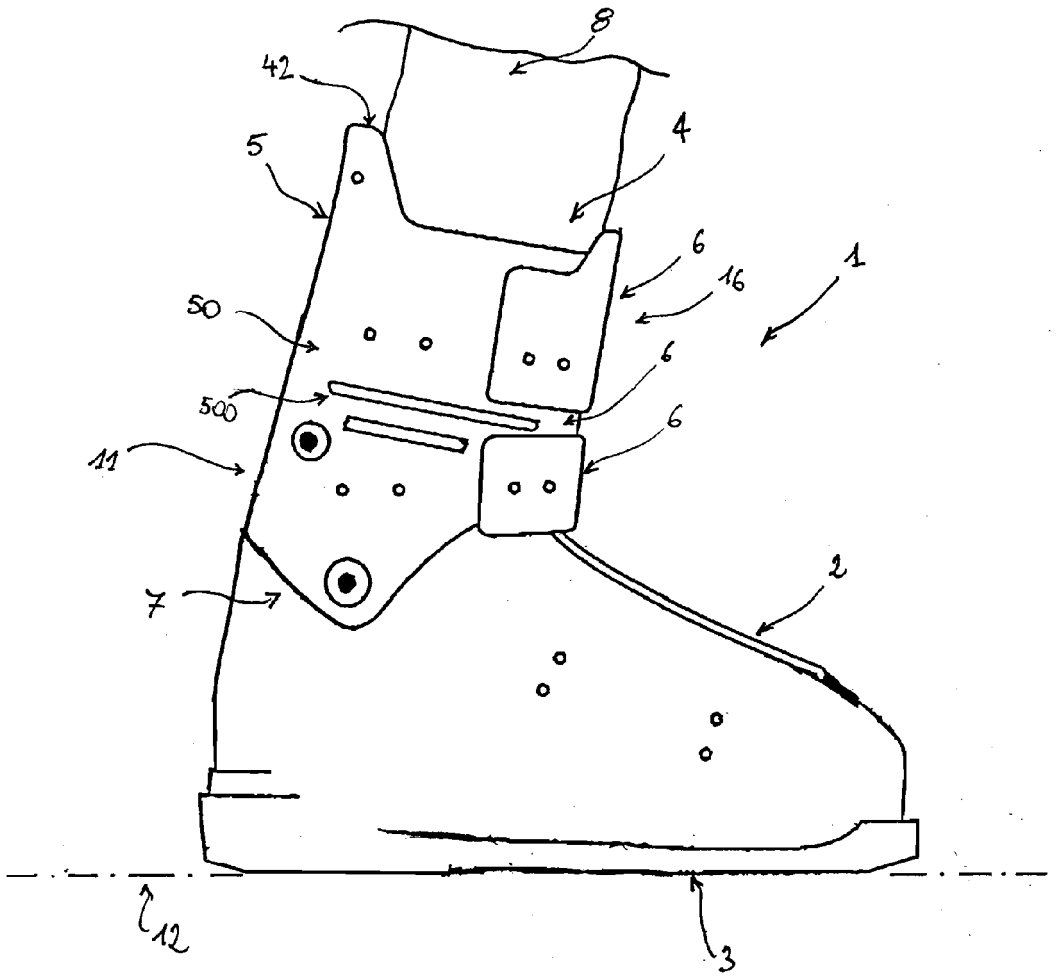


Fig. 1

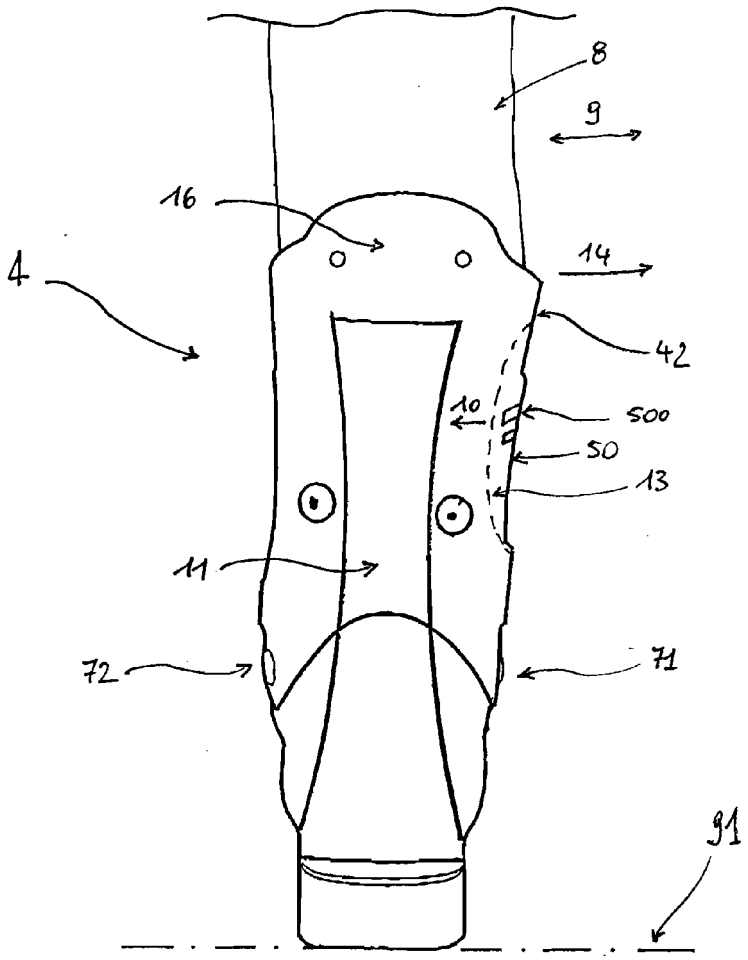
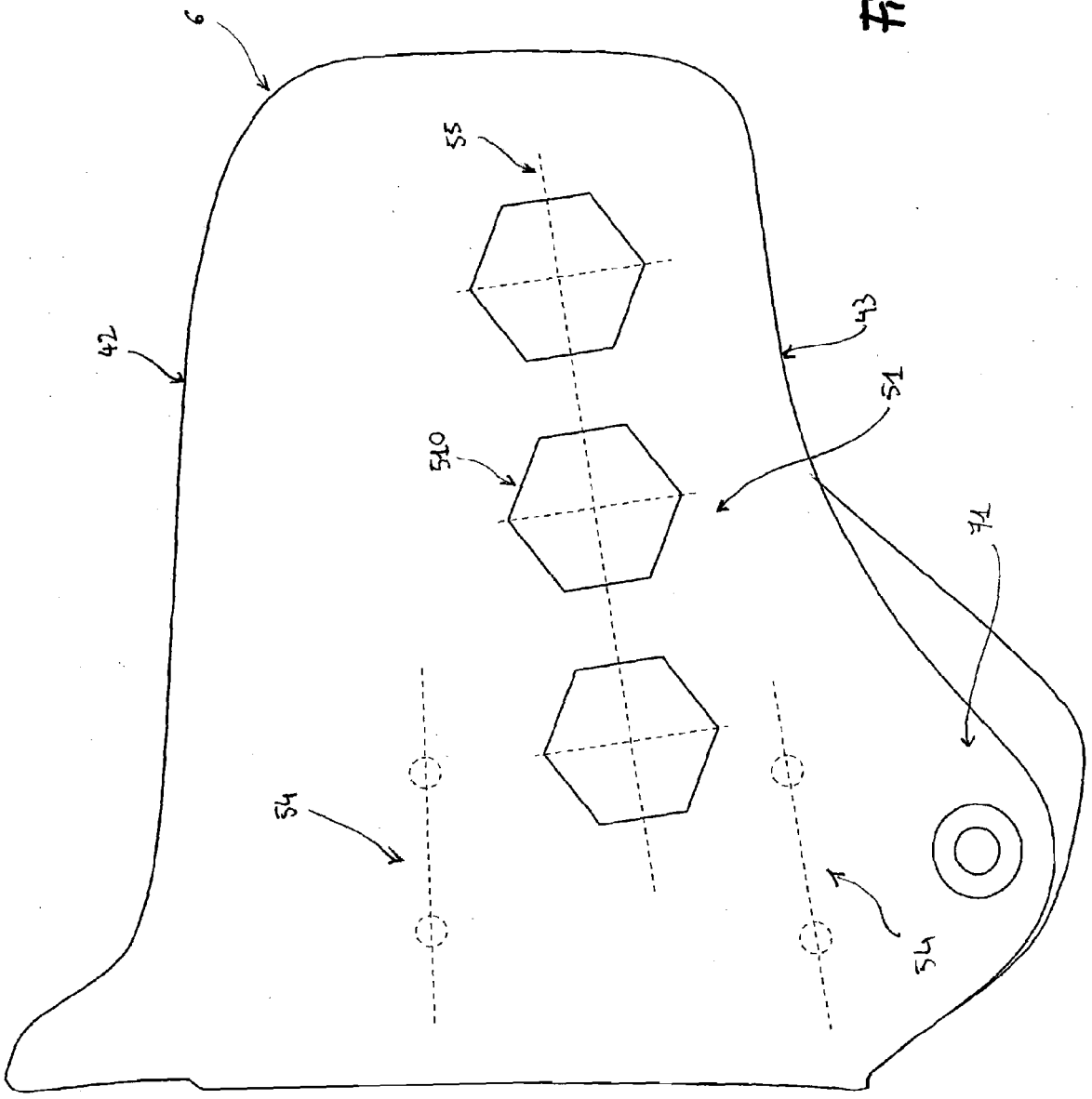


Fig. 2

Fig. 3



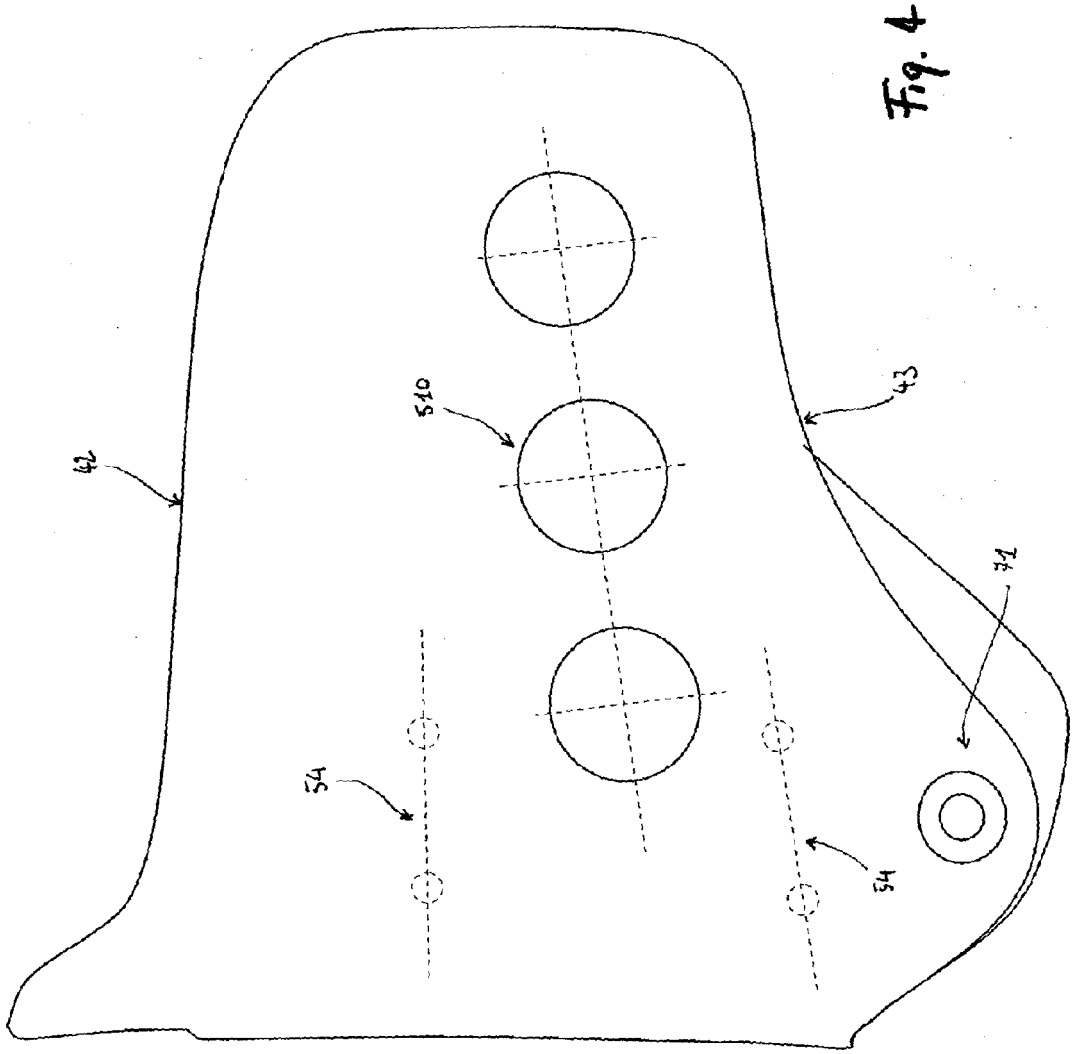


Fig. 4

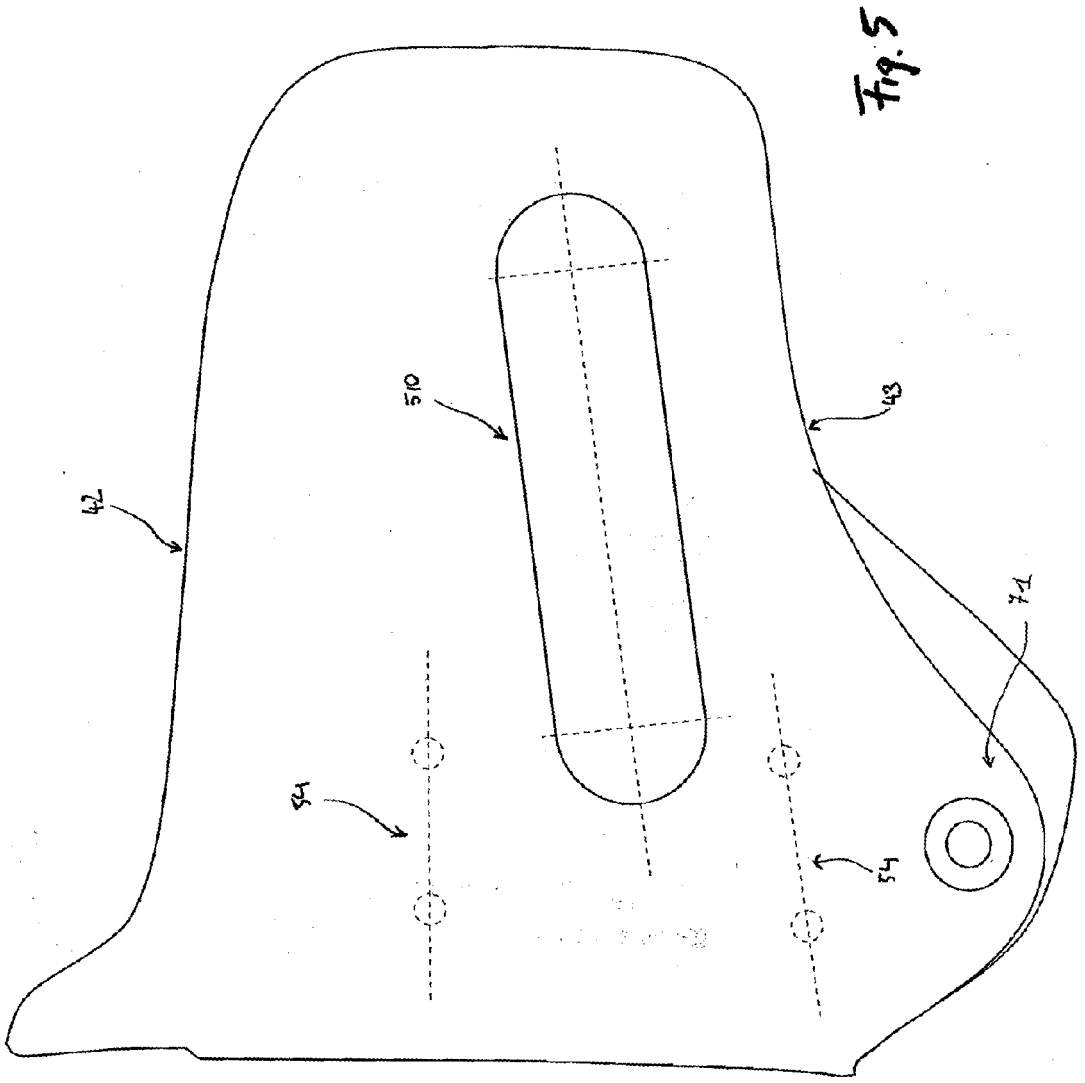


Fig. 5
510
43
42
41
54
54

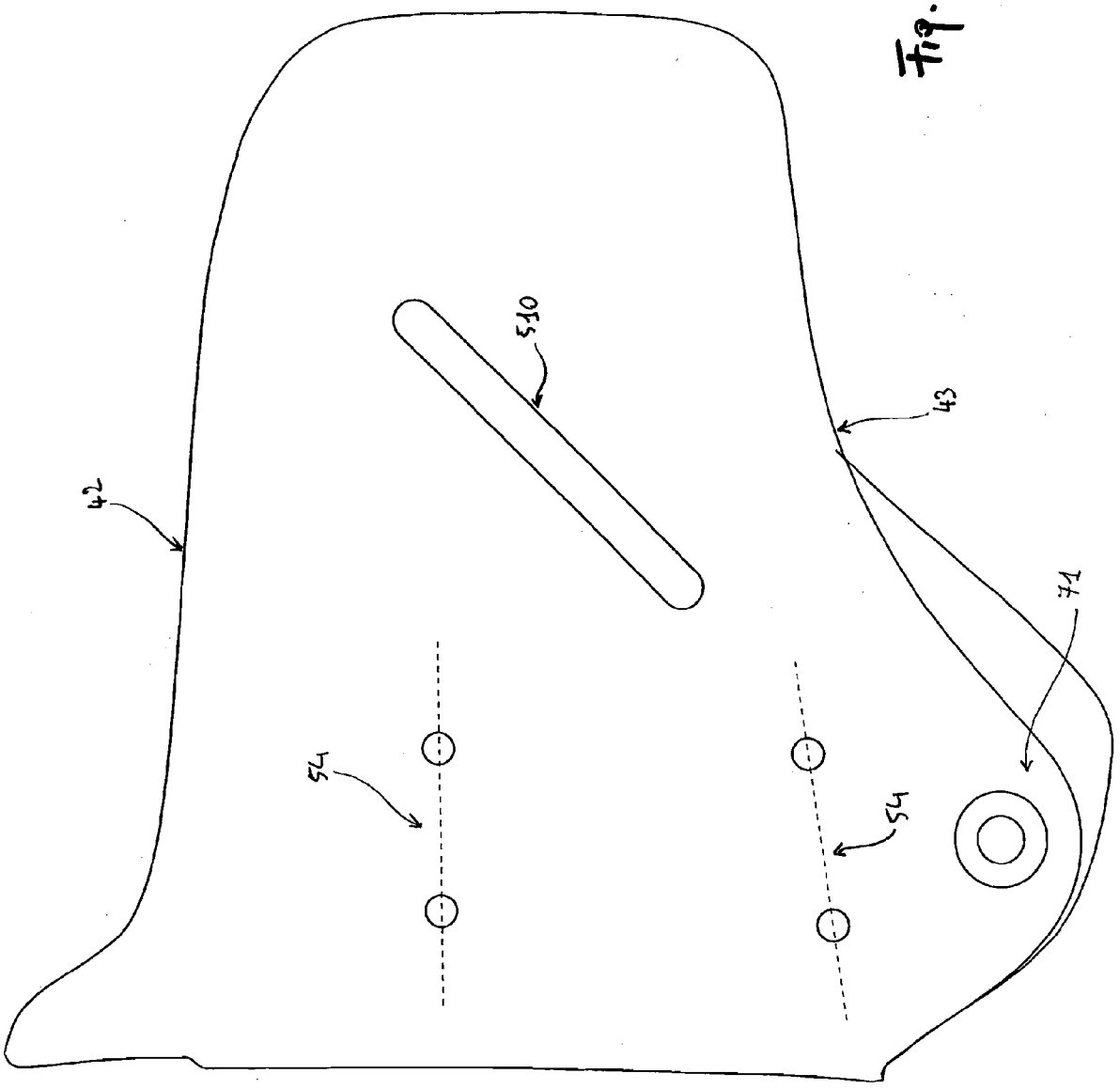


Fig. 6

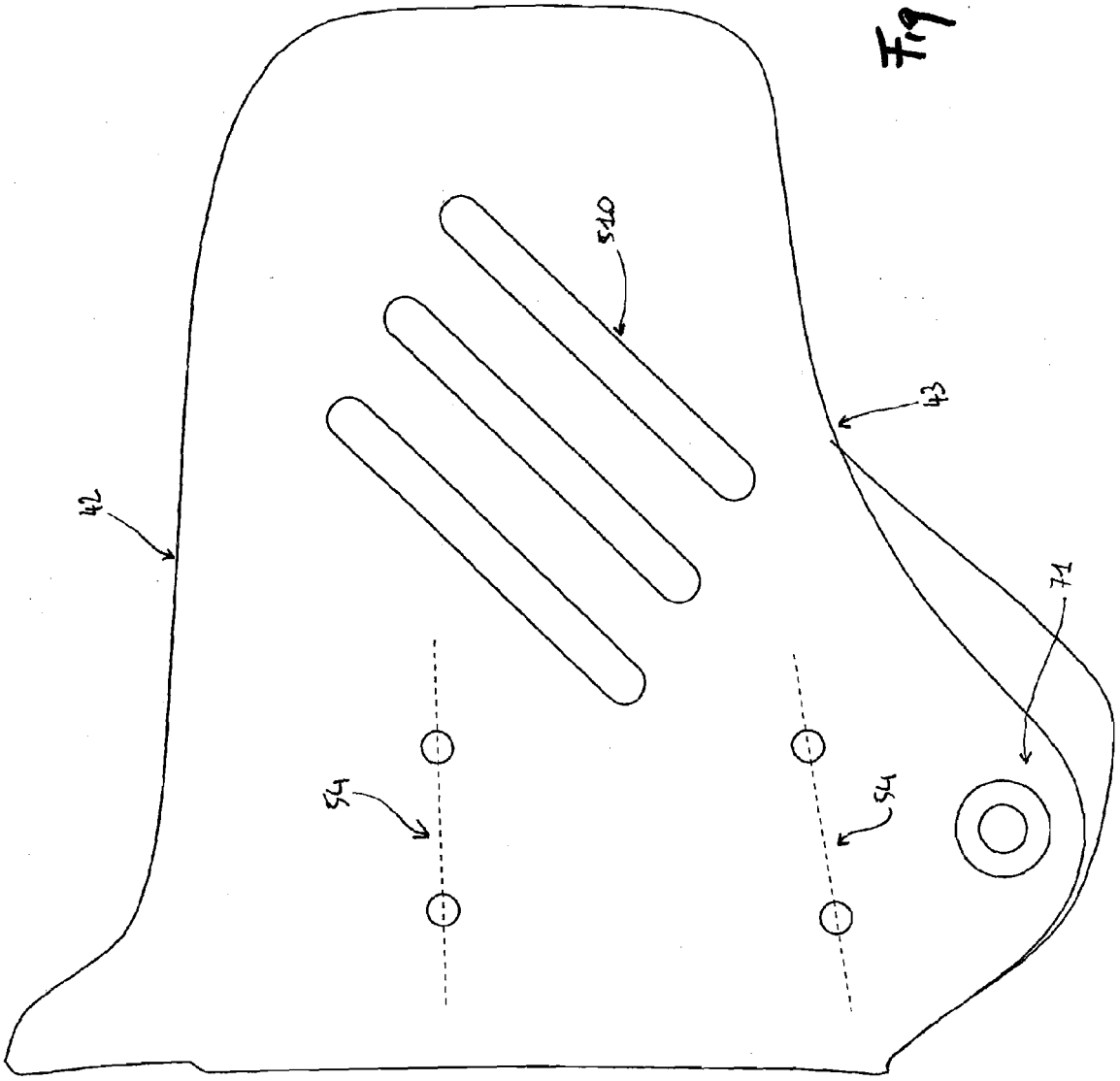


Fig. 7

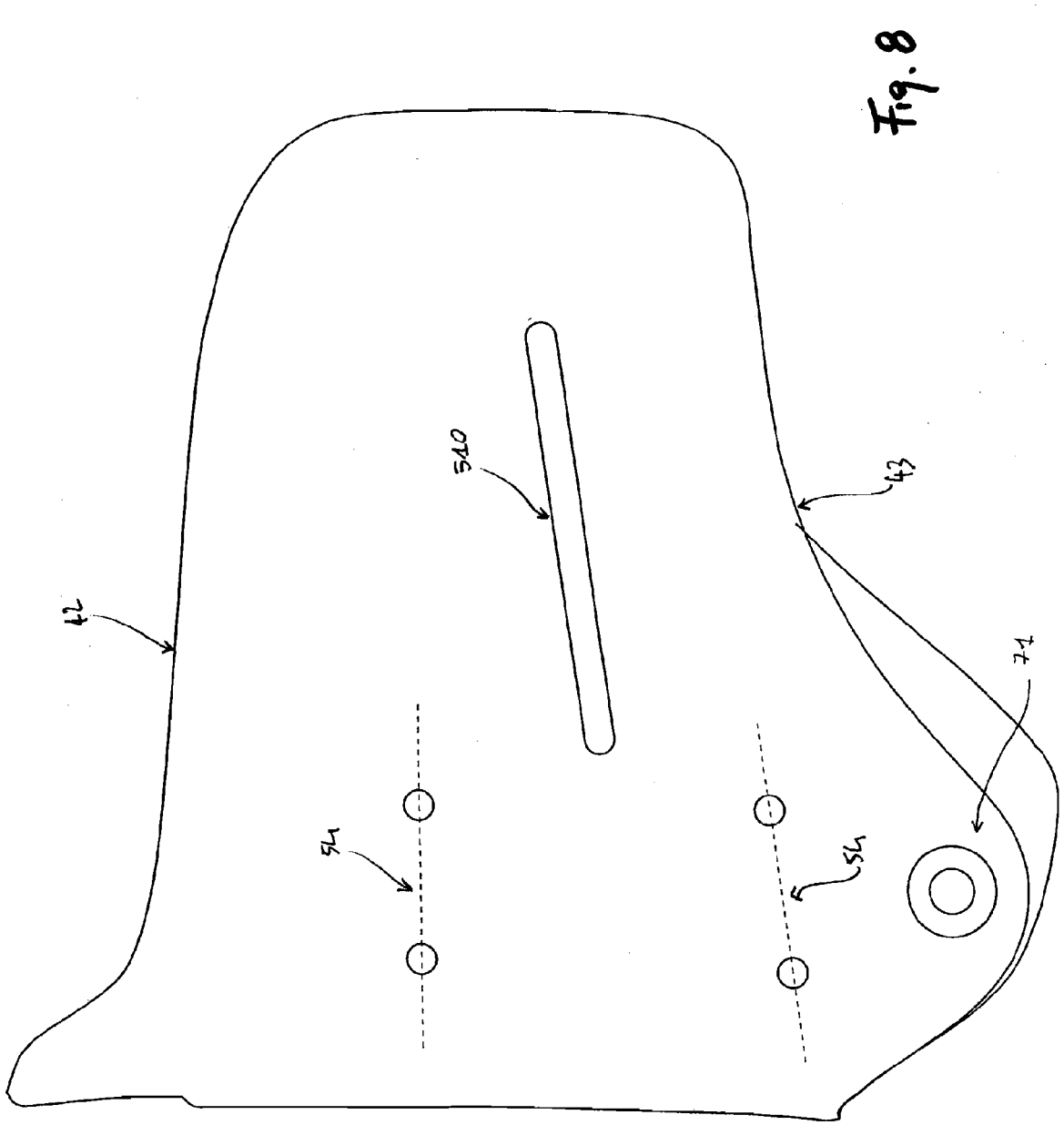


Fig. 8

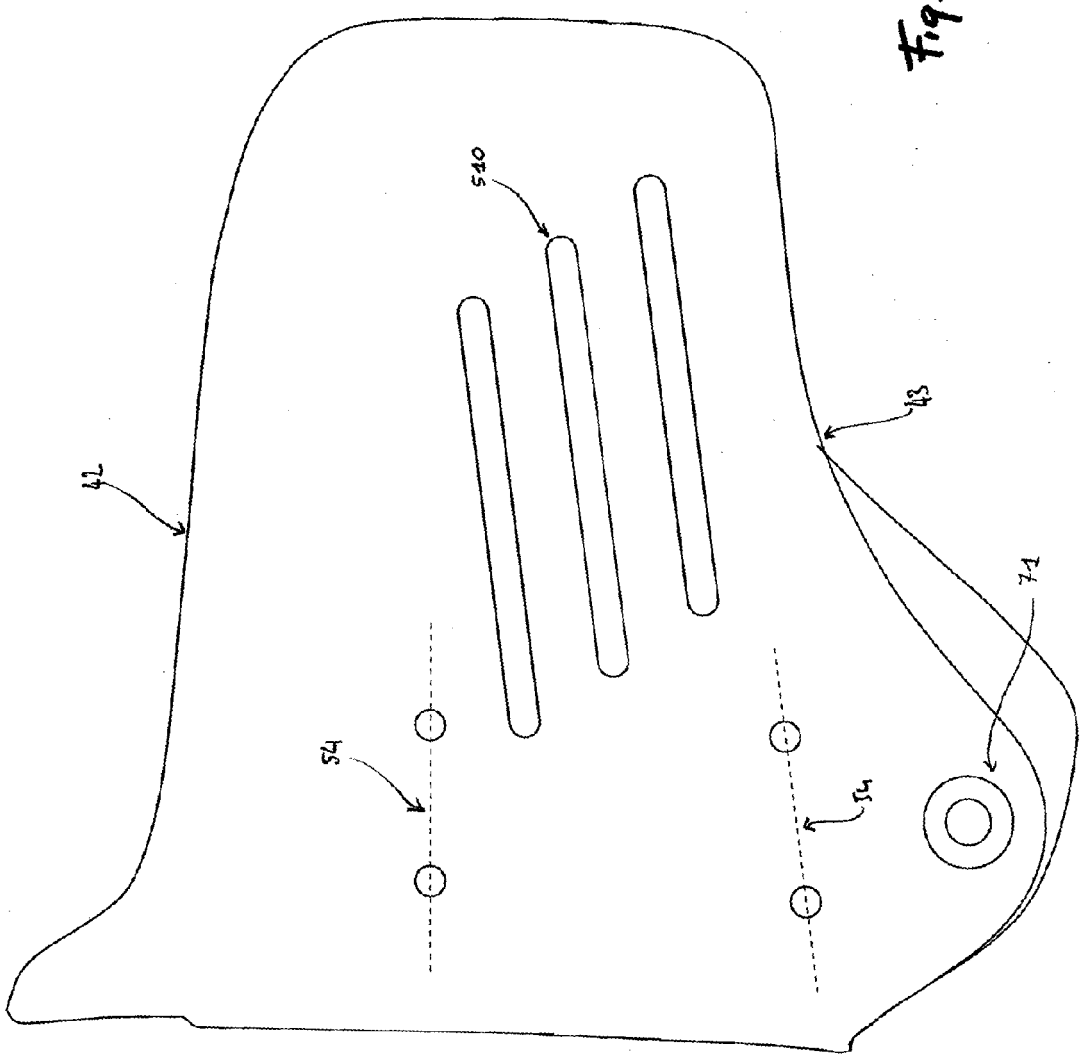


Fig. 9

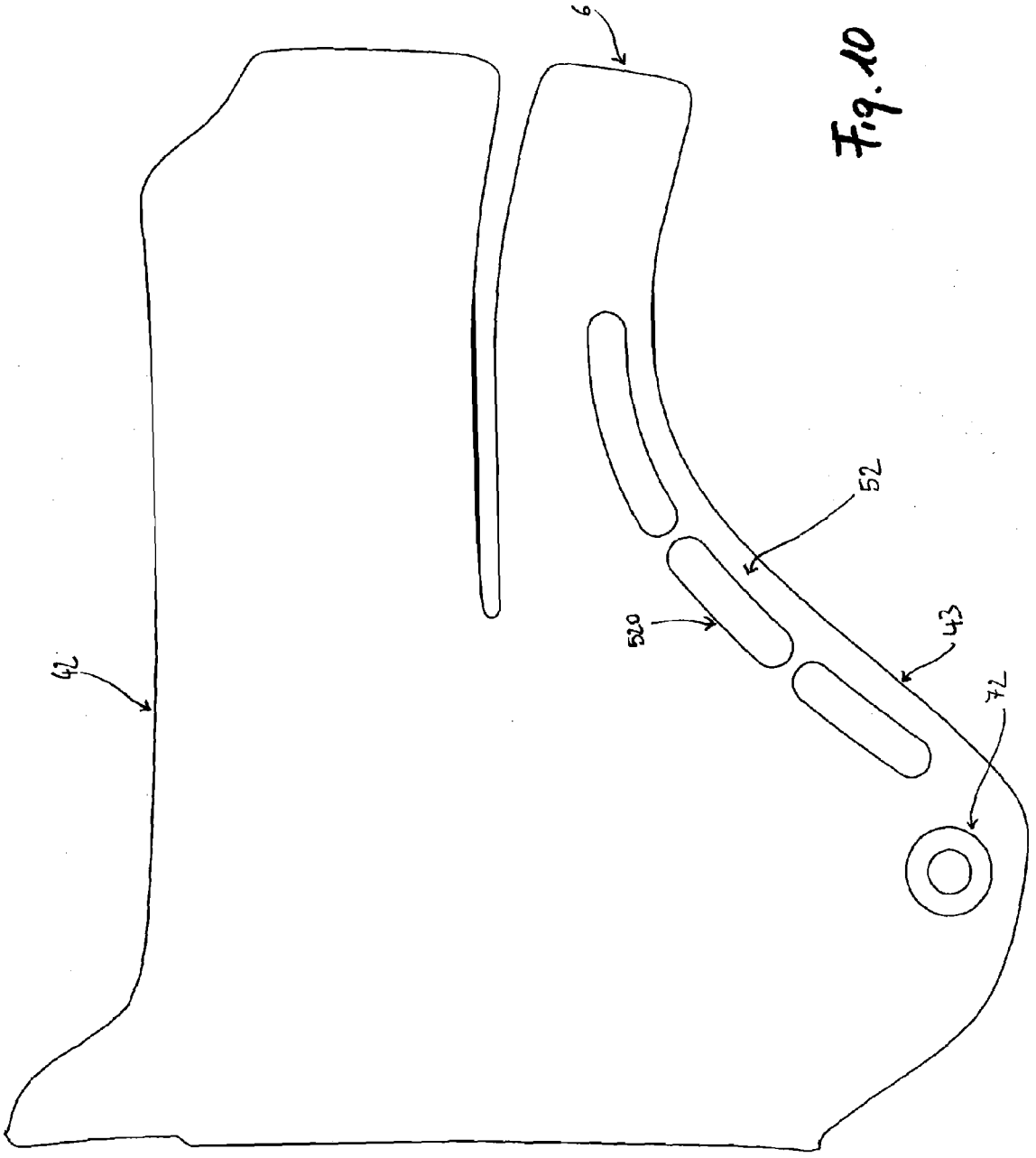


Fig. 10

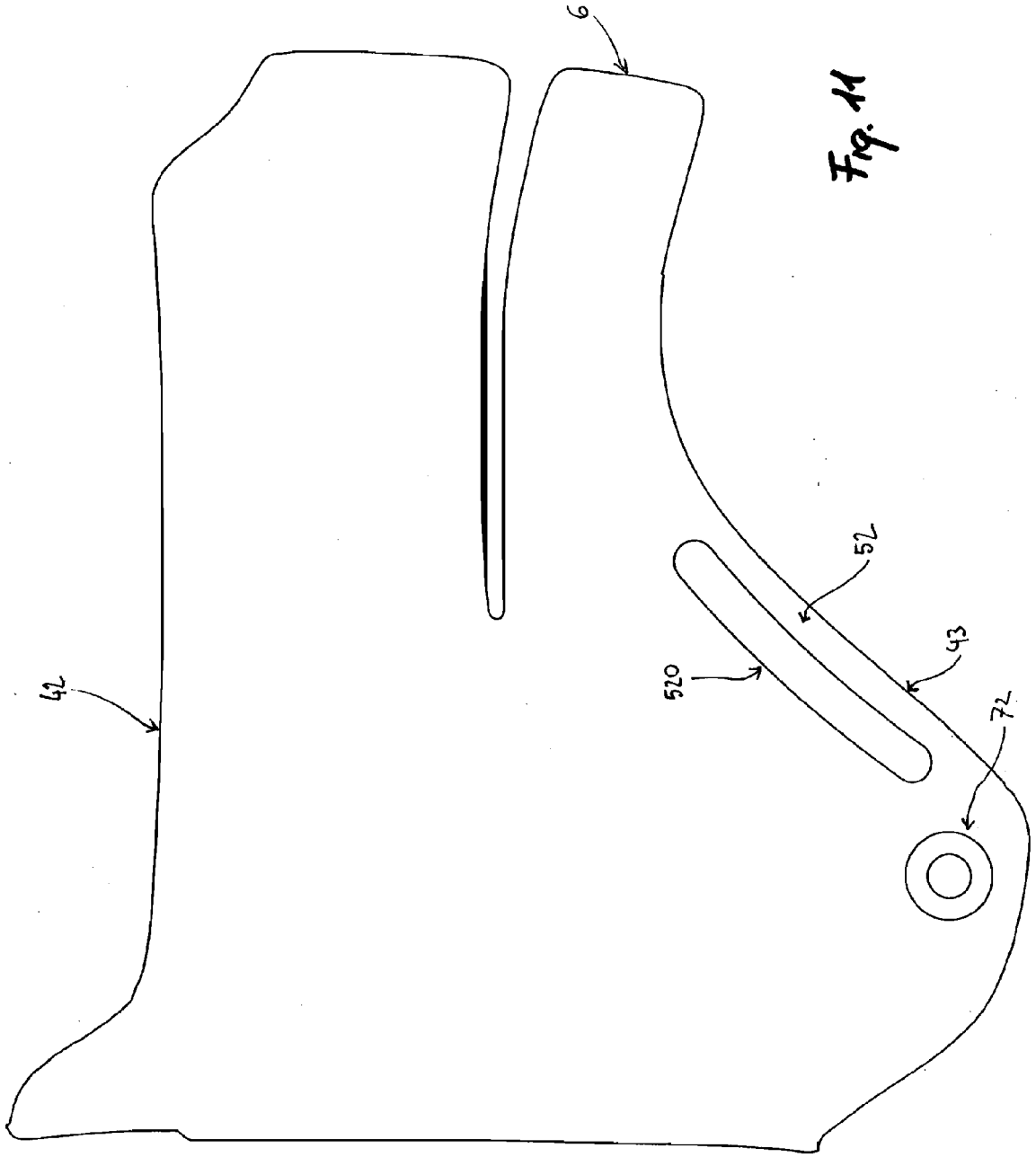


Fig. 11

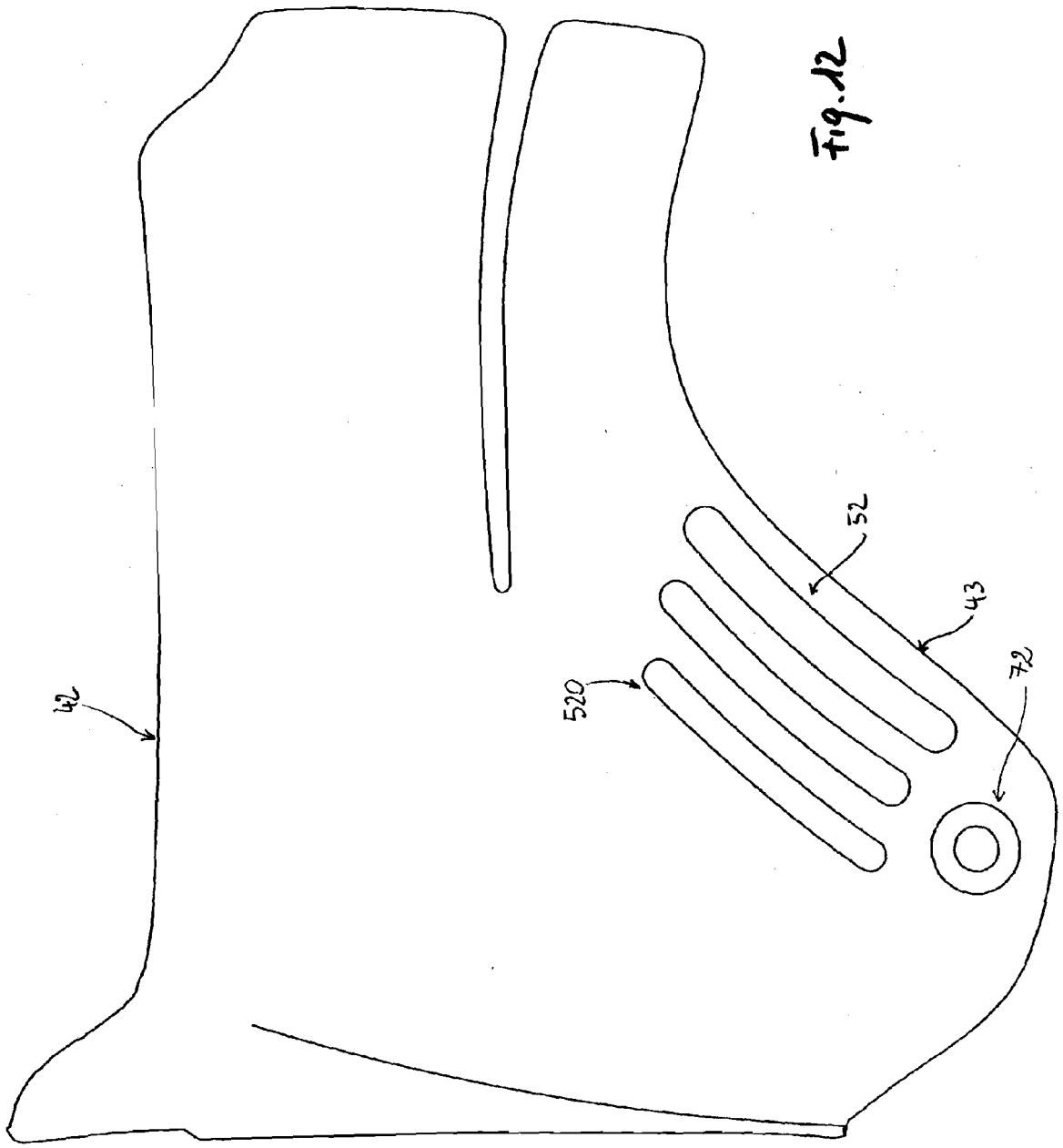


Fig.12

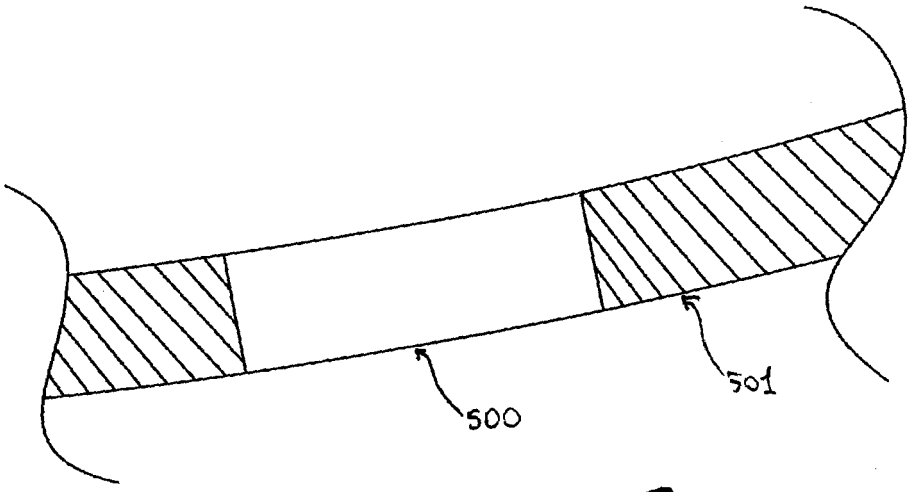


Fig. 13A

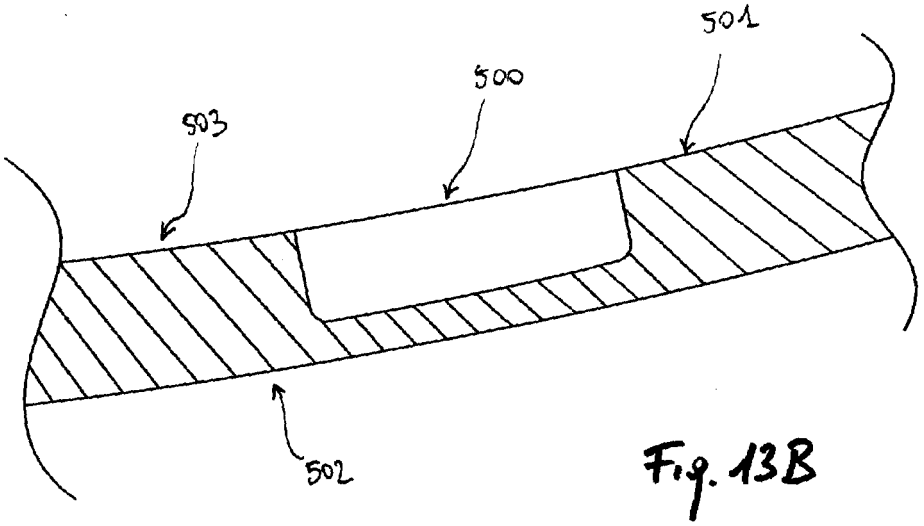


Fig. 13B

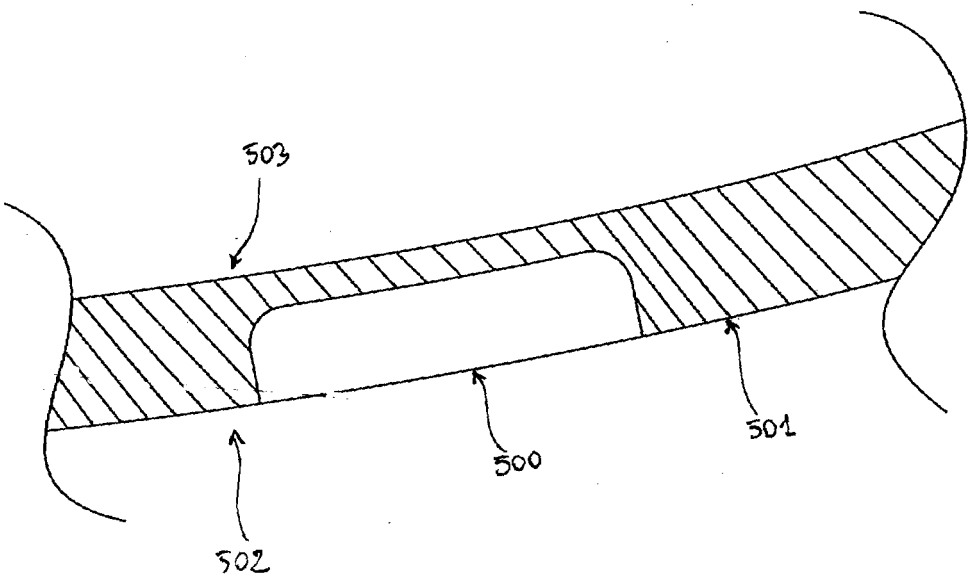


Fig. 13C

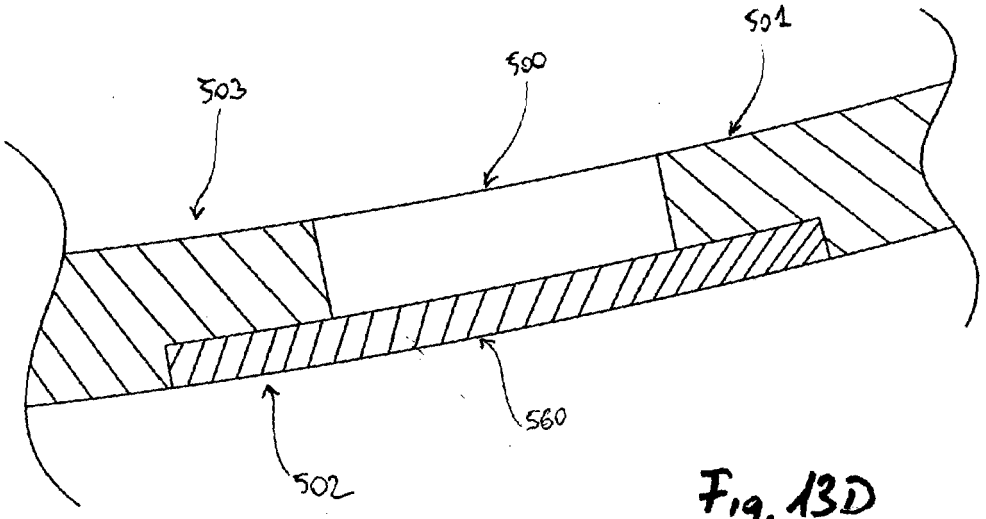


Fig. 13D

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Application Number
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Place of search	Date of completion of the search	Examiner
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