

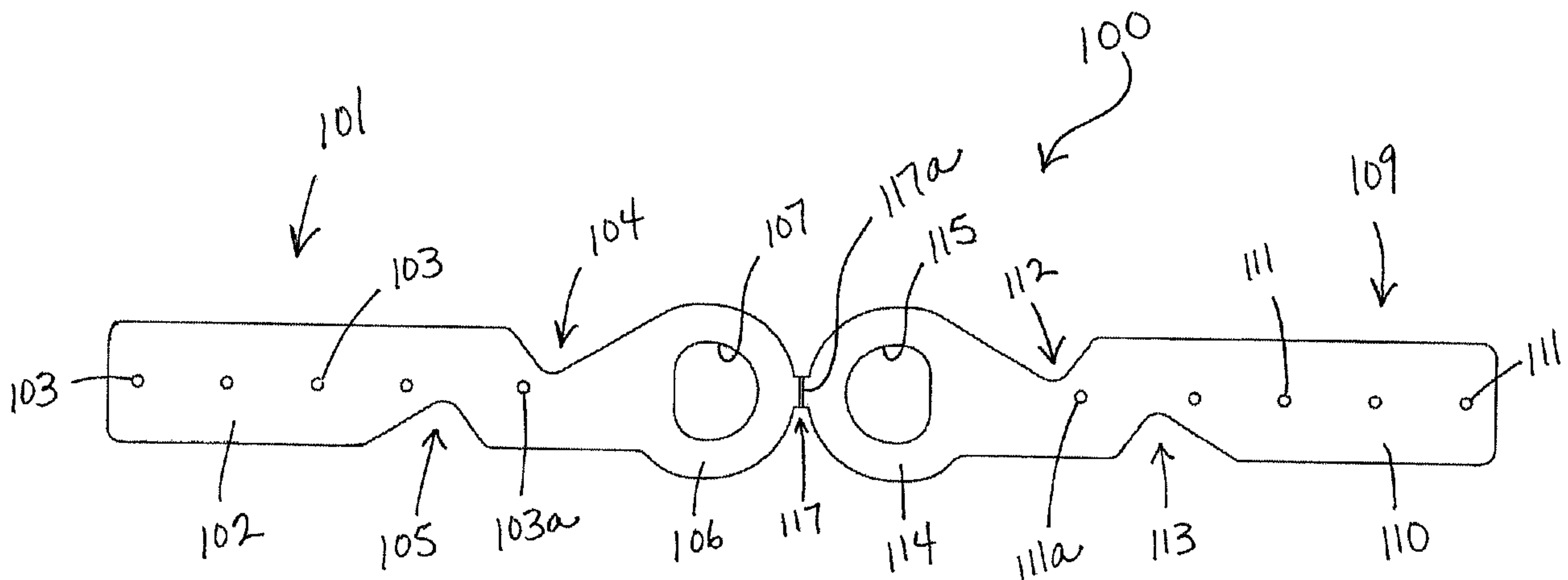


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(54) **Title: ROOF ANCHOR**



(57) **Abrégé/Abstract:**

A roof anchor (100) comprises a pliable member including an interconnecting portion (117) interconnecting a first portion (101) and a second portion (109). The first portion and the second portion each include a securing portion with a plurality of apertures and a connecting portion with an aperture. A first notch (104, 112) and a second notch (105, 113), are proximate the junctures of each securing portion and connecting portion. The first notch and the second notch extend inward from opposing sides and toward proximate a middle of the respective first and second portions, and an aperture (103a) is between each first notch and second notch.

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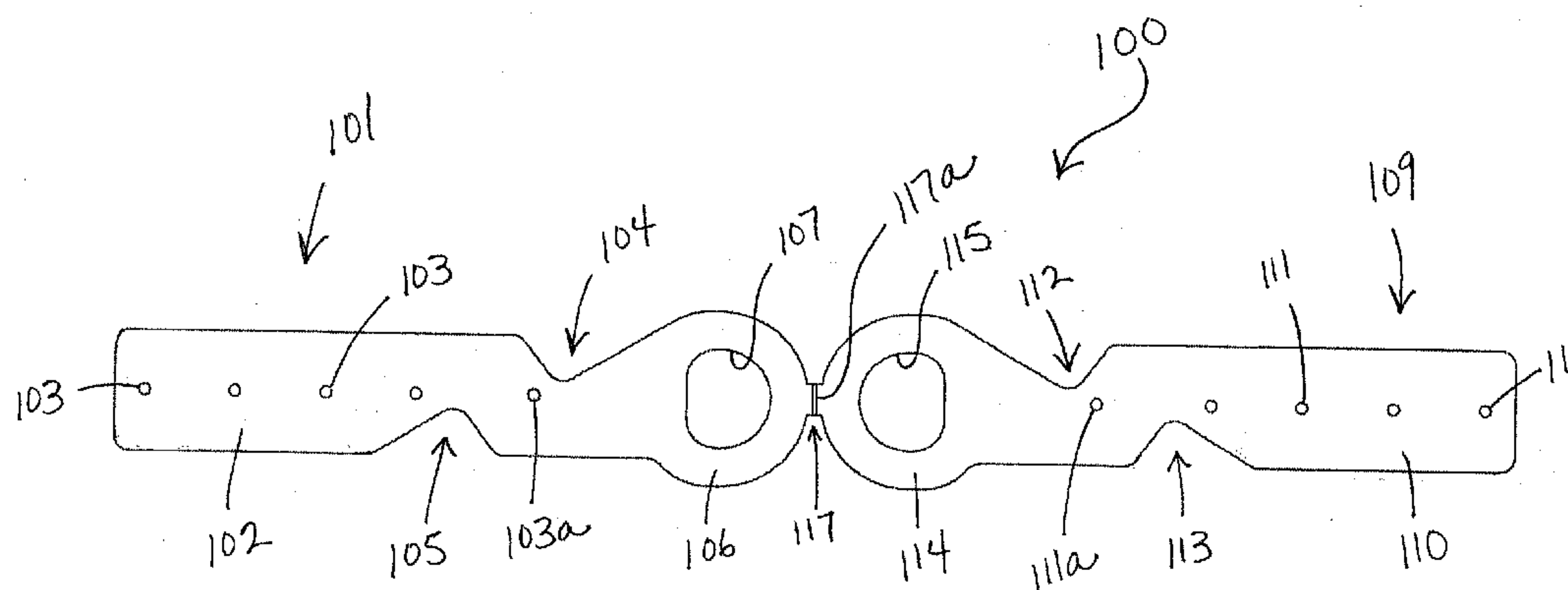
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ROOF ANCHOR

Field of the Invention

5 The present invention relates to an anchor for a roof for use with a fall protection safety system.

Background of the Invention

10 Anchor devices, such as roof anchors, are commonly used as anchorage points for fall protection safety systems while performing roof construction or repair. Fall protection safety systems include many types of fall arrest and restraint equipment. For fall arrest purposes, the user dons a full body safety harness and connects to the roof anchor with a suitable type of connecting system such as an energy absorbing lanyard or a self-retracting lifeline when there is a risk of a free fall occurring before the fall is arrested. For restraint purposes, the user dons
15 a full body safety harness and connects to the roof anchor with a lanyard or other suitable restraint device to restrain or tether the user from reaching a hazard, such as the leading edge of the roof, when there is no risk of a vertical free fall. Roof anchors may be temporary or permanent.

 Prior art roof anchors secured to a roof structure such as a truss tend to peel away from
20 the roof proximate the fasteners when subjected to a fall at an angle other than straight down relative to the roof anchor. Therefore, it is desired to provide a roof anchor that does not peel away from the roof when subjected to the forces of a fall.

Summary of the Invention

25 In one aspect of the present invention, a roof anchor comprises a pliable member including an interconnecting portion interconnecting a first portion and a second portion. The first portion includes a first securing portion with a first plurality of apertures and a first connecting portion with a first aperture. A first notch and a second notch are proximate a first juncture of the first securing portion and the first connecting portion. The first notch and the
30 second notch extend inward from opposing sides of the first portion toward proximate a middle of the first portion. A second aperture is between the first notch and the second notch. The second portion includes a second securing portion with a second plurality of apertures and a second connecting portion with a third aperture. A third notch and a fourth notch are proximate a second juncture of the second securing portion and the second connecting portion.

The third notch and the fourth notch extend inward from opposing sides of the second portion toward proximate a middle of the second portion. A fourth aperture is between the third notch and the fourth notch.

Another aspect of the present invention comprises a method of securing a roof anchor
5 to a mounting surface. The roof anchor includes a pliable member including an
interconnecting portion interconnecting a first portion and a second portion. The first portion
includes a first securing portion with a first plurality of apertures and a first connecting portion
with a first aperture. A first notch and a second notch are proximate a first juncture of the first
10 securing portion and the first connecting portion. The first notch and the second notch extend
inward from opposing sides of the first portion toward proximate a middle of the first portion.
A second aperture is between the first notch and the second notch. The second portion
includes a second securing portion with a second plurality of apertures and a second
connecting portion with a third aperture. A third notch and a fourth notch are proximate a
15 second juncture of the second securing portion and the second connecting portion. The third
notch and the fourth notch extend inward from opposing sides of the second portion toward
proximate a middle of the second portion. A fourth aperture is between the third notch and the
fourth notch. A fastener is inserted through each of the first and second plurality of apertures
and the second and fourth apertures, and the fasteners are secured to the mounting surface.

20 Brief Description of the Drawings

Figure 1 is a top view of a roof anchor constructed according to the principles of the present invention;

Figure 2 is a side view of a roof onto which the roof anchor shown in Figure 1 is
operatively connected and a user operatively connected to the roof anchor with a self-retracting
25 lifeline;

Figure 3 is a side view of a roof onto which the roof anchor shown in Figure 1 is
operatively connected and a user operatively connected to the roof anchor with a lanyard;

Figure 4 is a top view of the roof anchor shown in Figure 1 configured to be operatively
connected to a pitched roof;

30 Figure 5 is a side view of the roof anchor shown in Figure 4;

Figure 6 is a front view of a portion of the roof anchor shown in Figure 4;

Figure 7 is a side view of a roof anchor in a formed configuration;

Figure 8 is a top view of the roof anchor shown in Figure 1 configured to be operatively
connected to a flat surface of a roof;

Figure 9 is a side view of the roof anchor shown in Figure 8; and

Figure 10 is a front view of a portion of the roof anchor shown in Figure 8.

Detailed Description of a Preferred Embodiment

5 A preferred embodiment roof anchor constructed according to the principles of the present invention is designated by the numeral 100 in the drawings. The roof anchor 100 provides an anchorage point for various types of fall protection safety systems such as fall arrest and restraint equipment.

10 As shown in Figure 1, the roof anchor 100 is preferably one integral piece stamped from a sheet of relatively pliable but strong material such as metal, preferably 14 gauge carbon steel, which is preferably then formed and plated with zinc. Although the roof anchor 100 is preferably pre-formed, as shown in Figure 7, it is recognized that it could also be in a flattened configuration, as shown in Figure 1, and then formed prior to use. The roof anchor 100 includes a first portion 101, a second portion 109, and an interconnecting portion 117
15 interconnecting the first portion 101 and the second portion 109. The first portion 101 has a securing portion 102, through which a plurality of longitudinally spaced apertures 103 extends, and a connecting portion 106. Preferably, there are four apertures 103. Proximate the juncture of the securing portion 102 and the connecting portion 106 are a first notch 104 and a second notch 105. The first notch 104 and the second notch 105 extend inward from opposing sides of
20 the first portion 101 toward proximate the middle of the first portion 101 in a staggered arrangement with the first notch 104 being more proximate the connecting portion 106 and the second notch 105 being more proximate the securing portion 102. Between the notches 104 and 105 is an aperture 103a. The connecting portion 106 includes an aperture 107.

The second portion 109 has a securing portion 110, through which a plurality of
25 longitudinally spaced apertures 111 extends, and a connecting portion 114. Preferably, there are four apertures 111. Proximate the juncture of the securing portion 110 and the connecting portion 114 are a first notch 112 and a second notch 113. The first notch 112 and the second notch 113 extend inward from opposing sides of the second portion 109 toward proximate the middle of the second portion 109 in a staggered arrangement with the first notch 112 being
30 more proximate the connecting portion 114 and the second notch 113 being more proximate the securing portion 110. Between the notches 112 and 113 is an aperture 111a. The connecting portion 114 includes an aperture 115. The interconnecting portion 117 interconnects the connecting portions 106 and 114. Preferably, the second portion 109 is a mirror image of the first portion 101.

The interconnecting portion 117 may be folded, preferably approximately in half, so that the apertures 107 and 115 are in alignment with one another forming an opening through which a suitable connector such as a carabiner or a snap hook may be inserted for interconnecting a lifeline or a lanyard and the connecting portions 106 and 114. The opening provides an anchor aperture. To assist in folding the interconnecting portion 117, the interconnecting portion 117 may include a score line 117a along which the interconnecting portion 117 should be folded. Because the score line 117a creates a thinner portion relative to the rest of the interconnecting portion 117, the thinner portion is easier to fold along the score line 117a.

If the roof anchor 100 is in a flattened configuration as shown in Figure 1, the first and second portions 101 and 109 may be bent outward away from one another in opposite directions proximate the tops of the first notches 104 and 112 and the connecting portions 106 and 114, respectively, at an angle corresponding with the surface of the roof onto which the roof anchor is to be secured.

If the roof anchor 100 is pre-formed as shown in Figure 7, which preferably occurs during the manufacture process after it has been stamped and before it is plated, the first and second portions 101 and 109 are already bent so that the securing portions 102 and 110 extend outward away from one another after the interconnecting portion 117 has been folded. Because the roof anchor 100 is preferably pliable, the angles at which the portions 101 and 109 are pre-formed may be changed during installation of the roof anchor 100 to accommodate various roof pitches. The angles of the securing portions 102 and 110 may easily be changed by bending the portions 101 and 109 proximate the pre-formed bends to accommodate various roof pitches such as peaked, sloped, or flat. For connection proximate a peak of a roof, a possible configuration of the roof anchor 100 is shown in Figures 4-6, which shows a pre-formed roof anchor 100 after the interconnecting portion 117 has been folded.

The securing portion 102 includes the plurality of apertures 103 and the aperture 103a between the first and second notches 104 and 105, and the securing portion 110 includes the plurality of apertures 111 and the aperture 111a between the first and second notches 112 and 113. The apertures 103, 103a, 111, and 111a are preferably pre-drilled holes that facilitate anchorage to the truss of the roof using fasteners. The fasteners extend through the apertures 103, 103a, 111, and 111a to anchor each securing portion 102 and 110 to the truss. The fasteners used to secure the roof anchor 100 to the truss of the roof may be galvanized, vinyl-coated, or cement-coated nails; type 16d nails; screws; or any suitable fastener known in the art.

The dimensions of the roof anchor 100 are preferably approximately 0.075 inch by 2.00 inches by 23.17 inches, but other dimensions may be used. The total capacity of the roof anchor 100 is preferably 310 pounds, and the roof anchor 100 is preferably capable of withstanding approximately 1,800 pounds of force in any direction of loading. The roof anchor 100 is preferably used as a temporary roof structure and the connecting portions 106 and 114 are bent down against the roof surface and covered with shingles after use. However, if the roof anchor 100 is made out of a non-corrosive material such as stainless steel, it may be used as a permanent roof structure, and the securing portions 102 and 110 may be covered with shingles or flashing to protect the roof from water damage as well as to help conceal the roof anchor 100, leaving only the connecting portions 106 and 114 exposed and readily accessible. The roof anchor 100 provides an anchorage point for fall protection safety systems during construction of the roof. The roof anchor 100 may also provide an anchorage point for fall protection safety systems during subsequent repair of the roof. To connect to the roof anchor 100, snap hooks, carabiners, or other suitable connectors well known in the art may be used.

The roof anchor 100 is configured and arranged to be anchored to at least one truss of a roof. It is recognized that the roof may be a pitched roof with a peak or a flat roof. For a pitched roof, it is also recognized that the pitch of the roof and the angle of the peak may vary. The roof anchor 100 may be anchored to the roof proximate the peak of the roof or proximate a flat surface of the roof. Commonly, the truss of the roof is covered with a sheathing, and the sheathing is covered with overlapping shingles. The peak of the roof is covered with a ridge cap overlapping the shingles proximate the peak of the roof.

There are many ways known in the art for using the roof anchor 100 with fall protection safety systems. Two examples are shown in Figures 2 and 3. As shown in Figure 2, the roof anchor 100 is connected to the roof 120 with the portions 101 and 109 at an angle corresponding to the pitch of the roof 120 and on trusses on opposite sides of the peak of the roof 120. Figures 4-6 show a possible configuration of the roof anchor 100 for connection proximate a peak of a roof. A self-retracting lifeline 131 interconnects a full body safety harness 130 donned by a user and the roof anchor 100. For connection to a flat roof, the portions 101 and 109 are simply bent to form an angle of approximately 180 degrees. As shown in Figure 3, the roof anchor 100 is connected to the roof 120 with portions 101 and 109 at an angle of approximately 180 degrees corresponding to the relatively flat surface of the roof 120. Figures 8-10 show a possible configuration of the roof anchor 100 for connection to the relatively flat surface. A lifeline 132 is operatively connected to the roof anchor 100 and a counterweight 136. The counterweight 136 is preferably used to keep the lifeline 132

relatively straight on the surface of the roof 120. A rope grab 133 slides along the lifeline 132, and a lanyard 134 including an energy absorber 135 interconnects a full body safety harness 130 donned by a user and the rope grab 133.

5 In use, the interconnecting portion 117 is folded so that the apertures 107 and 115 are aligned and the securing portions 102 and 110 are at the desired angle to correspond with the surface upon which they are to be secured. The optional score line 117a assists in folding the interconnecting portion 117 in a desired location on the interconnecting portion 117. If the roof anchor 100 is in a flattened condition, the portions 101 and 109 are bent outward away from one another proximate the tops of the notches 104 and 112 and the connecting portions 106 and 114, respectively, so that the securing portions 102 and 110 correspond with the angle of the surface, the roof, upon which the roof anchor 100 will be mounted. If the roof anchor 100 is pre-formed, the portions 101 and 109 may be bent to change the angle between the securing portions 102 and 110 to correspond with the angle of the surface, the roof, upon which the roof anchor 100 will be mounted.

15 Preferably, the roof anchor 100 should be installed after the sheathing has been installed on the roof and should not be installed directly onto the truss(es). The securing portions 102 and 110 are placed on top of the sheathing with the apertures 103, 103a, 111, and 111a, respectively, positioned over the truss(es) or other suitable structural member of the roof such as a rafter. The securing portions 102 and 110 are anchored onto the truss, which is preferably made of a wood construction capable of meeting the anchorage strength requirements, with preferably ten fasteners, five fasteners on each securing portion 102 and 110. Preferably, pilot holes 1/8 inch in diameter are drilled into the truss to prevent splitting of the truss when the fasteners are inserted through the plurality of apertures 103 and 111 and driven into the truss. The fasteners must penetrate the truss.

25 The roof anchor 100 may be temporary and be removed prior to shingling the roof or it may be a permanent fixture of the roof. The roof anchor 100 is configured and arranged such that standard roofing materials such as shingles and a ridge cap can be installed over the roof anchor 100 with only the connecting portions 106 and 114 extending outward from the roofing materials. Shingles may be tucked under the connecting portions 106 and 114. Preferably, the roof anchors 100 should be positioned at least 6 feet from any exposed roof edge and should be spaced approximately 8 feet apart. Preferably, only one fall protection safety system should be connected to the roof anchor 100 at a time, and the user should stay within 30 degrees from the roof anchor 100 to minimize swing falls.

The connecting portions 106 and 114 preferably deform when subjected to a load should a fall occur, which allows the fasteners to be subjected to shearing loads thereby providing greater load-carrying capacity than pulling or prying on the fasteners. Should a fall occur, the roof anchor 100 tends to twist proximate the notches 104, 105, 112, and 113, which prevents the fasteners from being pulled out of the truss as tends to occur with prior art roof anchors.

More specifically, if a load is exerted on the connecting portions 106 and 114 in the direction A shown in Figure 6, the roof anchor 100 will twist or bend or otherwise deform proximate the second notches 105 and 113 and the fasteners extending through the apertures 103a and 111a may be at least partially pulled out of the roof. If a load is exerted on the connecting portions 106 and 114 in the direction B shown in Figure 6, the roof anchor 100 will twist or bend or otherwise deform proximate the first notches 104 and 112 and the fasteners extending through the apertures 103a and 111a will likely remain secured. Thus, when loads are exerted to the sides of the roof anchor, the notches allow the connecting portions 106 and 114 to twist or bend or otherwise deform thereby allowing the connector operatively connected to the connecting portions 106 and 114 to be proximate the roof, which reduces the likelihood that at least the plurality of fasteners 103 and 111 will be pulled out of the roof should a fall occur.

The connector, which is operatively connected to the connecting portions 106 and 114, is preferably centered on the length of the anchor 100 with fasteners through the securing portions 102 and 110 on both sides of the connector, which provides greater load-carrying capacity than if a connector were located at each end of the anchor. This allows the load to be balanced between the fasteners securing the securing portions 102 and 110 of the anchor 100 to the roof, which provides greater load-carrying capacity than a fixed connector.

The above specification, examples and data provide a complete description of the manufacture and use of the composition of the invention. The scope of the claims should not be limited by the preferred embodiments set forth in the examples, but should be given the broadest interpretation consistent with the description as a whole.

We Claim:

1. A roof anchor, comprising:
a pliable member including an interconnecting portion interconnecting a first portion and a second portion;
the first portion including a first securing portion with a first plurality of apertures and a first connecting portion with a first aperture, a first notch and a second notch are proximate a first juncture of the first securing portion and the first connecting portion, the first notch and the second notch extending inward from opposing sides of the first portion toward proximate a middle of the first portion, a second aperture being between the first notch and the second notch; and
the second portion including a second securing portion with a second plurality of apertures and a second connecting portion with a third aperture, a third notch and a fourth notch are proximate a second juncture of the second securing portion and the second connecting portion, the third notch and the fourth notch extending inward from opposing sides of the second portion toward proximate a middle of the second portion, a fourth aperture being between the third notch and the fourth notch.
2. The roof anchor of claim 1, wherein the pliable member is an integral piece of pliable material.
3. The roof anchor of claim 1, wherein the first portion and the second portion are mirror images.
4. The roof anchor of claim 1, wherein the first plurality of apertures are longitudinally spaced along the first securing portion and the second plurality of apertures are longitudinally spaced along the second securing portion.
5. The roof anchor of claim 1, wherein the first and second notches are staggered along the first portion and the third and fourth notches are staggered along the second portion.
6. The roof anchor of claim 1, wherein the interconnecting portion is bent to align the first aperture and the second aperture and the first and second portions are bent

proximate the first and third notches to form an angle between the first and second securing portions corresponding with a mounting surface.

7. The roof anchor of claim 1, wherein the interconnecting portion includes a score line.

8. A method of securing a roof anchor to a mounting surface, the roof anchor including a pliable member including an interconnecting portion interconnecting a first portion and a second portion, the first portion including a first securing portion with a first plurality of apertures and a first connecting portion with a first aperture, a first notch and a second notch are proximate a first juncture of the first securing portion and the first connecting portion, the first notch and the second notch extending inward from opposing sides of the first portion toward proximate a middle of the first portion, a second aperture being between the first notch and the second notch, the second portion including a second securing portion with a second plurality of apertures and a second connecting portion with a third aperture, a third notch and a fourth notch are proximate a second juncture of the second securing portion and the second connecting portion, the third notch and the fourth notch extending inward from opposing sides of the second portion toward proximate a middle of the second portion, a fourth aperture being between the third notch and the fourth notch, comprising:

inserting a fastener through each of the first and second plurality of apertures and the second and fourth apertures; and

securing the fasteners to the mounting surface.

9. The method of claim 8, further comprising connecting a connector of a safety device to the anchor aperture.

10. The method of claim 9, wherein the safety device is selected from the group consisting of a self-retracting lifeline, a lanyard, and a cable.

11. The method of claim 8, further comprising bending the interconnecting portion to align the first and third apertures to form an anchor aperture.

12. The method of claim 8, further comprising bending the first portion proximate the first notch and the first connecting portion and bending the second portion proximate the

third notch and the second connecting portion to form an angle between the first securing portion and the second securing portion corresponding with the mounting surface.

13. The method of claim 8, wherein should a fall occur, a first load exerted in a first direction deforms the roof anchor proximate the first and third notches and a second load exerted in a second direction deforms the roof anchor proximate the second and fourth notches, the notches allowing the connecting portions to deform thereby allowing the connector to be proximate the mounting surface and reducing the likelihood of pulling the fasteners out of the mounting surface.

14. The method of claim 13, wherein the fasteners extending through the second and fourth apertures could be at least partially pulled out of the mounting structure.

15. The method of claim 8, wherein the roof anchor can withstand a load of up to 1800 pounds in any direction.

16. The method of claim 8, wherein the fasteners are subjected to shearing loads should a fall occur.

17. The method of claim 8, wherein the fasteners are selected from a group consisting of galvanized nails, vinyl-coated nails, cement-coated nails, type 16d nails, and screws.

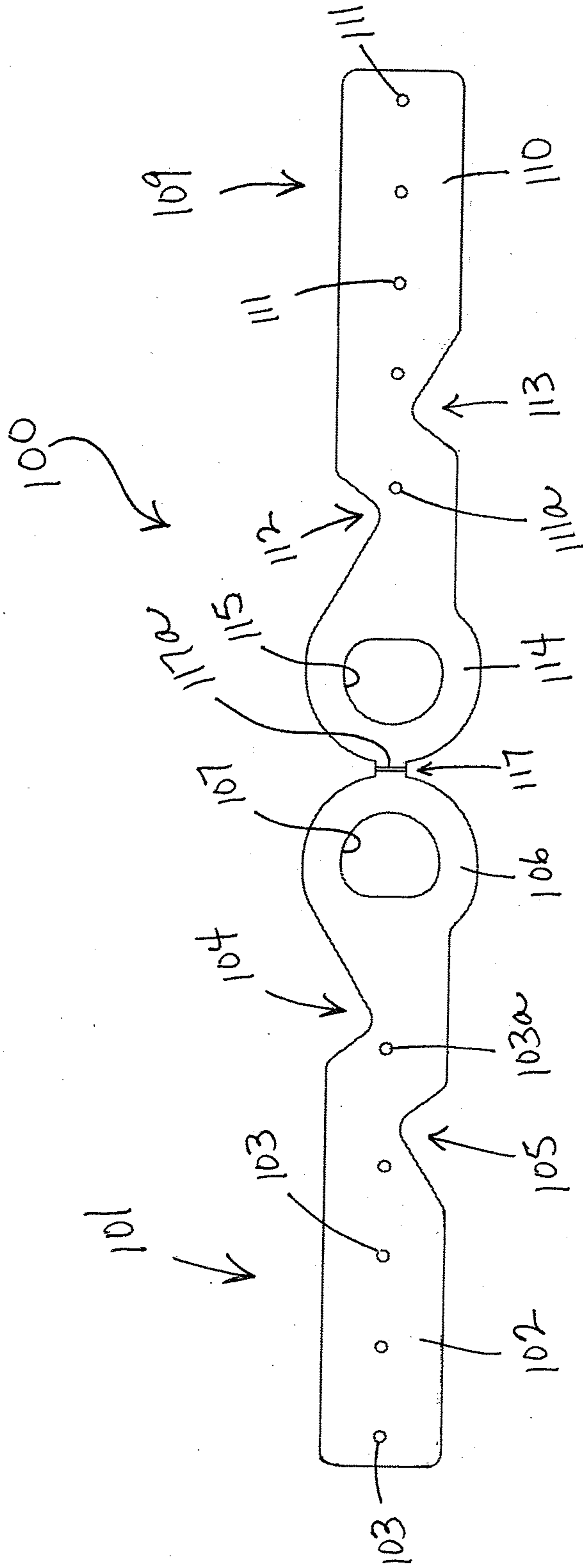


Fig. 1

Fig. 3

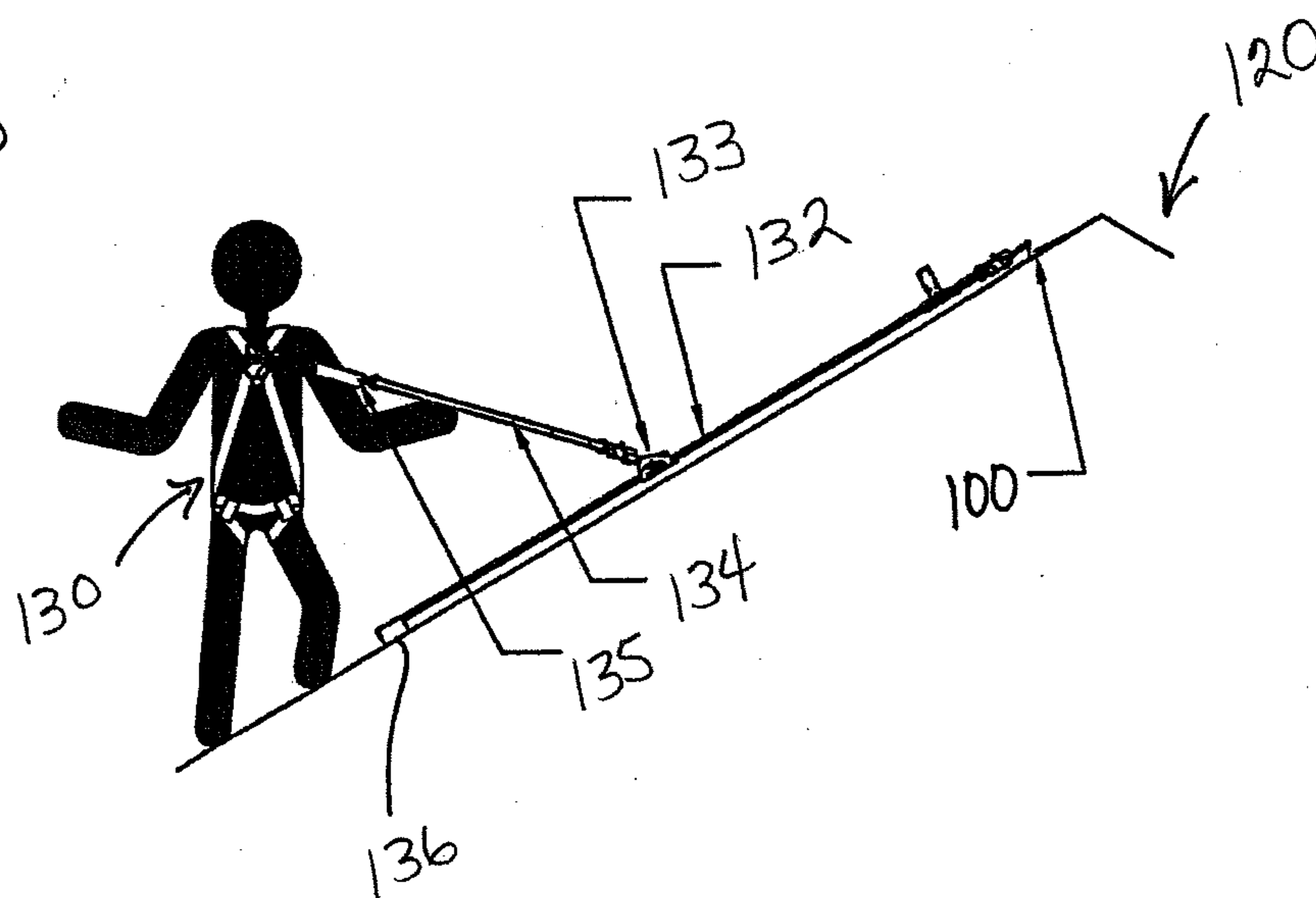
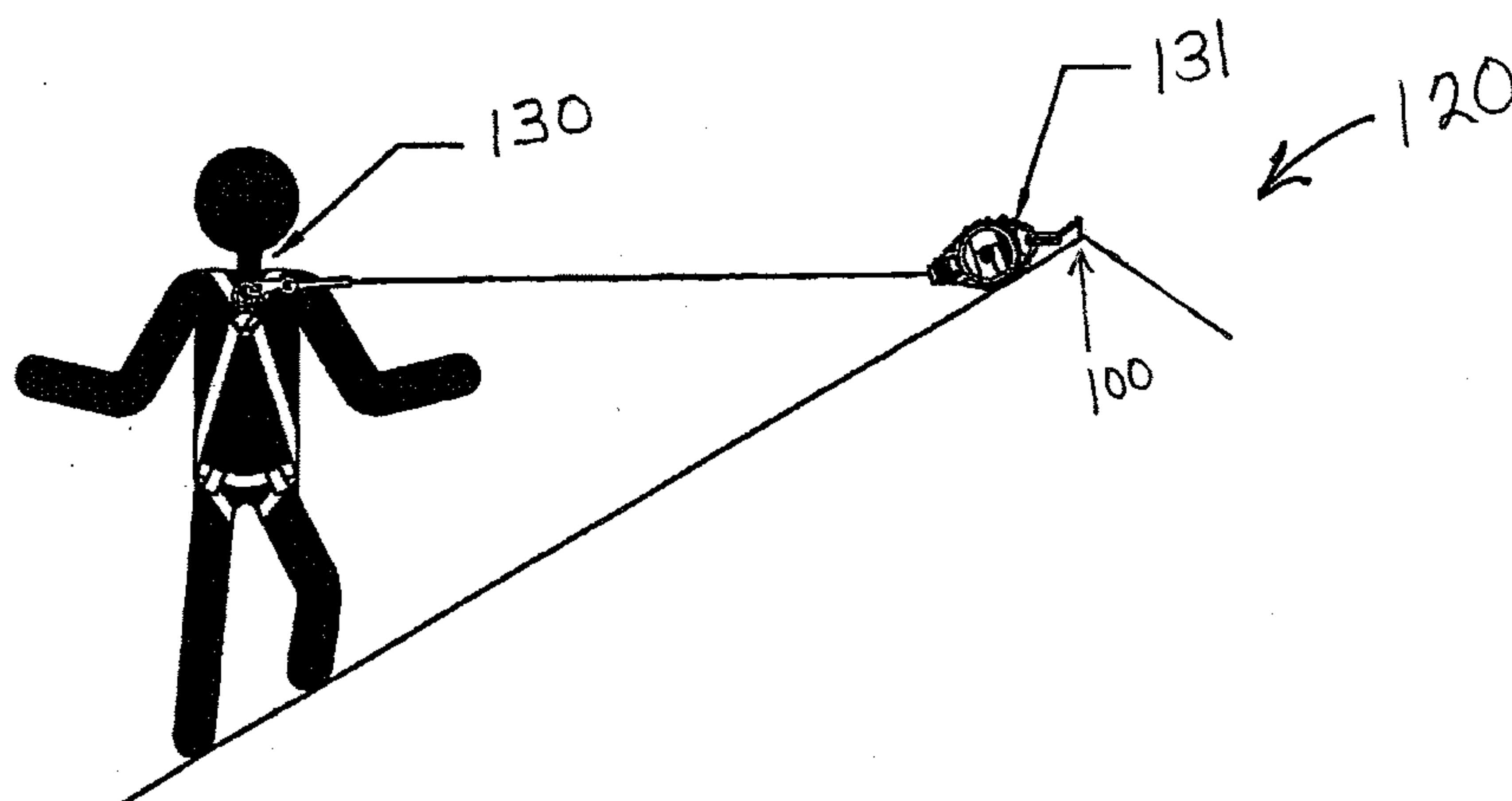


Fig. 2



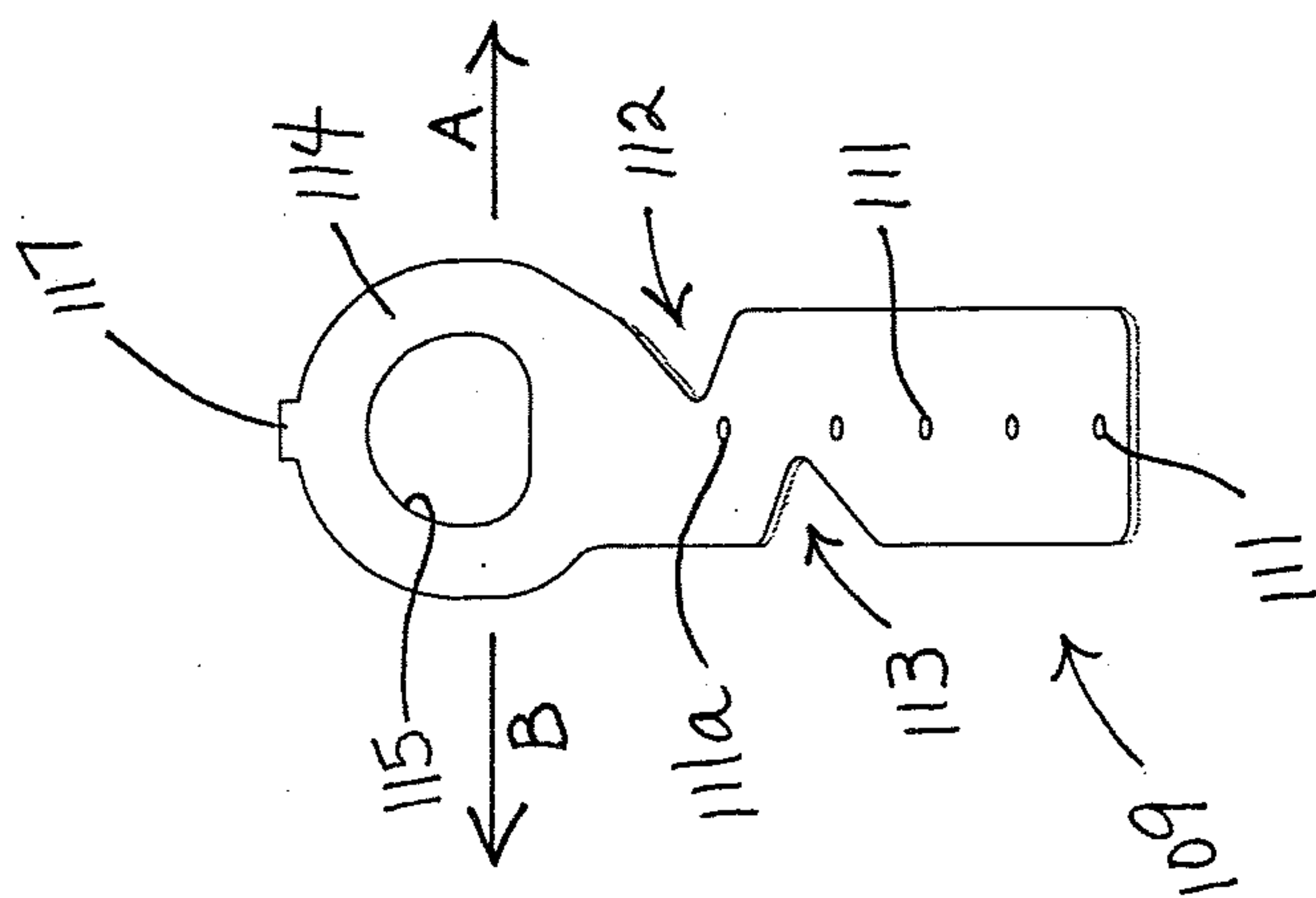
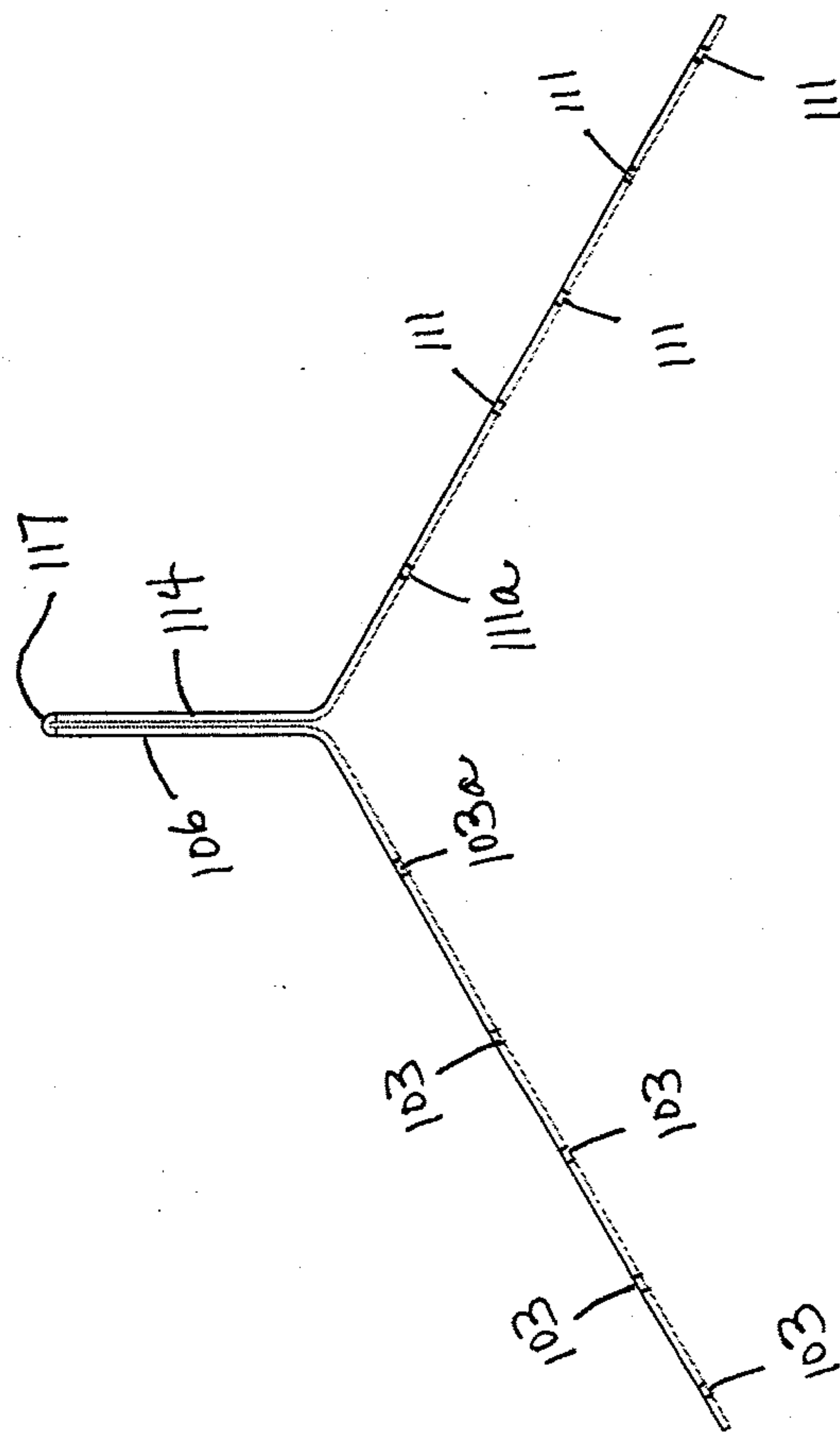
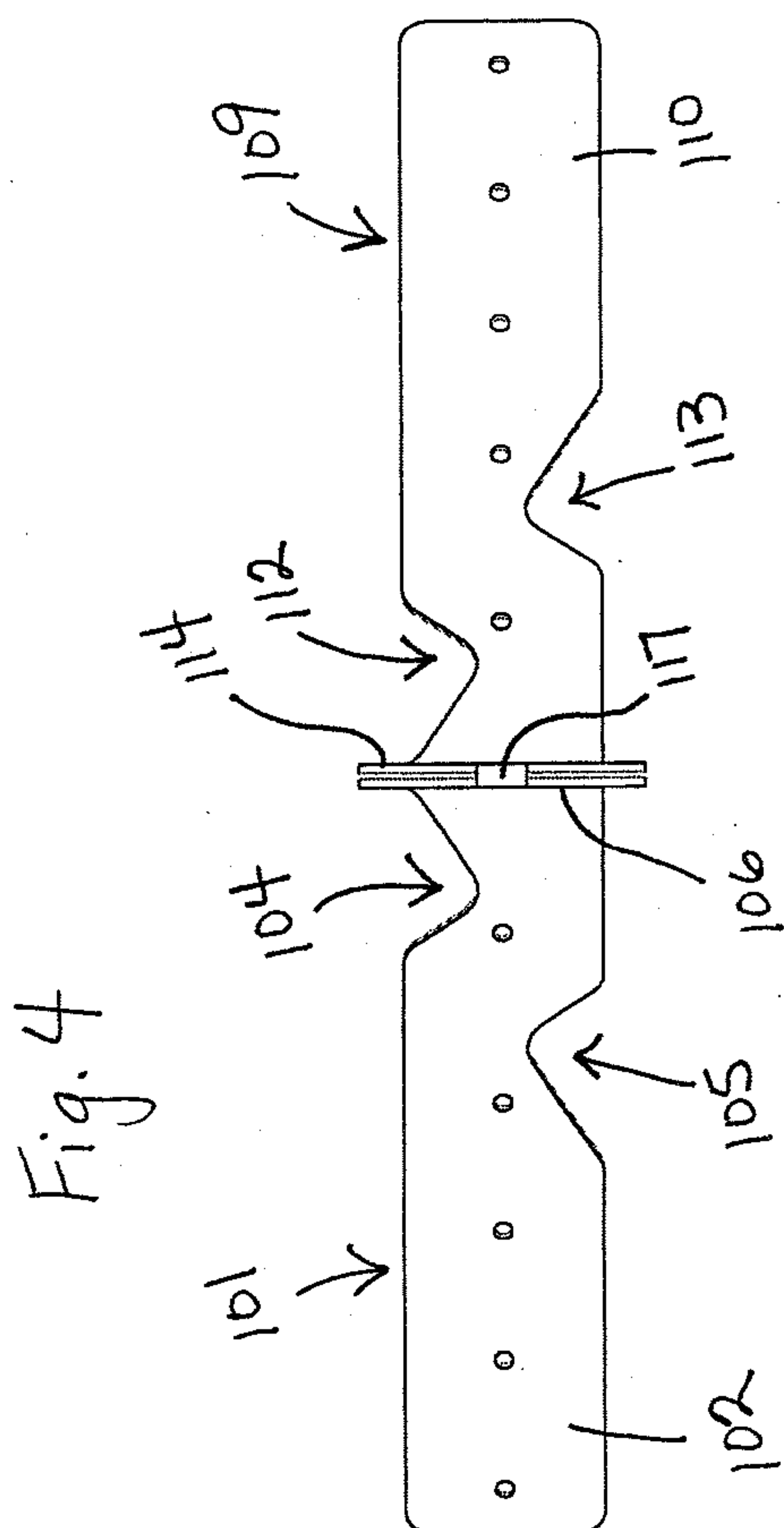


Fig. 7

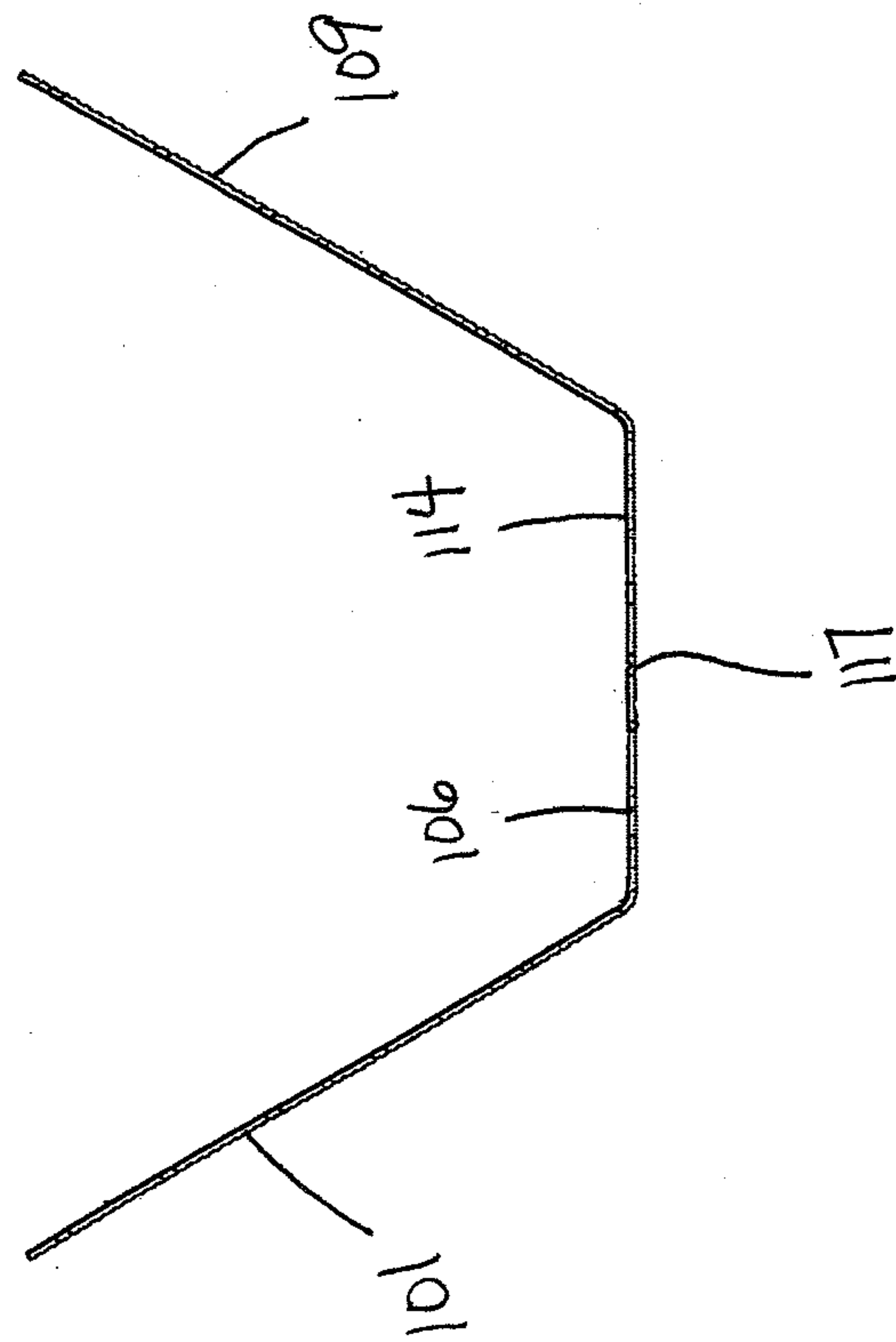


Fig. 8

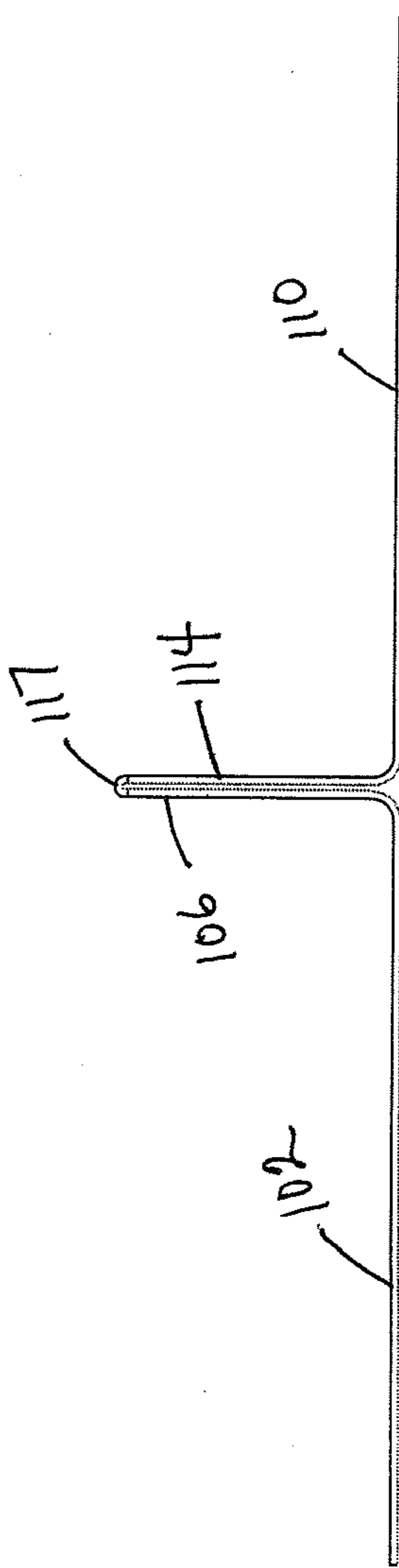
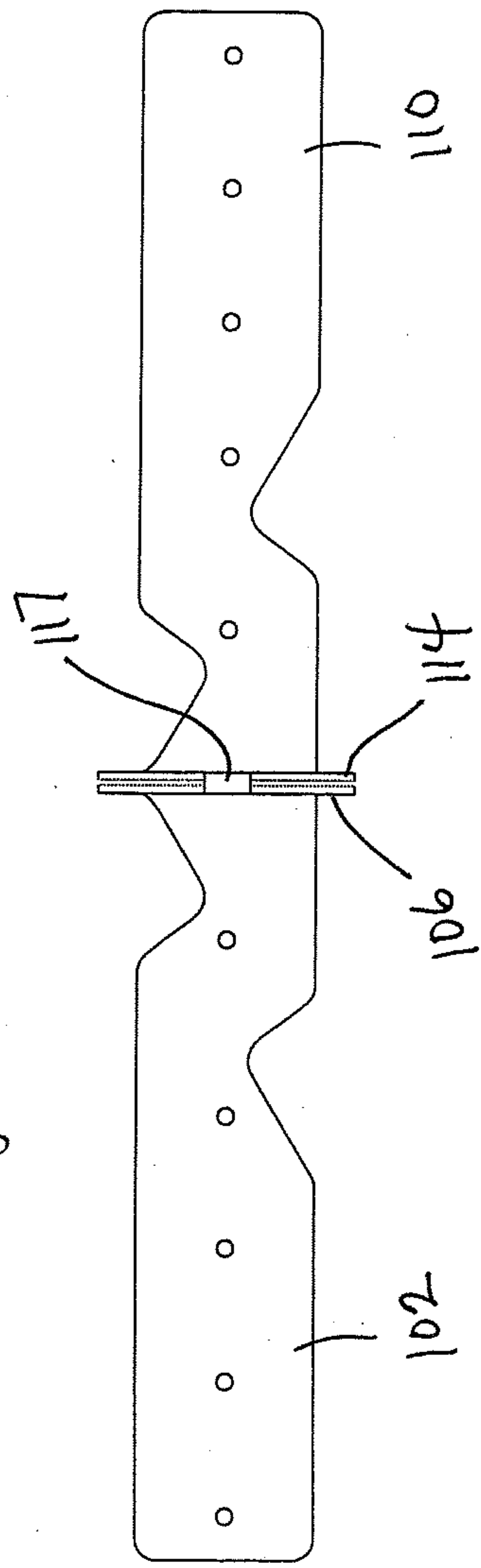


Fig. 9

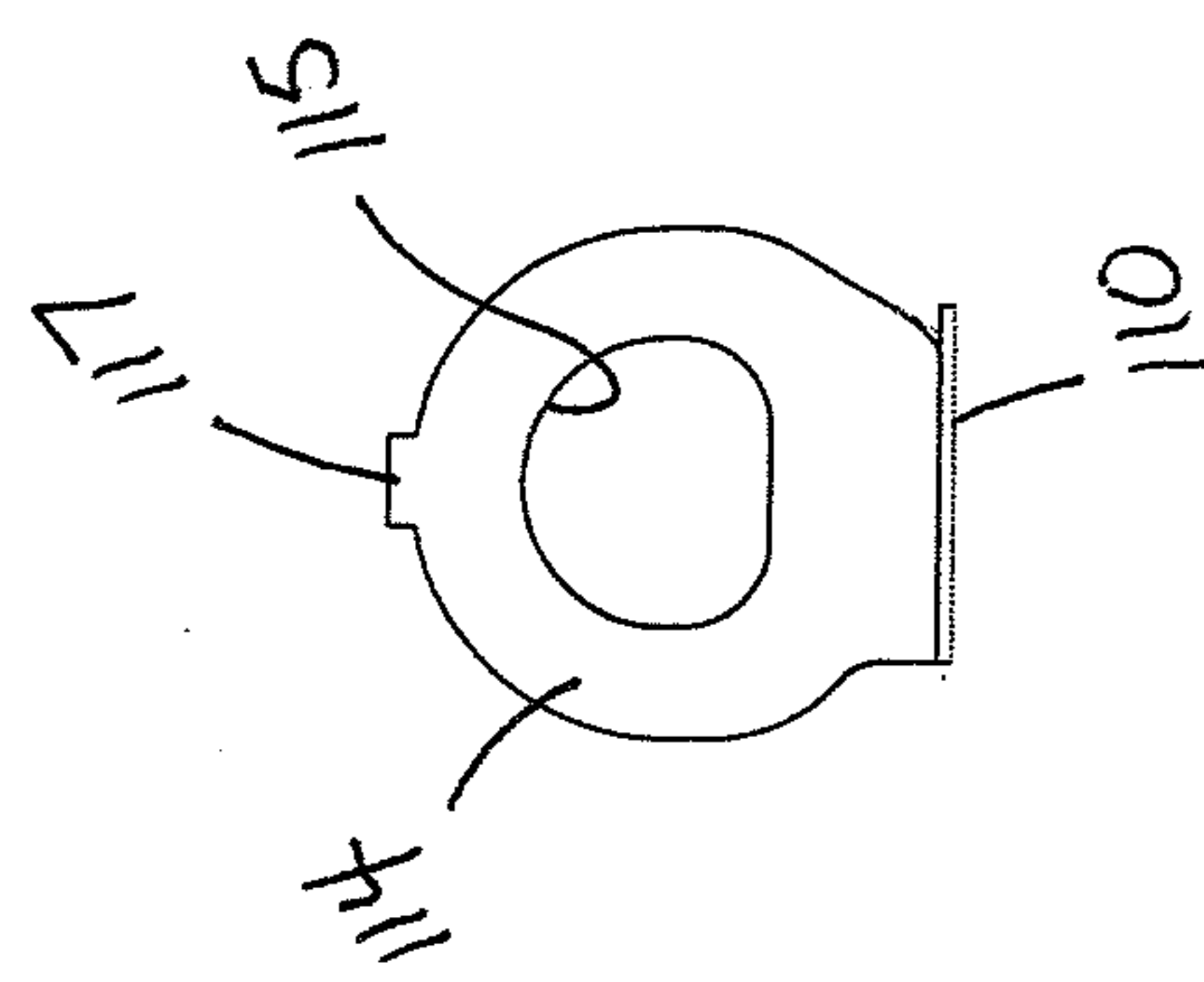


Fig. 10

