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Bailey

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(54) **PRO-ACTIVE DEFENSE STRUCTURE WITH TENSIONING MEMBER**

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(71) Applicant: **Robert D. Bailey**, McPherson, KS (US)

(58) **Field of Classification Search**

(72) Inventor: **Robert D. Bailey**, McPherson, KS (US)

CPC . *F41H 5/26*; *F41H 5/026*; *F41H 5/023*; *E06B 7/08*; *E06B 9/01*

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See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

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Related U.S. Application Data

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(60) Provisional application No. 62/626,563, filed on Feb. 5, 2018.

(51) **Int. Cl.**

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B32B 3/30 (2006.01)
B32B 3/06 (2006.01)
F41H 5/24 (2006.01)
E06B 9/01 (2006.01)
E06B 7/08 (2006.01)

(52) **U.S. Cl.**

CPC *F41H 5/023* (2013.01); *F41H 5/0407* (2013.01); *B32B 3/06* (2013.01); *B32B 3/30* (2013.01); *B32B 2307/558* (2013.01); *B32B 2571/02* (2013.01); *E06B 7/08* (2013.01); *E06B 9/01* (2013.01); *F41H 5/026* (2013.01);

4,727,789 A	3/1988	Katsanis
2009/0114083 A1	5/2009	Moore, III et al.
2010/0300275 A1	12/2010	Warren
2011/0067561 A1	3/2011	Joynt
2011/0239851 A1	10/2011	Mason et al.
2012/0125187 A1	5/2012	Hunn
2016/0040961 A1	2/2016	Kovalev
2016/0209178 A1	7/2016	Bailey et al.

(Continued)

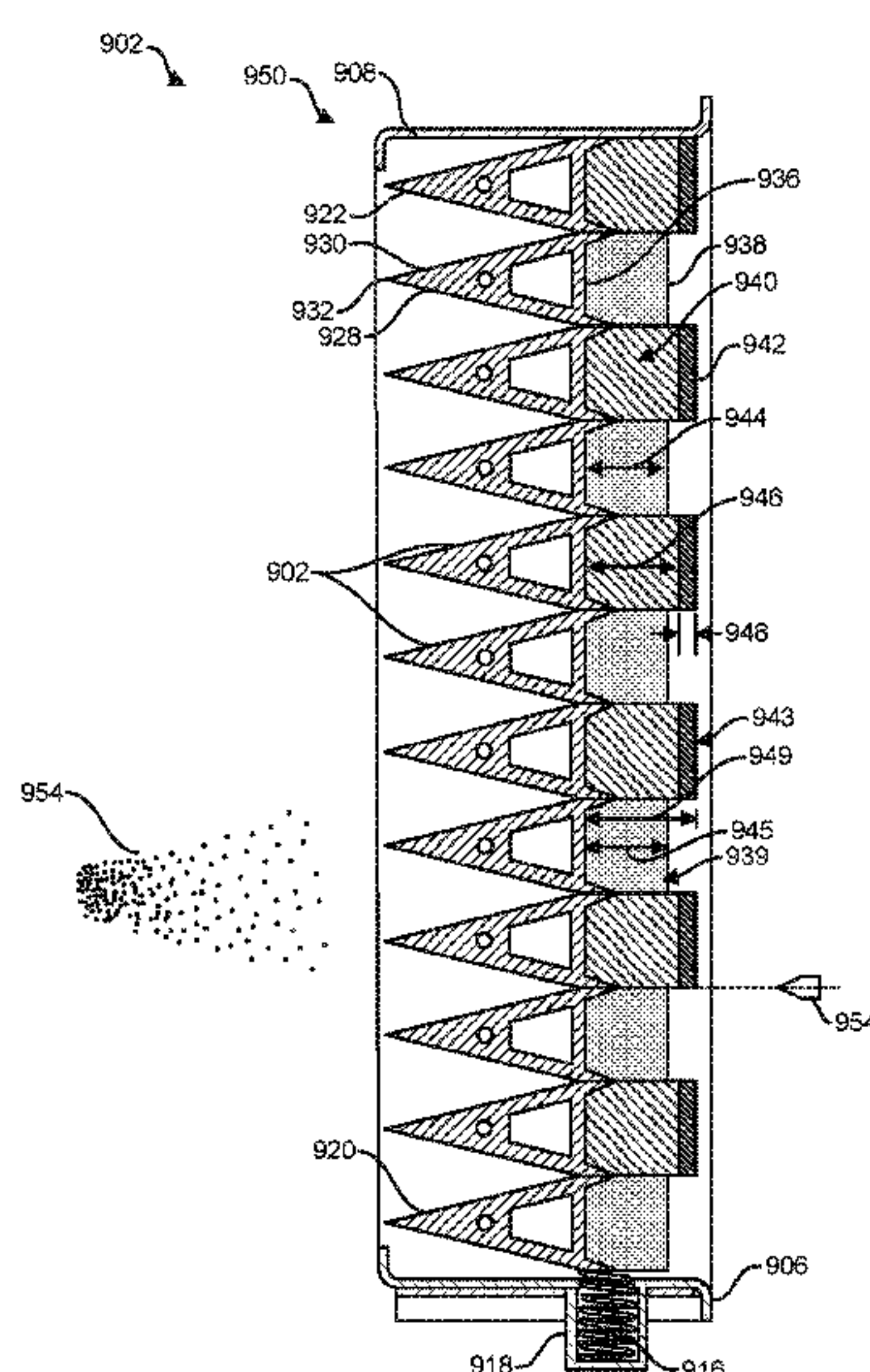
Primary Examiner — Alexander S Thomas

(57)

ABSTRACT

A defense structure and methods of use for penetrating the defense structure with a projectile from a first side and preventing a projectile from penetrating the defense structure from a second side. The defense structure comprising a plurality of wedges arranged to rotate and abut each other using a tensioning member, such as a spring. Ballistic and resilient members are provided on a rear surface of the plurality of wedges to prevent a projectile from penetrating the defense structure through deflection and/or adsorption of the projectile. A gap is formed between at least two of the plurality of wedges when a projectile is urged between the plurality of wedges from the first side. The tensioning member urges the plurality of wedges to rotate and abut each other after the projectile passes through the gap. The defense structure may be partially concealed within a structural element.

16 Claims, 21 Drawing Sheets



(56)

References Cited

U.S. PATENT DOCUMENTS

2017/0102216 A1 4/2017 Lam
2017/0226891 A1 8/2017 Twelves, Jr. et al.

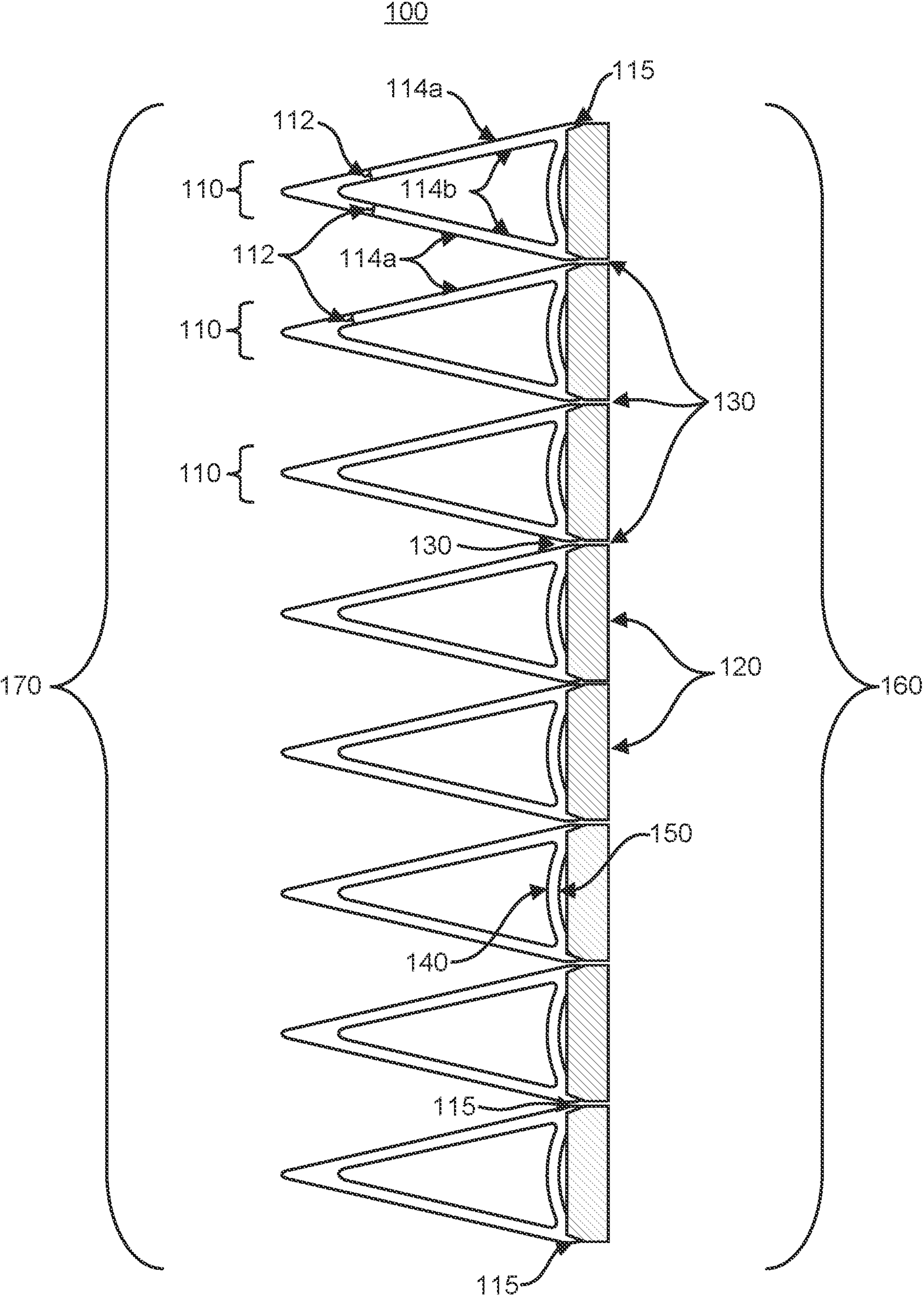


FIG. 1

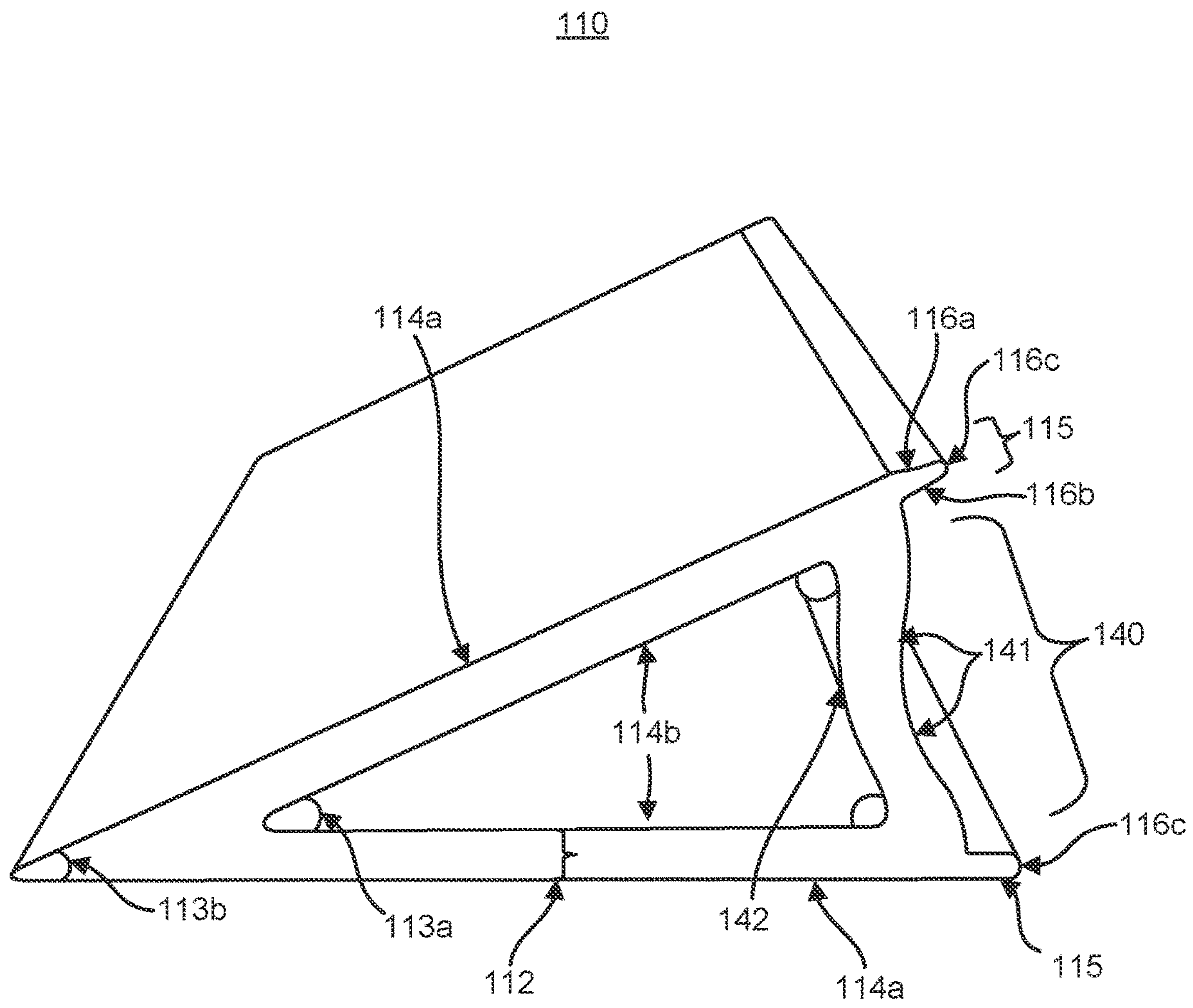


FIG. 2A

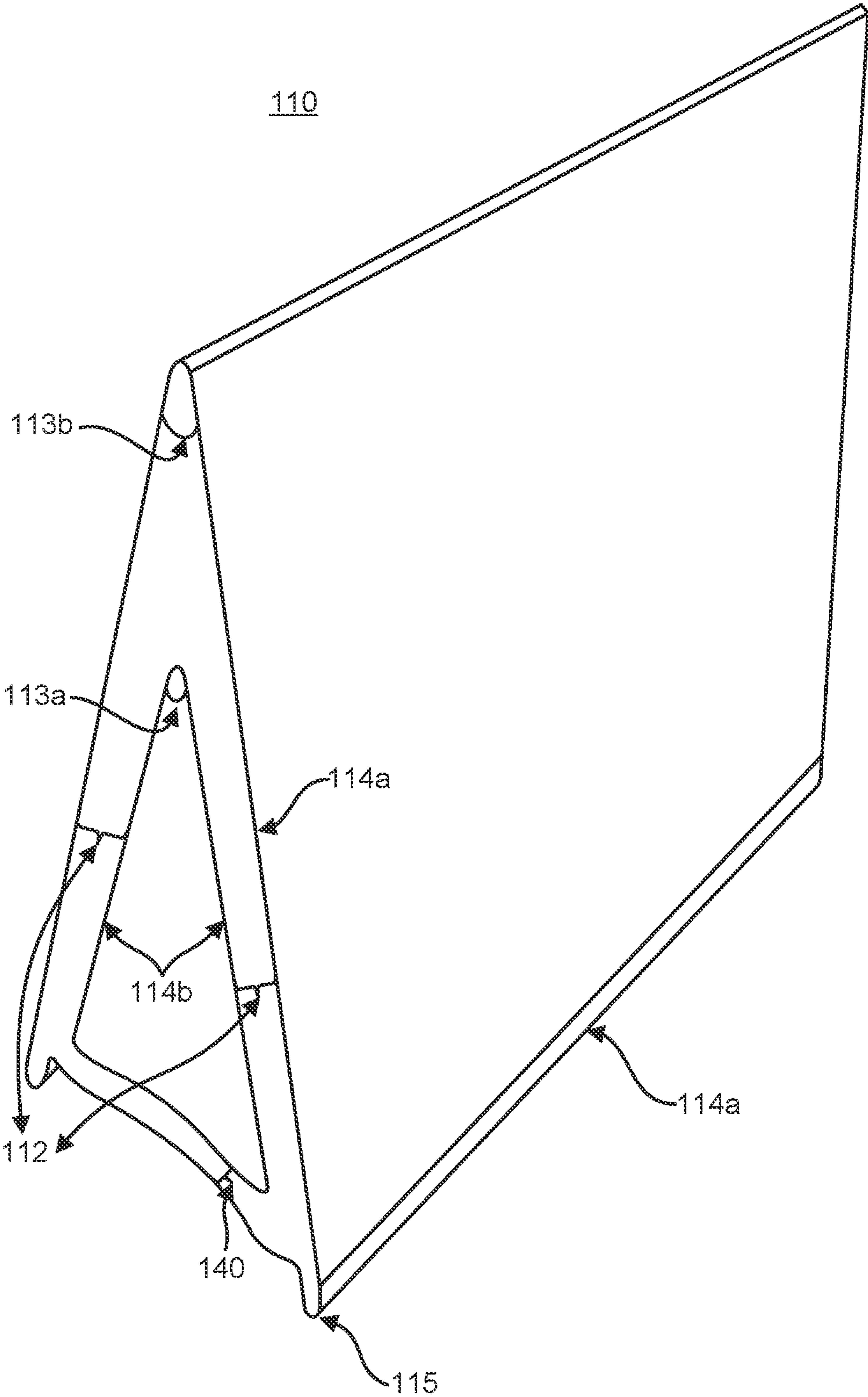


FIG. 2B

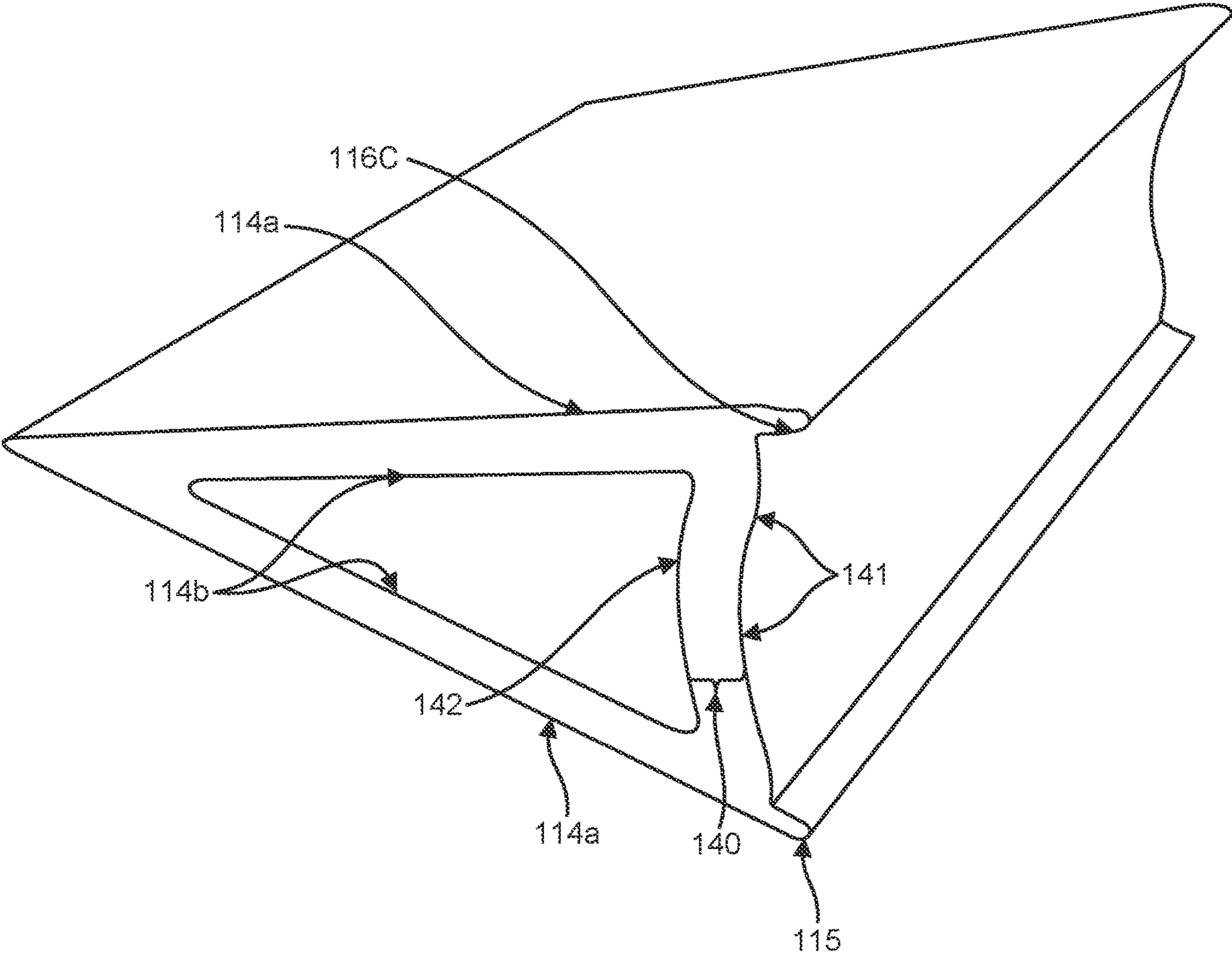


FIG. 3

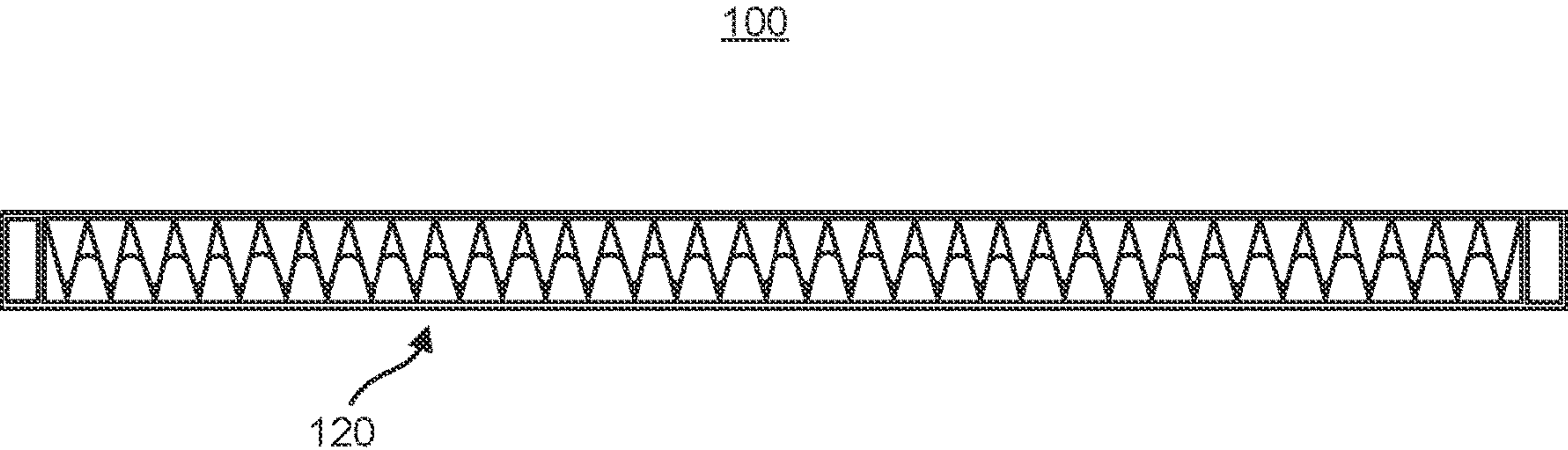


FIG. 4A

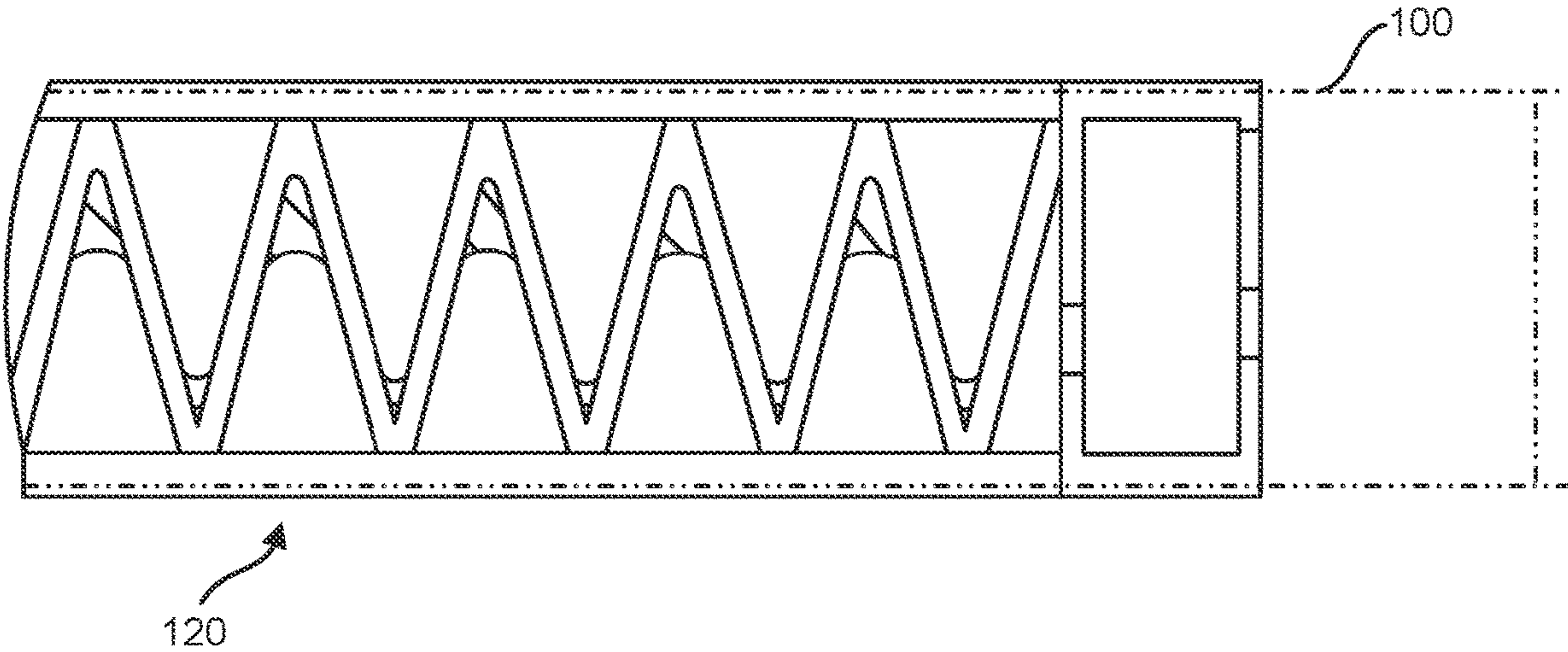


FIG. 4B

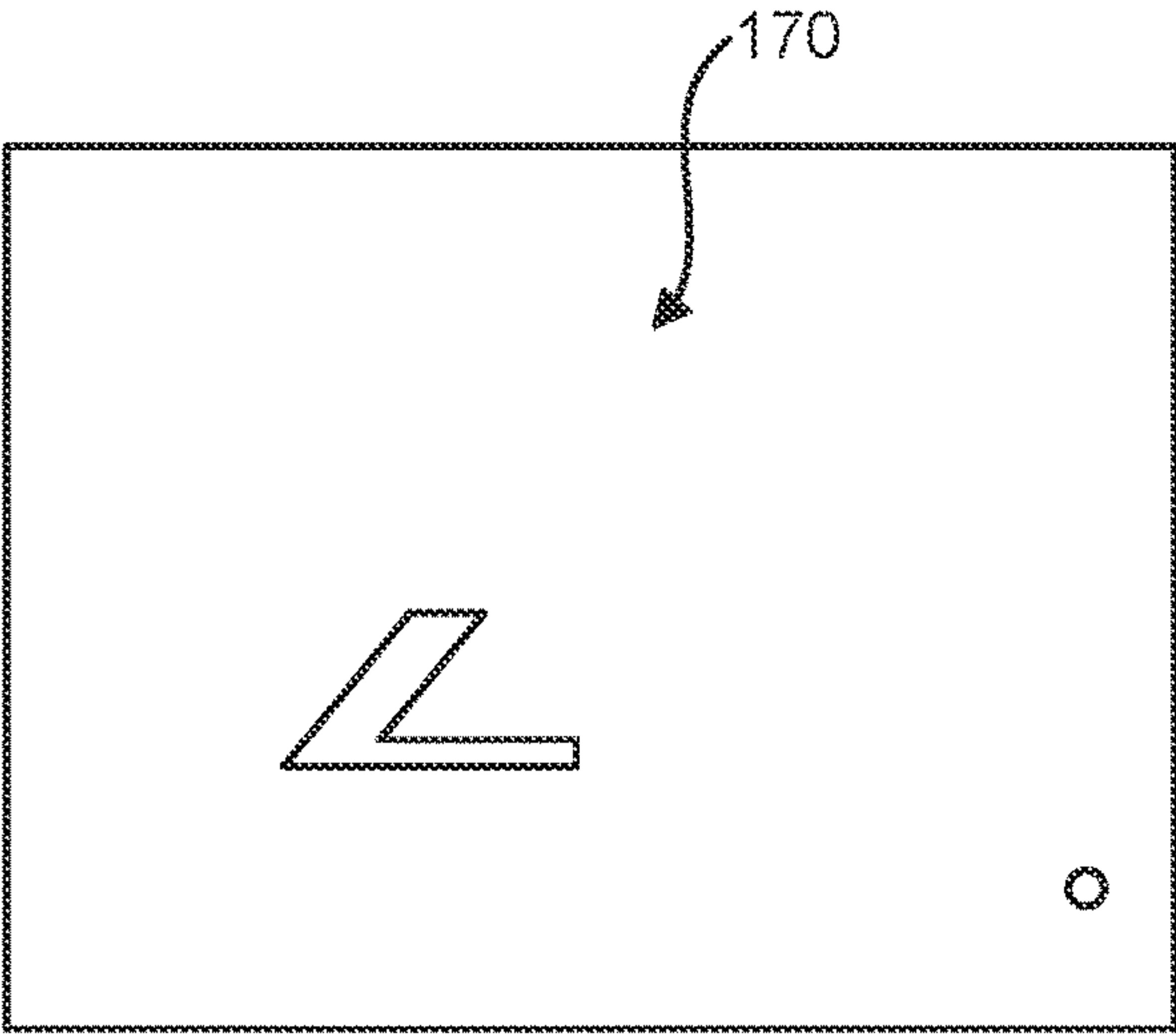


FIG. 5A

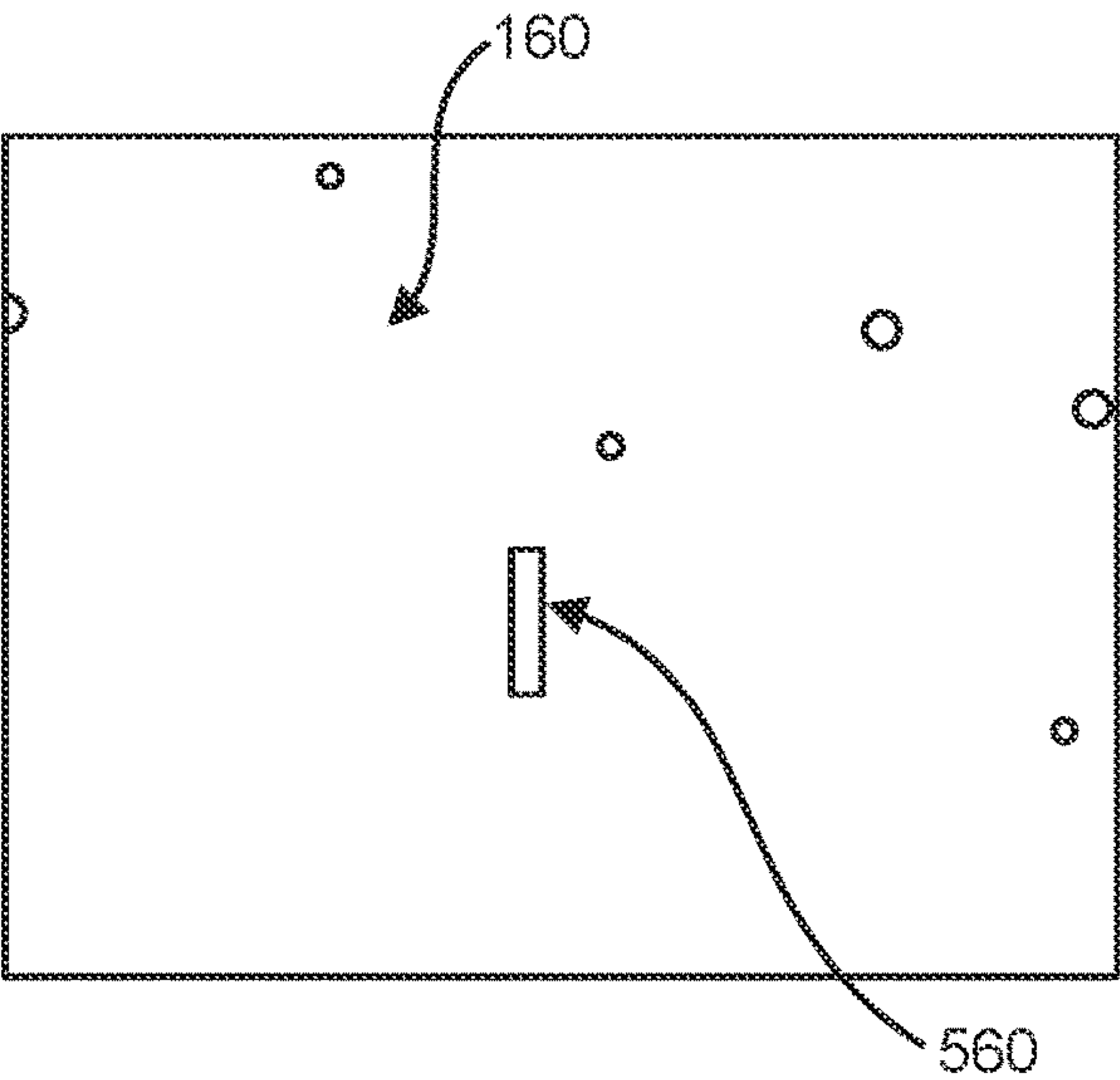


FIG. 5B

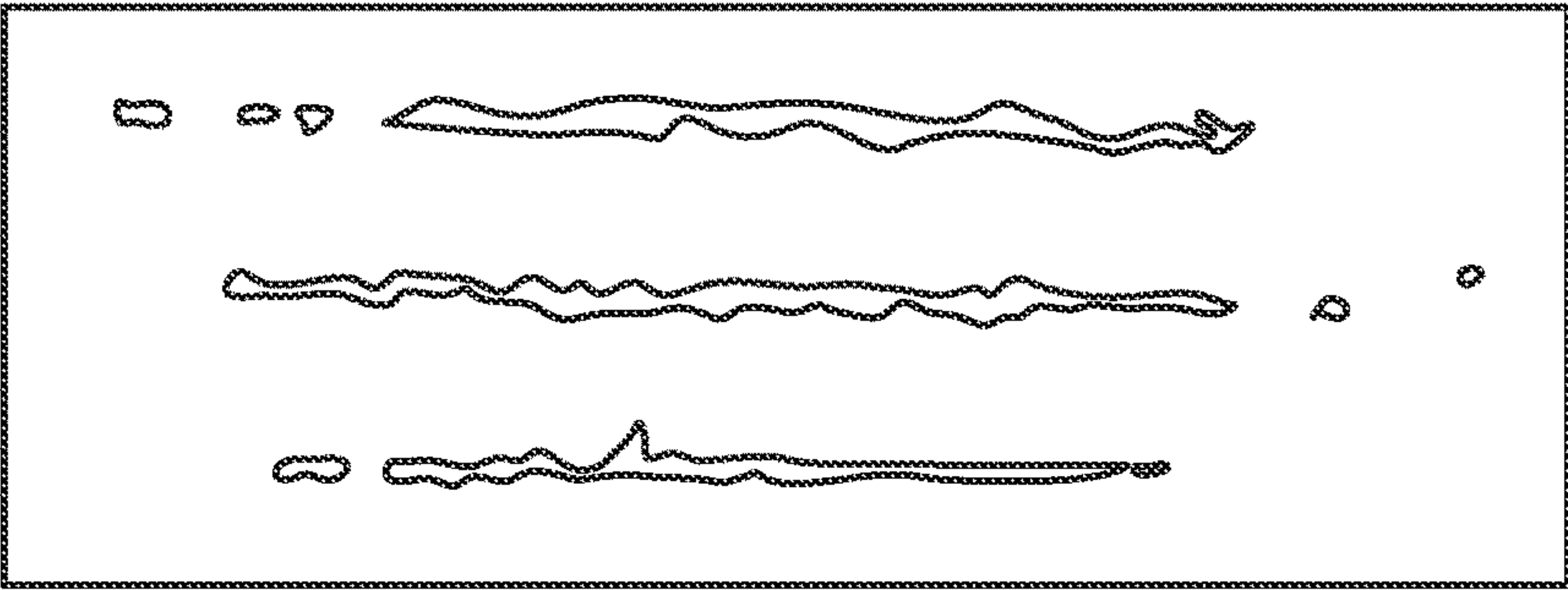


FIG. 5C

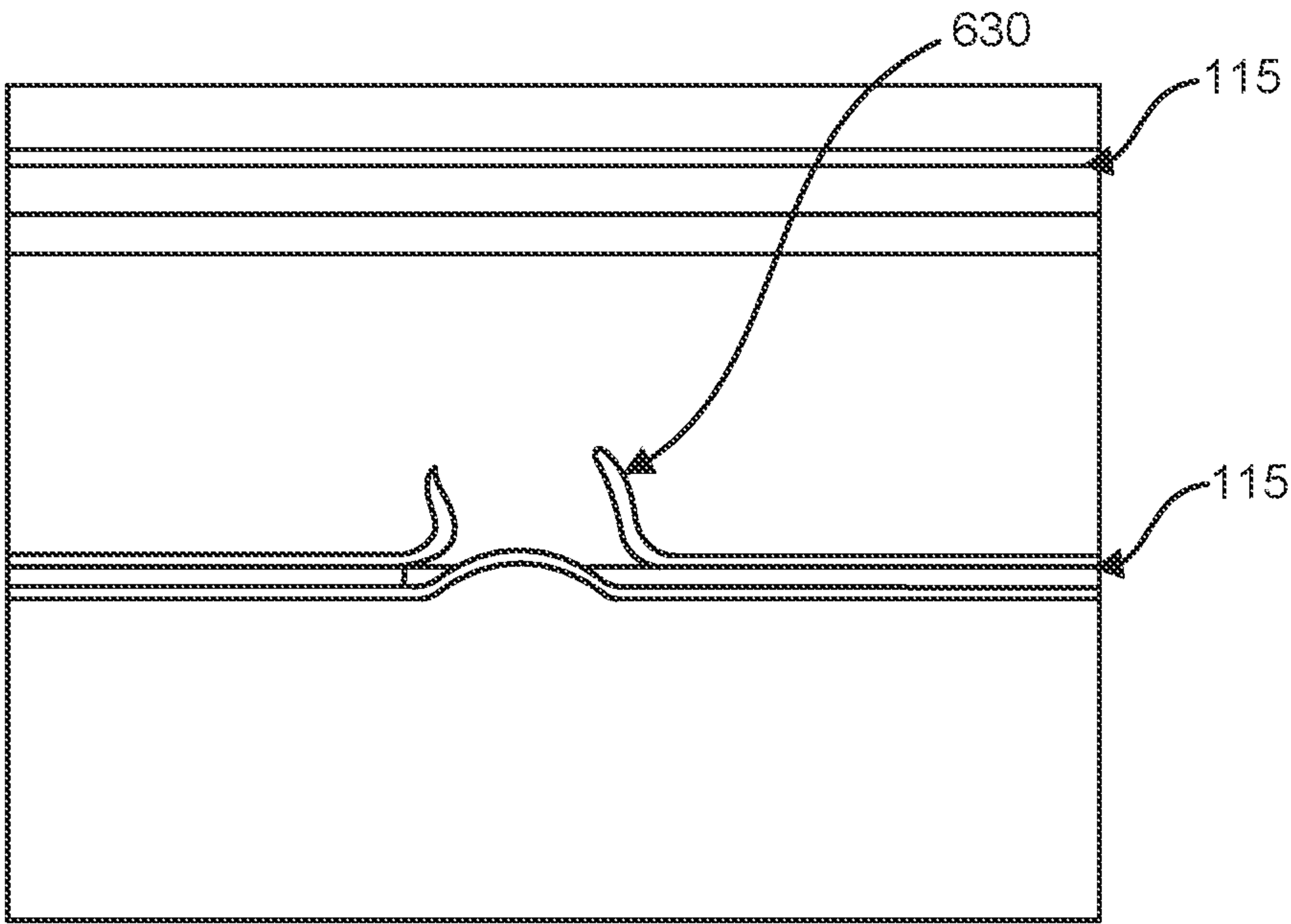


FIG. 6A

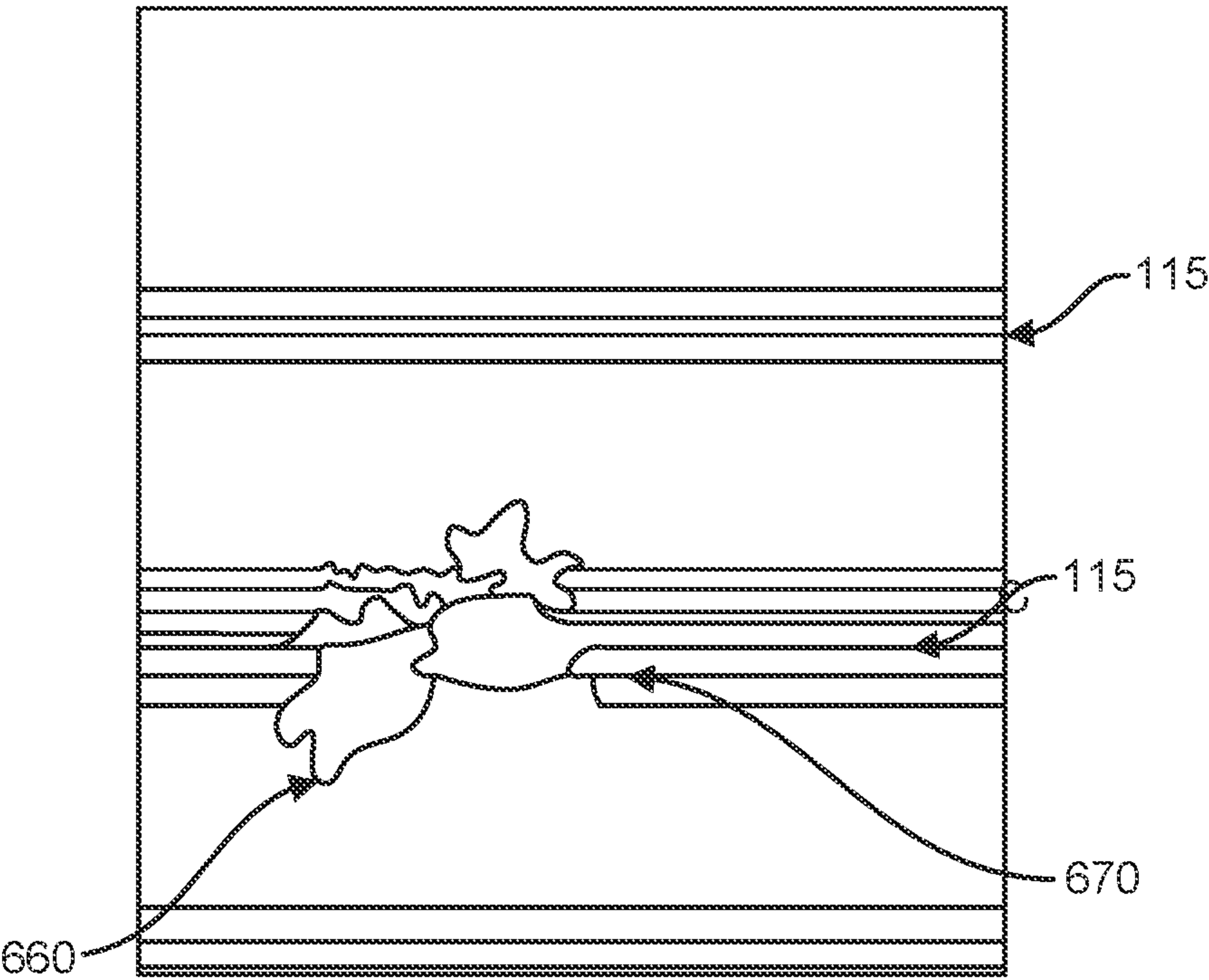


FIG. 6B

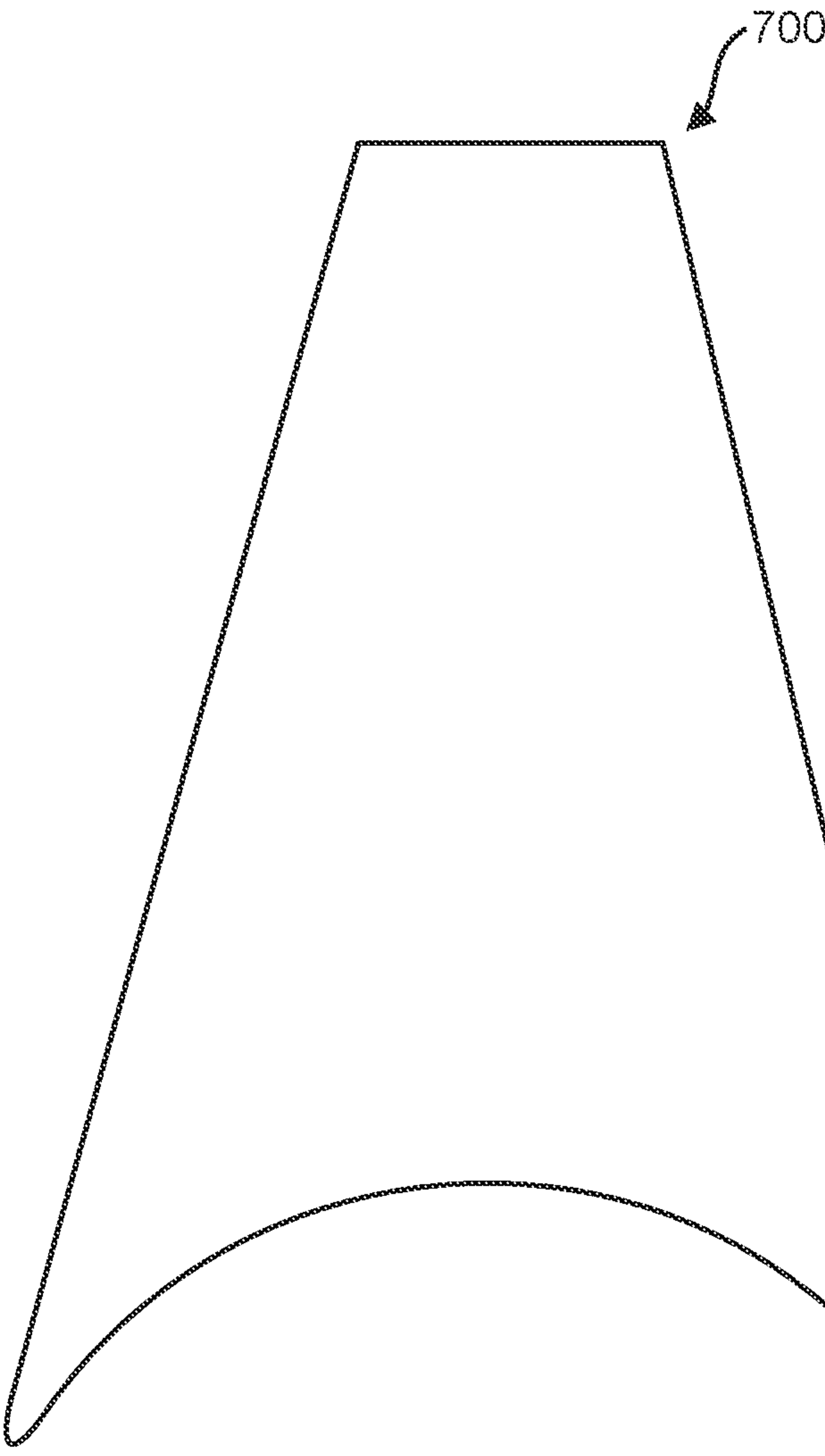


FIG. 7

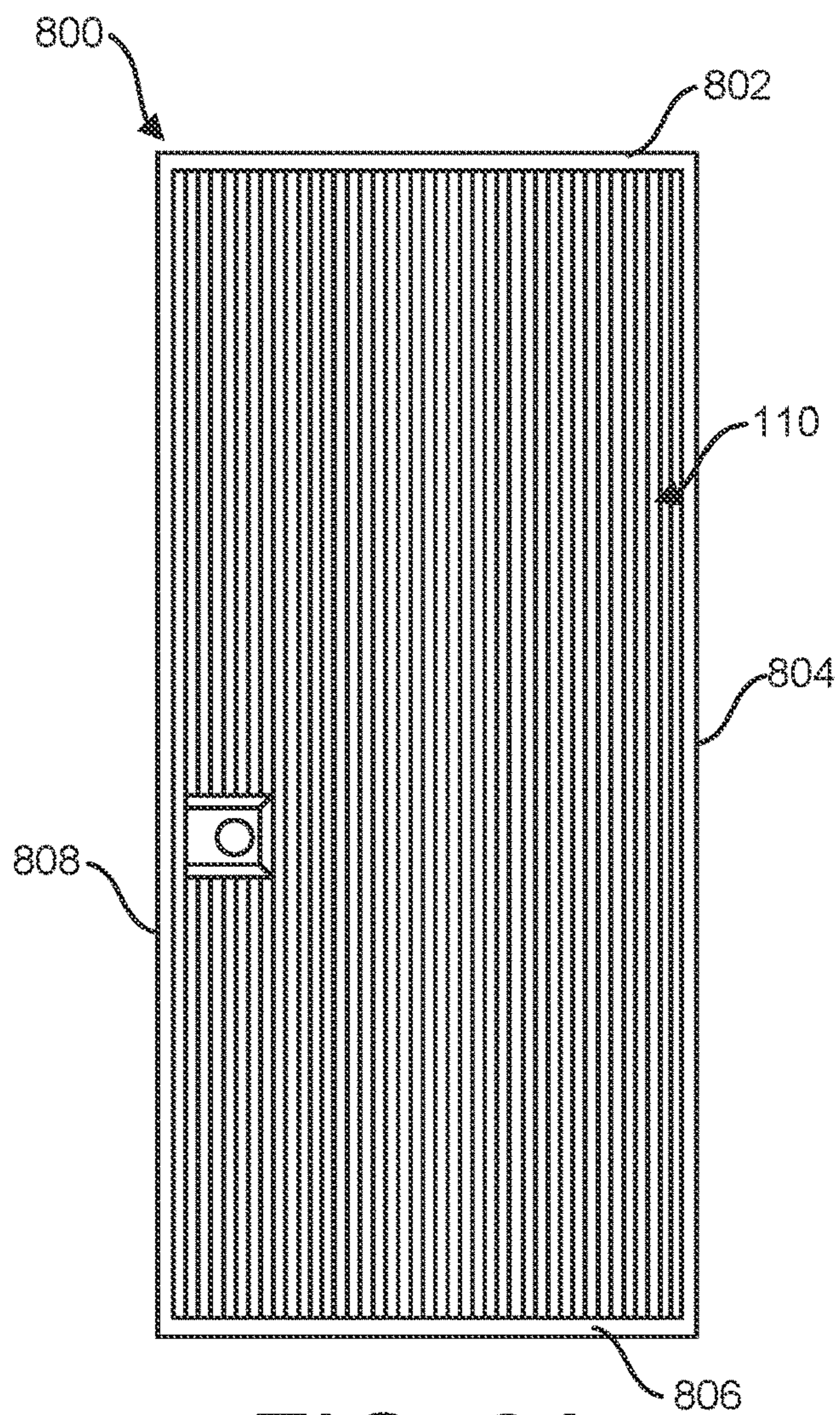


FIG. 8A

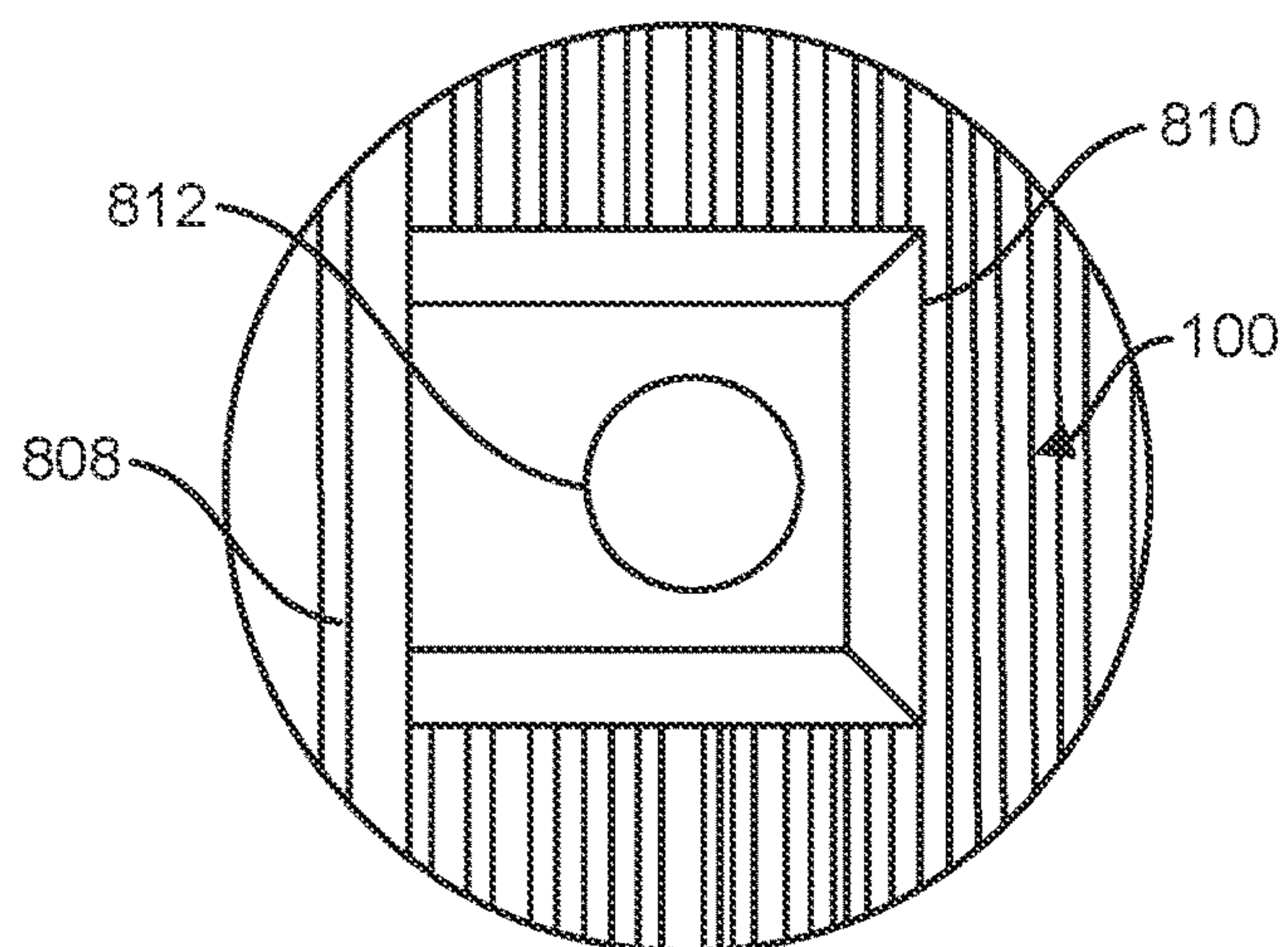


FIG. 8B

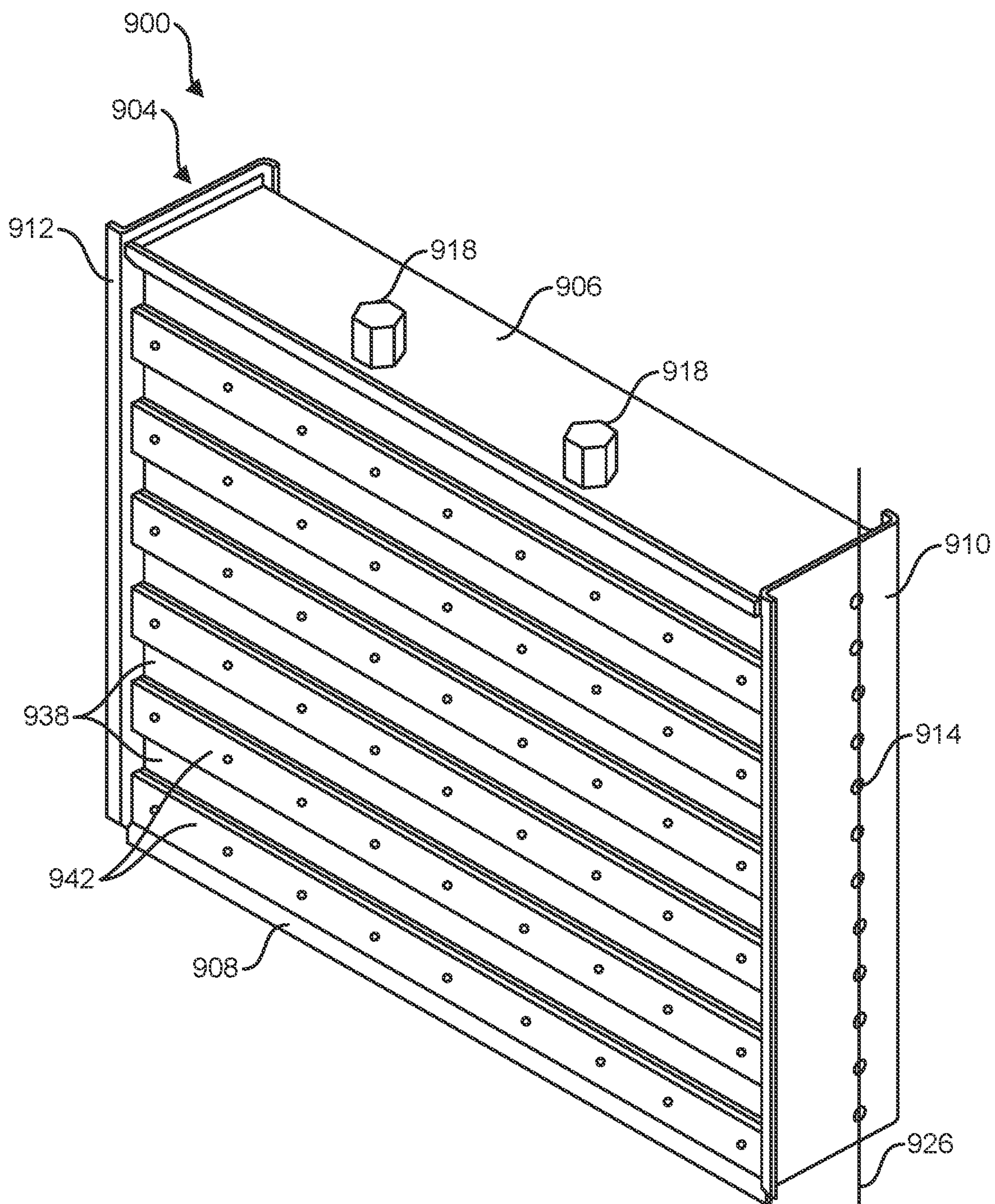


FIG. 9

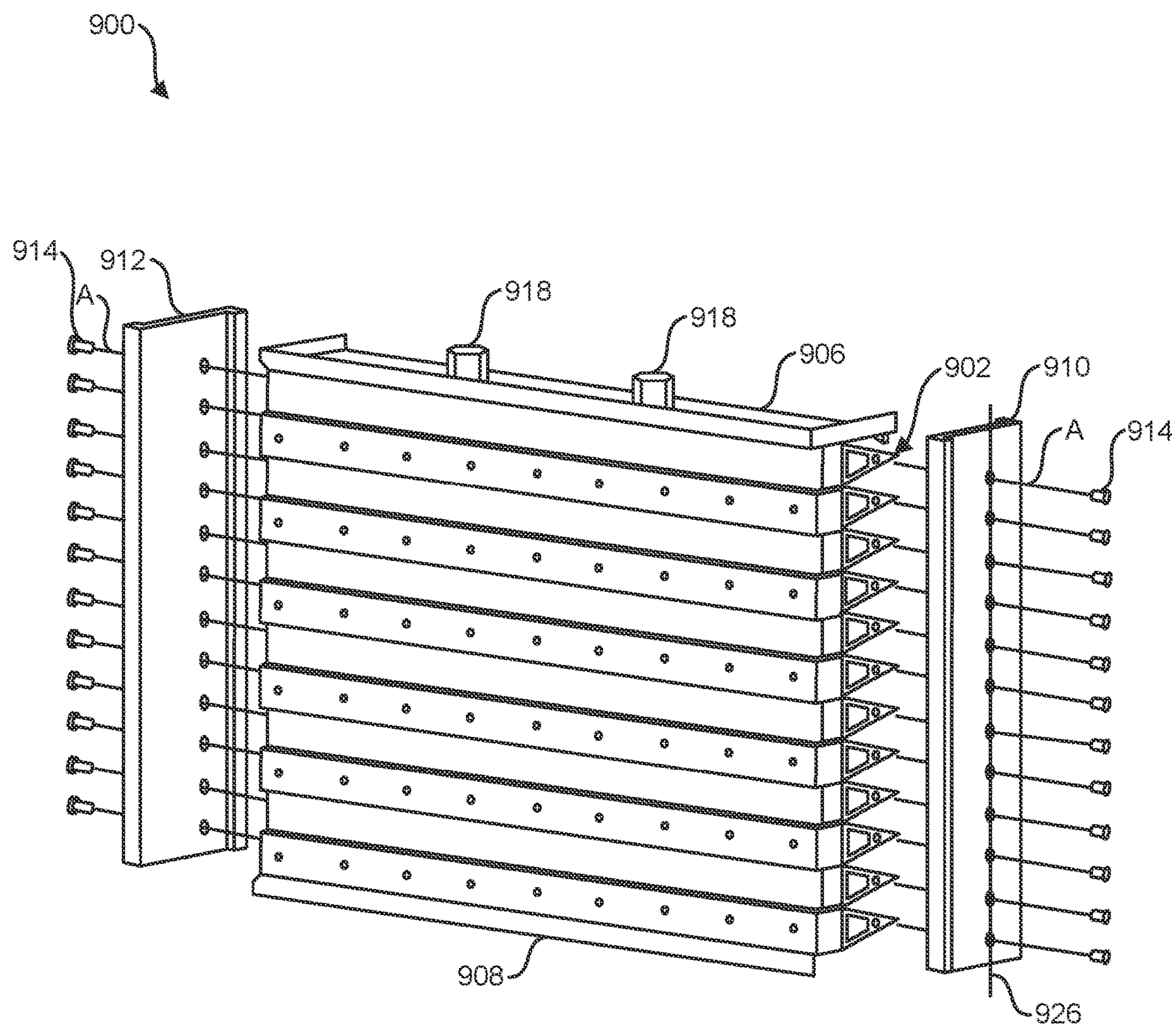


FIG. 10

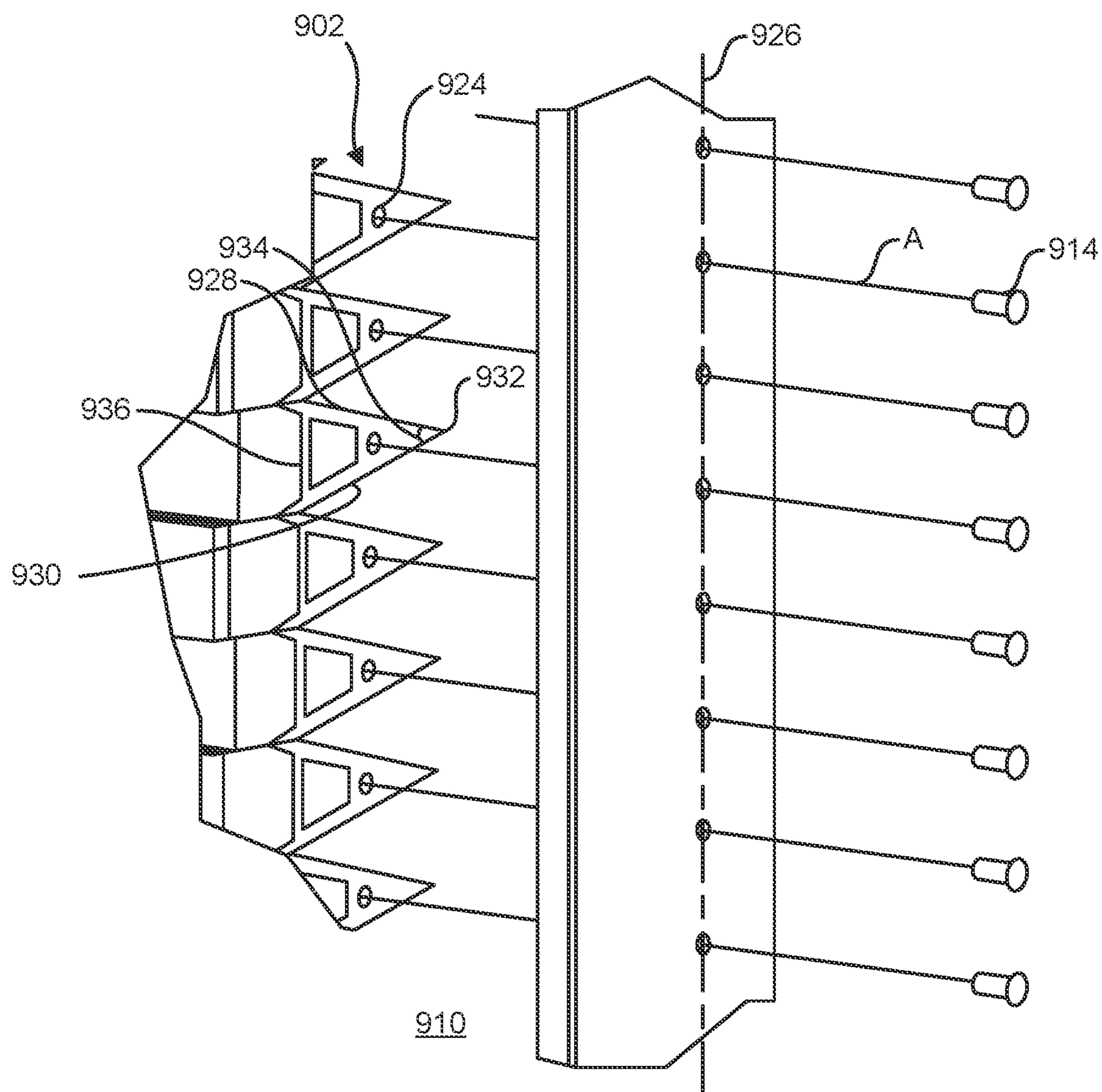


FIG. 11

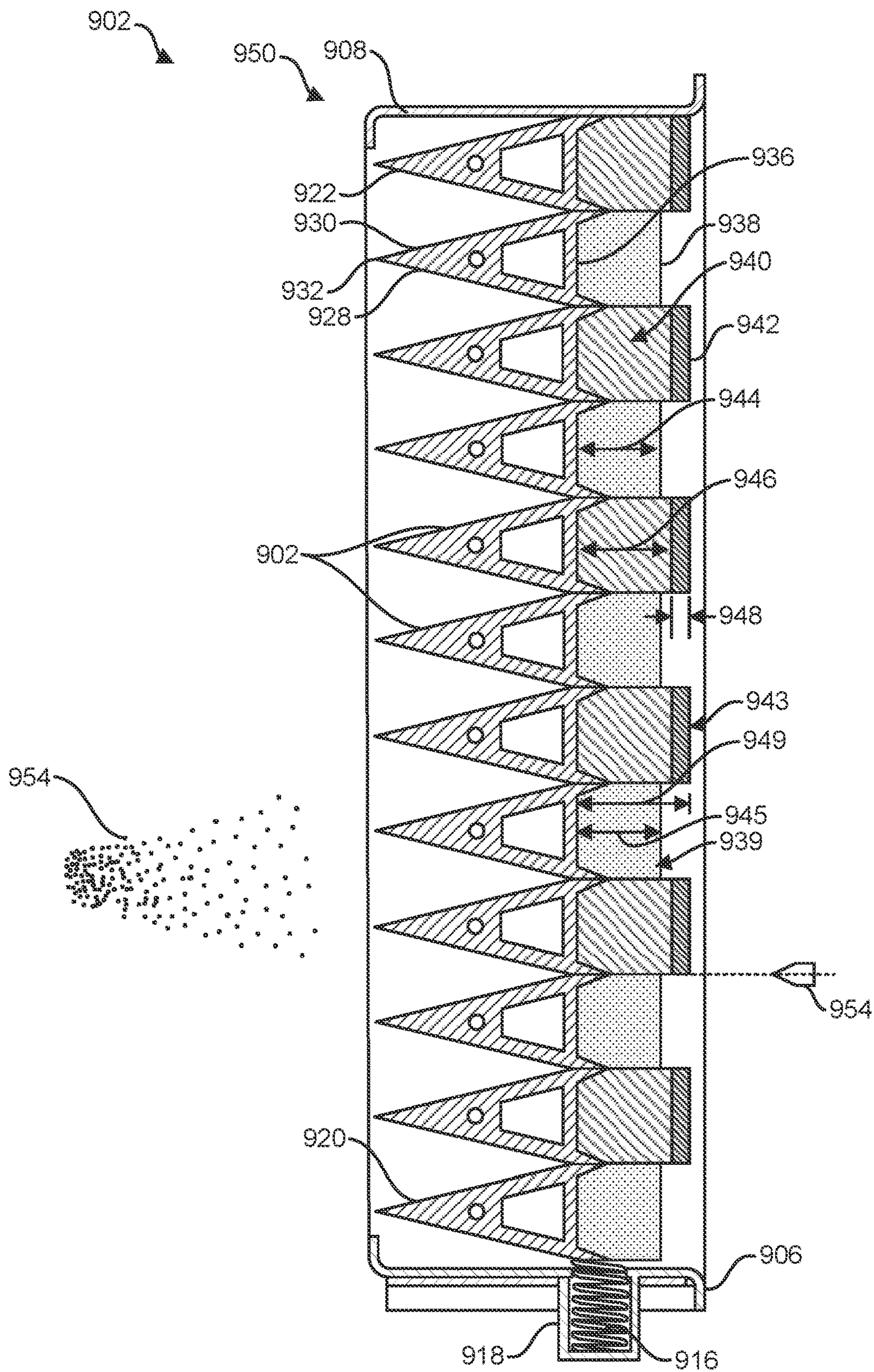


FIG. 12A

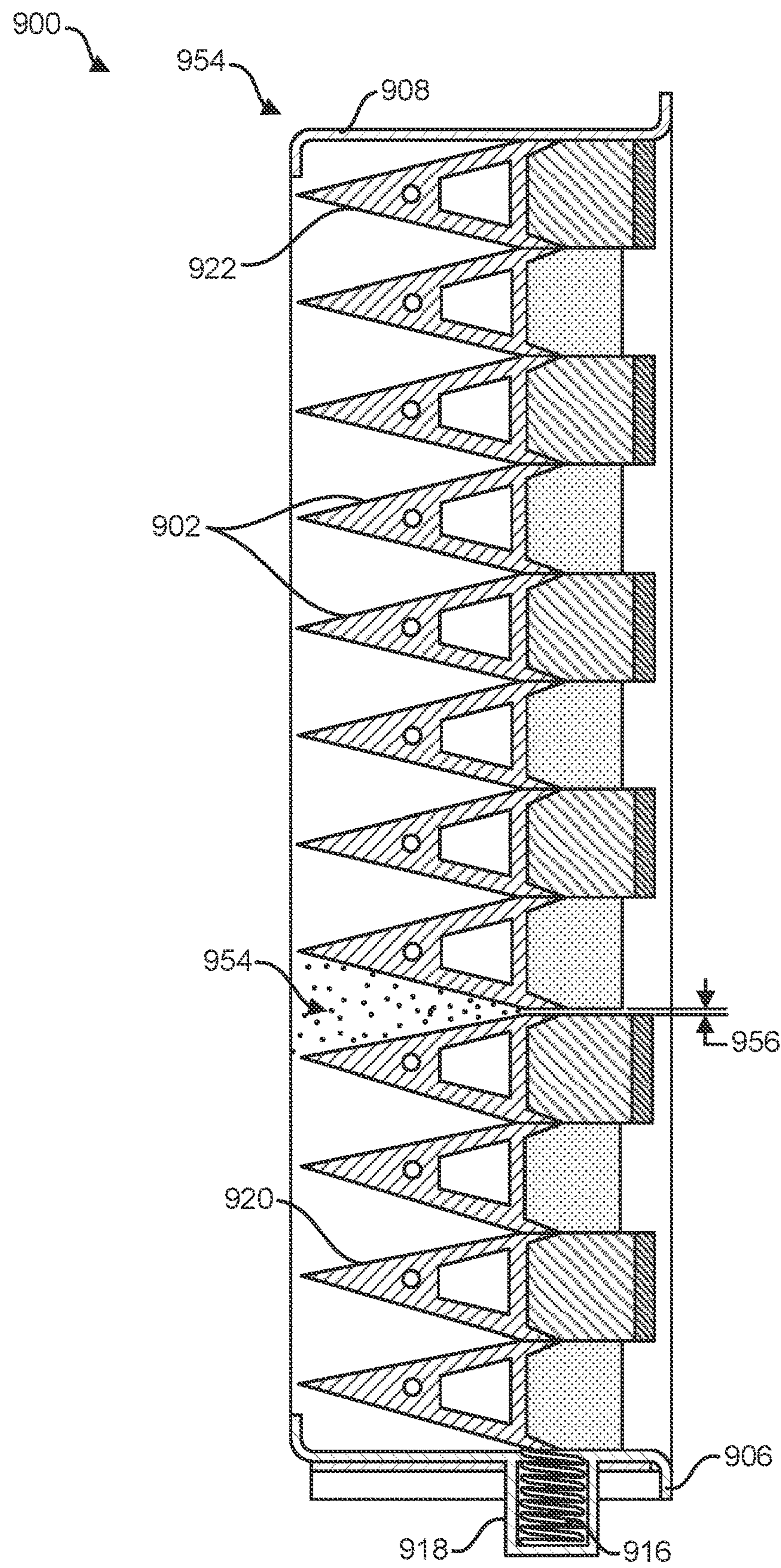


FIG. 12B

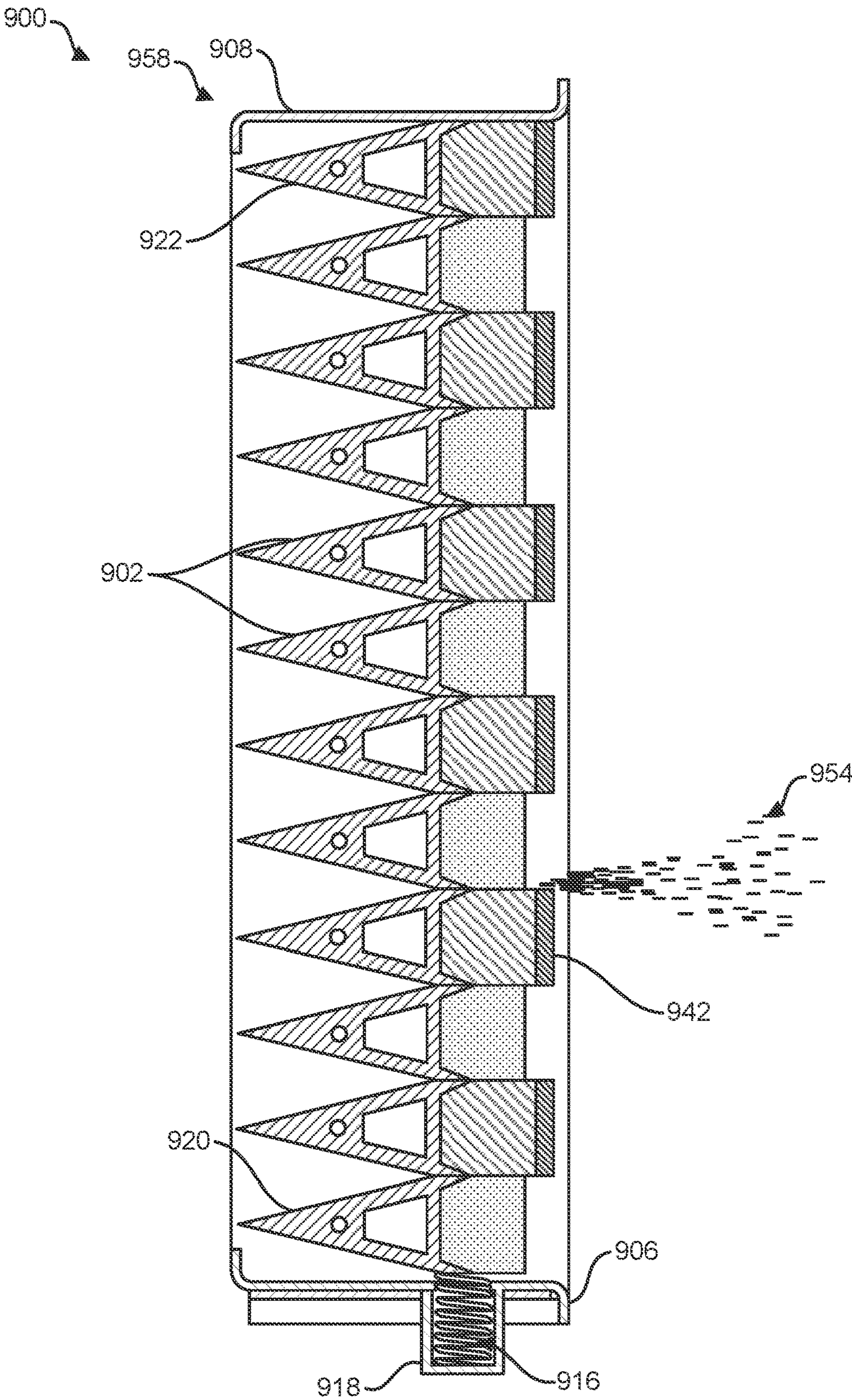


FIG. 12C

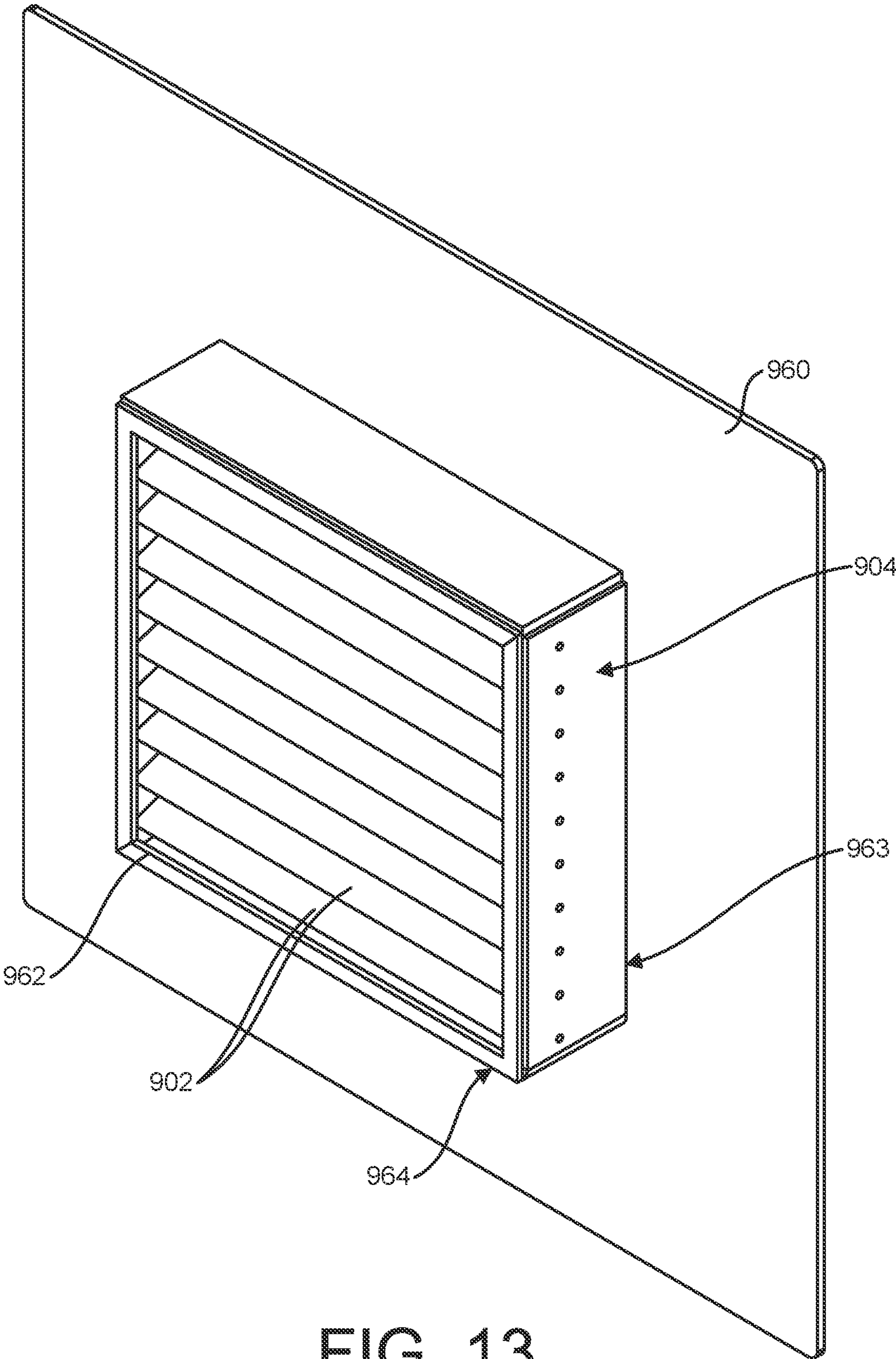


FIG. 13

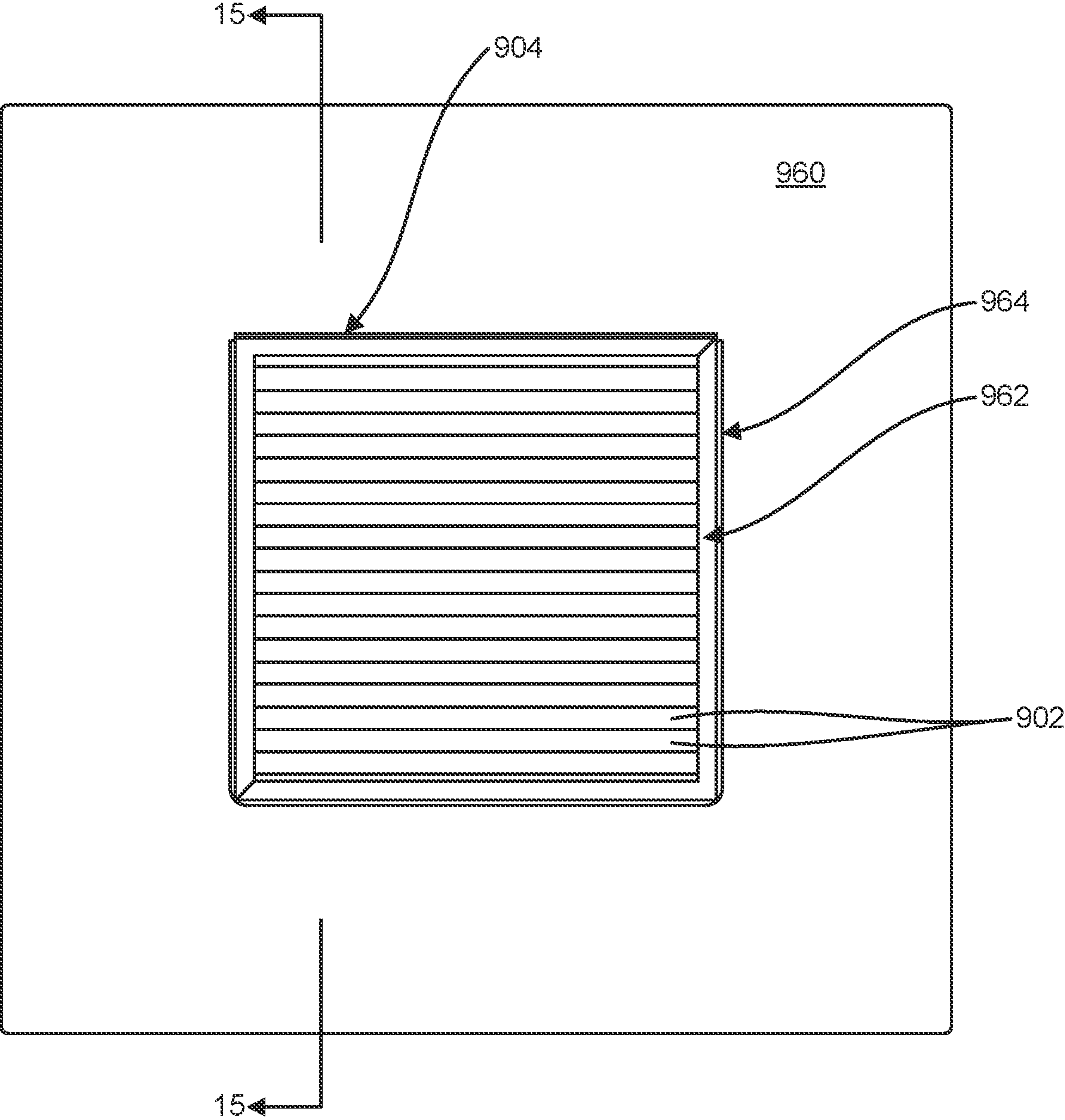


FIG. 14

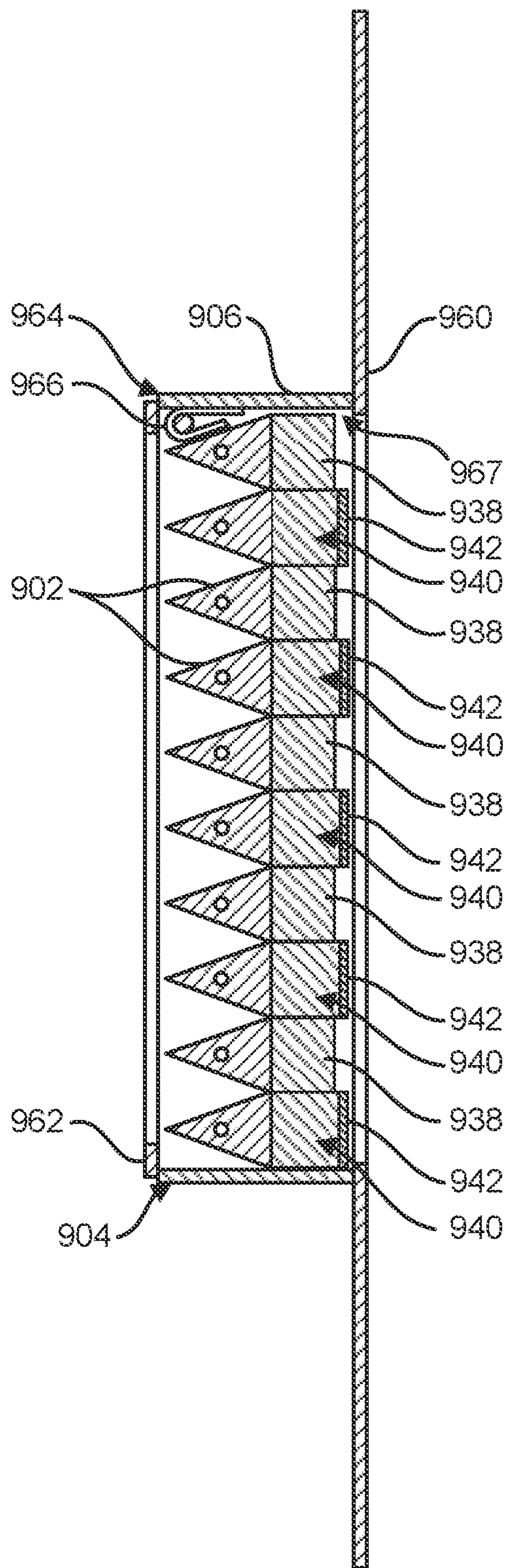


FIG. 15

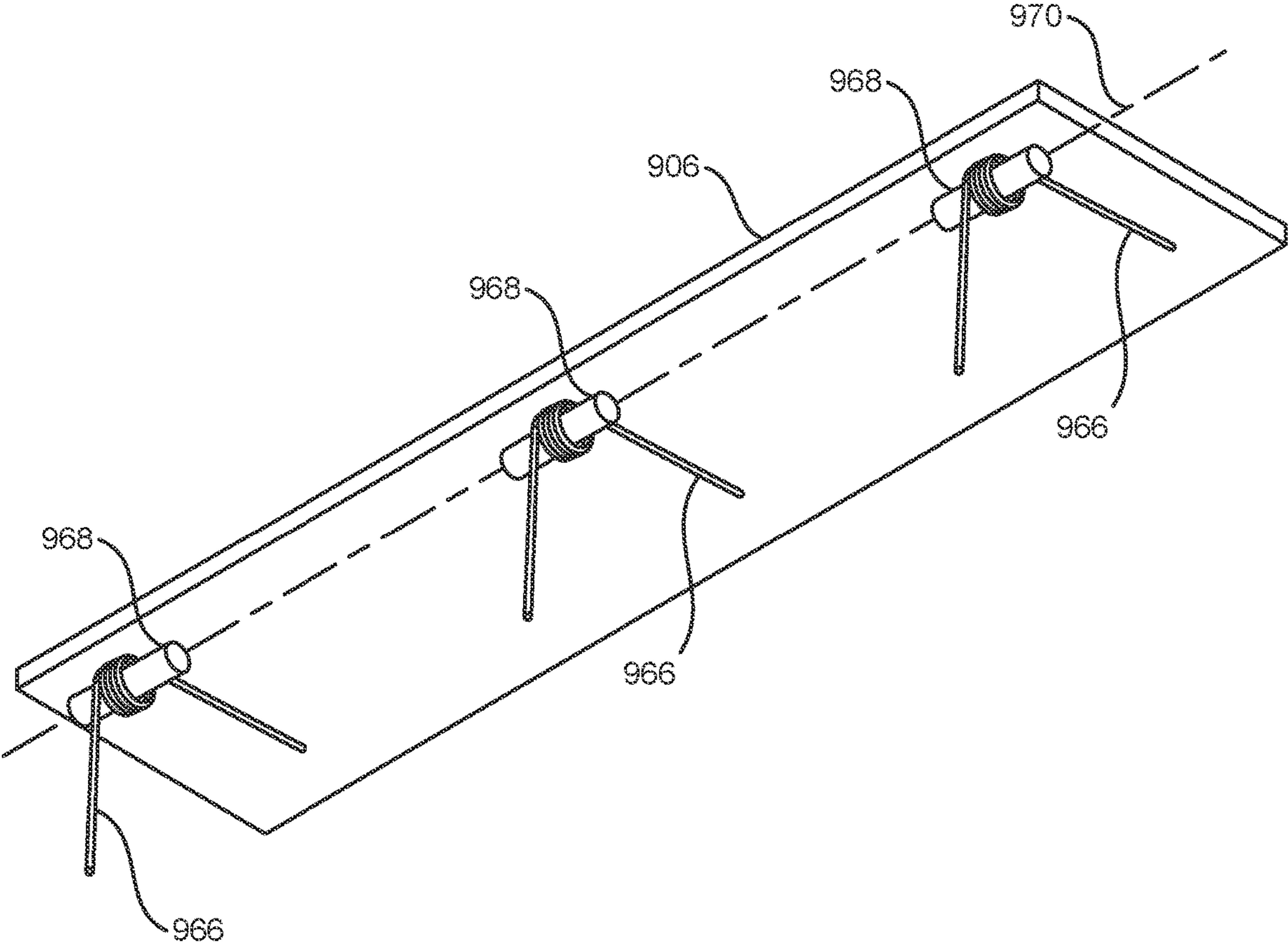


FIG. 16

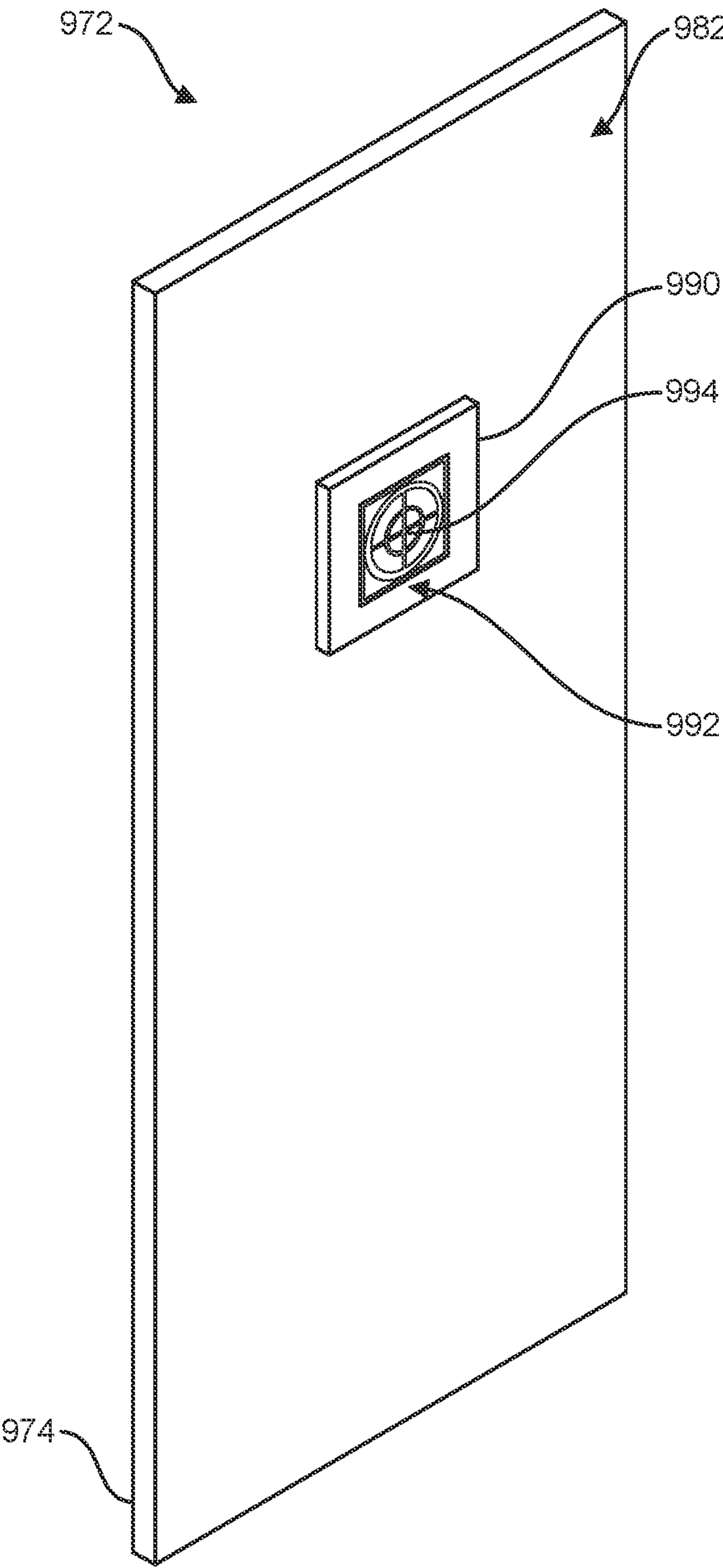


FIG. 17

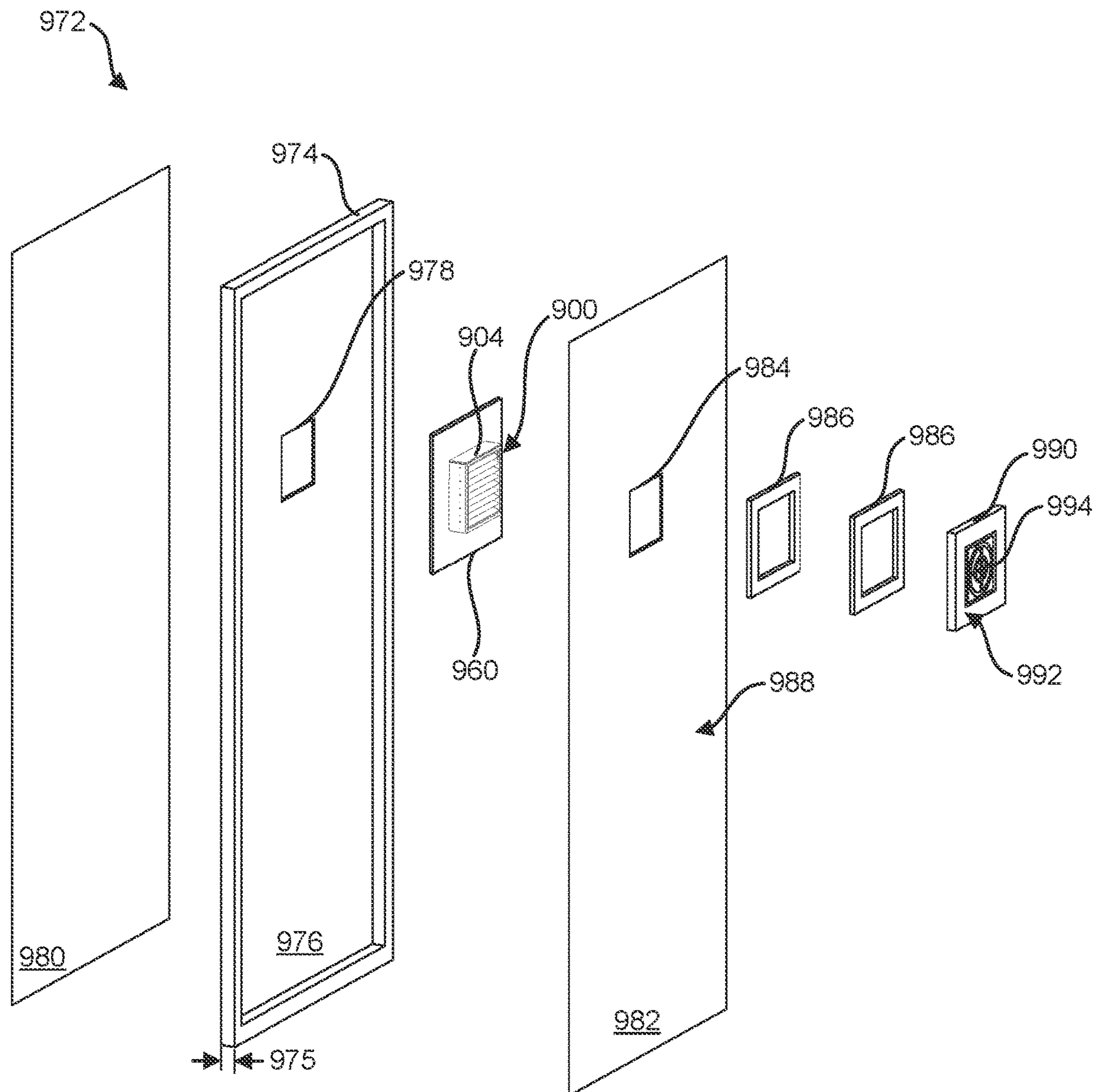


FIG. 18

PRO-ACTIVE DEFENSE STRUCTURE WITH TENSIONING MEMBER

RELATED APPLICATIONS

The present non-provisional patent application is a continuation-in-part application which claims priority of an earlier-filed patent divisional application titled METHODS OF USING A DEFENSE STRUCTURE, Ser. No. 16/865,017, filed May 1, 2020 now U.S. Pat. No. 11,085,737, which claims priority of an earlier-filed patent application titled PRO-ACTIVE DEFENSE STRUCTURE, Ser. No. 16/268,054, filed Feb. 5, 2019, now U.S. Pat. No. 10,648,777, which claims priority of an earlier-filed provisional patent application titled PROACTIVE DEFENSE STRUCTURE, Ser. No. 62/626,563, filed Feb. 5, 2018. The contents of the identified earlier-filed applications are hereby incorporated by reference into the present application.

BACKGROUND

1. Field of the Disclosed Subject Matter

The present invention and disclosed subject matter relate generally to ballistic resistant materials and structure and, more particularly, to ballistic multilayer arrangements that resist various projectiles on one side of the arrangement while allowing other projectiles to pass easily through on another side of the arrangement.

2. Background

Conventional safe rooms and other ballistic resistant structures are typically constructed of massive concrete or extremely costly materials, high density fiberglass panels are also being used. These types of materials inhibit projectiles from passing through the wall or door structure in either direction. The idea is to inhibit direct access to a victim from an assailant. However, in this standoff defenders cannot come and go as they wish. The safe room itself becomes a prison from where there is no escape and from where a defender cannot fire back. The defender is temporarily safe, but is no threat to the assailant and is held captive by the assailant within the “safe” room. This allows the assailant additional time to take drastic, pro-active measures to defeat the structure of the safe room. Moreover, safe rooms are typically located in a remote location within a building or home. During an invasion of the property a defender and others must get to the safe room in the remote location before being harmed or captured.

Current systems seldom provide entire rooms within a home that are ballistic resistant; nor entire commercial structures; nor can current systems provide ballistic resistant external panels of automobiles, armored vehicles, and/or aviation equipment or vehicles. Furthermore, current systems cannot enable defenders or victims to fire projectiles at assailants standing on the outside or opposite side of a “bullet proof” room or defense structure, thereby enabling a defender to no longer be held captive in safe rooms, but enabling the defender to pro-actively pick and choose whether they want to end the standoff with deadly force or with disabling effects on the assailants.

SUMMARY

The present invention is directed to ballistic resistant defense structures comprising V profiles, which further

comprise V-shaped wedges arranged sideways, adjacent to each other in a V column-type configuration; wherein the V-shaped wedges are spaced slightly apart with slight gaps between each V-shaped wedge; and an outside ballistic receptor or deflector of the profile that runs flush against and parallel to the length of the V column-type configuration.

In one embodiment of this invention, the V-shaped wedges are arranged straight up side by side in horizontal or vertical V row-type configurations. In another embodiment, the outside ballistic receptor of the profile is comprised of fiberglass ballistic materials, while in other embodiments the outside receptor of the profile is comprised of other polymers and/or viscous materials.

In a further embodiment, the fiberglass side of the defense structure has the capability to prevent a projectile that is shot from the fiberglass side towards the V-profile side, from passing all the way through the defense structure. In some embodiments the defense structure absorbs a portion of or the entire projectile and in other embodiments the defense structure deflects the projectile entirely.

In yet a further embodiment, the V-profile side of the defense structure has the capability to allow a projectile that is shot from the V-profile side towards the fiberglass side, to pass through the defense structure. The V-shaped wedges yield to the force of the projectile as it impacts the V-profile, creating bigger cavities for immediate following projectiles to also pass through. Additionally, the defense structure is partially self-healing when projectiles impact and enter the defense structure from the V-profile side and exit via the fiberglass side.

In embodiments of the invention, the slight gaps between each V-shaped wedge are approximately 0.0-0.50 inches wide in their normal and un-impacted state. Once a projectile is shot from the V-profile side, through the V-profile side, and towards the fiberglass side, the V-profile shaped wedges yield to the force of the projectile and create wider gaps that are approximately 0.01-0.50 inches wide.

In a further embodiment, the top edges, or wedge prongs, of the V in the V-shaped wedge are bent inwards at an angle slightly, towards the center of the V-shaped wedge. In another embodiment, the material lying across the top of the V-shaped wedge is slightly and concavely curved inwards towards the bottom tip of the V, forming a slight hollow space in between the outside receptor of the V-profile and each V-shaped wedge. In further embodiments, the material lying across the top of the V-shaped wedge is a flat hardened material that lays parallel and flush against the outside receptor of the V-profile and each wedge is filled with a ballistic deflecting polymer.

In yet another embodiment of the invention, the sidewalls of the V-shaped wedges have the capability to flex inward or outward.

In yet another embodiment of the invention, it is recommended that the ballistic resistant defense structure be replaced after being shot at once or after going through repeated back and forth fire.

In an embodiment of the disclosed subject matter, a defense structure comprises: a support frame; a plurality of wedges pivotally connected to the support frame, each wedge comprising: a top surface; a bottom surface connected to the top surface along a leading edge, wherein the top surface and the bottom surface form an acute angle; a rear surface disposed between the top surface and the bottom surface; and an axis of rotation disposed parallel to the leading edge, wherein each axis of rotation is in parallel arrangement; a plurality of first ballistic members connected to the rear surface in an alternating arrangement; a plurality

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of second ballistic members connected to the rear surface and disposed between the plurality of first ballistic members; a plurality of resilient members connected to the plurality of second ballistic members; and a tensioning member disposed between the support frame and at least one of the plurality of wedges, the tensioning member configured to rotate the plurality of wedges about the axis of rotation of each wedge.

In an embodiment, the acute angle is between about 20 degrees and about 40 degrees, and may comprise about 30 degrees. In yet another embodiment, the plurality of first ballistic members have a first thickness extending away from the rear surface, wherein the plurality of second ballistic members have a second thickness extending away from the rear surface, wherein the first thickness is equal to or less than the second thickness. The plurality of first ballistic members are configured to adsorb a ballistic and may comprise a fiberglass material.

In another embodiment, each of the plurality of first ballistic members comprising a first exterior surface disposed a first distance from the rear surfaces, and each of the plurality of resilient members comprising a second exterior surface disposed a second distance from the rear surfaces, wherein the second distance is greater than the first distance creating an offset arrangement between the first exterior surfaces and the second exterior surfaces, thereby deflecting a projectile directed between the plurality of first ballistic members and the plurality of second ballistic member.

In another embodiment, the plurality of resilient members is configured to deflect a ballistic and comprise a third thickness between about 0.1 inches and about 1.0 inches. In other embodiments, the third thickness is between about 0.25 inches and about 0.5 inches. The plurality of resilient members may comprise a bullet resistant material.

In another embodiment, the tensioning member comprises a spring. The spring may comprise one of a tension spring or a torsion spring.

In another embodiment, a projection of the axis of rotation of each of the plurality of wedges intersects the support frame along a straight line.

In another embodiment, the defense structure is at least partially concealed within a structural element, such as a door, a wall, a floor or a ceiling. A lid may be demountable attached to the defense structure to further conceal the defense structure.

In yet another embodiment of the defense structure, a defense structure comprises: a support frame; a plurality of wedges pivotally connected to the support frame, each wedge comprising: a top surface; a bottom surface connected to the top surface along a leading edge, wherein the top surface and the bottom surface form an acute angle; a rear surface disposed between the top surface and the bottom surface; and an axis of rotation disposed parallel to the leading edge, wherein the axis of rotation of the wedges are in parallel arrangement; a plurality of first ballistic members connected to the rear surface of alternating wedges, the plurality of first ballistic members comprised of a fiberglass material and having a first thickness extending away from the rear surface; a plurality of second ballistic members connected to the rear surface and disposed between the plurality of first ballistic members, the plurality of second ballistic members having a second thickness extending away from the rear surface, wherein the first thickness is equal to or less than the second thickness; a plurality of resilient members connected to the plurality of second ballistic members, the plurality of resilient members comprised of a bullet resistant steel having a third thickness between about

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0.25 inches and about 0.5 inches; and a tensioning member connected to at least one of the plurality of wedges, the tensioning member configured to rotate the plurality of wedges.

In an embodiment, a method of using a defense structure, comprising the steps of: providing a defense structure comprising: a plurality of wedges, each wedge comprising a leading edge; and a tensioning member connected to at least one of the plurality of wedges, the tensioning member configured to rotate the plurality of wedges; directing a first projectile towards the leading edges; rotating at least one of the plurality of wedges from a first position to a second position with the first projectile, thereby compressing the tensioning member and forming a gap between at least two of the plurality of wedges; passing the first projectile between the gap; and decompressing the tensioning member, thereby rotating at least one of the plurality of wedges from the second position to the first position. The method may further include the step of partially concealing the defense structure within a structural element.

In an embodiment, a method of using a defense structure, comprising the steps of: providing a defense structure comprising: a plurality of wedges, each wedge comprising a leading edge and a rear surface; a plurality of first ballistic members connected to the rear surface of alternating wedges; a plurality of second ballistic members connected to the rear surface and disposed between the plurality of first ballistic members; a plurality of resilient members connected to the plurality of second ballistic members; and a tensioning member connected to at least one of the plurality of wedges, the tensioning member configured to rotate the plurality of wedges; directing a second projectile towards the rear surfaces; and adsorbing the second projectile into at least one of the plurality of first ballistic members.

In an embodiment, a method of using a defense structure, comprising the steps of: providing a defense structure comprising: a plurality of wedges, each wedge comprising a leading edge and a rear surface; a plurality of first ballistic members connected to the rear surface of alternating wedges, the plurality of first ballistic members comprising a first exterior surface disposed a first distance from the rear surfaces; a plurality of second ballistic members connected to the rear surface and disposed between the plurality of first ballistic members; a plurality of resilient members connected to the plurality of second ballistic members, the plurality of resilient members comprising a second exterior surface disposed a second distance from the rear surfaces, wherein the second distance is greater than the first distance; and a tensioning member connected to at least one of the plurality of wedges, the tensioning member configured to rotate the plurality of wedges; directing a third projectile towards at least one of the plurality of resilient members; and deflecting the third projectile away from the at least one of the plurality of resilient members. After the deflecting step, the method may further comprise adsorbing the third projectile into at least one of the plurality of first ballistic members.

Thus an object of the present invention is to provide a defense structure that deflects or absorbs and stops ballistics from passing through the defense structure on one side, while allowing projectiles fired from the opposite side to pass through the defense structure.

Another object of disclosed subject matter is to provide a concealed defense structure within a structural element and provide a target indicating the location of defense structure in order to accurately direct a projectile through one side of the defense structure.

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BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be illustrated in more detail, but not limited, by reference to the specific embodiment shown in the accompanying drawings, with greater emphasis being placed on clarity rather than scale:

FIG. 1 is a perspective view of a V-Profile in a column-type configuration;

FIG. 2A is a perspective view of a V-shaped wedge laying sideways with the top of the V-shaped wedge curved inwards slightly towards the bottom end of the V;

FIG. 2B is another perspective view of a V-shaped wedge standing up;

FIG. 3 is another perspective view of a V-shaped wedge laying sideways;

FIG. 4A is a perspective view of a V-Profile in a horizontal V row-type configuration;

FIG. 4B is a zoomed in perspective view of 5 V-shaped wedges from the V-Profile pictured in FIG. 4A;

FIG. 5A depicts an interior wall showing a large entry hole of a shot;

FIG. 5B depicts an exterior of the wall in 5A, showing the exit pattern when the V-profile is set up vertically in an V-column type configuration and the vertical alignment of the exit shot;

FIG. 5C depicts an exterior of the wall in 5A, showing the exit pattern when the V-profile is set up horizontally in a V-row type configuration and the horizontal alignment of the exit shot.

FIG. 6A depicts a two or more V-shaped wedges placed side by side with an obtrusion from being struck by a projectile.

FIG. 6B depicts an exemplary projectile stop even with a dead center strike to a gap in the V profile.

FIG. 7 is a perspective of a hardened material insert used to deflect a projectile.

FIG. 8A depicts a door comprised of a ballistic resistant defense structure.

FIG. 8B depicts a zoomed in view of the ballistic resistant defense structure details on the door depicted in FIG. 4.

FIG. 9 is a perspective view of a defense structure.

FIG. 10 is an exploded view of a defense structure.

FIG. 11 is a detailed view of a plurality of wedges.

FIG. 12A is a sectional view of a defense structure in a first state.

FIG. 12B is a sectional view of a defense structure in a second state.

FIG. 12C is a sectional view of a defense structure in a third state.

FIG. 13 is a perspective view of a defense structure and a reinforcing plate.

FIG. 14 is a front view of a defense structure and a reinforcing plate.

FIG. 15 is a sectional view of a defense structure and a reinforcing plate.

FIG. 16 is a perspective view of a top frame member and at least one torsion spring.

FIG. 17 is a perspective view of a structural element and a lid.

FIG. 18 is an exploded view of a structural element comprising a defense structure.

DETAILED DESCRIPTION

It is to be understood that while certain aspects of the disclosed subject matter have been shown and described, the disclosed subject matter is not limited thereto and encom-

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passes various other embodiments and aspects. Furthermore, certain terminology will be used in the following description, and are shown in the drawings, and will not be limiting. For example, up, down, front, back, right and left refer to the disclosed subject matter as orientated in the view being referred to. The words, "inwardly" and "outwardly" refer to directions toward and away from, respectively, the geometric center of the aspect being described and designated parts thereof. Forwardly and rearwardly are generally in reference to the direction of travel, if appropriate. Said terminology will include the words specifically mentioned, derivatives thereof and words of similar meaning.

The disclosed subject matter will now be described with reference to the drawing figures, in which like reference numerals refer to like parts throughout. For purposes of clarity in illustrating the characteristics of the present disclosed subject matter, proportional relationships of the elements have not been maintained in the figures. In some cases, the sizes of certain small components have been exaggerated for illustration.

The present invention and the disclosed subject matter relate generally to ballistic resistant defense structures and more particularly to ballistic multilayer arrangements that defend against ballistics and other projectiles on one side of the arrangement while allowing ballistics or other projectiles to pass through on another side of the arrangement.

In FIG. 1 a perspective side view of an embodiment of a V-Profile 100 in a column-type configuration according to the invention is represented. The first component of the V-Profile 100 comprises V-shaped wedges 110 arranged sideways adjacent to each other in a V column-type configuration. FIG. 2A depicts a close up end view of the V-shaped wedge 110. FIG. 2B depicts a close up side view of the V-shaped wedge 110. Each V-shaped wedge 110 is comprised of two rectangular side walls 112 that connect to each other at one of the longer sides of each of the two rectangular side walls 112, to form a V. The side walls 112 are approximately 0.03-0.250 inches thick. Therefore once connected to form a V, the V connection area of the two side walls 112 has an inner radius 113(a) and an outer radius 113(b). The inner radius 113(a) is approximately R0.040-R0.060 inches; and the outer radius 113(b) is approximately R0.021-R0.041 inches. Again because of the thickness of the side walls 112, once connected to form a V, the measurements for the outside perimeter walls 114(a) of the V-shaped wedge 110 varies from the measurements for the inner perimeter walls 114(b) of the V-shaped wedge 110. The measurements for the outer side walls 114(a) are each approximately 3.00-3.054 inches high and approximately 47-49 inches long. The measurements for the inner side walls 114(b) are each approximately 1.887-1.907 inches high and approximately 47-49 inches long. Extending out from the longer, free/non-connected side of each of the side walls 112 are protruding horns or wedge prongs 115. The wedge prongs 115 are approximately 0.0625-0.167 inches high and approximately 47-49 inches long, and taper in thickness from 0.062-0.092 inches thick to 0.010-0.030 inches thick. The thicker parts of the wedge prongs 115 are the ends of the prongs 115 that are connected to and/or extend from the sidewalls 112, and the wedge prongs 115 narrows in thickness as it extends out. The outer walls 116(a) of the wedge prongs 115 bend inwards slightly towards the center of the V-shaped wedge 110 at approximately R0.010-R0.030 inches. The inner walls 116(b) of the wedge prong 115 bend outward slightly away from the center of the V-shaped wedge 110 at approximately 4 deg.-8 deg. The

outer **116(a)** and inner **116(b)** walls of the wedge prong **115** narrow in to a tip **116(c)** that has a radian of approximately R0.005-R0.020 inches.

The second component of the V-Profile **100** comprises the outside receptor **120** of the profile. In one embodiment, the fiberglass ballistic material is set within the outside receptor **120**. The first and second components make up the core of objects created, such as doors, walls, floors, vehicle components, etc. In another embodiment the two components make up a typical residential or commercial wall section 3.250-4.750 inches thick or greater (not including the exterior material like a drywall, just the V-profile components).

FIG. **3** is a close up end view of the V-shaped wedge **110**. Each V-shaped wedge **110** is also comprised of a rectangular material **140** that is inserted at the top opening of each V-shaped wedge **110** that is slightly and concavely curved towards the bottom tip of the V-shaped wedge **110**. The material **140** is approximately 0.170-0.271 inches thick; the outer wall **141** is approximately 1.420-1.440 inches wide and 47-49 inches long (the same length of the sidewalls **112**); and the inner wall **142** is approximately 0.884-1.004 inches wide and 47-49 inches long. The material **140** is placed in between the opening of the V-shaped wedge **110** (i.e. between the non-connected ends of the side walls **112**). The length of the longer sides of the rectangular material **140** is matched up with the longer sides of the non-connected sidewalls **112**. The outer wall **141** of the material **140** extends out from the outer sidewall **114(a)** towards the center of the V-shaped wedge **110** at a straight line for approximately 0.264-0.293 inches angled at approximately R0.010-R0.030 inches from the outer side wall **114(a)** right where the outer side wall **114(a)** connects to the wedge prongs **115**. The outer wall **141** then arcs slightly and concavely towards the center of the V-shaped wedge **110** at an arc of approximately R1.320-R1.340 inches, for a length of approximately 0.794-0.994 inches, before extending back out in a straight line for approximately 0.264-0.293 inches and connecting to the opposite outer side wall **114(a)** at an angle of approximately R0.010-R0.030 inches. The inner wall **142** connects with one of the inner side walls **114(b)** at a radian of approximately R0.040-R0.060 inches. The inner wall **142** then curves slightly and concavely downward towards the center of the V-shaped wedge **110** as it extends out for a width of approximately 0.794-0.994 inches towards the opposite inner side wall **114(b)**; connecting to that inner side wall **114(b)** at a radian of approximately R0.040-R0.060 inches. The radian of the concave arc of the inner wall **142** is approximately R1.507-R1.527 inches.

In other embodiments, the material **140** is made of different thickness, different arc degrees, and/or different series of continuous convex and/or parabolic curves depending on the type of ballistic and/or caliber of gun intended for the defense structure to resist.

In another embodiment, the material **140** is a hardened flat/rigid material with no arc and each V-shaped wedge is filled with a ballistic deflecting polymer. The V-shaped wedges **110** are spaced slightly apart from each other with slight gaps **130** between each V-shaped wedge **110**. In yet another embodiment, the slight gaps **130** are approximately 0.0-0.50 inches wide.

The V-Profile **100** also comprises an outside ballistic receptor **120** of the profile that runs flush against and parallel to the length of the column of V-shaped wedges **110**. FIG. **4A** depicts an alternate body of the invention, wherein the V-shaped wedges are arranged side by side in a V row-type configuration. In an embodiment of the invention the ballistic defense structure comprises V-Profiles **100** comprising

V-shaped wedges **110** wherein the outside receptor **120** is comprised of fiberglass ballistic materials.

In one embodiment of this invention, the material **140** at the top of each V-shaped wedge **110** is flat and lays parallel and flush against the outside receptor **120** as depicted in FIG. **4B**. A hardened material is placed on the top of each V-shaped **110** and the V-shaped wedge **110** is filled with filler materials such as polymers and polycarbons. Alternatively in another embodiment, the material **140** at the top of each V-shaped wedge **110** is concavely curved slightly towards the bottom tip of the V, as shown in FIG. **1**, forming a slight hollow space **150** in between the outside receptor **120** and each V-shaped wedge **110**. In an embodiment of this invention, the V-shaped wedges' **110** side walls **112** have the capability to flex or arc both concavely and convexly. In another embodiment, once the V-shaped wedges **110** are stacked or placed next to each other with a slight gap **130** between the wedge prongs **115**, a considerable amount of material from the wedge prongs may fill up the junction or gap between each V-shaped wedge **110**. See FIGS. **6A-B**. In an embodiment the slight gap **130** is approximately 0.0-0.50 inches wide.

In another embodiment of this invention, as shown in FIGS. **5A** and **5B**, when a projectile is shot from a shotgun and impacts the interior V-shaped wedges side **170**, towards and through the exterior outside receptor of the profile side **160**, the side walls **112** of the V-shaped wedges **110** yield to the force of the projectile, creating wider gaps **130** for an immediate following projectile to pass through. When the projectile is expelled from the weapon, it strikes the V-shaped wedge side **170**, penetrates the interior wall surface **170**, and is immediately guided into the V columns or V rows **100** of V-shaped wedges **110** creating respective vertical **560** or horizontal rows of ballistics which can slip through the gaps **130** between the V-shaped wedges **110**. In an embodiment of the invention, when the projectile pushes against the gap **130** and the adjoining side walls **112** yield to the force of the projectile, an effective gap **130**, approximately 0.010-0.50 inches wide is created for the subsequent projectiles to pass through. In effect, the first line of shots **560** open the door for subsequent shots to pass through. These factors maximize the effective force of the following shot. In one embodiment, a 12 gauge shotgun is used on the inside **170** of the defense core **110** to fire through the core; and the 12 gauge shell has optimal capacities. In another embodiment, a 12 gauge shotgun using number 6-8 shot with a wide pattern discharge is optimal.

As shown in FIGS. **5A** and **5B**, in another embodiment, when a projectile is shot from the V-shaped wedges side **170**, towards and through the outside receptor of the profile side **160**, the defense structure has a self-healing capability. The slight gaps **130**, the entrance hole **500** in the V-profile **100** side, and the cavity and widened gap created by the projectile traveling through the defense structure, are all self-healing. The V profile **100** can also be referred to or used interchangeably with "the defense structure", the "V profile system", or the "Defense Structure System." One or more V profiles make up a defense structure. The V-profile **100** and the material that comprise it return to their pre-ballistic state sufficient to maintain effectiveness or became completely ballistic resistant again. A defense structure system **100**, in the case of wall construction, has the ability to be constructed in standard 3'x4' smaller or larger modular component panels, thus, providing for quick and easy repairs, and or replacement as needed.

In an embodiment of the invention, the defense structure **100** is referred to as a Pro-Active Defense Structure because

it enables a defendant to fire projectiles at an assailant standing on the other side of the Pro-Active Defense Structure, in a "one way" pattern, if the defendant actively chooses to. The effective use of the simple geometric shape of a V, placed side by side VVVV and then interlaced together, creates the geometry of the "One Way" ballistic resistant panel system **100**. Use of Polymers and/or viscous materials placed within the external wedge of the V completes the critical "One Way" effect of the Pro-Active Defense Structure system. The defendant is able to pro-

actively choose when they want to end a standoff with deadly force or disabling effects on their assailants. This action of the defendant shooting through the wall can be repeated over and over at the defender's option with little or no degradation to the structural integrity of the Pro-Active Defense Structure **100**.

In addition, in other embodiments the Pro-Active Defense Structure is used for external panels of automobiles, trucks, armored vehicles, military vehicles, and aviation. Hijacking an armored car would be virtually impossible with the ability of the security agent inside the cargo area, no longer held captive, to shoot forward into a driver's area. Equipping the cockpit door of commercial airplanes with the Pro-Active system helps prevent the possible security breach of the cockpit. A small caliber weapon such as a .22 Caliber hand gun loaded with bird shot is effective to easily blind or disable the assailant, with the added value of dispersing its energy before perforating the outer wall of the pressure chamber. The low caliber weapon is effectively fired at an upward angle, greatly minimizing the danger to the crew or passengers.

In another embodiment of the present invention, a projectile fired at the outside receptor of the profile side **160**, will be absorbed into the fiberglass material **120**. The design of the V profile **100** further enhances the effectiveness of the fiberglass material **120**. The walls **112** of the V-shaped wedges and the material **140** at the top of the V-shaped wedge **110** (i.e. the outer surface shapes of the V-shaped wedge **110**) have the capabilities to remain flat/straight or flex and arc both concavely and convexly; serving to guide projectiles toward the center of the V-shape wedge **110**. This provides for maximum energy absorption, which traps and stops the projectile within the viscous material or hollow void **114(b)** and **142**. In another embodiment, the side walls **112** have the ability to flex inward or outward depending on the direction of the projectile force, causing energy to be absorbed. In an embodiment, the slight convex hollow **150** under the fiberglass base **120**, allows the fiberglass material to flex inward when the projectile energy strikes the material. This allows some of the projectile's energy to be absorbed decreasing the projectile's velocity. In another embodiment, when a projectile strikes outside receptor of the profile side **160**, the fiberglass material **120** expands and pushes against the adjoining V-shaped wedges **110**, closing the gap **130** thus expending some additional energy. In yet another embodiment, various thickness of fiberglass material **120** are used and the various fiberglass thickness are capable of absorbing various calibers and charge loads of typical ballistics (i.e. $\frac{7}{16}$ inches thick material will absorb full metal jacket 9 mm forces).

In another embodiment of the present invention, a hard top **140** is placed at the top of the V-shaped **110** and, and is concavely curved towards the point/center of the V-shaped wedge **110**, and forms a slight convex hollow **150** between the V-shaped wedge **110** and the outer receptor of the profile

receptor of the profile **120**. This will allow some of the projectile's energy to be absorbed, decreasing its velocity. Additionally, as depicted in FIG. 6A, when two or more V-shaped cavities **110** are placed side by side with a slight gap **130** in between the wedge prongs **115** of the two V-shaped wedges **110**, a considerable amount of wedge prong/horn material is formed at the gap **130**. This creates a high degree of resistance to penetration. In an embodiment, when a projectile shot from and towards the outer receptor side **160**, strikes the V profile **100**, at the gap **130** between the V-shaped wedges **110**, the wedge prongs/protruding horns **115** redirect the projectile. In one embodiment, the wedge prongs **115** fold under pressure **630** and, thus, act as a sealing barrier at the gap **130**. In another embodiment the shear mass of the adjoining V-shaped wedges **110** and the lateral pressures surrounding the V-shaped wedges **110** prevent full penetration. FIG. 6B depicts the folding effect again, with a first shot **660** and also with a second shot **670** which was a dead center strike at the V profile gap **130**. In yet another embodiment, when a projectile strikes the outer receptor fiberglass material **120** anywhere not just dead center between the gaps **130**, the material expands and pushes against the adjoining V-shaped wedges **110**, closing the gap **130** and thus expending some additional energy of the projectile.

In another embodiment of the present invention, ballistic or other projectiles are deflected from the defense structure rather than absorbed. A hardened rectangular material **140** is placed in the outer V wedge connecting the longer sides of the rectangular material **140** to the longer free sides of the sidewalls **112** and filler materials like polymers, polycarbons, or hardened metal materials are formulated and used to deflect the incoming projectiles that are shot from the outer receptor side **160** towards the v-shaped wedge side **170**. In another embodiment of the present invention a hardened material **700** as depicted in FIG. 7 is inserted into the cavity or hollow of the V-shaped wedges **110**. In yet another embodiment, the hardened rectangular material **140** is removed and just the hardened material **700** is inserted into the cavity or hollow of the V-shaped wedges **110**. The hardened material **700** is configured to deflect incoming projectiles. A positive outcome of deflecting the projectile is that certain projectiles will ricochet back towards the assailant, creating the chance that a projectile will ricochet into the assailant causing them to cease fire. In another embodiment when the assailant increases the rate of fire, the ricocheted projectiles will bring more devastation to the assailant and/or their allies standing nearby.

In yet another embodiment of the invention, it is recommended that the ballistic resistant defense structure be replaced after being shot at once or after going through repeated back and forth fire.

Referring to FIGS. 8A and 8B, in an embodiment of the disclosed subject matter, the V-shaped wedges **110** are vertically arranged within a door frame **800** having a top door frame member **802**; two side door frame members **804**, **808**; and a bottom door frame member **806**. The door frame **800** may comprise a subframe **810** to support a door handle **812** in order to rotate the door frame about a hinge (not shown). The V-shaped wedges **110** extend between the subframe **810** and the top and bottom frame members **802**, **806** in order to maximize the operating area of the V-shaped wedges **110**.

Referring to FIGS. 9-11, in an embodiment of the disclosed subject matter, a defense structure **900** comprises a plurality of wedges **902** pivotally connected to a support frame **904**.

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The support frame 904 comprising: a top frame member 906; a bottom frame member 908 substantially parallel with the top frame member 906; a first side frame member 910 generally perpendicular to the top frame member 906 and the bottom frame member 908; and a second side frame member 912 generally parallel to the first side frame member 910. The support frame 904 may constructed of steel, plastic, fiberglass or other suitably durable material. In an embodiment, the support frame 904 is constructed of 10 gage stainless steel. The top frame member 906, bottom frame member 908, first side frame member 910, and second side frame member 912 may be fastened together using traditional connection techniques such as, by way of example, welding, mechanical fasteners, high strength adhesives, or combination thereof.

In an embodiment, the plurality of wedges 902 are pivotally connected between the first side frame member 910 and the second side frame member 912. Each wedge of the plurality of wedges 902 is configured to abut an adjacent wedge. In an embodiment, one of the plurality of wedges is configured to abut one of the top frame member 906 or the bottom frame member 908.

In an embodiment, each of the plurality of wedges 902 are pivotally connected to the support frame 904 using connectors 914 disposed along an axis of rotation A of each wedge. Each axis of rotation A is in parallel arrangement to each other. The connectors 914 are disposed through the first and second side frame members 910, 912 in order to align the plurality of wedges 902 within the support frame 904. In an embodiment, the plurality of wedges 902 are aligned horizontally so that a projection of the axis of rotation A of each wedge intersects the support frame along a straight line 926. In an embodiment of the disclosed subject matter, the plurality of wedges 902 are aligned vertically or at other predetermined angles.

The connectors 914 may be secured to the first and second side frame members 910, 912 or physically restrained by adjacent structure (not shown). In an embodiment, the connectors 914 are cylindrical in shape any may comprise about 0.25 inch diameter stainless steel rods. The connectors 914 are configured to be received within a pivot receptor 924 positioned at each distal end of each of the plurality of wedges 902.

Referring to FIG. 12A, in an embodiment, a tensioning member 916 is positioned between the support frame 904 and at least one of the plurality of wedges 902 in order to rotate the plurality of wedges about their axis of rotation A, such that no gaps are present between the plurality of wedges 902. The tensioning member 916 is configured to resist a rotation of any one of the plurality of wedges about their axis of rotation A. The tensioning member 916 serves to compresses the plurality of wedges 902 against adjacent wedges. In an embodiment, the tensioning member 916 comprises at least one spring.

In an embodiment, the tensioning member 916 comprises one or more of a torsion spring or a compression spring. In an embodiment, the spring is partially enclosed by a receiver 918 connected to the support frame 904.

Referring to FIGS. 11 and 12A, each wedge of the plurality of wedges 902 comprises: a top surface 928; a bottom surface 930 connected to the top surface 928 along a leading edge 932; and rear surface 936 disposed between the top surface 928 and the bottom surface 930. The top surface 928 and bottom surface 930 form an acute angle 934 with each other. In an embodiment of the disclosed subject matter, the acute angle 934 is between about 20 degrees and

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about 40 degrees. In another embodiment of the disclosed subject matter, the acute angle is about 30 degrees.

In an embodiment of the disclosed subject matter, a plurality of first ballistic members 938 are connected to the rear surface 936 in an alternating arrangement. The alternating arrangement may comprise one of the plurality of first ballistic members connected to the rear surface 936 of alternating wedges. The plurality of first ballistic members 938 comprise a first thickness 944 extending outwardly and away from the rear surface 936. The first thickness 944 corresponding to a first predetermined bullet resistance. In an embodiment of the disclosed subject matter, the first thickness 944 is between about 0.5 inches and about 2 inches. Each of the plurality of first ballistic members 938 comprising a first exterior surface 939 disposed a first distance 945 from the rear surfaces 936. The first distance 945 being equal to the first thickness 944.

In an embodiment of the disclosed subject matter, a plurality of second ballistic members 940 are connected to the rear surface 936 and disposed between the plurality of first ballistic members 938. The plurality of second ballistic members 940 comprise a second thickness 946 extending outwardly and away from the rear surface 936. The second thickness 946 corresponding to a second predetermined bullet resistance. In an embodiment of the disclosed subject matter, the second thickness 946 is between about 0.5 inches and about 2 inches. In some embodiments, the first thickness 944 is less than or equal to the second thickness 946.

The plurality first and second ballistic members 938, 940 are configured to adsorb a ballistic. The plurality first and second ballistic members 938, 940 may comprise a fiberglass material or a ballistic steel.

In an embodiment of the disclosed subject matter, a plurality of resilient members 942 are connected to the plurality of second ballistic members 940. The plurality of resilient members 942 having a third thickness 948 and extending outwardly and away from the plurality of second ballistic members 940. The plurality of resilient members 942 configured to deflect a ballistic, and may comprise a bullet resistant steel. A deflected ballistic may be adsorbed by one of the plurality of first ballistic members 938. In an embodiment of the disclosed subject matter, the third thickness 948 is between about 0.1 and about 1.0 inches. In another embodiment, the third thickness 948 is between about 0.25 and about 0.5 inches. Each of the plurality of resilient members 942 comprising a second exterior surface 943 disposed a second distance 949 from the rear surfaces 936. The second distance 949 is greater than the first distance 945, creating an offset arrangement between the first exterior surface 939 and the second exterior surface 943. The offset arrangement prevents a projectile directed towards the plurality of resilient members 942 from entering between the plurality of first and second ballistic members 938, 940. Since all projectiles comprise a certain diameter, a projectile directed squarely between one of the plurality of first and second ballistic members 938, 940 will not penetrate the defense structure 900 because at least a portion of the projectile will strike the one of the plurality of resilient members 942 resulting in deflection of the projectile either away from the defense structure 900 or into one of the plurality of first ballistic members 938.

FIGS. 12A-C illustrate the operation of the defense structure. In FIG. 12A, the defense structure 900 is shown in a first state 950 where the plurality of wedges 902 abut each other and the plurality of first ballistic members 938 abut the plurality of second ballistic members 940. In FIG. 12B, the defense structure 900 is shown in second state 952, where a

projectile 954 is urged between the top and bottom surfaces 928, 930 and is subsequently urged through a gap 956 formed between at least two of the plurality of wedges 902 by rotation of at least one of the plurality of wedges 902. The rotation of at least one of the plurality of wedges 902 imparts a compressive force upon the tensioning member 916. In FIG. 12C, the defense structure 900 is shown in a third state 958 where the projectile 954 has passed through the defense structure 900 and proceeds to outwardly and away from the plurality of resilient members 942. In the third state 958, the tensioning member 916 urges rotation of at least one of the plurality of wedges 902 in order to close the gap 956 formed in the second state 952.

Referring to FIGS. 13-15 in an embodiment of the disclosed subject matter, the support frame 904 is connected to a reinforcing plate 960 proximate the plurality of first ballistic members 938 and the plurality of second ballistic members 940. The reinforcing plate 960 extending outwardly and away from the support frame 904 in order to provide ballistic protection around a first perimeter 963 of the support frame 904. A front cover 962 is connected to the support frame 904 proximate the plurality of wedges 902, wherein the front cover 962 partially conceals the defense structure 900 along a second perimeter 964. The reinforcing plate 960 and front cover 962 are configured to deflect a ballistic, and may comprise bullet resistant steel. The reinforcing plate 960 and front cover 962 may be welded to the support frame 904 or connected to the support frame 904 through other tradition means of attachment, such as, by way of example, mechanical fasteners or adhesives.

Referring to FIGS. 15 and 16, in an embodiment of the disclosed subject matter, the tensioning member 916 may comprise at least one torsion spring 966 connected to the top frame member 906 and abuts one of the pluralities of wedges 902, wherein a space 967 is formed between the top frame member 906 and one of the plurality of wedges 902. In an embodiment, the space 967 is about 0.0625 inches. The at least one torsion spring 966 is configured to resist the rotation of the pluralities of wedges 902 about their axis A and compresses the pluralities of wedges 902 in an abutted configuration so that no gaps are present between the pluralities of wedges 902. In an embodiment, a cylindrical rod 968 is configured to be inserted along a spring axis 970 of the at least one torsion spring 966 in order to connect the at least one torsion spring 966 to the top frame member 906 and align the spring axis 970 in parallel arrangement with the axis A of the plurality of wedges 902. Alternatively, the at least one torsion spring 966 may be welded, or mechanically fastened, directly to the top frame member 906.

Referring to FIGS. 17 and 18, in an embodiment of the disclosed subject matter, the defense structure 900 is at least partially concealed within a structural element 972, wherein the structural element 972 may comprises one of a door, a wall, a floor, a ceiling, or other predetermined structure. The structural element 972 comprises a structural frame 974 having a frame thickness 975 configured to at least partially conceal the defense structure 900. A ballistic layer 976 is connected to the structural frame 974, the ballistic layer 976 having an aperture 978 disposed therethrough. The defense structure 900, having a reinforcing plate 960 and support frame 904, is connected to the ballistic layer 976 proximate the aperture 978; whereby a ballistic may pass through the defense structure 900 and aperture 978. The structural element 972 further comprising a first layer 980 connected to the ballistic layer 976 opposite the defense structure 900. The first layer 980 is configured to be penetrated by a ballistic and serves to conceal the defense structure 900

within the structural element 972. The structural element 972 further comprising a second layer 982 connected to the structural frame 974 opposite the first layer 980. The second layer 982 comprising an opening 984 proximate the defense structure 900. The second layer 982 configured to at least partially conceal the defense structure 900. At least one spacer 986 is connected to an exterior surface 988 of the second layer 982, the at least one spacer 986 is disposed around a perimeter of the opening 984. The at least one spacer 986 configured to mount a lid 990 thereon. The lid 990 having an outer surface 992 and configured to demountably attach to the at least one spacer 986. The lid 990 comprising a graphic 994 on the outer surface 992, the graphic 994 configured to provide a target indicating the location of the defense structure 900. The graphic 994 may comprise, by way of example, a cross hair or other suitable visual aid for aiming a ballistic to penetrate the defense structure 900.

Methods of Using Defense Structure

In an embodiment of this disclosed subject matter, the defense structure 900 may be used offensively in passing a projectile through the defense structure, or defensively by prohibiting a projectile from penetrating the defense structure. An offensive method of using a defense structure comprising the steps of: (1) providing a defense structure comprising: a plurality of wedges, each wedge comprising a leading edge; and a tensioning member connected to at least one of the plurality of wedges, the tensioning member configured to rotate the plurality of wedges; (2) directing a first projectile towards the leading edges; (3) rotating at least of one of the plurality of wedges from a first position to a second position with the first projectile, thereby compressing the tensioning member and forming a gap between at least two of the plurality of wedges; (4) passing the first projectile between the gap; and (5) decompressing the tensioning member, thereby rotating at least of one of the plurality of wedges from the second position to the first position. In an embodiment of the offensive method, the tensioning member may comprise a spring. In other embodiments, the offensive method of using a defense structure may comprise partially concealing the defense structure within a structural element.

A defensive method of using a defense structure comprises the steps of: (1) providing a defense structure comprising: a plurality of wedges, each wedge comprising a leading edge and a rear surface; a plurality of first ballistic members connected to the rear surface of alternating wedges, the plurality of first ballistic members comprising a first exterior surface disposed a first distance from the rear surfaces; a plurality of second ballistic members connected to the rear surface and disposed between the plurality of first ballistic members; a plurality of resilient members connected to the plurality of second ballistic members, the plurality of resilient members comprising a second exterior surface disposed second distance from the rear surfaces, wherein the second distance is greater than the first distance; and a tensioning member connected to at least one of the plurality of wedges, the tensioning member configured to rotate the plurality of wedges; (2) directing a second projectile towards the rear surfaces; and (3) adsorbing the second projectile into at least one of the plurality of first ballistic members.

In other embodiments, a third projectile is directed towards the rear surfaces and deflected away from at least one of the plurality of resilient members. In other embodiments, the defensive method further comprises the step of adsorbing the third projectile into at least one of the plurality

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of first ballistic members after the deflecting step. In an embodiment of the defensive method, the tensioning member may comprise a spring. In other embodiments, the defensive method of using a defense structure may comprise partially concealing the defense structure within a structural element.

Having described the disclosed subject matter, what is claimed as new and desired to be secured by Letters Patent is:

1. A defense structure comprising:
 - a support frame;
 - a plurality of wedges pivotally connected to the support frame, each wedge comprising:
 - a top surface;
 - a bottom surface connected to the top surface along a leading edge, wherein the top surface and the bottom surface form an acute angle;
 - a rear surface disposed between the top surface and the bottom surface; and
 - an axis of rotation disposed parallel to the leading edge, wherein each axis of rotation is in parallel arrangement;
 - a plurality of first ballistic members connected to the rear surface in an alternating arrangement;
 - a plurality of second ballistic members connected to the rear surface and disposed between the plurality of first ballistic members;
 - a plurality of resilient members connected to the plurality of second ballistic members; and
 - a tensioning member disposed between the support frame and at least one of the plurality of wedges, the tensioning member configured to rotate the plurality of wedges about the axis of rotation of each wedge.
2. The defense structure of claim 1, wherein each of the plurality of first ballistic members comprising a first exterior surface disposed a first distance from the rear surfaces; wherein each of the plurality of resilient members comprising a second exterior surface disposed a second distance from the rear surfaces; wherein the second distance is greater than the first distance.
3. The defense structure of claim 1, wherein the plurality of first ballistic members having a first thickness extending away from the rear surfaces, wherein the plurality of second ballistic members having a second thickness extending away from the rear surfaces, wherein the first thickness is equal to or less than the second thickness.
4. The defense structure of claim 1, wherein the plurality of resilient members is configured to deflect a ballistic.
5. The defense structure of claim 4, wherein the plurality of resilient members comprises a third thickness is between about 0.1 inches and about 1.0 inches.
6. The defense structure of claim 5, wherein the plurality of resilient members comprises a third thickness is between about 0.25 inches and about 0.5 inches.
7. The defense structure of claim 4, wherein the plurality of resilient members is comprised of a bullet resistant steel.

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8. The defense structure of claim 1, wherein the plurality of first ballistic members are configured to adsorb a ballistic.

9. The defense structure of claim 8, wherein the plurality of first ballistic members comprises one of a fiberglass material or a ballistic steel.

10. The defense structure of claim 1, wherein the tensioning member comprises a spring, whereby rotation of at least one of the plurality of wedges compresses the spring.

11. The defense structure of claim 10, wherein the spring comprises one of a compression spring or a torsion spring.

12. The defense structure of claim 1, wherein a projection of the axis of rotation of each of the plurality of wedges intersects the support frame along a straight line.

13. The defense structure of claim 1, wherein the defense structure is at least partially concealed within a structural element.

14. The defense structure of claim 13, wherein the structural element comprises one of a door, a wall, a floor, or a ceiling.

15. The defense structure of claim 1, further comprising a lid disposed in front of the leading edges.

16. A defense structure comprising:

- a support frame;
- a plurality of wedges pivotally connected to the support frame, each wedge comprising:
 - a top surface;
 - a bottom surface connected to the top surface along a leading edge, wherein the top surface and the bottom surface form an acute angle;
 - a rear surface disposed between the top surface and the bottom surface; and
 - an axis of rotation disposed parallel to the leading edge, wherein the axis of rotation of the plurality of wedges are in parallel arrangement;
- a plurality of first ballistic members connected to the rear surface of alternating wedges, the plurality of first ballistic members comprising a first exterior surface disposed a first distance from the rear surfaces;
- a plurality of second ballistic members connected to the rear surface and disposed between the plurality of first ballistic members;
- a plurality of resilient members connected to the plurality of second ballistic members, the plurality of resilient members comprising a second exterior surface disposed a second distance from the rear surfaces, wherein the second distance is greater than the first distance; and
- a tensioning member connected to at least one of the plurality of wedges, the tensioning member configured to rotate the plurality of wedges.

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