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(54) Title: A THERMAL INSULATED WIND TURBINE NACELLE COVER ARRANGEMENT

(57) Abstract: The invention discloses a cover 102 for a nacelle 100. The nacelle 100 may have a frame structure 104 where the covers 102 are assembled. The cover 102 may include a first sheet 106 having a first face 108 and a second face 110. The cover 102 may include a corrugated sheet 112 having a first face 114 and a second face 116. The first face 114 may be attached to the second face 110 the first sheet 106 The-cover-102-may further included a second sheet 118 haying a.firs face 120 an a second face 122 the first face 120 may be attached to the the second-face 116 of the corrugated sheet 112: The cover 102 may. further include a projection 124 extending perpendicularly from the second face 122 of the-second-sheet 118 and may be fastened to the frame structured 104.

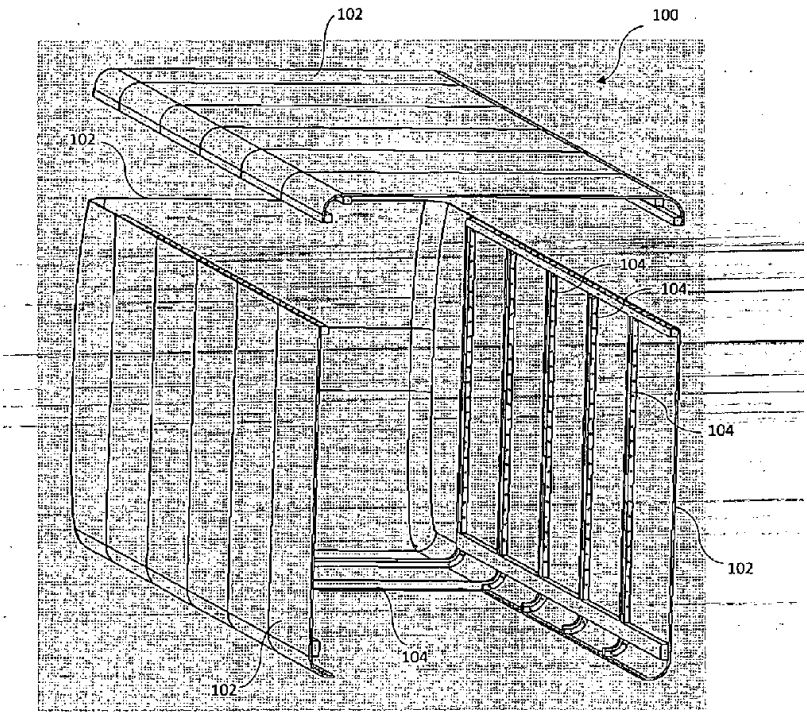
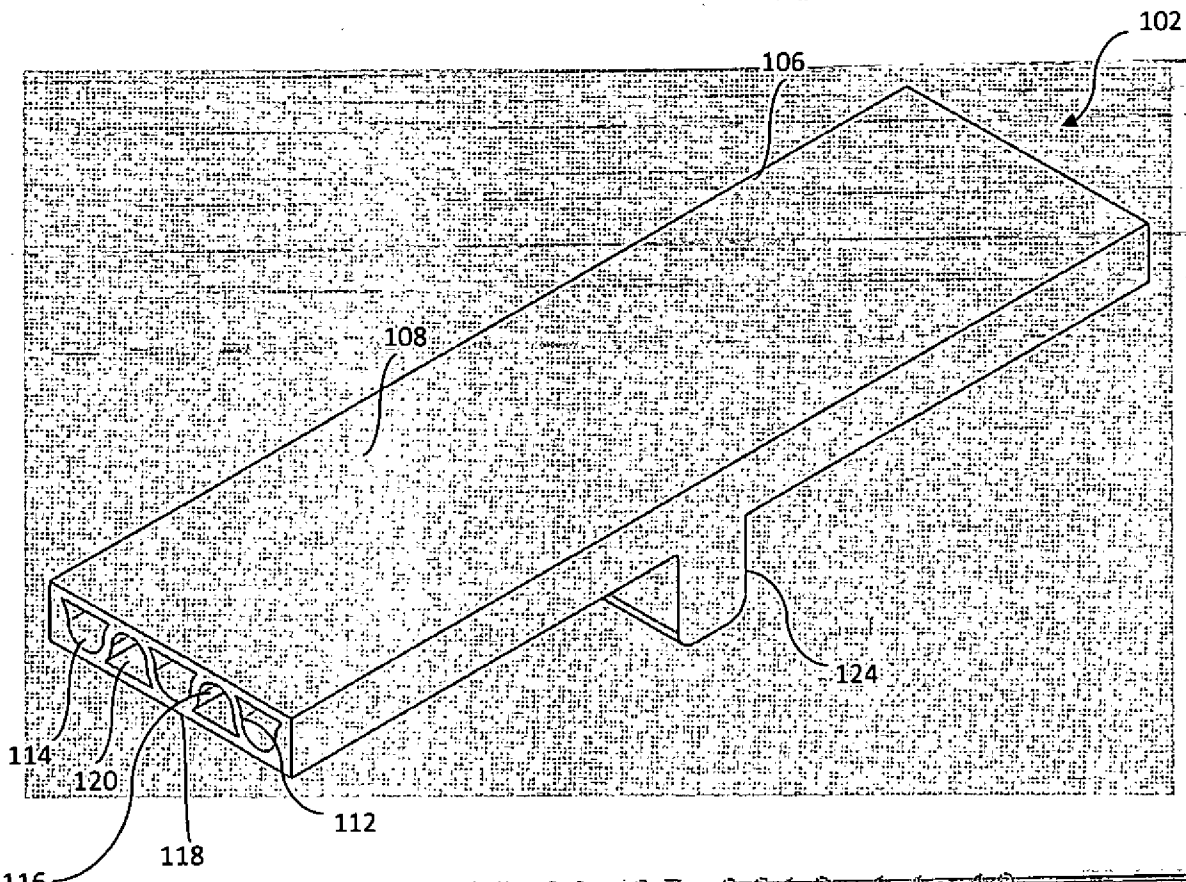


Figure 1

ABSTRACT

A thermal insulated wind turbine nacelle cover arrangement

The invention discloses a cover 102 for a nacelle 100. The nacelle 100 may have a frame structure 104 where the covers 102 are assembled. The cover 102 may include a first sheet 106 having a first face 108 and a second face 110. The cover 102 may include a corrugated sheet 112 having a first face 114 and a second face 116. The first face 114 may be attached to the second face 110 of the first sheet 106. The cover 102 may further include a second sheet 118 having a first face 120 and a second face 122. The first face 120 may be attached to the second face 116 of the corrugated sheet 112. The cover 102 may further include a projection 124 extending perpendicularly from the second face 122 of the second sheet 118 and may be fastened to the frame structure 104.



We claim:

1. A cover 102 for a nacelle 100 of a wind turbine, the nacelle 100 having a substantially cuboidal frame structure 104, the frame structure 104 is covered by assembling a plurality of the covers 102 on the frame structure 104, each of the cover 102 comprising:

a first sheet 106 having a first face 108 and a second face 110, the first face 106 being an external face of the cover 102;

a corrugated sheet 112 having a first face 114 and a second face 116, the first face 114 of the corrugated sheet 112 is attached to the second face 110 of the first sheet 106;

a second sheet 118 having a first face 120 and a second face 122, the first face 120 of the second sheet 118 is attached to the second face 116 of the corrugated sheet 112 and the second face 122 being an internal face of the cover 102; and

at least one projection 124 extending perpendicularly from the second face 122 of the second sheet 118, the projection 124 having a provision for fastening the projection 124 to the frame structure 104 of the nacelle 100.

2. The cover 102 for the nacelle 100 as claimed in claim 1, wherein length and width of the first sheet 106, the corrugated sheet 112 and the second sheet 118 are same.

3. The cover 102 for the nacelle 100 as claimed in claim 1, wherein the first face 114 of the corrugated sheet 112 and the second face 110 of the first sheet 106, and the first face 120 of the second sheet 118 and the second face 116 of the corrugated sheet 112, are attached by means of a nut and bolt arrangement.

4. The cover 102 for the nacelle 100 as claimed in claim 1, wherein the first face 114 of the corrugated sheet 112 and the second face 110 of the first sheet 106, and the first face 120 of the second sheet 118 and the second face 116 of the corrugated sheet 112, are attached by means of adhesives.

5. The cover 102 for the nacelle 100 as claimed in claim 1, wherein the first sheet 106, the corrugated sheet 112, and the second sheet 118 of the cover 102 are moulded as an individual component.

6. The cover 102 for the nacelle 100 as claimed in claim 1, wherein the projection 124 includes one or more openings 126 for fastening the projection 124 to the frame structure 104.

Dated this 29th day of June 2018

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FIELD OF INVENTION

The invention generally relates to wind turbine nacelle and more particularly to a cover for wind turbine nacelle.

BACKGROUND

A typical wind turbine includes a nacelle mounted on the top of a tower. The wind turbine further includes a rotor disposed at one end of the nacelle. The rotor is connected to a rotor shaft that protrudes into the nacelle. The nacelle houses power generating components (i.e. generator, gearbox, drive train, main shaft and brake assembly) and power transmission components (Converters and transformers) that convert the wind energy into electrical energy. The nacelle is enclosed by a cover that protects the nacelle components from the effects of the weather.

Generally, the nacelle components i.e. the power generating components and the power transmission components are known to generate heat within the nacelle. During summer months, and/or in hot climates, such heat generation may cause an undesirable accumulation of heat within the nacelle. Such heat accumulation may damage the one or more nacelle components as well as may reduce the efficiency of the wind turbine. Furthermore, during winter months and/or in cold climates, the temperature within the nacelle may fall below a desired level for safe and/or optimal wind turbine operation. Such a situation may also lead to reduction in the efficiency of the wind turbine.

Hence, there is a need for an improved nacelle cover for the wind turbine nacelle.

SUMMARY OF THE INVENTION

According to an embodiment of the invention, a cover for a nacelle of a wind turbine is disclosed. The nacelle may have a substantially cuboidal frame structure where a plurality of the covers is assembled. Each of the covers may include a first sheet having a first face and a second face. The first face of the first sheet may act as an external face of the cover. The cover may further include a corrugated sheet having a first face and a second face. The first face of the corrugated sheet may be attached to the second face of the first sheet. The cover may further include a second sheet having a first face and a second face. The first face of the second sheet may be attached to the second face of the corrugated sheet. The second face of the second sheet may act as an internal face of the cover. The cover may further include at least one projection extending perpendicularly from the second face of the second sheet. The projection may include a provision for fastening the projection to the frame structure of the nacelle.

BRIEF DESCRIPTION OF DRAWINGS

Other objects, features, and advantages of the invention will be apparent from the following description when read with reference to the accompanying drawings. In the drawings, wherein like reference numerals denote corresponding parts throughout the several views:

Figure 1 illustrates an isometric view of a nacelle with a cover according to an exemplary embodiment of the invention.

Figure 2 illustrates an isometric view of the cover according to an exemplary embodiment of the invention.

Figure 3 illustrates a side view of the cover according to an exemplary embodiment of the invention.

Figure 4 illustrates a front view of the cover according to an embodiment of the invention.

Figure 5 illustrates a cross sectional side view of the cover according to an embodiment of the invention.

DETAILED DESCRIPTION OF DRAWINGS

The following description with reference to the accompanying drawings is provided to assist in a comprehensive understanding of exemplary embodiments. It includes various specific details to assist in that understanding but these are to be regarded as merely exemplary. Accordingly, those of ordinary skilled in the art will recognize that various changes and modifications of the embodiments described herein can be made without departing from the scope and spirit of the invention. In addition, descriptions of well-known functions and constructions are omitted for clarity and conciseness.

Figure 1 illustrates an isometric view of a nacelle 100 of a wind turbine (not shown in figure) along with a cover 102 according to an exemplary embodiment of the invention. The nacelle 100 may be rotatably mounted on the top of a high-altitude tower (not shown in figure). The rotatable mounting may enable the nacelle 100 to pitch itself with respect to the tower. The

wind turbine may include one or more rotor blades (not shown in figure) and a rotor hub (not shown in figure) disposed at one end of the nacelle 100. The rotor blades may rotate due to the effect of wind flowing towards the rotor blades and transfer wind energy through a rotor shaft (not shown in figure) into the nacelle 100. The nacelle 100 may accommodate power generating components (not shown in figure) and power transmission components (not shown in figure) that enable generation and transmission of power by converting the wind energy into electrical energy. The main function of the nacelle 100 is to protect the power generating components accommodated within the nacelle 100 from the harsh effects of the weather. The power generating components accommodated within the nacelle 100 may include components such as, but not limited to, a generator, gearbox, drive train, main shaft, brake assembly, converters, transformers etc.

The nacelle 100 may have a frame structure 104 for providing support and strength to the nacelle 100. For the purpose of illustration, the frame structure 104 may form the outer skeleton of the nacelle 100. The frame structure 104 may be constructed from materials or combination of materials that may include, but are not limited to one or more of metal, alloy, fibre, plastic, and any other suitable material known in the art. According to an embodiment, the frame structure 104 may have a substantially cuboidal shape. It will be apparent to a person skilled in the art that the shape of the frame structure 104 may vary depending to the requirement and design of the wind turbine. The frame structure 104 of the nacelle 100 may be covered by assembling a plurality of the covers 102 on the frame structure 104. The frame structure 104 may further have a provision for assembling each of the covers 102 on the frame structure 104. According to an embodiment, the provision for assembling the cover 102 on the frame structure 104 may be one or more openings provided on frame structure 104 where the cover 102 may be fastened. As will be appreciated by those skilled in the art, the nacelle 100 may further have

an opening at a front end for attaching a rotor to the nacelle 100 and another opening at any other side for allowing service men to enter into the nacelle 100 for servicing the power generating components.

Figure 2 illustrates an isometric view of the cover 102 of the nacelle 100 according to an exemplary embodiment of the invention. The cover 102 may have a thermal insulation arrangement. In other words, the cover 102 may enable an optimum temperature to be maintained within the nacelle 100. A plurality of covers 102 are assembled on the frame structure 104 to completely cover the frame structure 104. It should be noted that the shape of the cover 102 may vary based on the part of the nacelle 100 where the cover 102 is to be assembled. The cover 102 may include a first sheet 106 having a first face 108 and a second face 110. It should be noted that the shape of the first sheet 106 may vary based on the part of the nacelle 100 where the cover 102 is to be assembled. The first face 108 of the first sheet 106 may act an external face of the cover 102. It will be apparent to a person skilled in the art that the first sheet 106 may be a flat sheet. The cover 102 may further include a corrugated sheet 112. The corrugated sheet 112 may have a first face 114 and a second face 116. The corrugated sheet 112 may have a plurality of ridges and grooves. It should be noted that the ridges and grooves on the first face 114 may become the grooves and ridges on the second face 116 of the corrugated sheet 112. The first face 114 of the corrugated sheet 112 may be attached to the second face 110 of the first sheet 106. It should be noted that the second face 110 of the first sheet 106 may be attached to the top of the ridges on the first face 114 of the corrugated sheet 112. According to an embodiment, the first face 114 of the corrugated sheet 112 may be attached to the second face 110 of the first sheet 106 by means of a nut and bolt arrangement. According to another embodiment, the first face 114 of the corrugated sheet 112 may be attached to the second face 110 of the first sheet 106 by means of adhesives. The grooves on

the first face 114 of the corrugated sheet 112 may trap air. The trapped air may enable the cover 102 to maintain an optimum temperature within the nacelle 100 and may provide an efficient working condition for the power generating components. According to an embodiment, the cover 102 may further have a provision for replacing the trapped air by gases to provide the required temperature within the nacelle 100. The gases may be filled in the grooves between the first face 114 of the corrugated sheet 112 and the second face 110 of the first sheet 106 through an aperture (not shown in figure) provided on the first sheet 106 of the cover 102. The pattern of the corrugated sheet 112 may further enhance the strength of the cover 102. It should be noted that the corrugated sheet 112 may be replaced by a different sheet having a pattern such as, but not limited to, a cylindrical pattern, honeycomb pattern or any suitable pattern known in the art. The cover 102 may further include a second sheet 118. The second sheet 118 may have a first face 120 and a second face 122. It should be noted that the shape of the second sheet 118 may vary depending on the part of the nacelle 100 where the cover 102 is assembled. The second face 122 of the second sheet 118 may act as an internal face of the cover 102. It will be apparent to a person skilled in the art that the second sheet 112 may be a flat sheet. The first face 120 of the second sheet 118 may be attached to the second face 116 of the corrugated sheet 112. It should be noted that the first face 120 of the second sheet 118 may be attached to the top of the ridges on the second face 116 of the corrugated sheet 112. According to an embodiment, the first face 120 of the second sheet 118 may be attached to the second face 116 of the corrugated sheet 112 by means of a nut and bolt arrangement. According to another embodiment, the first face 120 of the second sheet 118 may be attached to the second face 116 of the corrugated sheet 112 by means of adhesives. According to yet another embodiment, the first sheet 106, the corrugated sheet 112 and the second sheet 118 of the cover 102 may be moulded as an individual component. For the purpose of illustration, the cover 102 having the first sheet 106, the corrugated sheet 112 and the second sheet 118 may be manufactured as a

single unit. The grooves on the second face 116 of the corrugated sheet 112 may trap air. The trapped air may enable the cover 102 to maintain an optimum temperature within the nacelle 100 and may provide an efficient working condition for the power generating components. According to an embodiment, the cover 102 may further have a provision for replacing the trapped air by gases to provide the required temperature within the nacelle 100. The gases may be filled in the grooves between the first face 120 of the second sheet 118 and the second face 116 of the corrugated sheet 112 through an aperture (not shown in figure) provided on the second sheet 118 of the cover 102. It should be noted that the cover 102 may be made of composite materials such as a combination of a resin and a fibre glass. The resin may be an epoxy and the fibre glass may be of any types such as UD fibre glass, biax fibre glass, trial fibre glass etc. As will be appreciated by a person skilled in the art, the length and width of the first sheet 106, the corrugated sheet 112 and the second sheet 118 may be similar. The dimensions of the each of the cover 102 assembled on the frame structure 104 may depend on factors such as, but not limited to, size of the nacelle, air gap within the cover, size of the nacelle, strength of the nacelle etc.

Figure 3, Figure 4 and Figure 5 illustrates a side view, a front view and a cross-sectional side view respectively of the cover 102 according to an exemplary embodiment of the invention. The cover 102 may further include at least one projection 124 extending perpendicularly from the second face 122 of the second sheet 118. According to an embodiment, the projection 124 may be moulded as a part of the second sheet 118. According to another embodiment, the projection 124 may be separately attached to the second face 122 of the second sheet 118 by an adhesive. Each of the covers 102 may be assembled on the frame structure 104 in such a way that the projection 124 may position itself adjacent to the frame structure 104. The projection 124 of the cover 102 may further include a provision for fastening the cover 102 to

the frame structure 104 of the nacelle 100. According to an embodiment, the provision may be at least one or more openings 126 for fastening the projection 124 on the frame structure 104. The cover 102 may be fastened to the frame structure 104 by fastening means such as, but not limited to, bolting, riveting etc.

It is understood that the above description is intended to be illustrative, and not restrictive. It is intended to cover all alternatives, modifications and equivalents as may be included within the spirit and scope of the invention as defined in the appended claims. Many other embodiments will be apparent to those of skill in the art upon reviewing the above description. The scope of the invention should, therefore, be determined with reference to the appended claims, along with the full scope of equivalents to which such claims are entitled. In the appended claims, the terms "including" and "in which" are used as the plain-English equivalents of the respective terms "comprising" and "wherein," respectively.

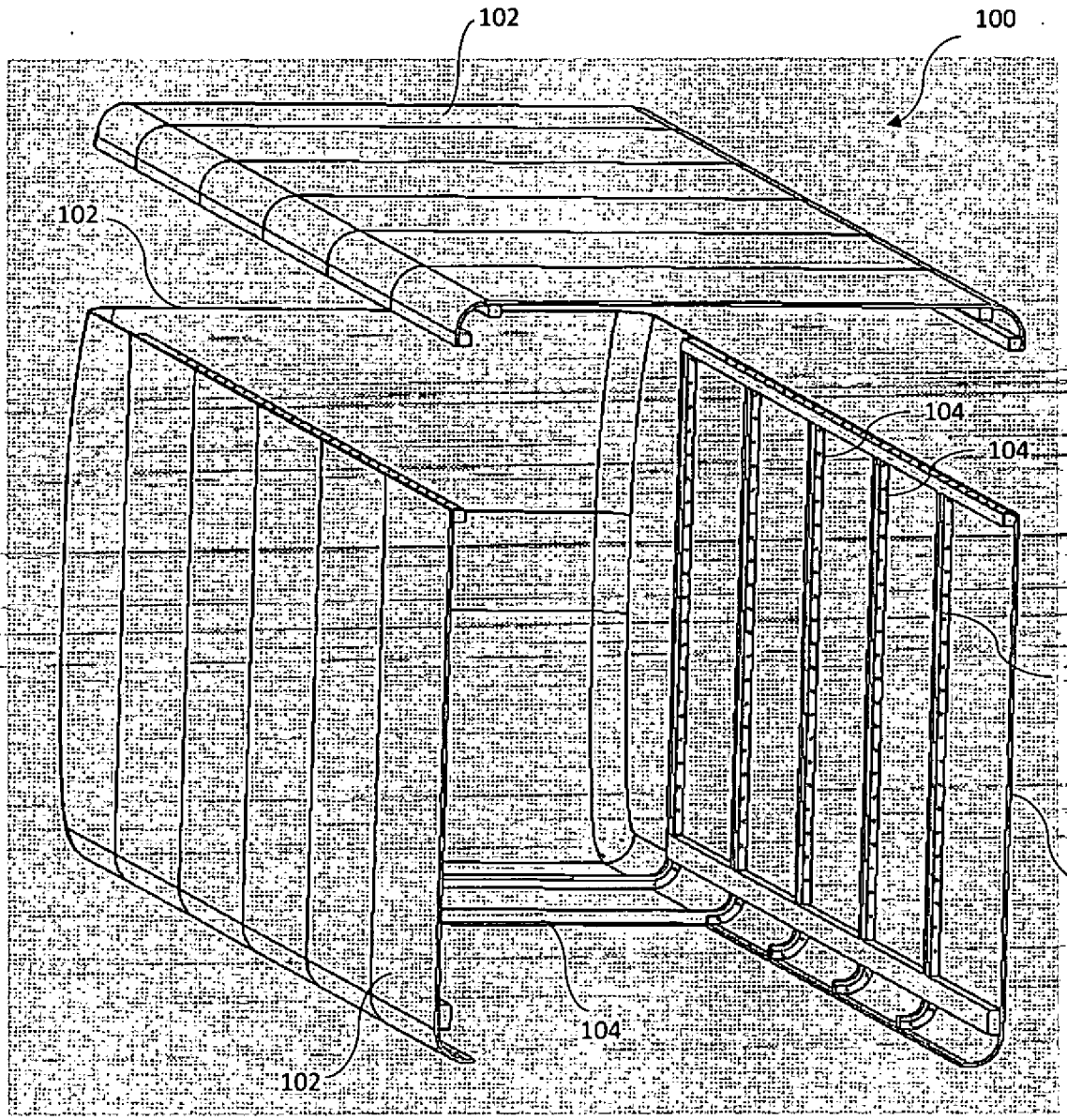

Figure 1

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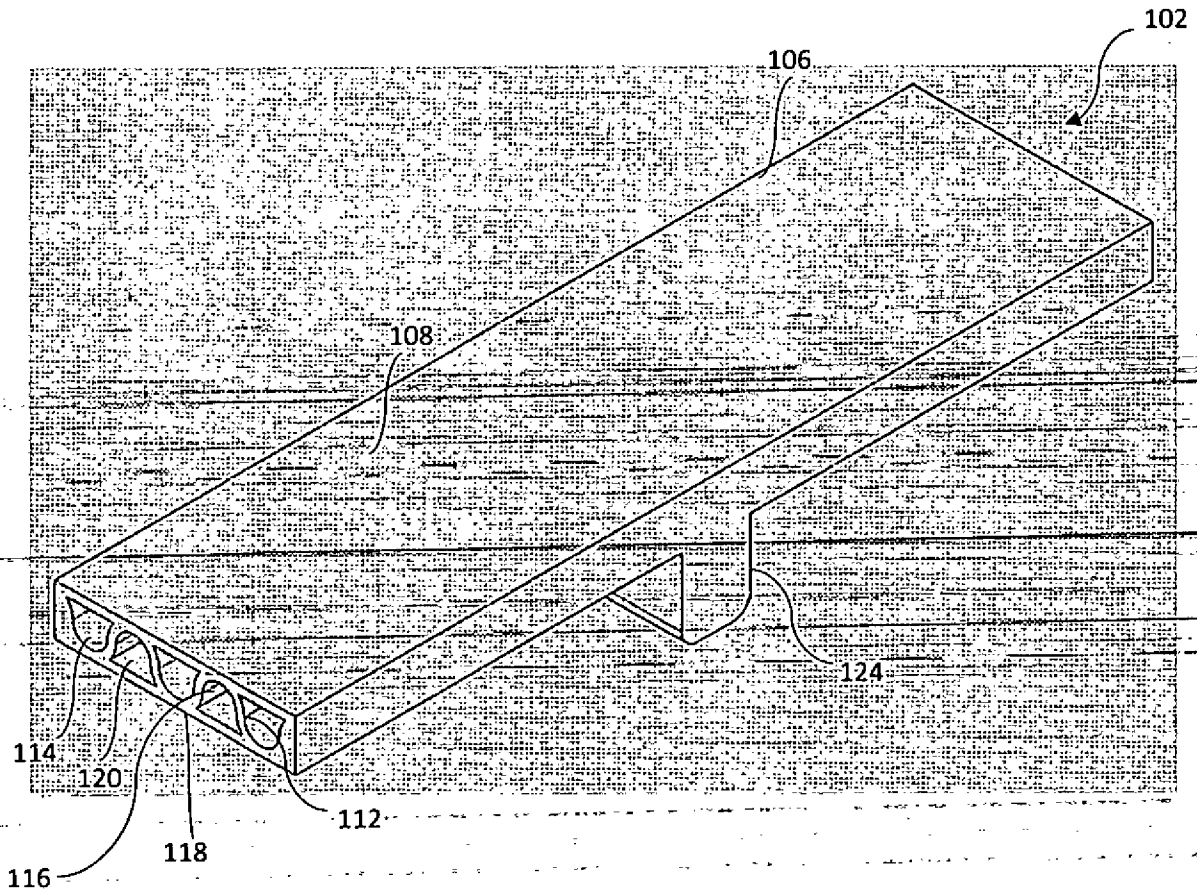

Figure 2

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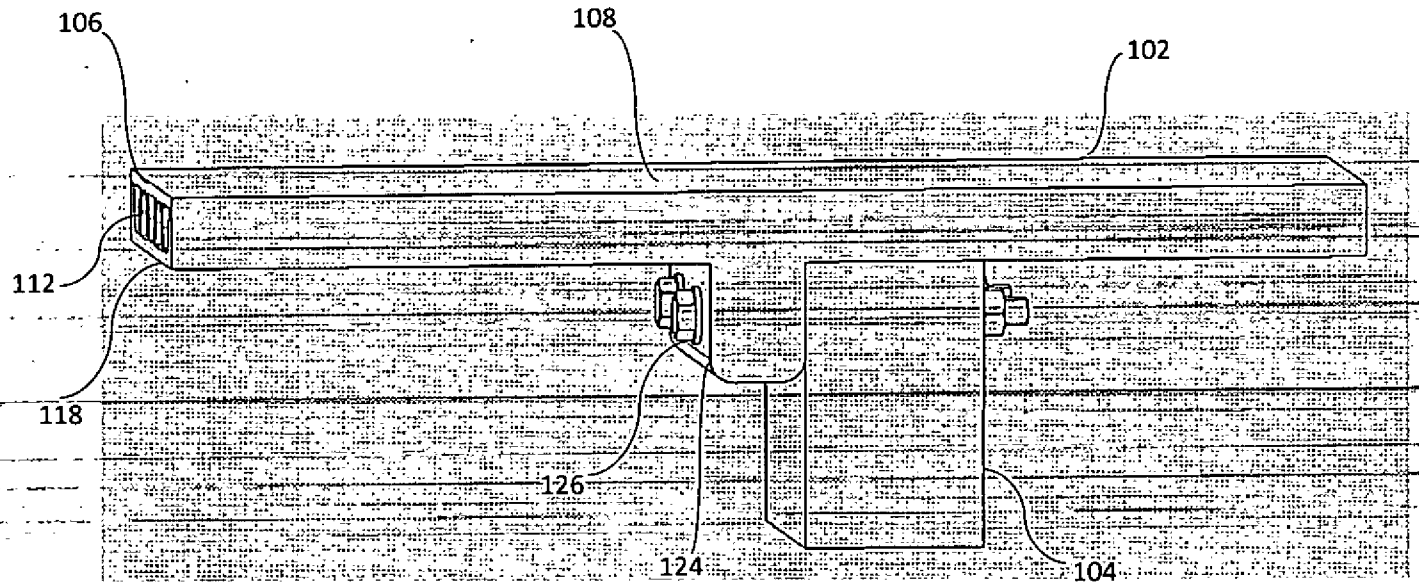

Figure 3

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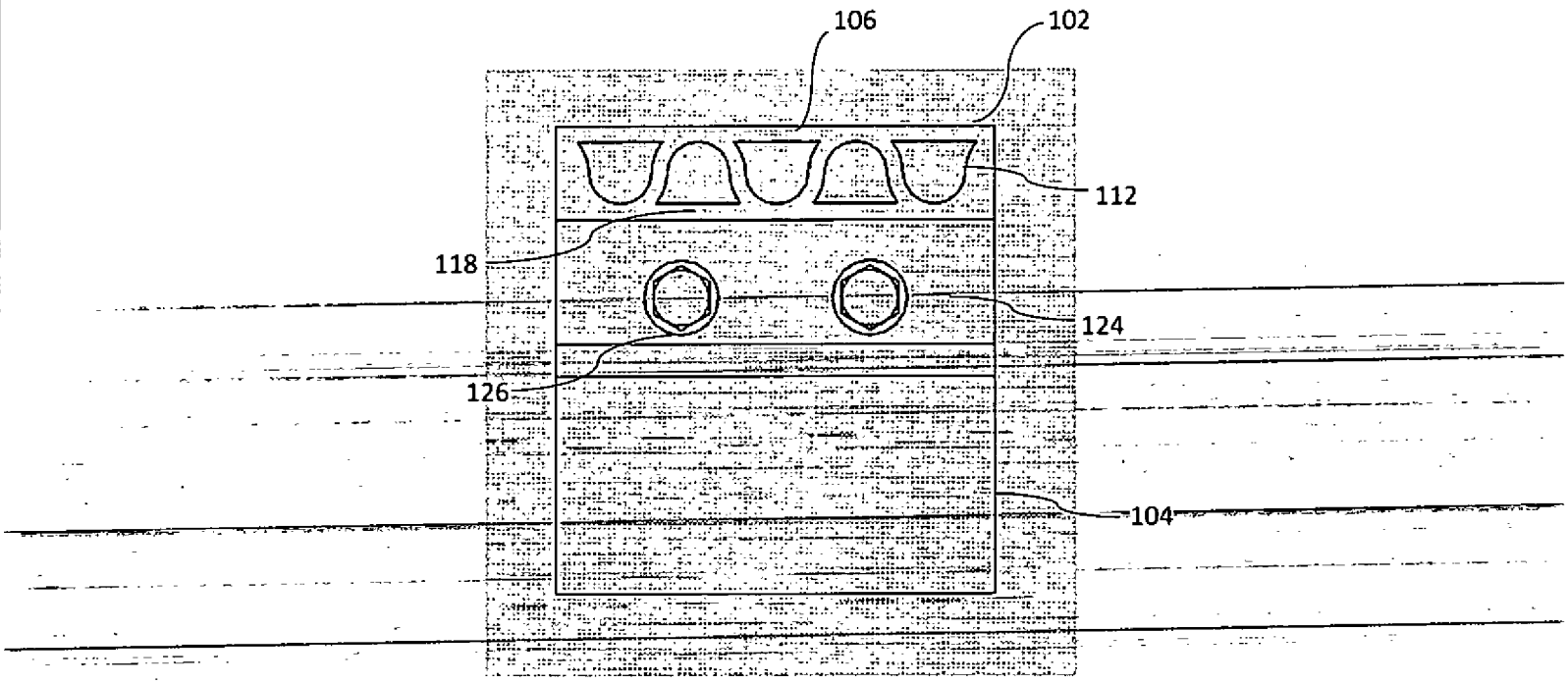

Figure 4

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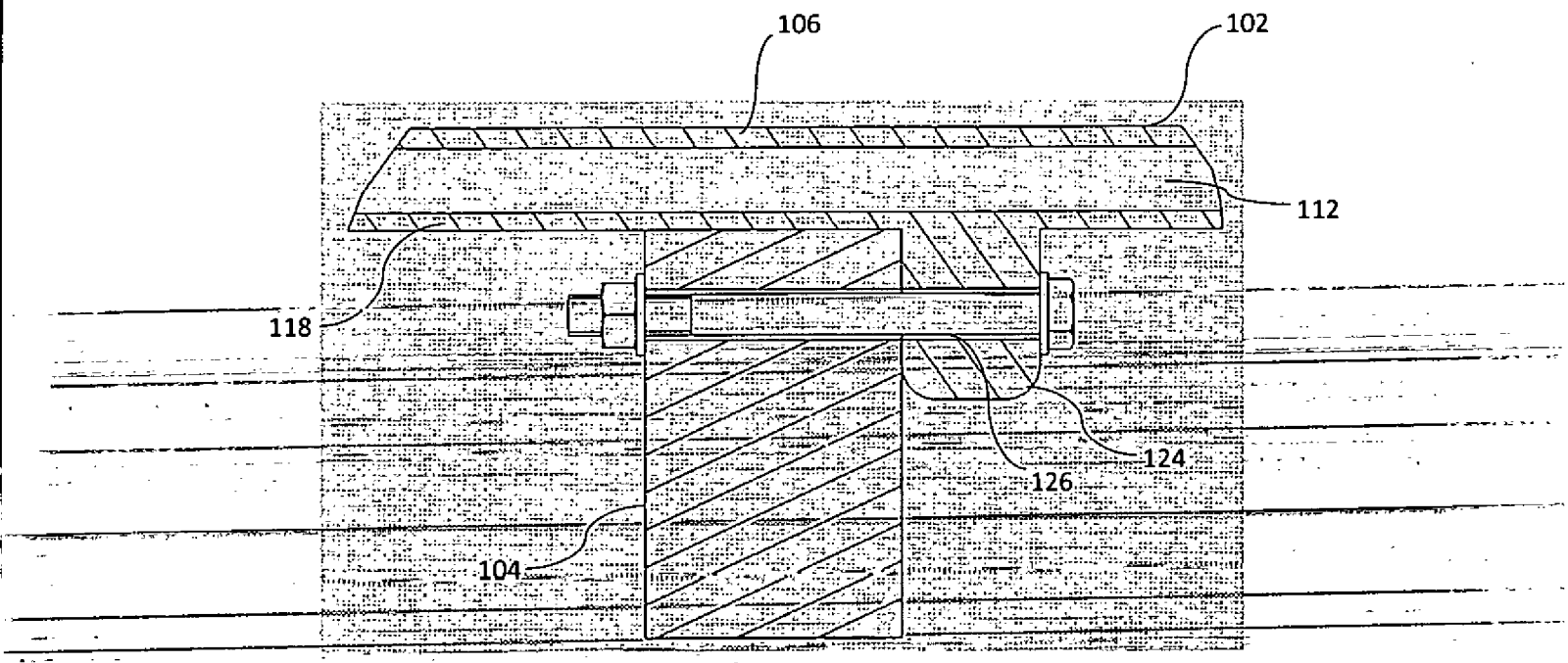

Figure 5

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