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(54) **INSULATED SIDING SHEET, AN INSULATED SHEET SYSTEM, AND BUILDINGS FORMED WITH THE INSULATED SHEET SYSTEM**

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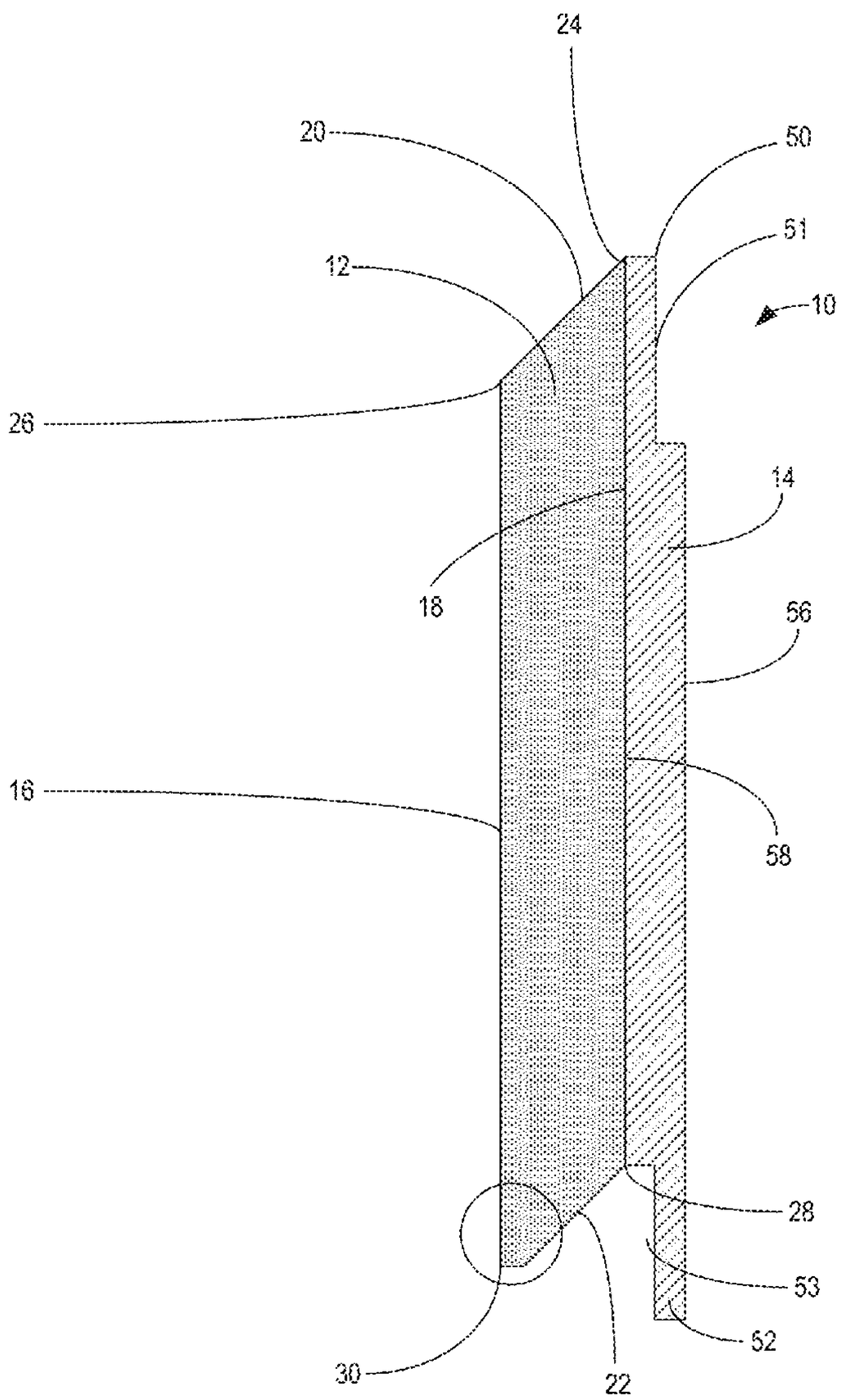
CPC ***E04B 1/80*** (2013.01); ***E04B 2/08*** (2013.01); *E04B 2002/0208* (2013.01); *E04B 2103/04* (2013.01)

(57) **ABSTRACT**

An insulated siding sheet includes an integrated insulation material and a plank siding. The integrated insulation material includes: (i) a back side; (ii) a front side opposite the back side; (iii) a top horizontal edge having a 45 degree angle; and (iv) a bottom horizontal edge having a 45 degree angle, in which the back side of the integrated insulation material has vertical grooves that extend from the top horizontal edge to the bottom horizontal edge. The plank siding is attached to the front side of the integrated insulation material. The plank siding includes a top horizontal edge and a bottom horizontal edge that both have a portion of the plank siding cut-away to overlap with horizontal edges of adjacent insulated siding sheets. An insulated siding sheet system and a building having the insulated siding sheet system is also included.



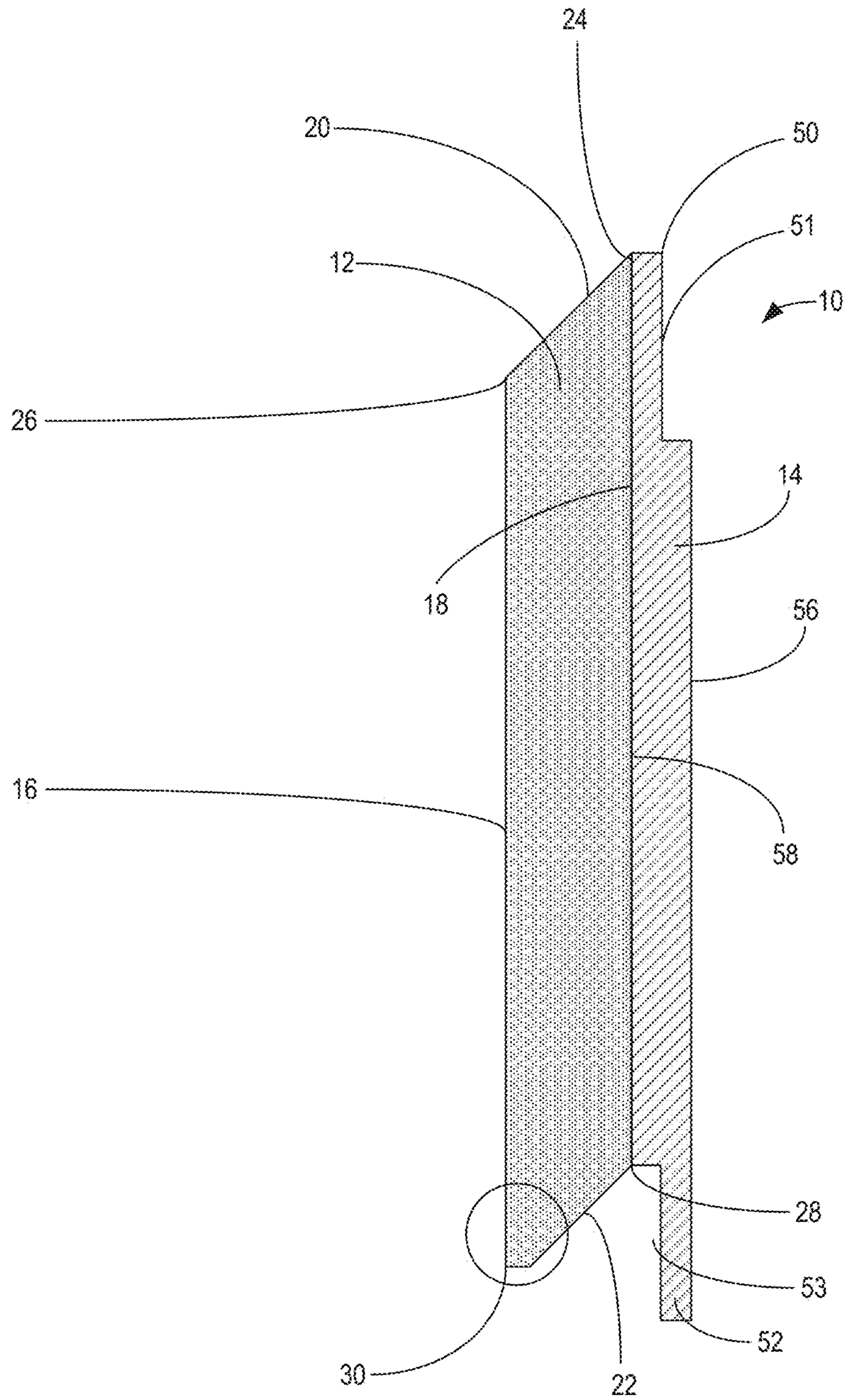


FIG. 1

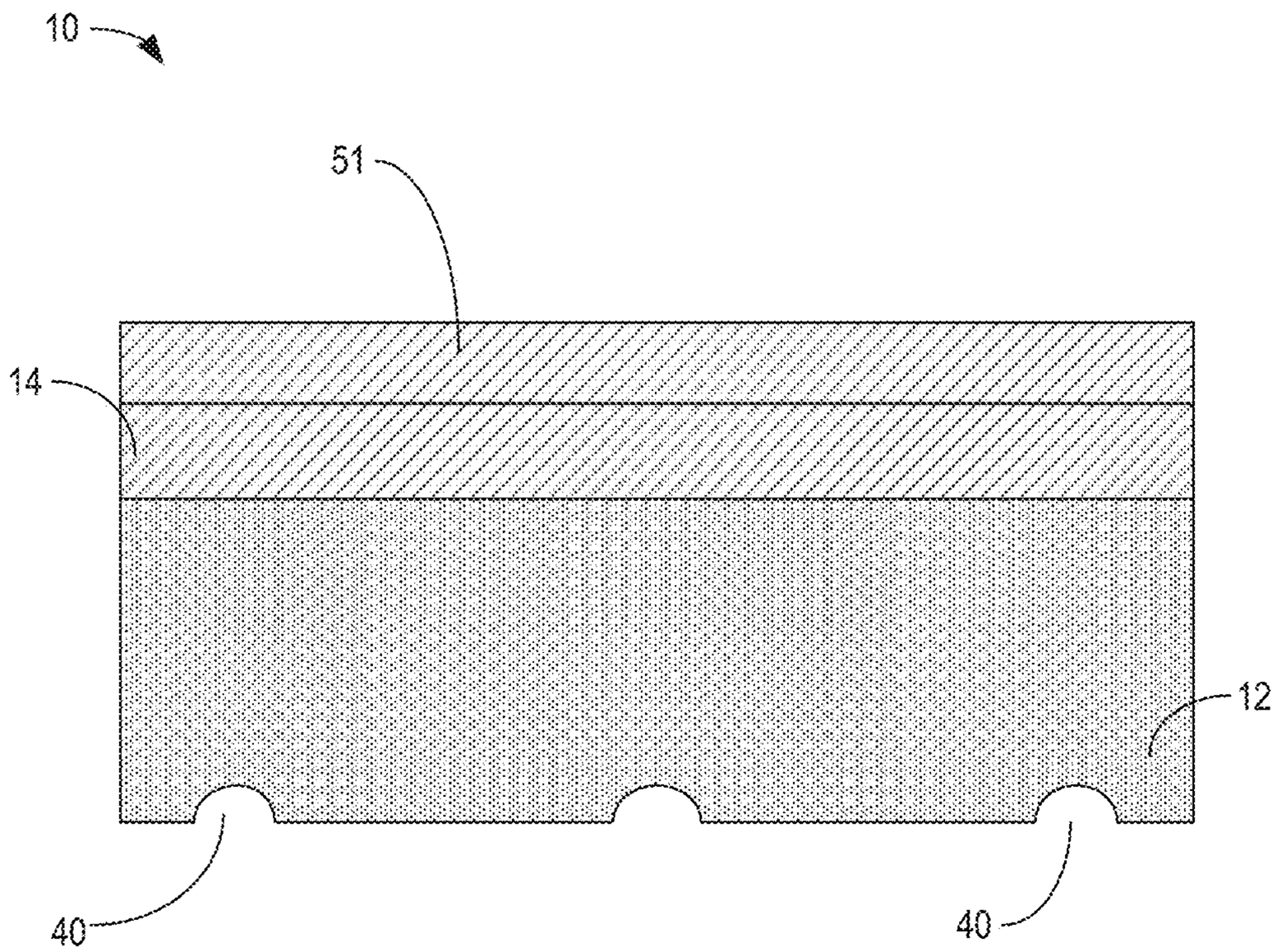


FIG. 2

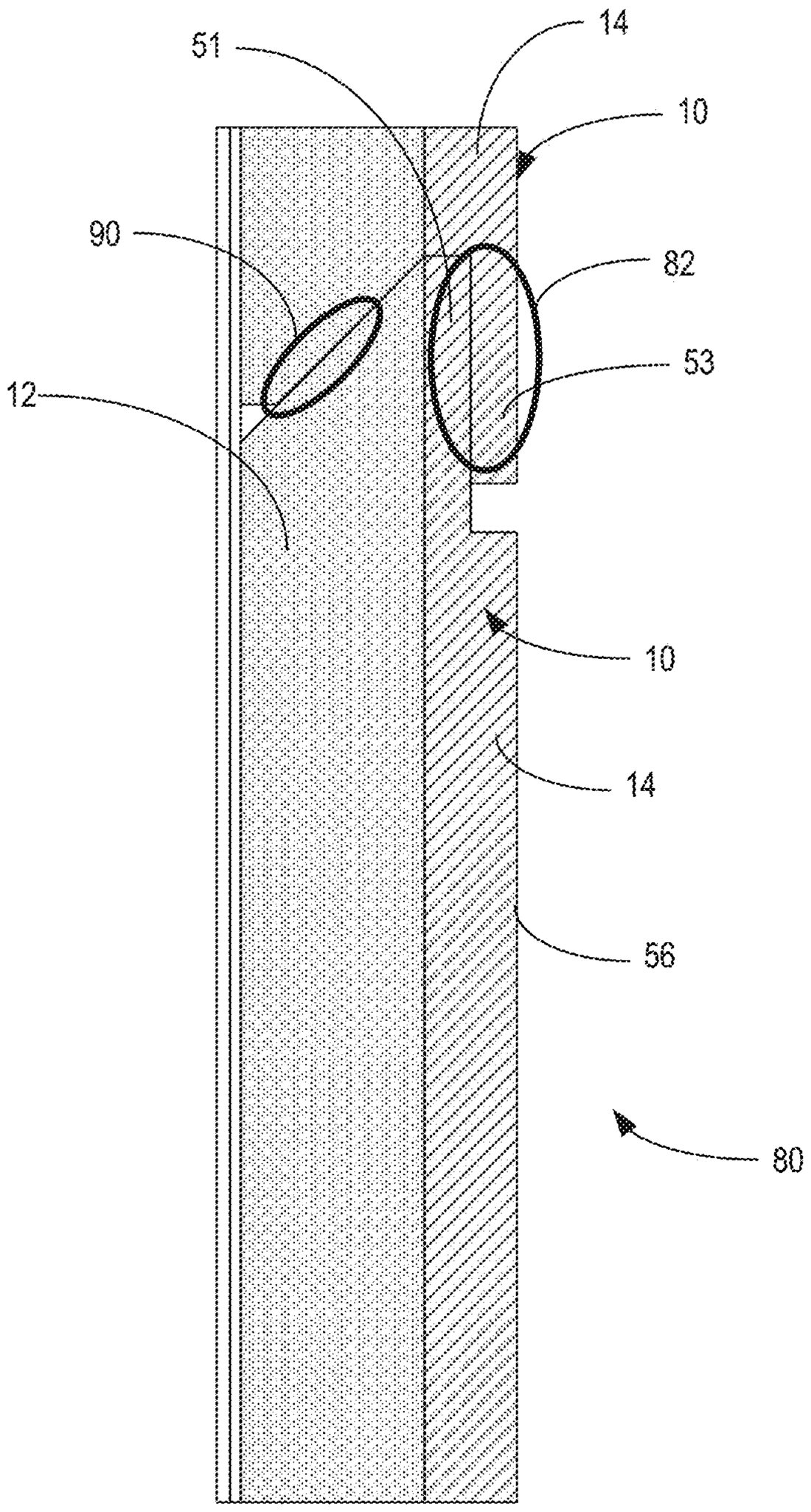


FIG. 3

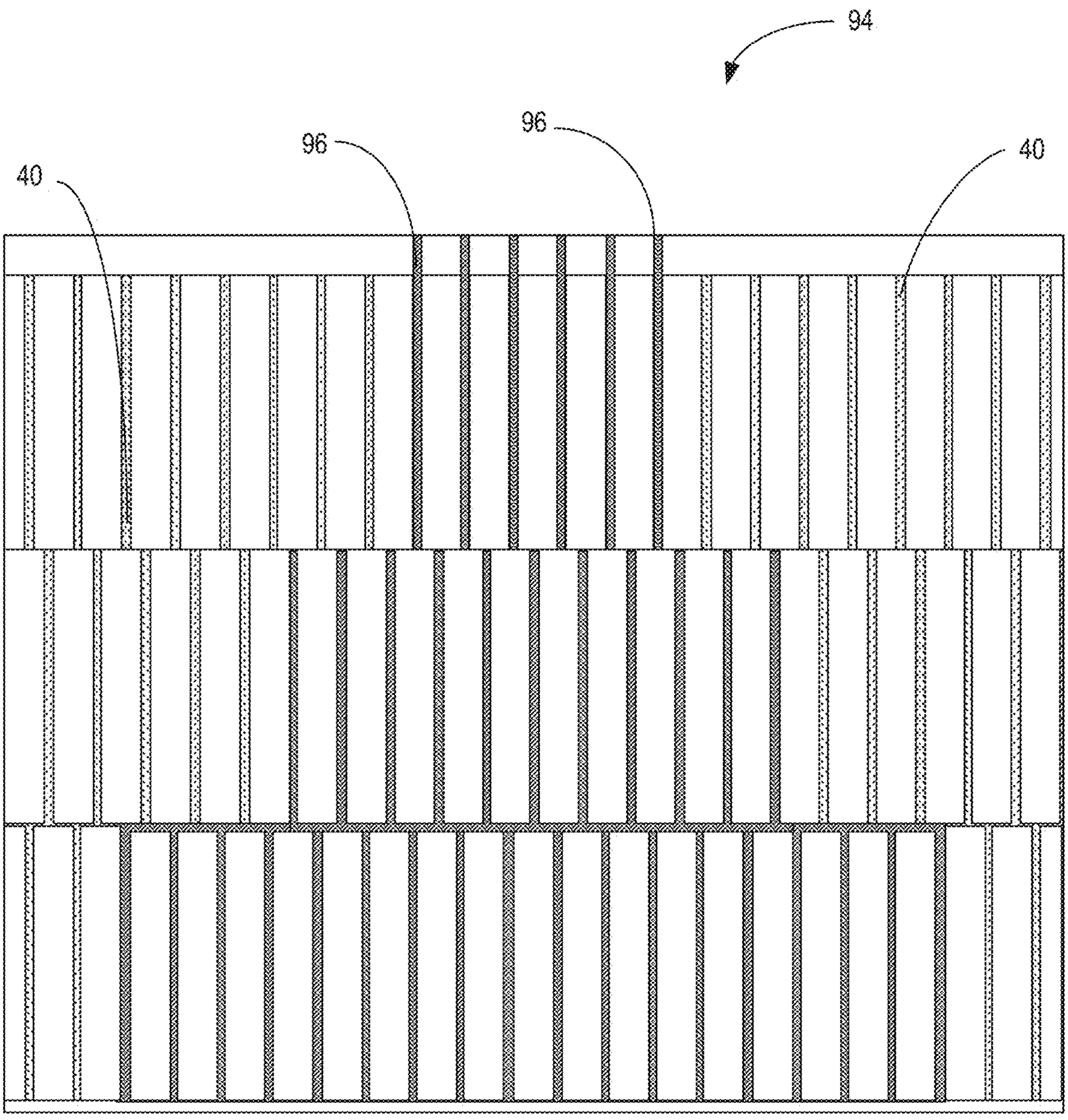


FIG. 4

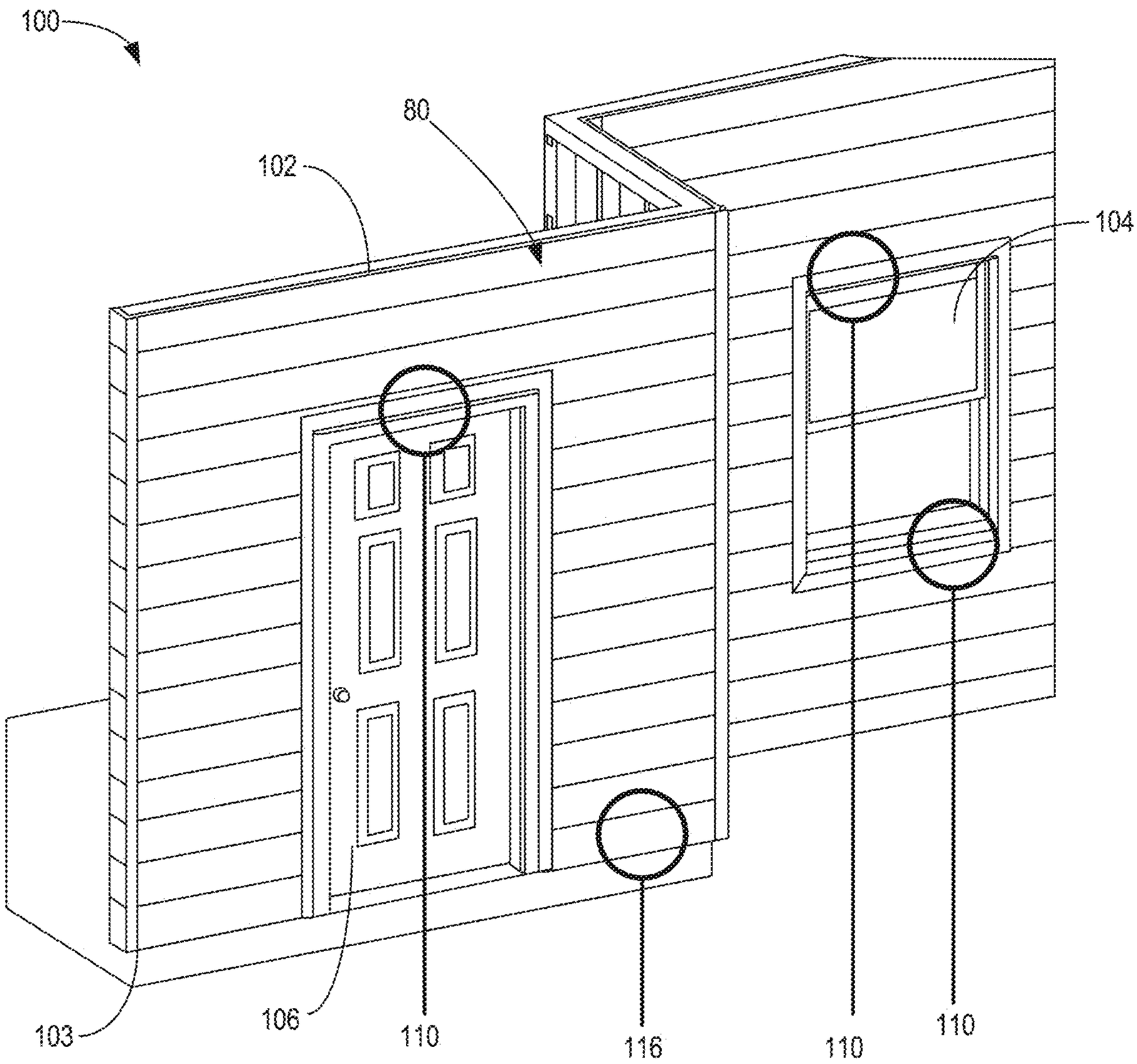


FIG. 5

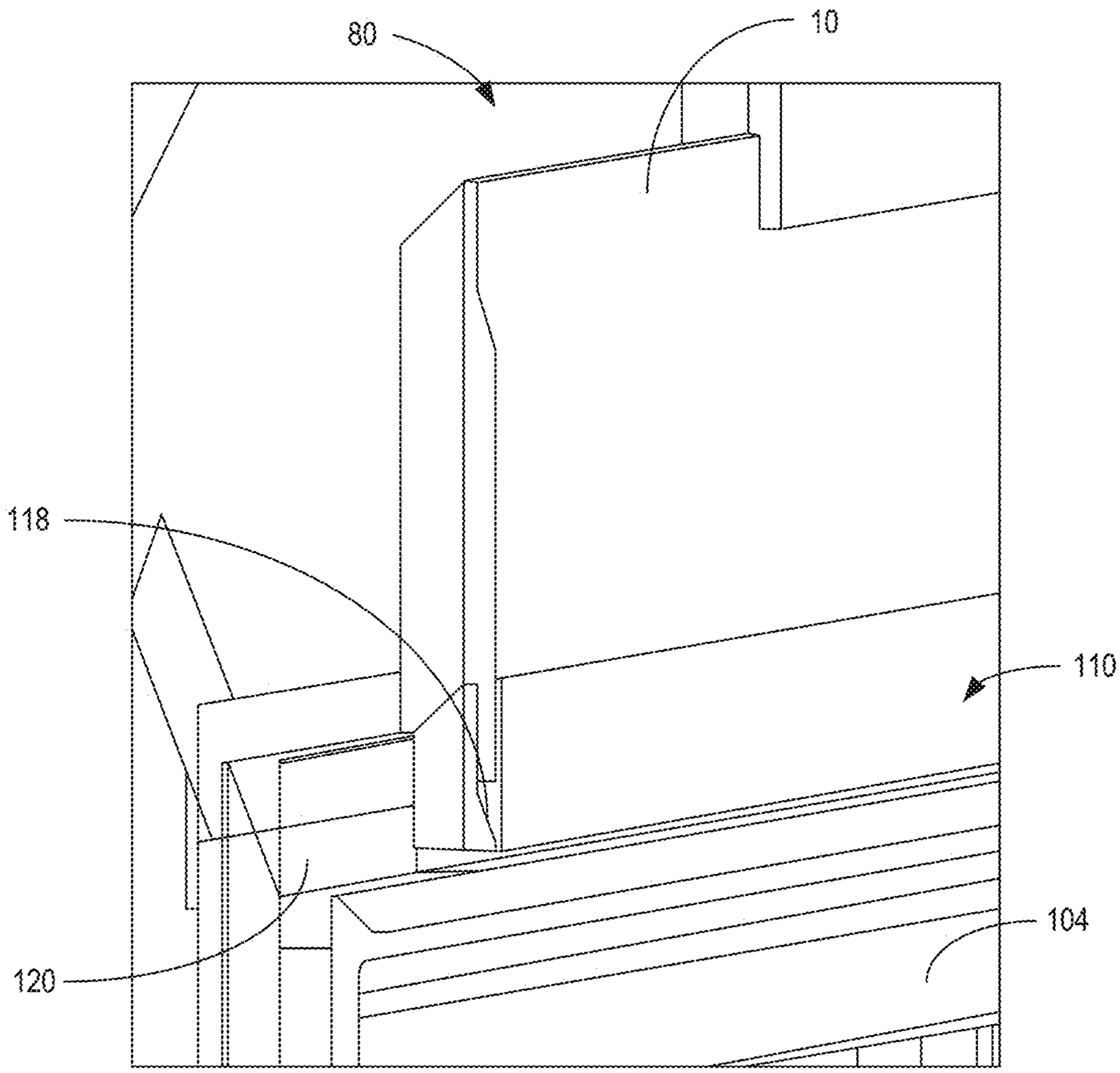


FIG. 6

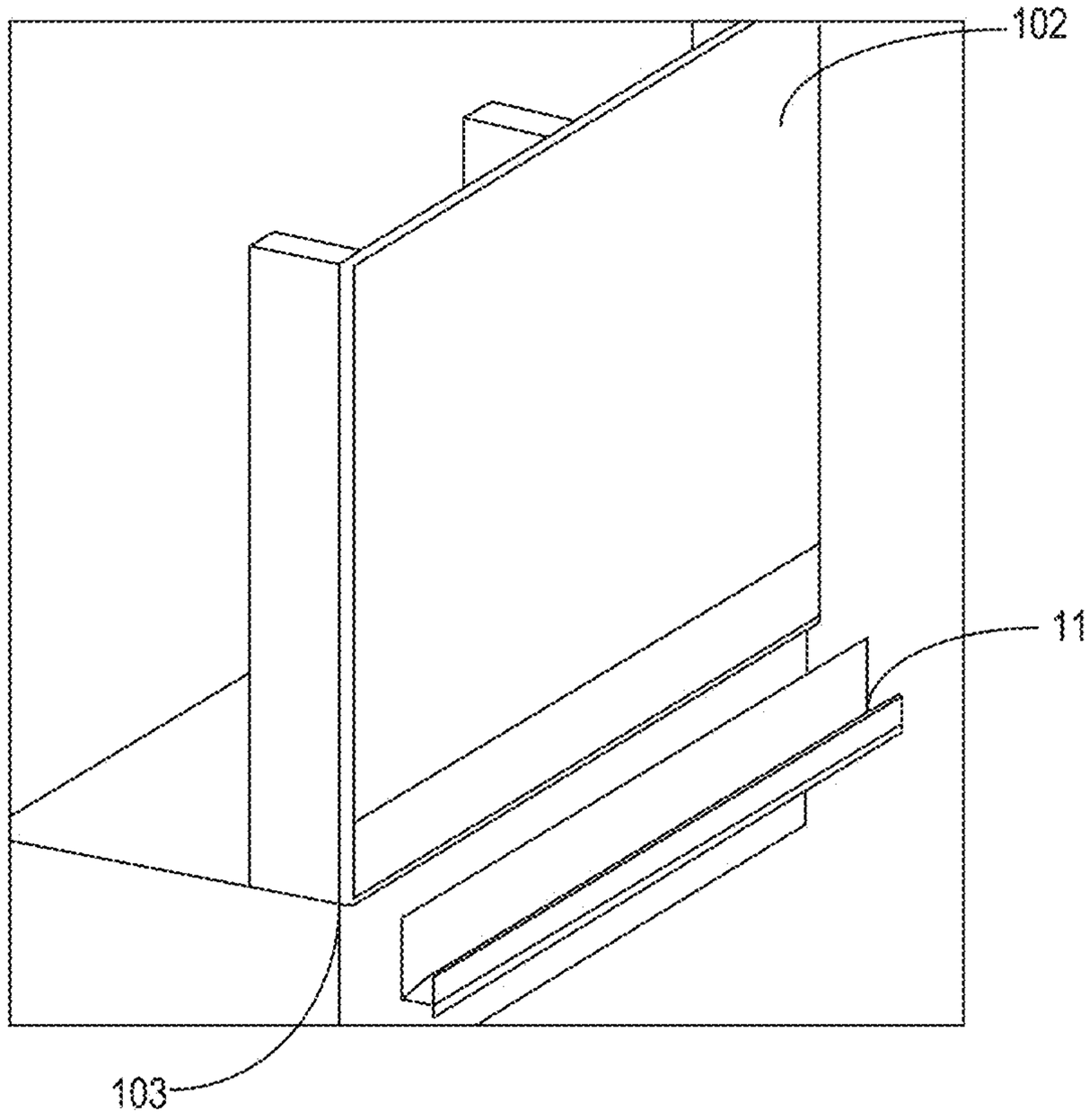


FIG. 7A

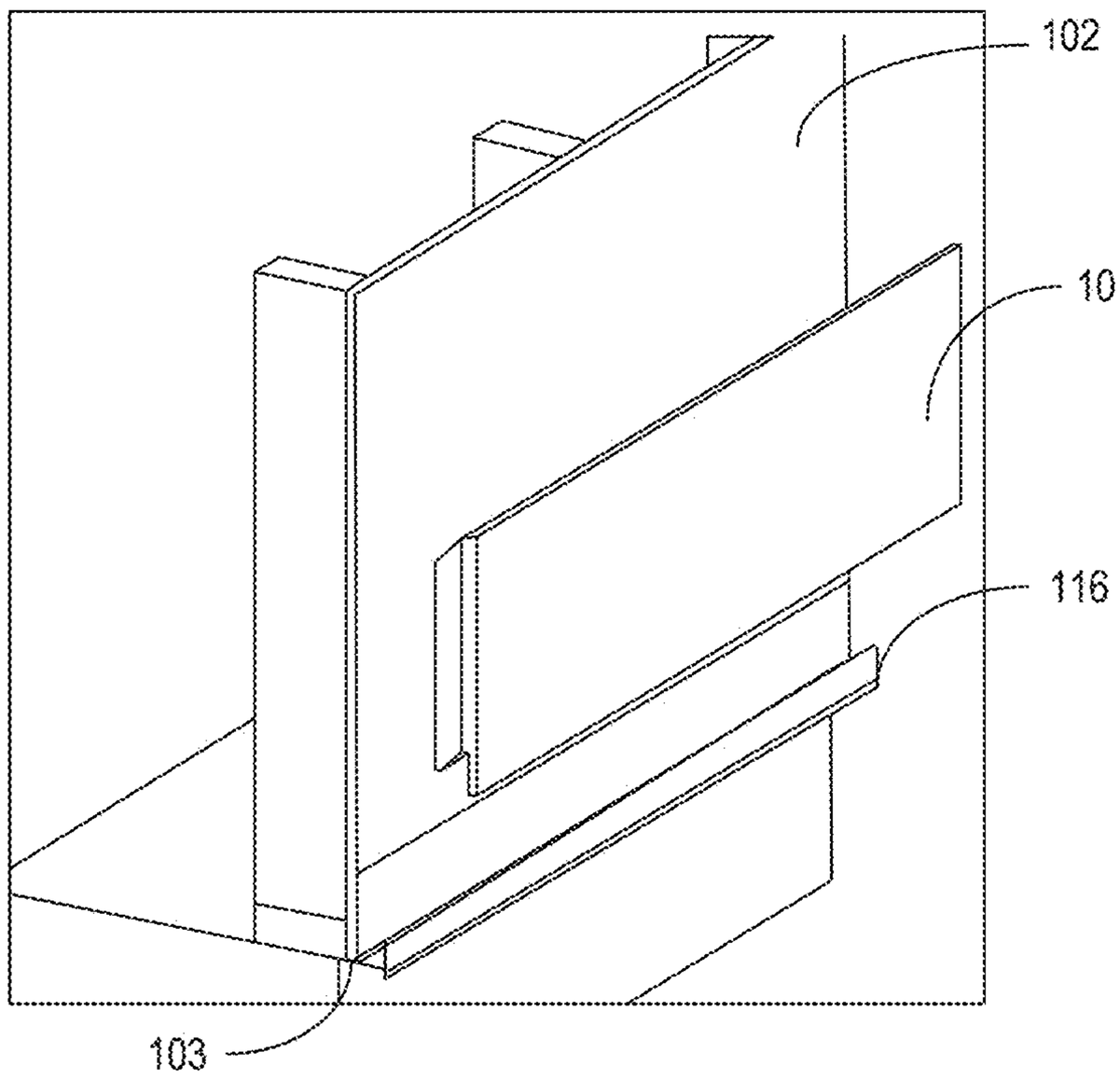


FIG. 7B

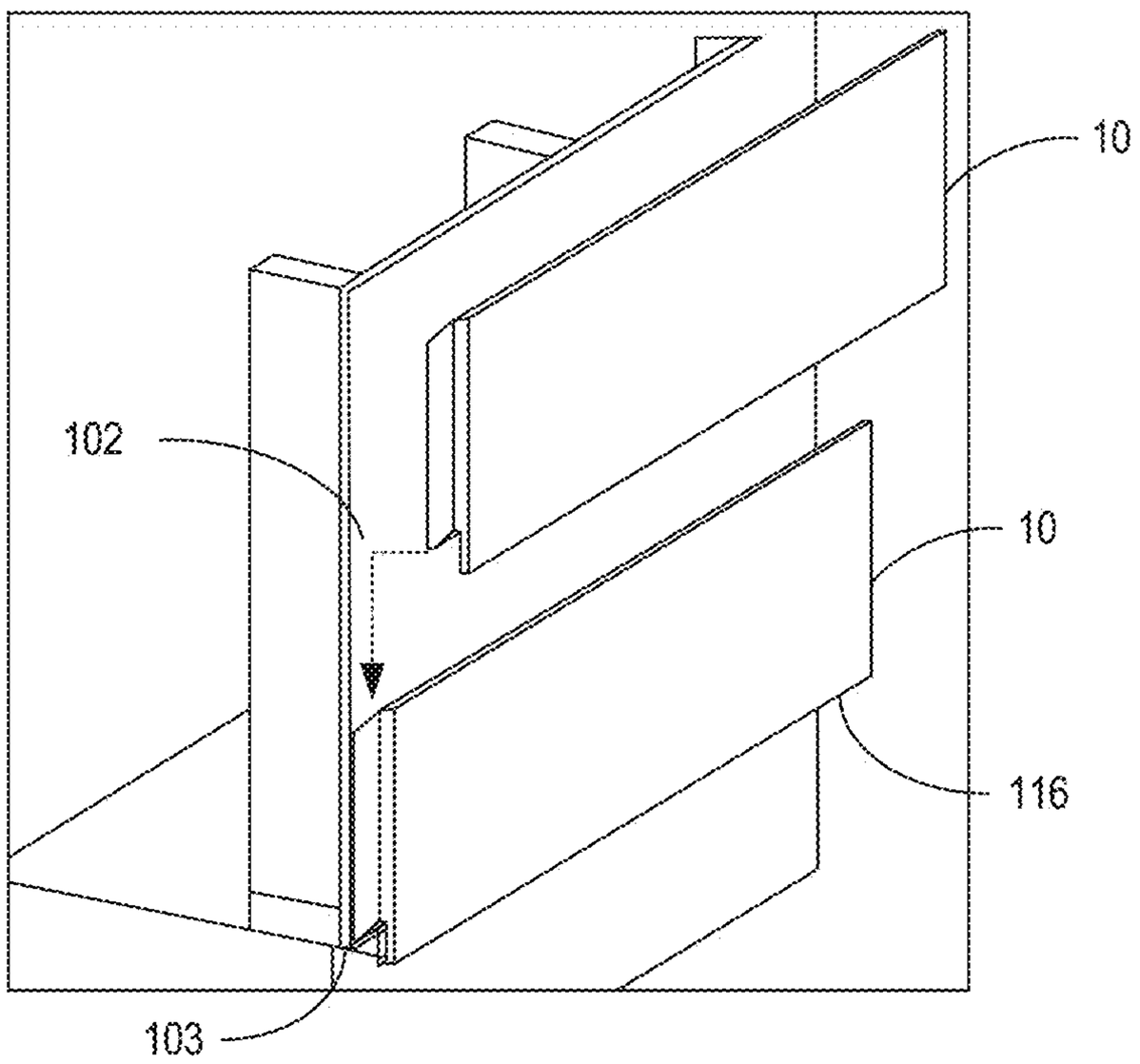


FIG. 7C

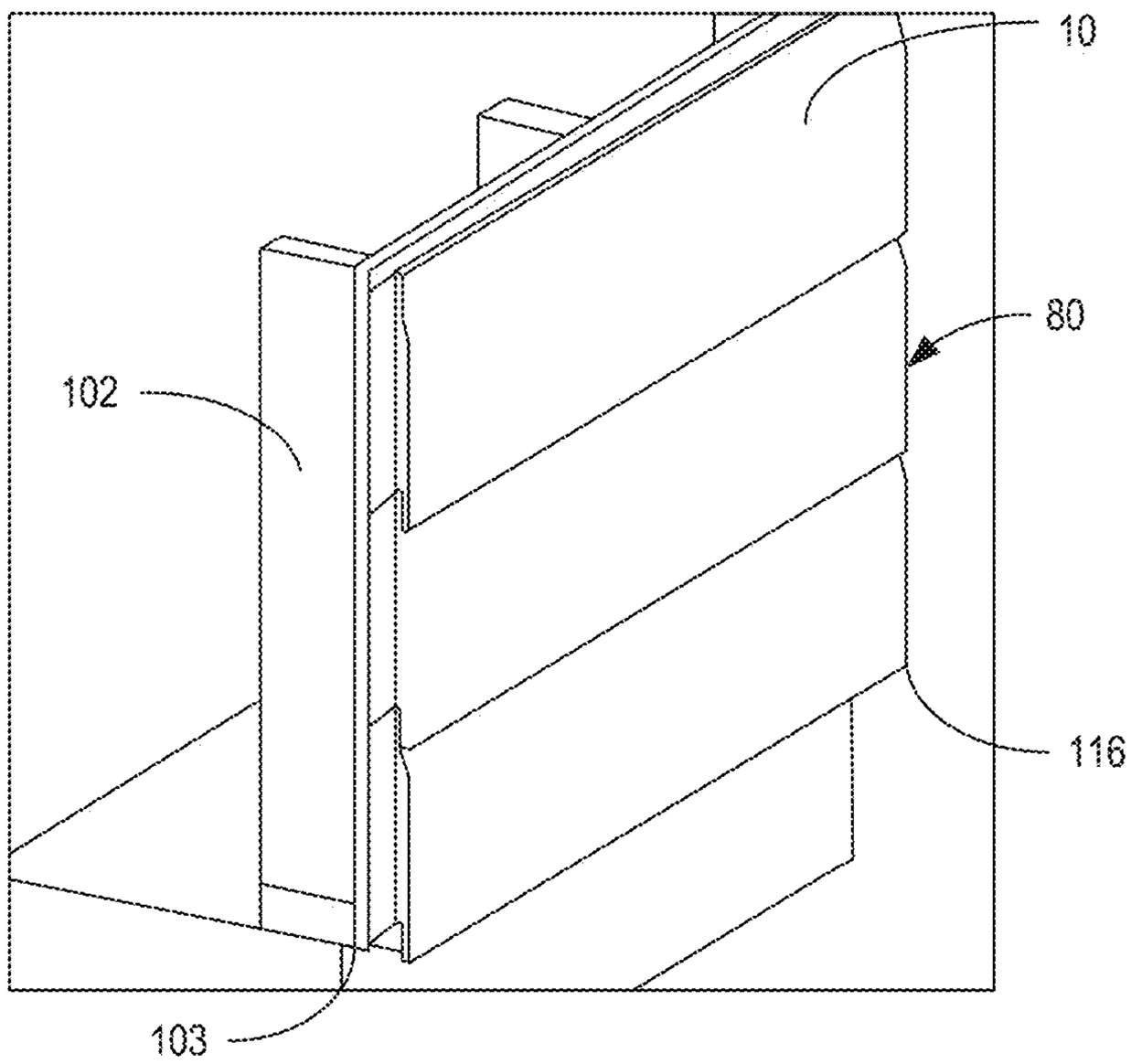


FIG. 7D

INSULATED SIDING SHEET, AN INSULATED SHEET SYSTEM, AND BUILDINGS FORMED WITH THE INSULATED SHEET SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims priority to U.S. Provisional Patent Application No. 63/444,731, filed Feb. 10, 2023, the content of which is incorporated herein by reference in its entirety.

NOTICE OF GOVERNMENT SUPPORT

[0002] This invention was made with Government support under Contract No. DE-SC-0022616 awarded by the Department of Energy.

BACKGROUND

Technical Field

[0003] The present disclosure is generally directed to an insulated siding sheet, an insulated sheet system formed with multiple insulated siding sheets, and buildings with the insulated sheet system positioned over one or more sides.

Technical Description

[0004] In the existing home market, re-roofing, new windows, HVAC replacement, and replacing the siding on the exterior of a home are the dominant retrofit activities. As to the siding on the exterior of a home, the primary reasons for replacing the siding are storm damage or improving aesthetics due to aging. For instance, homes in the cold and mixed humid regions are typically outfitted with some type of vinyl, aluminum, steel, or wood siding product. However, these homes are commonly exposed to air infiltration through the exterior envelope, which may lead to excessive energy loss, comfort issues, and durability issues to the siding and structure of the home.

[0005] While retrofit siding options are available, continuous insulation is typically not included or even offered in a re-siding retrofit, nor is any type of rainscreen offered to provide better bulk water drainage. Thus, it is desirable to provide an insulated siding system that can be retrofitted onto a building and which does not exhibit the various known drawbacks.

SUMMARY

[0006] In some non-limiting embodiments, provided is an insulated siding sheet. The insulated siding sheet includes an integrated insulation material and a plank siding. The integrated insulation material includes: (i) a back side; (ii) a front side opposite the back side; (iii) a top horizontal edge having a 45 degree angle; and (iv) a bottom horizontal edge having a 45 degree angle, in which the back side of the integrated insulation material comprises vertical grooves that extend from the top horizontal edge to the bottom horizontal edge. The plank siding is attached to the front side of the integrated insulation material, where the plank siding comprises a top horizontal edge and a bottom horizontal edge that both have a cut-away portion of the plank siding to overlap with horizontal edges of adjacent insulated siding sheets.

[0007] In certain non-limiting embodiments, the integrated insulation material has a minimum insulation R-value of R-5. For example, the integrated insulation material can be formed from a material selected from the group consisting of a R-5 extruded polystyrene, a R-6.5 polyisocyanurate, a R-5 graphite polystyrene, spray foam, poured foam, and any combination thereof. In some non-limiting embodiments, the integrated insulation material has a thickness within a range of from 1 inch to 4 inches.

[0008] In certain non-limiting embodiments, the vertical grooves have a depth of ¼ inch or less, and/or a width within a range of from ⅛ inch to ¼ inch. The vertical grooves can also be spaced apart horizontally by at least 0.5 inch. The vertical grooves can have various shapes, such as a rounded shape for example.

[0009] In certain non-limiting embodiments, the plank siding comprises wood, plastic composite, wood fiber, metal, cement fiber, or any combination. In some non-limiting embodiments, a front portion of the top horizontal edge of the plank siding is cut-away and a back portion of the bottom horizontal edge of the plank siding is cut-away.

[0010] In some non-limiting embodiments, the present disclosure also includes an insulated siding sheet system comprising two or more of the previously described insulated siding sheets in which the insulated siding sheets are attached to each other with a lapped configuration. The lapped configuration can comprise overlapping cut-away portions of the plank siding of adjacent insulated siding sheets. In certain non-limiting embodiments, the bottom horizontal edge of the integrated insulated material of a first insulated siding sheet engages and mates onto the top horizontal edge of the integrated insulated material of a second insulated siding sheet.

[0011] In some non-limiting embodiments, the present disclosure includes a building comprising the previously described insulated siding sheet system that is formed over at least a portion of one side of the building. In certain non-limiting embodiments, the insulated siding sheet system is formed over each side of the building. The building can include a residential building for example.

[0012] In certain non-limiting embodiments, the building further includes at least one window and at least one door, in which the at least one window and the at least one door each independently comprise metal trim that extends around the at least one window and the at least one door. The metal trim can form a channel that receives insulated siding sheets extending around the at least one window and the at least one door.

[0013] In certain non-limiting embodiments, the building further includes a starter strip positioned at the bottom of each side of the building. The starter strip can include a channel that receives insulated siding sheets extending down toward a bottom of the sides of the building.

[0014] In some non-limiting embodiments, the present disclosure further includes a method of retrofitting an insulated siding sheet system onto a building. The method includes attaching the insulated siding sheet system previously described onto one or more sides of a building. In certain non-limiting embodiments, attaching the insulated siding sheet system onto one or more sides of the building includes laminating the integrated insulation material onto the one or more sides of the building.

[0015] The present disclosure also includes the following aspects.

[0016] Aspect 1: An insulated siding sheet comprising: an integrated insulation material comprising (i) a back side, (ii) a front side opposite the back side, (iii) a top horizontal edge having a 45 degree angle; and (iv) a bottom horizontal edge having a 45 degree angle, wherein the back side of the integrated insulation material comprises vertical grooves that extend from the top horizontal edge to the bottom horizontal edge; and a plank siding attached to the front side of the integrated insulation material, wherein the plank siding comprises a top horizontal edge and a bottom horizontal edge that both have a cut-away portion to overlap with horizontal edges of adjacent insulated siding sheets.

[0017] Aspect 2: The insulated siding sheet of aspect 1, wherein the integrated insulation material has a minimum insulation R-value of R-5.

[0018] Aspect 3: The insulated siding sheet of aspect 1 or 2, wherein the integrated insulation material is formed from a material selected from the group consisting of a R-5 extruded polystyrene, a R-6.5 polyisocyanurate, a R-5 graphite polystyrene, spray foam, poured foam, and any combination thereof.

[0019] Aspect 4: The insulated siding sheet of any one of aspects 1-3, wherein the integrated insulation material has a thickness within a range of from 1 inch to 4 inches.

[0020] Aspect 5: The insulated siding sheet of any one of aspects 1-4, wherein the vertical grooves have a depth of ¼ inch or less.

[0021] Aspect 6: The insulated siding sheet of any one of aspects 1-5, wherein the vertical grooves have a width within a range of from ⅛ inch to ¼ inch.

[0022] Aspect 7: The insulated siding sheet of any one of aspects 1-6, wherein the vertical grooves are each spaced apart horizontally by at least ½ inch.

[0023] Aspect 8: The insulated siding sheet of any one of aspects 1-7, wherein the vertical grooves have a rounded shape.

[0024] Aspect 9: The insulated siding sheet of any one of aspects 1-8, wherein the plank siding comprises wood, plastic composite, wood fiber, metal, cement fiber, or any combination.

[0025] Aspect 10: The insulated siding sheet of any one of aspects 1-9, wherein a front portion of the top horizontal edge of the plank siding is cut-away to form a first cut-away portion and a back portion of the bottom horizontal edge of the plank siding is cut-away to form a second cut-away portion.

[0026] Aspect 11: An insulated siding sheet system comprising two or more insulated siding sheets according to any one of aspects 1-10, wherein the insulated siding sheets are attached to each other with a lapped configuration.

[0027] Aspect 12: The insulated siding sheet system of aspect 11, wherein the lapped configuration comprises overlapping cut-away portions of the plank siding of adjacent insulated siding sheets.

[0028] Aspect 13: The insulated siding sheet system of aspect 11 or 12, wherein the bottom horizontal edge of the integrated insulated material a first insulated siding sheet engages and mates onto the top horizontal edge of the integrated insulated material a second insulated siding sheet.

[0029] Aspect 14: A building comprising the insulated siding sheet system according to any one of aspects 11-13 formed over at least a portion of one side of the building.

[0030] Aspect 15: The building of aspect 14, wherein the insulated siding sheet system is formed over each side of the building.

[0031] Aspect 16: The building of aspects 14 or 15, wherein the building is a residential building.

[0032] Aspect 17: The building of any one of aspects 14-16, further comprising at least one window and at least one door, wherein the at least one window and the at least one door each independently comprise metal trim that extends around the at least one window and the at least one door, and wherein the metal trim forms a channel that receives insulated siding sheets extending around the at least one window and the at least one door.

[0033] Aspect 18: The building according to any one of aspects 14-17, further comprising a starter strip positioned at the bottom of each side of the building, wherein the starter strip comprises a channel that receives insulated siding sheets extending down toward a bottom of the sides of the building.

[0034] Aspect 19: A method of retrofitting an insulated siding sheet system onto a building, the method comprising attaching the insulated siding sheet system according to any one of aspects 14-18 onto one or more sides of a building.

[0035] Aspect 20: The method of aspect 19, wherein attaching the insulated siding sheet system onto one or more sides of the building comprises laminating the integrated insulation material onto the one or more sides of the building.

BRIEF DESCRIPTION OF THE DRAWINGS

[0036] FIG. **1** is a side view of non-limiting embodiments of an insulated siding sheet according to the principles of the present disclosure;

[0037] FIG. **2** is a top view of non-limiting embodiments of an insulated siding sheet according to the principles of the present disclosure;

[0038] FIG. **3** is a side view of non-limiting embodiments of an insulated siding sheet system according to the principles of the present disclosure;

[0039] FIG. **4** is a back cross-sectional view of non-limiting embodiments of a rainscreen formed from an insulated siding sheet system according to the principles of the present disclosure;

[0040] FIG. **5** is a perspective view of non-limiting embodiments of a building having the insulated siding sheet according to the principles of the present disclosure;

[0041] FIG. **6** is a perspective exploded view of non-limiting embodiments of a window of a building having the insulated siding sheet according to the principles of the present disclosure;

[0042] FIG. **7**A is a perspective view of non-limiting embodiments of a building with a starter strip first attached according to the principles of the present disclosure;

[0043] FIG. **7**B is a perspective view of non-limiting embodiments of a building with a starter strip and insulated siding sheet attached according to the principles of the present disclosure;

[0044] FIG. **7**C is a perspective view of the building shown in FIG. **7**B with multiple insulated siding sheets attached according to the principles of the present disclosure; and

[0045] FIG. **7**D is a perspective view of the building shown in FIG. **7**B with multiple insulated siding sheets

attached that form an insulated siding sheet system according to the principles of the present disclosure.

DETAILED DESCRIPTION

[0046] For purposes of the following detailed description, it is to be understood that the disclosure may assume various alternative variations and step sequences, except where expressly specified to the contrary. Moreover, other than in any operating examples, or where otherwise indicated, all numbers expressing, for example, quantities of ingredients used in the specification and claims are to be understood as being modified in all instances by the term "about". Accordingly, unless indicated to the contrary, the numerical parameters set forth in the following specification and attached claims are approximations that may vary depending upon the desired properties to be obtained by the present disclosure. At the very least, and not as an attempt to limit the application of the doctrine of equivalents to the scope of the claims, each numerical parameter should at least be construed in light of the number of reported significant digits and by applying ordinary rounding techniques.

[0047] Notwithstanding that the numerical ranges and parameters setting forth the broad scope of the disclosure are approximations, the numerical values set forth in the specific examples are reported as precisely as possible. Any numerical value, however, inherently contains certain errors necessarily resulting from the standard variation found in their respective testing measurements.

[0048] Also, it should be understood that any numerical range recited herein is intended to include all sub-ranges subsumed therein. For example, a range of "1 to 10" is intended to include all sub-ranges between (and including) the recited minimum value of 1 and the recited maximum value of 10, that is, having a minimum value equal to or greater than 1 and a maximum value of equal to or less than 10.

[0049] Further, the terms "upper," "lower," "right," "left," "vertical," "horizontal," "top," "bottom," "lateral," "longitudinal," and derivatives thereof shall relate to the disclosure as it is oriented in the drawing figures. However, it is to be understood that the disclosure may assume alternative variations and step sequences, except where expressly specified to the contrary. It is also to be understood that the specific devices and processes illustrated in the attached drawings, and described in the specification, are simply exemplary embodiments or aspects of the present disclosure. Hence, specific dimensions and other physical characteristics related to the embodiments or aspects disclosed herein are not to be considered as limiting.

[0050] In this application, the use of the singular includes the plural and plural encompasses singular, unless specifically stated otherwise. In addition, in this application, the use of "or" means "and/or" unless specifically stated otherwise, even though "and/or" may be explicitly used in certain instances. It will also be appreciated that the dimensions and sizes provided in the drawings are only non-limiting examples. Therefore, different dimensions and sizes can be used.

[0051] Referring to FIG. **1**, and in some non-limiting embodiments, the present disclosure is directed to an insulated siding sheet **10**. The insulated siding sheet **10** includes an integrated insulation material **12** and a plank siding **14**.

[0052] As used herein, an "integrated insulation material" refers to concrete forms of insulation made of blocks of polymeric foam or other rigid insulated foam. In certain non-limiting embodiments, the integrated insulation material **12** is made of a material that has a minimum insulation R-value of R-5. For example, the integrated insulation material **12** can be formed from a R-5 extruded polystyrene, a R-6.5 polyisocyanurate, a R-5 graphite polystyrene, spray foam, poured foam, or any combination thereof.

[0053] The "R-value", as used herein, refers to a material's insulating properties and its ability to impede heat flow. The greater the ability to impede heat flow, the higher the R-value. Calculating R-value involves measurements of heat energy transfer through different insulation materials and determining the R-value of insulation based on how quickly (or slowly) this heat flows through the material.

[0054] In some non-limiting embodiments, referring to FIG. **1**, the integrated insulation material **12** comprises a back side **16**, a front side **18** opposite the back side **16**, a top horizontal edge **20** having a 45 degree angle, and a bottom horizontal edge **22** having a 45 degree angle. As shown in FIG. **1**, the 45 degree angle of the top horizontal edge **20** and the bottom horizontal edge **22** can be formed in the same direction. That is, in such embodiments, the configuration of the integrated insulation material **12** can be such that the top horizontal edge **20** comprises a 45 degree angle that is cut/formed from the front top edge **24** downward to the back top edge **26**, and the bottom horizontal edge **22** comprises a 45 degree angle that is cut/formed from the front bottom edge **28** downward to the back bottom edge **30**. It will be appreciated that an opposite configuration can also be used where the top horizontal edge **20** comprises a 45 degree angle that is cut/formed from the back top edge **26** downward to the front top edge **24**, and the bottom horizontal edge **22** comprises a 45 degree angle that is cut/formed from the back bottom edge **30** downward to the front bottom edge **28**.

[0055] The integrated insulation material **12** can also be prepared to have a desired thickness. For instance, the integrated insulation material **12** can have a thickness of at least 1 inch, or at least 1 and half inches. The integrated insulation material **12** can also have a thickness of up to 4 inches or up to 3 inches. The thickness of the integrated insulation material **12** can be selected within a range of from 1 inch to 4 inches, or within a range of from 1 inch to 3 inches, or within a range of from 1 inch to 2 inches.

[0056] As further shown in FIG. **2**, the back side **16** of the integrated insulation material **12** comprises vertical grooves **40** that extend from the top horizontal edge **20** to the bottom horizontal edge **22**. In certain non-limiting embodiments, the vertical grooves **40** can have a depth of a ¼ inch or less, or ⅕ inch or less, or ⅛ inch or less. It is appreciated that the vertical grooves **40** have a depth that extends from the back side **16** of the integrated insulation material **12** toward the front side **18** of the integrated insulation material **12**. The vertical grooves **40** can also have a width selected within a range of from ⅛ inch to ¼ inch, or within a range of from ⅕ inch to ¼ inch. Each vertical groove **40** can further be spaced apart horizontally at a desired distance such as by at least ½ inch, or by at least ¾ inch, or by at least 1 inch. The vertical grooves **40** can also have various shapes, such as a rounded shape, a square shape, or a triangular shape.

[0057] The vertical grooves **40** can have any combination of the previously described configurations. It was found that the vertical grooves **40** allow rain water, as well as other liquids, to drain through the integrated insulation material

12. As such, the vertical grooves act as a rainscreen to provide bulk water drainage through the insulated siding sheet **10**.

[0058] As indicated, the insulated siding sheet **10** also comprises a plank siding **14**. Referring to FIG. **1**, the plank siding **14** is attached, such as being bonded for example, to the front side **18** of the integrated insulation material **12**. The plank siding **14** can be formed from various materials used as siding materials on buildings. For example, the plank siding **14** can be selected from wood, plastic composite, wood fiber, metal, cement fiber, or any combination thereof. If the material is wood, the wood can be engineered wood or natural wood.

[0059] In certain non-limiting embodiments, the plank siding **14** comprises a top horizontal edge **50** and a bottom horizontal edge **52** that both have cut-away portions **51** and **53** to overlap with cut-away portions **51** and **53** of the horizontal edges **50** and **52** of adjacent insulated siding sheets **10**. It is appreciated that the cut-away portions **51** and **53** of the plank siding **14** have a thickness that is less than the thickness of the remaining portions of the plank siding **14**. In certain non-limiting embodiments, the cut-away portions **51** and **53** have a thickness that is 75% or less than the thickness of the remaining portions of the plank siding **14**, or a thickness that is 50% or less (i.e., half or less) than the thickness of the remaining portions of the plank siding **14**. For example, the cut-away portions **51** and **53** can have a thickness that is about a ½ inch, while the remaining portions of the plank siding **14** have a thickness of about 1 inch.

[0060] As further shown in FIG. **1**, the cut-away portion **51** at the top horizontal edge **50** can be taken from a different side of the plank siding **14** as compared to the cut-away portion **53** at the bottom horizontal edge **52**. For instance, the cut-away portion **51** at the top horizontal edge **50** can be taken from the front side **56** of the plank siding **14** and the cut-away portion **53** at the bottom horizontal edge **52** can be taken from the back side **58** of the plank siding **14**.

[0061] In some non-limiting embodiments, as shown in FIG. **3**, the present disclosure is also directed to an insulated siding sheet system **80** comprising two or more insulated siding sheets **10** as previously described. The insulated siding sheets **10** are attached to each other with a lapped configuration **82**, as shown in FIGS. **2** and **3**. The lapped configuration **82** comprises overlapping cut-away portions **51** and **53** of the plank sidings **14** from adjacent insulated siding sheets **10**. In certain non-limiting embodiments, the lapped configuration **82** forms an outer barrier of plank sidings **14** that are substantially even or flush across the front sides **56**. FIG. **3** also illustrates a gap in the lapped configuration. However, such a gap can be removed and the plank sidings **14** can abut each other.

[0062] In some non-limiting embodiments, referring to FIG. **3**, the bottom horizontal edge **22** of the integrated insulation material **12** of a first insulated siding sheet **10** engages and forms a mating alignment **90** onto the top horizontal edge **20** of the integrated insulated material **12** of a second insulated siding sheet **10**. This arrangement has been found to provide an easy alignment **90** between adjacent integrated insulation materials **12**.

[0063] Referring to FIG. **4**, the vertical grooves **40** from the various insulated siding sheets **10** that make-up the insulated siding sheet system **80** form a rainscreen **94**. As further shown in FIG. **4**, water **96** is drained through at least some of the grooves **40** of the insulated siding sheet system **80** to provide improved drying capabilities. It is noted that the shading has been adjusted for clarity in FIG. **4**.

[0064] It was found that the insulated siding sheet system **80** provides a durable exterior siding with robust sturdiness due to the combination of plank siding **14** and rigid integrated insulation material **12**. The integrated insulation material **12** further provides a minimum insulation R-value of R-5, along with a continuous rainscreen **94** formed from the vertical grooves **40** that provides drying capabilities. The angled integrated insulation materials **12** with the mating alignment **90** and lapped configuration **82** between plank sidings **14** further allows for an easy installation due to the stacking interlock between plank sidings **14**.

[0065] In certain non-limiting embodiments, referring to FIG. **5**, the present disclosure further includes a building **100** that comprises the previously described insulated siding sheet system **80** formed over at least a portion of one side **102** of the building **100**. The building **100** can also include the insulated siding sheet system **80** formed over an entire side **102** of the building, or over all the sides **102** of the building. The building **100** can be a residential building, or it can be a different type of building **100** such as a commercial building. It is noted that the shading has been adjusted for clarity in FIG. **5**.

[0066] In some non-limiting embodiments, referring again to FIG. **5**, the building **100** further includes at least one window **104** and at least one door **106**. The window **104** and the door **106** can each independently comprise metal trim **110** that extends around the window **104** and door **106**. As shown in FIG. **6**, the metal trim **110** can form a channel **118** that receives insulated siding sheets **10** extending around the window **104** and door **106**. It is noted that the shading has been adjusted for clarity in FIG. **6**.

[0067] As shown in FIG. **5**, the building **100** can also include a starter strip **116** positioned at the bottom **103** of each side **102** of the building **100**. The starter strip **116** can also include a channel **118** that receives insulated siding sheets **10** extending down toward a bottom **103** of the sides **102** of the building **100**.

[0068] The building **100** can also include various other components associated with the insulated siding sheet system **80**. For example, as shown in FIG. **6**, the building **100** can also include a drip cap **120** around the window **104**. The building **100** can further include known materials typically used in a building **100**.

[0069] The present disclosure further includes a method of retrofitting an insulated siding sheet system **80** onto a building **100**. The method can include attaching the insulated siding sheet system **80** as previously described onto one or more sides **102** of the building **100**. The step of attaching the insulated siding sheet system **80** onto one or more sides **102** of the building **100** can include laminating the integrated insulation material **12** onto the one or more sides **102** of the building **100**. The method can include other steps, such as removing previously existing siding prior to attaching the insulated siding sheet system **80** onto the sides **102** of the building **100**. It is appreciated that the insulated siding sheet system **80** can be attached by overlapping cut-away portions **51** and **53** of the plank sidings **14** from adjacent insulated siding sheets **10**.

[0070] Referring to FIG. **7**A, in certain non-limiting embodiments, the method can include attaching a starter strip **116** positioned at the bottom **103** of each side **102** of the

building **100**. This step, in some non-limiting embodiments, can occur before applying the insulated siding sheets **10**. As shown in FIGS. **7**B-**7**C, insulating siding sheets **10** are positioned onto the sides **102** of the building **100** with a first insulating siding sheet **10** being positioned into the starter strip **116**. Referring to FIG. **7**D, additional insulating siding sheets **10** are attached to the sides **102** of the building **100** and to each other to form the previously described insulating siding sheet system **80**. It is noted that the shading has been adjusted for clarity in FIGS. **7**A-**7**D.

[0071] It was found that the insulated siding sheet system **80** can be easily installed and retrofitted to provide a minimum insulation R-value of R-5, along with a continuous rainscreen **94** system.

[0072] Whereas particular embodiments or aspects of this disclosure have been described above for purposes of illustration, it will be evident to those skilled in the art that numerous variations of the details of the present disclosure may be made without departing from the disclosure as defined in the appended claims.

What is claimed is:

1. An insulated siding sheet comprising:

an integrated insulation material comprising (i) a back side, (ii) a front side opposite the back side, (iii) a top horizontal edge having a 45 degree angle; and (iv) a bottom horizontal edge having a 45 degree angle, wherein the back side of the integrated insulation material comprises vertical grooves that extend from the top horizontal edge to the bottom horizontal edge; and

a plank siding attached to the front side of the integrated insulation material, wherein the plank siding comprises a top horizontal edge and a bottom horizontal edge that both have a cut-away portion to overlap with horizontal edges of adjacent insulated siding sheets.

2. The insulated siding sheet of claim **1**, wherein the integrated insulation material has a minimum insulation R-value of R-5.

3. The insulated siding sheet of claim **2**, wherein the integrated insulation material is formed from a material selected from the group consisting of a R-5 extruded polystyrene, a R-6.5 polyisocyanurate, a R-5 graphite polystyrene, spray foam, poured foam, and any combination thereof.

4. The insulated siding sheet of claim **1**, wherein the integrated insulation material has a thickness within a range of from 1 inch to 4 inches.

5. The insulated siding sheet of claim **1**, wherein the vertical grooves have a depth of ¼ inch or less.

6. The insulated siding sheet of claim **5**, wherein the vertical grooves have a width within a range of from ⅛ inch to ¼ inch.

7. The insulated siding sheet of claim **5**, wherein the vertical grooves are each spaced apart horizontally by at least ½ inch.

8. The insulated siding sheet of claim **5**, wherein the vertical grooves have a rounded shape.

9. The insulated siding sheet of claim **1**, wherein the plank siding comprises wood, plastic composite, wood fiber, metal, cement fiber, or any combination.

10. The insulated siding sheet of claim **1**, wherein a front portion of the top horizontal edge of the plank siding is cut-away to form a first cut-away portion and a back portion of the bottom horizontal edge of the plank siding is cut-away to form a second cut-away portion.

11. An insulated siding sheet system comprising two or more insulated siding sheets according to claim **1**, wherein the insulated siding sheets are attached to each other with a lapped configuration.

12. The insulated siding sheet system of claim **11**, wherein the lapped configuration comprises overlapping cut-away portions of the plank siding of adjacent insulated siding sheets.

13. The insulated siding sheet system of claim **12**, wherein the bottom horizontal edge of the integrated insulated material a first insulated siding sheet engages and mates onto the top horizontal edge of the integrated insulated material a second insulated siding sheet.

14. A building comprising the insulated siding sheet system according to claim **11** formed over at least a portion of one side of the building.

15. The building of claim **14**, wherein the insulated siding sheet system is formed over each side of the building.

16. The building of claim **14**, wherein the building is a residential building.

17. The building of claim **14**, further comprising at least one window and at least one door, wherein the at least one window and the at least one door each independently comprise metal trim that extends around the at least one window and the at least one door, and wherein the metal trim forms a channel that receives insulated siding sheets extending around the at least one window and the at least one door.

18. The building according to claim **14**, further comprising a starter strip positioned at the bottom of each side of the building, wherein the starter strip comprises a channel that receives insulated siding sheets extending down toward a bottom of the sides of the building.

19. A method of retrofitting an insulated siding sheet system onto a building, the method comprising attaching the insulated siding sheet system according to claim **11** onto one or more sides of a building.

20. The method of claim **19**, wherein attaching the insulated siding sheet system onto one or more sides of the building comprises laminating the integrated insulation material onto the one or more sides of the building.

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