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(54) **Title:** VAPOR MITIGATION APPARATUS AND METHOD

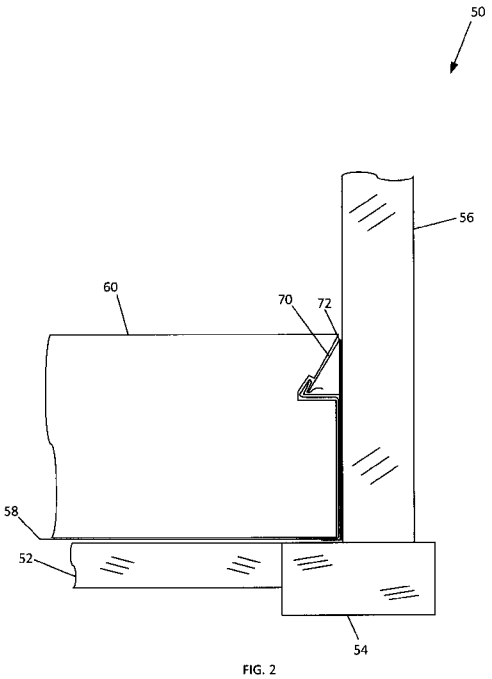


FIG. 2

(57) **Abstract:** A vapor mitigation apparatus and method for use with the construction of a building. The apparatus includes a vertical securing piece configured to be affixed to a foundation wall proximate a footing that is supporting the foundation wall. The vertical securing piece has a first end located proximate to a footing and a second end. A horizontal foot is located at the first end of the securing piece and extends away from the securing piece. The horizontal foot is configured to rest against the footing. The apparatus also includes a mechanical clip located at the second end of the vertical securing piece and is configured to secure a piece of plastic sheeting. The method includes securing the apparatus to the foundation wall, securing a plastic sheeting to the mechanical clip and then creating a concrete slab by pouring concrete over the apparatus.

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VAPOR MITIGATION APPARATUS AND METHOD

TECHNICAL FIELD

[0001] The present invention is generally directed toward a vapor mitigation, and more specifically, toward the mitigation of radon vapor in the construction of buildings.

BACKGROUND

[0002] Radon is a colorless, odorless gas that can cause lung cancer. Radon gas can move through small spaces in the soil and rock upon which a house is built. It can seep into a home through dirt floors, cracks in concrete walls and floors, sumps, joints, basement drains, under the furnace base, and jack posts if the base is buried in the floor.

[0003] FIG. 1 illustrates a prior art system 10 to reduce the amount of radon gas from seeping into a house. As illustrated, the prior art system 10 utilizes a gas permeable layer 12 that is created below the building slab 14, which is usually made from concrete. The gas permeable layer 12 allows the radon gas to move laterally beneath the slab 14 to the location where a vent pipe can collect the gas and transport it away from the building. The gas permeable layer 12 is usually created with drainage rock, crushed gravel and/or other drainage material. Surrounding the gas permeable layer 12 are the building's footings 16 and foundation wall 18. The prior art system 10 places a layer of plastic sheeting 20 between the gas permeable layer 12 and the slab 14. The joint seams and all openings between the foundation wall 18 and slab 14 are sealed with an elastomeric sealant 22 such as polyurethane caulk.

[0004] The prior art, however, has disadvantages. The footings are purposely poured very rough and porous for proper adhesion of the foundation wall, which is poured on top of the footings. The footings can become soiled with dirt, sand, fine gravel, or other contaminants preventing a proper seal between the footing and membrane.

[0005] Further, it is difficult to determine if the plastic sheeting 20 remained in place over the gas permeable layer 12 after the concrete that forms slab 14 is poured thereon, or if the plastic sheeting 20 has moved. If the plastic sheeting 20 remained in place, an airtight seal may be created. However, if there is movement, an airtight seal may not have been created. Due to the sheeting 20 being located under the slab 14, there is no way to make this determination.

[0006] Accordingly, there is a need for an apparatus and method to address the issues set out above.

SUMMARY

[0007] The present invention is generally directed toward a vapor mitigation, and more specifically, toward the mitigation of radon vapor in the construction of buildings.

[0008] In one aspect, a vapor mitigation apparatus for use with the construction of a building is disclosed. The building has a gas permeable layer surround by a foundation wall and footing. A sheet of plastic sheeting is placed between the gas permeable layer and the buildings slab. The term plastic sheeting is used to mean any type of plastic sheet, membrane, film or other continuous polymeric material that is used to separate areas or volume to act as a barrier.

[0009] The apparatus includes a vertical securing piece configured to be affixed to the foundation wall by adhesion or other known securing fasteners. The securing piece has a first end located proximate to the footing and a second end. A horizontal foot is located at the first end of the securing piece and extends away from the securing piece. The horizontal foot is configured to rest on the footing that is supporting the foundation wall. A mechanical clip is located at the second end of the securing piece and is configured to secure the piece of plastic sheeting. This creates an airtight seal between the ground below the building and the building.

[0010] In some aspects, the mechanical clip includes a first jaw member and a second jaw member that is hinged to the first jaw member. In the locked, or closed, position, the first jaw member and second jaw member are configured to secure the piece of plastic sheeting therebetween.

[0011] In some aspects, the mechanical clip includes a base member extending substantially horizontally away from securing piece. The base member has a locking portion at its distal end. The mechanical clip further includes a retention member that configured to be depressed against the locking portion. In the locked, or closed, position the retention member and locking portion are configured to secure the piece of plastic sheeting therebetween.

[0012] In one aspect, a method for vapor mitigation in the construction of a building is disclosed. The method includes utilizing a vapor mitigation apparatus having a vertical securing piece having a first end located and a second end, a horizontal foot located at the first end of the securing piece and extending away from the securing piece, and a mechanical clip located at the second end and configured to secure a piece of plastic sheeting. The method includes affixing the vertical securing piece to the circumference of the foundation wall such that the horizontal foot rest on the footing, placing a piece of plastic sheeting over the gas permeable layer, securing the ends of piece of plastic sheeting to mechanical clip thereby creating a vapor barrier over the gas permeable layer, and creating a slab of concrete by pouring a sufficient amount of concrete over the vapor mitigation apparatus and plastic sheeting.

[0013] Other aspects and features of the present invention will become apparent to those ordinarily skilled in the art upon review of the following description of specific embodiments of the invention in conjunction with the accompanying figures.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] In drawings which illustrate embodiments of the invention wherein similar characters of reference denote corresponding parts in each view,

[0015] FIG. 1 is a cross-sectional view of a prior art system for radon gas control in a building.

[0016] FIG. 2 is a cross-sectional view of an embodiment of the apparatus of the present invention in use within a building in a closed position.

[0017] FIG. 3 is a cross-sectional view of an embodiment of the apparatus of the present invention in use within a building in an open position.

[0018] FIG. 4 is a cross-sectional view of an embodiment of the apparatus of the present invention in use within a building in a closed position.

[0019] FIG. 5 is a cross-sectional view of an embodiment of the apparatus of the present invention in an open position.

[0020] FIG. 6 is a cross-sectional view of an embodiment of the apparatus of the present invention in a closed position.

[0021] FIG. 7 is a front view of an embodiment of the apparatus of the present invention in a closed position.

[0022] FIG. 8 is a cross-sectional view of an additional embodiment of the apparatus of the present invention in a closed position.

[0023] FIG. 9 is a cross-sectional view of an additional embodiment of the apparatus of the present invention in an open position.

[0024] FIG. 10 is a cross-sectional view of an additional embodiment of the apparatus of the present invention in a closed position.

[0025] FIG. 11 is a cross-sectional view of an additional embodiment of the apparatus of the present invention in an open position.

[0026] FIG. 12 is a cross-sectional view of an additional embodiment of the apparatus of the present invention in an open position.

[0027] FIG. 13 is a cross-sectional view of an additional embodiment of the apparatus of the present invention in a closed position.

[0028] FIG. 14 is a cross-sectional view of an additional embodiment of the apparatus of the present invention in a closed position in use with a piece of sheeting.

[0029] FIG. 15 is a cross-sectional view of an additional embodiment of the apparatus of the present invention in an open position.

[0030] FIG. 16 is a cross-sectional view of an additional embodiment of the apparatus of the present invention in a closed position.

[0031] FIG. 17 is a cross-sectional view of an additional embodiment of the apparatus of the present invention in a closed position in use with a piece of sheeting.

[0032] FIG. 18 is a cross-sectional view of an additional embodiment of the apparatus of the present invention in a closed position in use with a piece of wall gasket.

[0033] FIG. 19 is a flow chart of an embodiment of the method of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0034] FIG. 2 illustrates an embodiment of a schematic representation of an apparatus 70 of the present invention in use to reduce the amount of radon gas from seeping into a house. As illustrated, house includes a gas permeable layer 52 that is created below the building slab

60. Surrounding the gas permeable layer 52 are the building's footing 54 and foundation wall 56. A layer of plastic sheeting 58 is placed between the gas permeable layer 52 and the slab 60. The apparatus 70 is affixed to the foundation wall 56 by an adhesive 72 and rests against the footing 54. Further, the plastic sheeting 58 is secured to apparatus 70. When slab 60 is created by pouring cement over the footing 54, gas permeable layer 52, plastic sheeting 58 and foundation wall 56, the cement also encapsulates apparatus 70 therein. Thus, plastic sheeting 58 is maintained in place to create an airtight seal from radon leakage from the soil beneath the building. FIG. 2 illustrates some space between slab 60 and the footing 54, gas permeable layer 52, plastic sheeting 58, foundation wall 56, and apparatus 70. This is illustrative. When slab 60 is created, slab 60 will be directly against the footing 54, gas permeable layer 52, plastic sheeting 58, foundation wall 56 and apparatus 70. No space therebetween will remain.

[0035] As illustrated in FIGS. 3 and 4, an embodiment 100 of the apparatus 110 of the present invention is disclosed in use. Embodiment 100 includes a footing 102 supporting a foundation wall 104. A piece of plastic sheeting 106 is placed against footing 102, and between a gas permeable layer and concrete slab (not shown). Apparatus 110 may include a securing piece 114 which is affixed to foundation wall 104 by an adhesive, mechanical fastener or other fastener (not shown) sufficient to secure securing piece 114 to foundation wall 104. Apparatus 110 also includes a horizontal foot 116 extending away from the securing piece 114 at one end of securing piece 114. Horizontal foot 116 is configured to rest against footing 102.

[0036] Apparatus 110 also include a mechanical clip 112 that is configured to secure the plastic sheeting therein. Mechanical clip 112 is shown in an open position, see FIG. 3, and a closed position, see FIG. 4. In a locked, or closed, position, mechanical clip 112 secures the plasitic sheeting 106 therein.

[0037] Concrete may be poured over apparatus 112 to create the building's slab. Due to the plastic sheeting 106 being secured to mechanical clip 112, the plastic sheeting does not

move or otherwise pull away from the foundation wall 104 thereby creating an airtight seal between the ground and base of the house.

[0038] To assist with the creation of the slab, the length of securing piece 114 may be dimensioned as a gauge for the needed depth of the concrete. For example, if the concrete slab needs to be four (4) inches deep, the length of securing piece 114 may be four (4) inches.

[0039] As illustrated in FIGS. 5-7, an embodiment of the apparatus 110 of the present invention is disclosed. Apparatus 110 includes a securing piece 114, a horizontal foot 116 extending away from the securing piece 114 at one end of securing piece 114 and a mechanical clip 110 at the second end of securing piece 114. Mechanical clip 112 is shown in an open position, see FIG. 5, and a closed position, see FIG. 6. In a locked, or closed, position, mechanical clip 112 secures plastic sheeting therein. In this embodiment, mechanical clip 112 includes a base member 120 that extends substantially horizontally away from securing piece 114. The base member 120 has a locking portion 122 at its distal end. The mechanical clip 112 further includes a retention member 118 that configured to be depressed against the locking portion 122. In the locked, or closed, position the retention member 118 and locking portion 122 are configured to secure the piece of plastic sheeting therebetween.

[0040] As shown in FIG. 7, some embodiments may include openings 124 that may act as a guide for drilling fasteners, such as concrete screws, to secure apparatus 110 to a foundation wall or as a guide for the pouring of concrete when creating a slab. While these embodiments may use fasteners to secure apparatus 110 to a foundation wall, those skilled in the art will recognize that apparatus 110 may be securing to a foundation wall by other sufficient means, such as adhesives.

[0041] As illustrated in FIGS. 8-9, an additional embodiment of the apparatus 150 of the present invention is disclosed. Apparatus 150 includes a securing piece 154, a horizontal

foot 156 extending away from the securing piece 154 at one end of securing piece 154 and a mechanical clip 160 at the second end of securing piece 154. Mechanical clip 160 is shown in a closed position, see FIG. 8, and an open position, see FIG. 9. In a locked, or closed, position, mechanical clip 160 secures plastic sheeting 152 therein. In this embodiment, mechanical clip 160 includes a first jaw member 162 and a second jaw member 164 that is hinged to the first jaw member 162. In this embodiment, a first jaw member 162 and a second jaw member 164 extend substantially horizontally away from securing piece 154. In the locked, or closed, position, the first jaw member 162 and second jaw member 164 are configured to secure the piece of plastic sheeting 152 therebetween.

[0042] As illustrated in FIGS. 10-11, an additional embodiment of the apparatus 180 of the present invention is disclosed. Apparatus 180 includes a securing piece 184, a horizontal foot 186 extending away from the securing piece 184 at one end of securing piece 184 and a mechanical clip 190 at the second end of securing piece 184. Mechanical clip 190 is shown in a closed position, see FIG. 10, and an open position, see FIG. 11. In a locked, or closed, position, mechanical clip 190 secures plastic sheeting 182 therein. In this embodiment, mechanical clip 190 includes a first jaw member 192 and a second jaw member 194 that is hinged to the first jaw member 192. In this embodiment, a first jaw member 192 and a second jaw member 194 are positioned substantially vertically next to securing piece 184. In the locked, or closed, position, the first jaw member 192 and second jaw member 194 are configured to secure the piece of plastic sheeting 182 therebetween.

[0043] As illustrated in FIGS. 12-14, an additional embodiment of the apparatus 200 of the present invention is disclosed. Apparatus 200 includes a securing piece 212, a horizontal foot 214 extending away from the securing piece 212 at one end of securing piece 212 and a mechanical clip 210 at the second end of securing piece 212. Mechanical clip 210 is shown in an open position, see FIG. 12, and a closed position, see FIGS. 13 and 14. In a locked, or

closed, position, mechanical clip 210 secures plastic sheeting 226 therein. In this embodiment, mechanical clip 210 includes a base member 222 that extends substantially horizontally away from securing piece 212. The base member 222 has a first locking portion 224 at its distal end. The mechanical clip 210 further includes a retention member 216 having a second locking portion 218 at its distal end. Retention member 216 is configured to be depressed against base member 222 such that the first locking portion 224 interlock with the second locking portion 218. In the locked, or closed, position the retention member 216 and base member 222 are configured to secure the piece of plastic sheeting 226 therebetween.

[0044] As illustrated in FIGS. 15-17, an additional embodiment of the apparatus 230 of the present invention is disclosed. Apparatus 230 includes a securing piece 232, a horizontal foot 234 extending away from the securing piece 232 at one end of securing piece 234 and a mechanical clip 236 extending away from the securing piece 232. Mechanical clip 236 is illustrated extending away from securing piece at approximately the center portion thereof. This is illustrative and not meant to be limiting. Those skilled in the art will recognize that the placement of mechanical clip 236 may be located at any location along securing piece 232. Mechanical clip 236 is shown in an open position, see FIG. 15, and a closed position, see FIGS. 16 and 17. In a locked, or closed, position, mechanical clip 236 secures plastic sheeting 244 therein.

[0045] In this embodiment, mechanical clip 236 includes a securing bar 242 being held in place by an upper retention member 238 having an upper retention end 239 and a lower retention member 240 having a lower retention end 241. Securing bar 242 is illustrated in a square cross-sectional configuration. This is illustrative and not meant to be limiting. Those skilled in the art will recognize that other cross-sectional configurations, such as rectangular and circular, are within the scope of this disclosure. Securing bar 242 is configured to slide, or

otherwise be received between upper retention member 238 and lower retention member 240. Securing bar 242 is locked in place by upper retention end 239 and lower retention end 241.

[0046] In operation, as shown in FIG. 17, a sheet of plastic sheeting 244 is held in place between securing bar 242 and upper retention member 238 and lower retention member 240.

[0047] As illustrated in FIG. 18, an additional embodiment of the apparatus 260 of the present invention is disclosed. Apparatus 260 includes a securing piece 262, a horizontal foot 264 extending away from the securing piece 262 at one end of securing piece 264 and a mechanical clip 266 extending away from the securing piece 262. This embodiment also includes a gasket 270 is affixed to the foundation wall side of the securing piece 262 and is in communication with the foundation wall. Gasket 270 may be affixed to the foundation wall by an adhesive, glue or other fastening agents and/or may be secured by pressure exerted by the securing piece. Gasket 270 acts as a barrier for any gas that may try to escape into occupied living areas of the building from between the gas permeable layer, plastic sheeting, securing piece 262 and the foundation wall. Gasket 270 which may be constructed from a foam or other material that is flexible so as to conform to the surface of the foundation wall and also be able to be secured to the securing piece 262.

[0048] As illustrated in FIG. 19, In one aspect, a method 300 for vapor mitigation in the construction of a building is disclosed. The method includes utilizing a vapor mitigation apparatus 110, as set out above, having a vertical securing piece 114, a horizontal foot 116 located at one end of the securing piece 114 and extending away from the securing piece 114, and a mechanical clip 112 located at the second end of the securing piece 114 and is configured to secure a piece of plastic sheeting 106 thereto. The method includes affixing the vertical securing piece to the circumference of a foundation wall that surround a gas permeable layer such that the horizontal foot rests on the footing that supports the foundation wall (block 310). A piece of plastic sheeting is placed over the gas permeable layer (block 320). The edges of

the plastic sheeting are secured to the mechanical clip thereby creating a vapor barrier over the gas permeable layer (block 330). A slab of concrete is created by pouring a sufficient amount of concrete over the vapor mitigation apparatus 100 and plastic sheeting 106 (block 340).

[0049] While preferred embodiments of the present inventive concept have been shown and disclosed herein, it will be obvious to those persons skilled in the art that such embodiments are presented by way of example only, and not as a limitation to the scope of the inventive concept. Variations, changes, and substitutions may occur or be suggested to those skilled in the art without departing from the intent, scope, and totality of this inventive concept. Such variations, changes, and substitutions may involve other features which are already known per se and which may be used instead of, in combination with, or in addition to features already disclosed herein. Accordingly, it is intended that this inventive concept be inclusive of such variations, changes, and substitutions, and by no means limited by the scope of the claims presented herein.

IN THE CLAIMS

I claim:

1. A vapor mitigation apparatus for use with the construction of a building, the building having a foundation wall, a footing and a slab, the apparatus comprising:

a vertical securing piece configured to be affixed to a foundation wall, the vertical securing piece having a first end located proximate to a footing and a second end;

a horizontal foot located at the first end of the securing piece and extending away from the securing piece; and

a mechanical clip located at the second end and configured to secure a piece of plastic sheeting.

2. The vapor mitigation apparatus of claim 1, further comprising:

an adhesion strip affixed to the vertical securing piece and configured to be affixed to a foundation wall.

3. The vapor mitigation apparatus of claim 1, wherein the horizontal foot is configured to rest upon a footing.

4. The vapor mitigation apparatus of claim 1, wherein the mechanical clip comprises:

a first jaw member; and

a second jaw member hinged to the first jaw member,

the first jaw member and second jaw member configured to secure the piece of plastic sheeting therebetween.

5. The vapor mitigation apparatus of claim 1, wherein the mechanical clip comprises:

a base member extending substantially horizontally away from securing piece, base member having a distal end, the base member having a locking portion at the distal end; and

a retention member configured to be depressed against the locking portion, the retention member and locking portion configured to secure the piece of plastic sheeting therebetween.

6. The vapor mitigation apparatus of claim 1, further comprising a gasket affixed to the vertical securing piece and configured to be affixed to the foundation wall.

7. A vapor mitigation apparatus for use with the construction of a building, the building having a foundation wall and footing, the apparatus comprising:

a vertical securing piece configured to be affixed to a foundation wall, the vertical securing piece having a first end located proximate to a footing and a second end;

a horizontal foot located at the first end of the securing piece and extending away from the securing piece, the horizontal foot is configured to rest upon a footing;

an adhesion strip affixed to the vertical securing piece and configured to be affixed to a foundation wall;

a gasket affixed to the vertical securing piece and configured to be affixed to the foundation wall; and

a mechanical clip located at the second end and configured to secure a piece of plastic sheeting.

8. The vapor mitigation apparatus of claim 7, wherein the mechanical clip comprises:

a first jaw member; and

a second jaw member hinged to the first jaw member,

the first jaw member and second jaw member configured to secure the piece of plastic sheeting therebetween.

9. The vapor mitigation apparatus of claim 7, wherein the mechanical clip comprises:

a base member extending substantially horizontally away from securing piece, base member having a distal end, the base member having a locking portion at the distal end; and

a retention member configured to be depressed against the locking portion, the retention member and locking portion configured to secure the piece of plastic sheeting therebetween.

10. A method for vapor mitigation in the construction of a building, the building having a foundation wall and footing, the foundation wall and footing having a circumference that surrounds a gas permeable layer, and utilizing a vapor mitigation apparatus having a vertical securing piece having a first end located and a second end, a horizontal foot located at the first end of the securing piece and extending away from the securing piece, and a mechanical clip located at the second end and configured to secure a piece of plastic sheeting, the method comprising:

affixing the vertical securing piece to the circumference of the foundation wall such that the horizontal foot rest on the footing;

placing a piece of plastic sheeting over the gas permeable layer;

securing the ends of piece of plastic sheeting to mechanical clip thereby creating a vapor barrier over the gas permeable layer; and

creating a slab of concrete by pouring a sufficient amount of concrete over the vapor mitigation apparatus and plastic sheeting to encase the vapor mitigation apparatus and cover the plastic sheeting

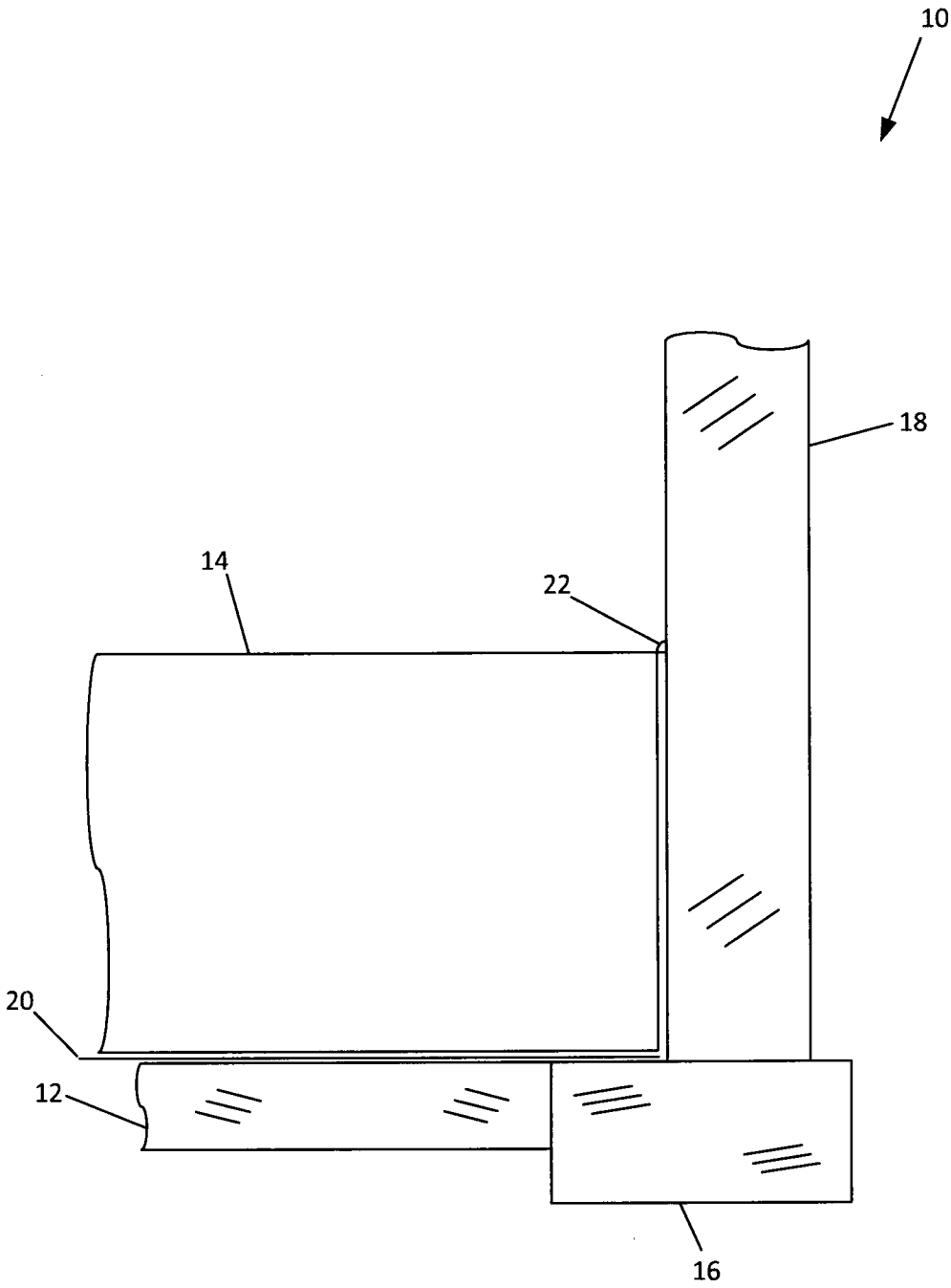


FIG. 1 – PRIOR ART

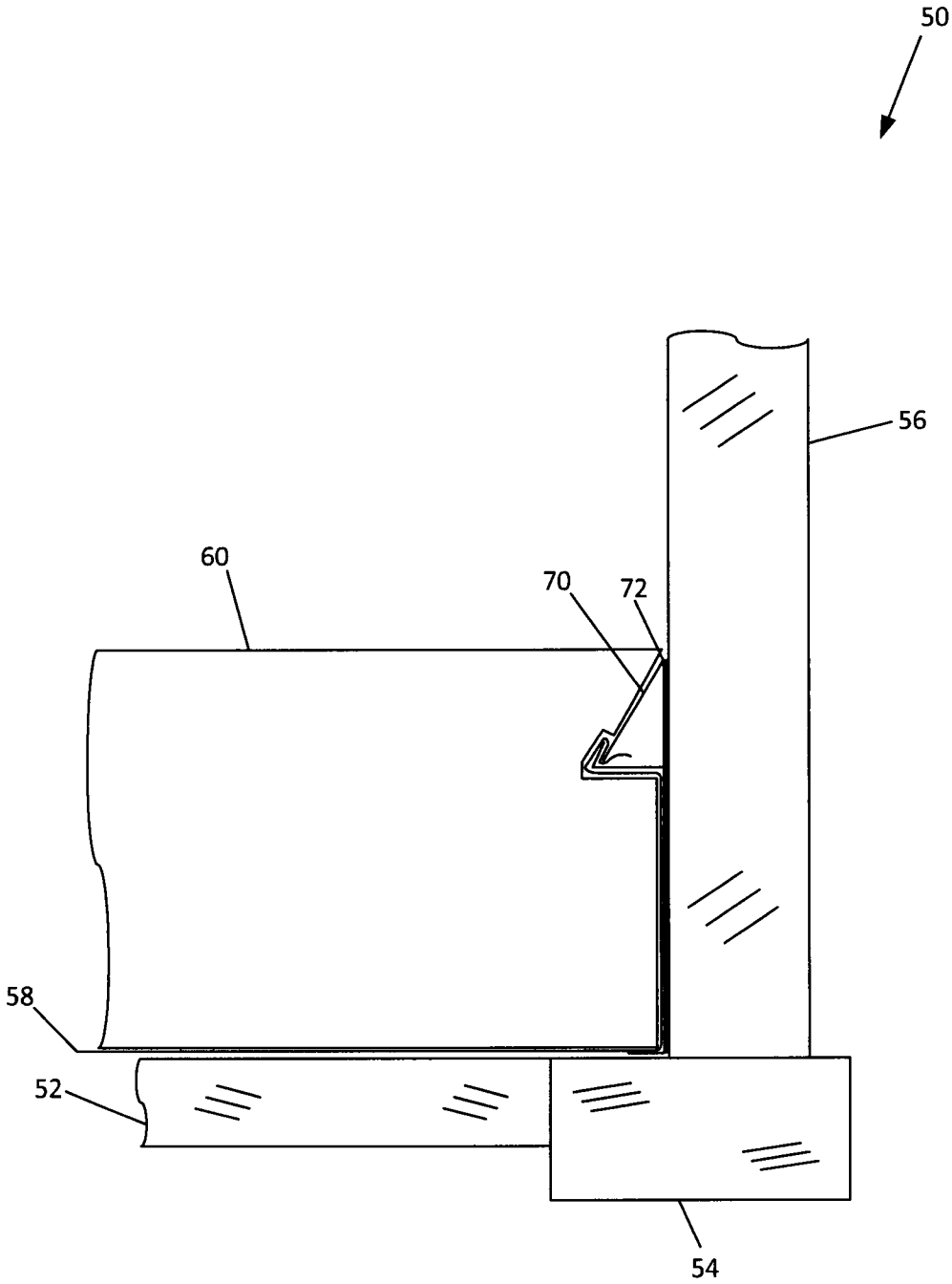


FIG. 2

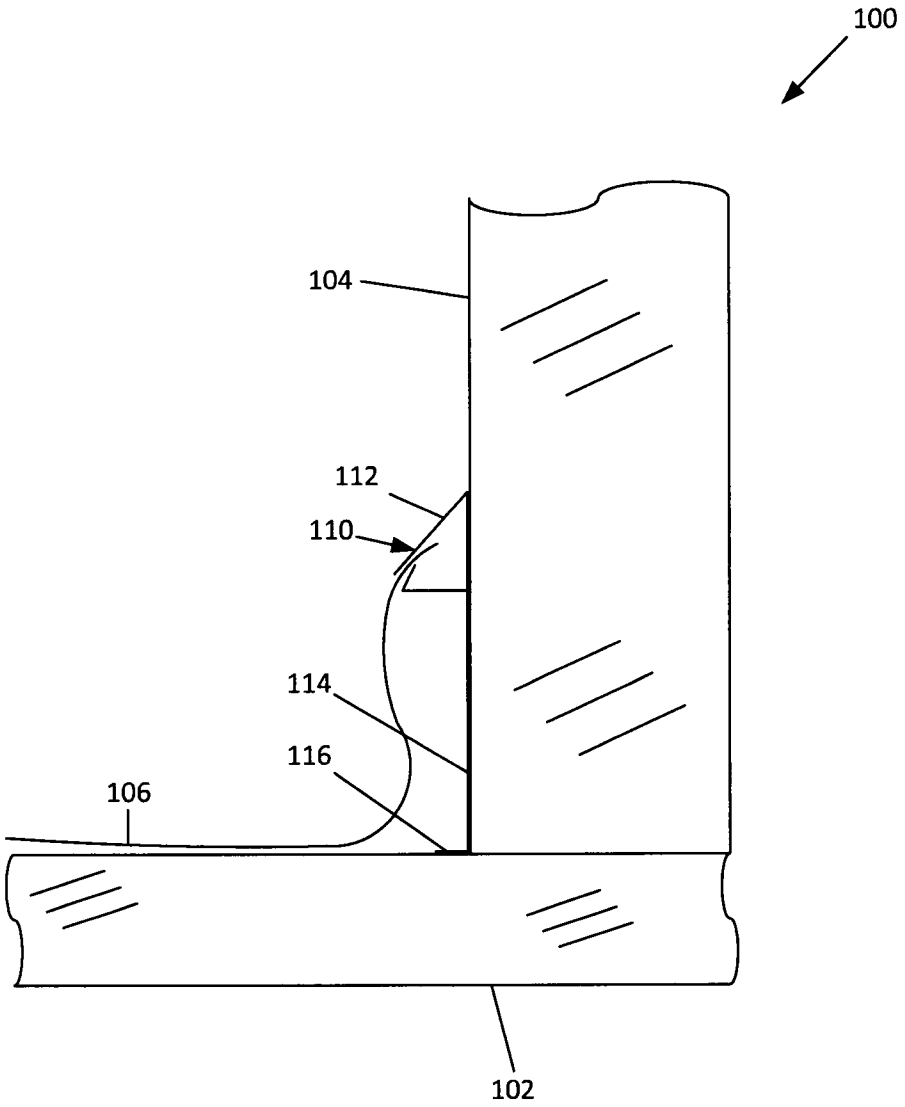


FIG. 3

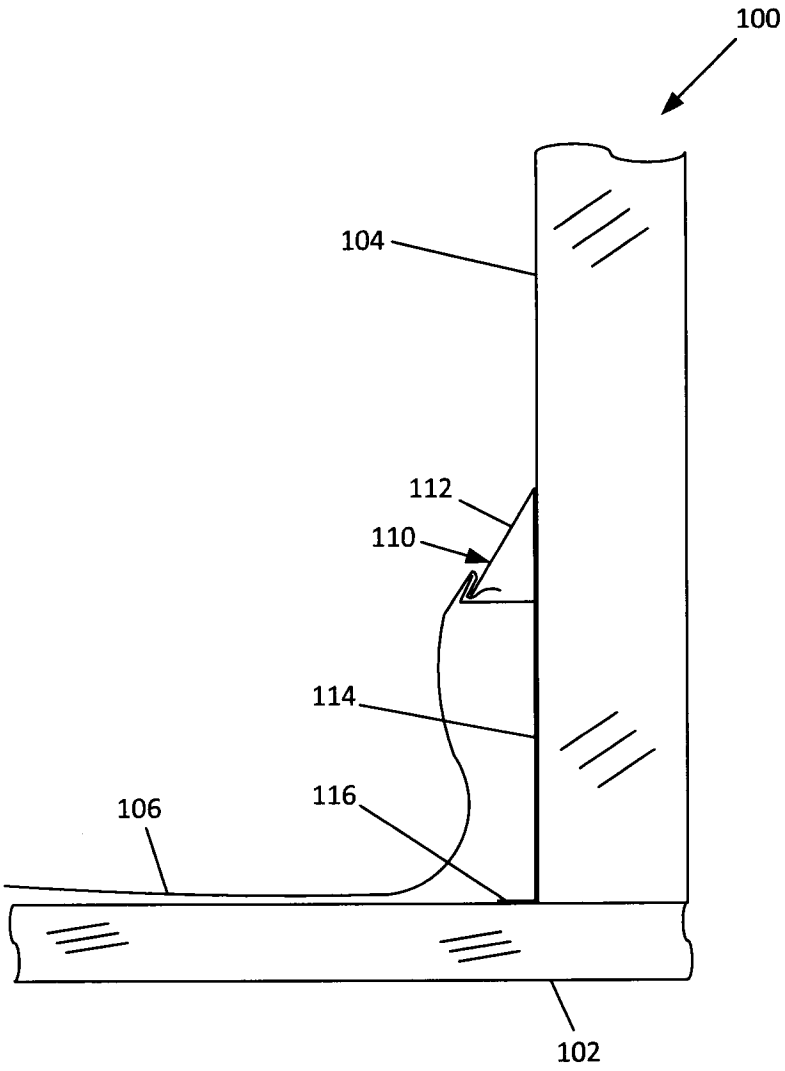


FIG. 4

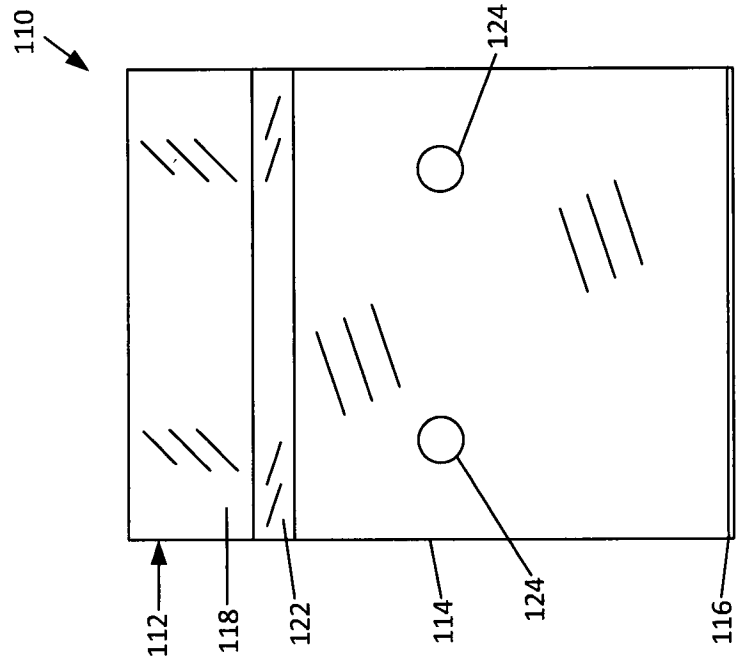


FIG. 7

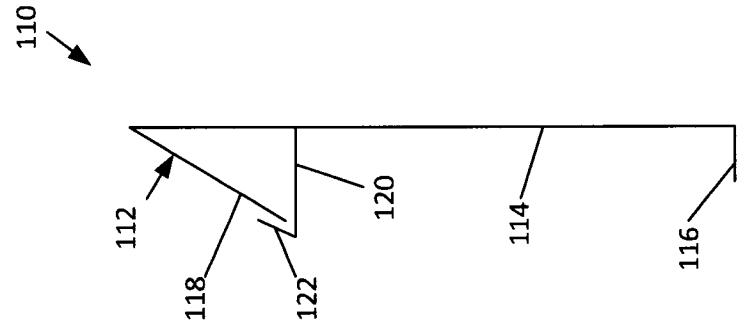


FIG. 6

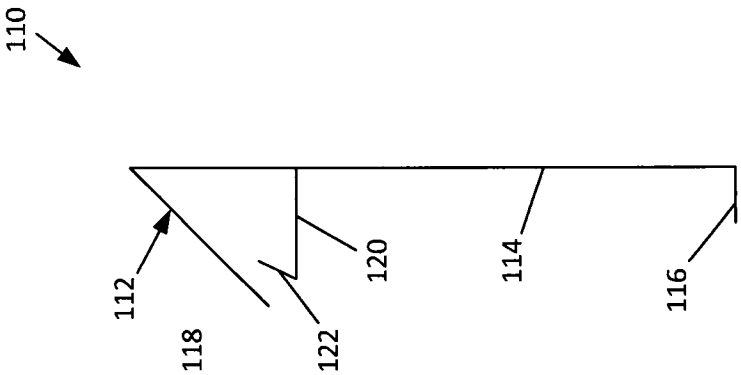


FIG. 5

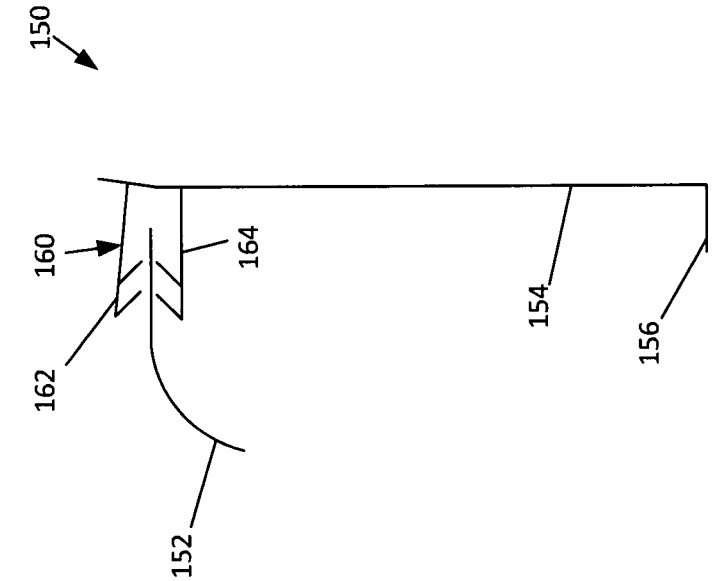


FIG. 9

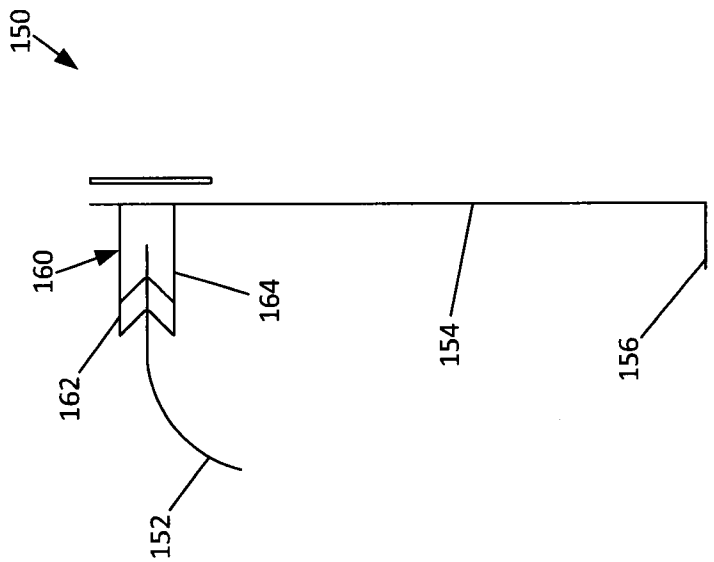


FIG. 8

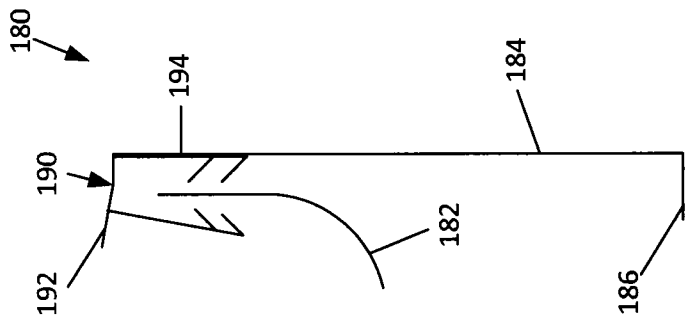


FIG. 11

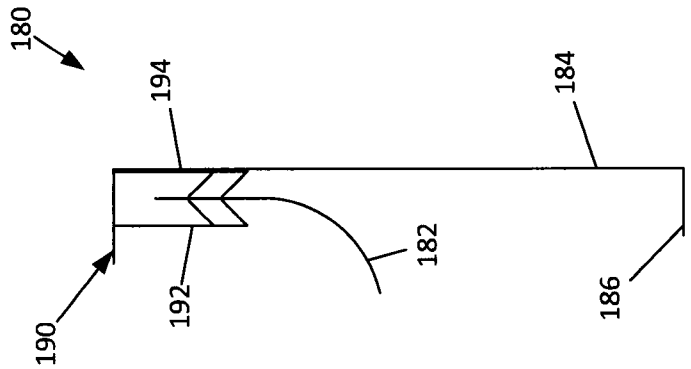


FIG. 10

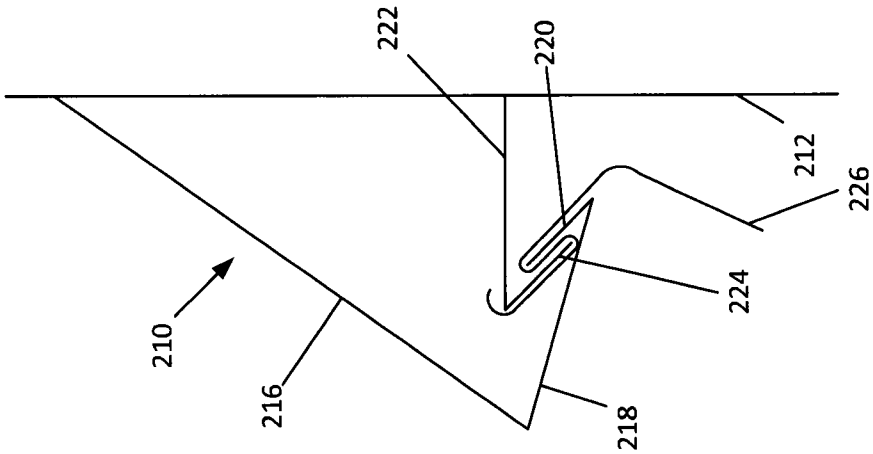


FIG. 14

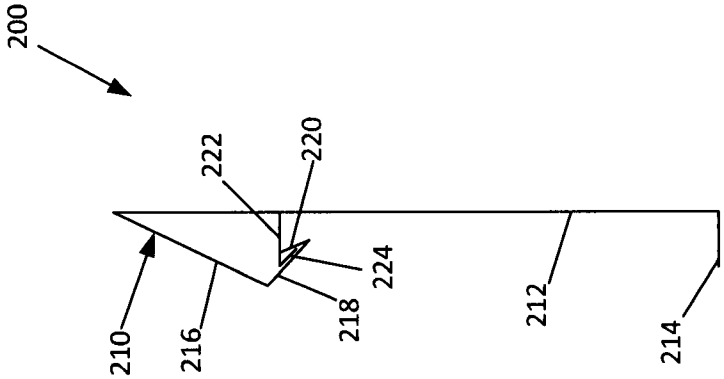


FIG. 13

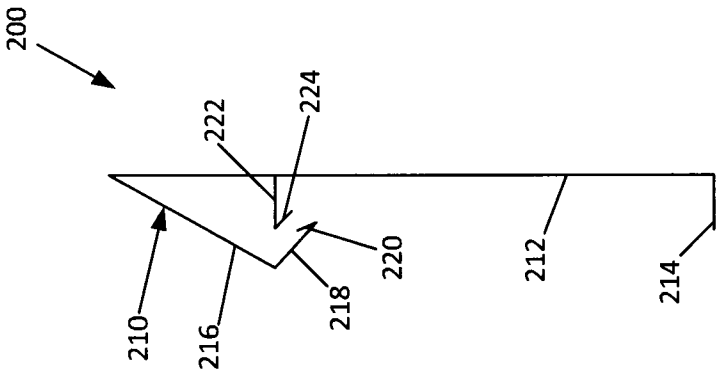


FIG. 12

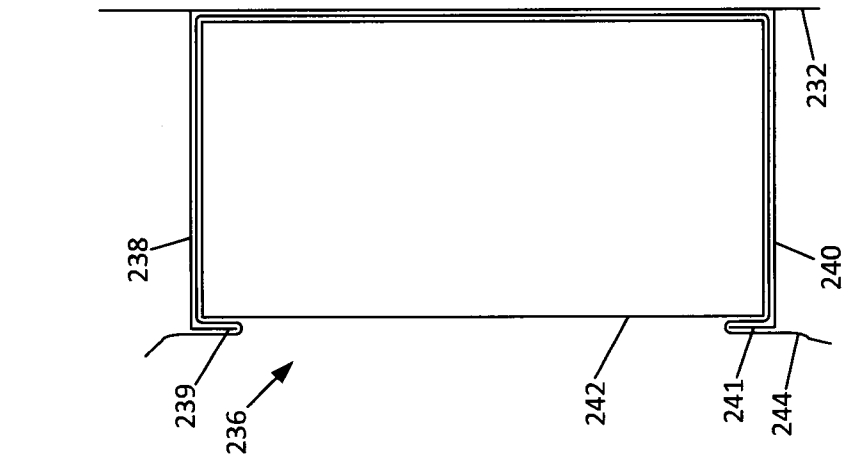


FIG. 17

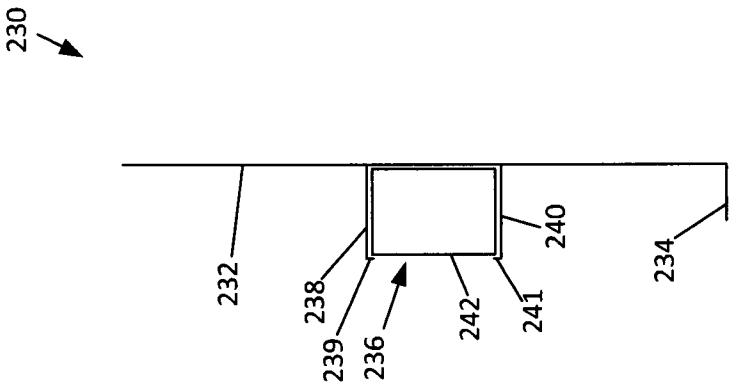


FIG. 16

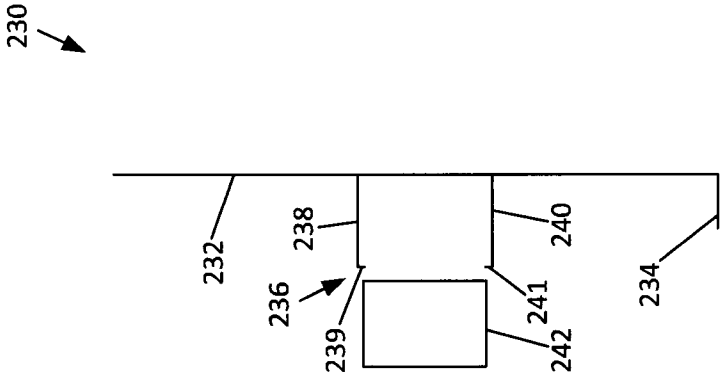


FIG. 15

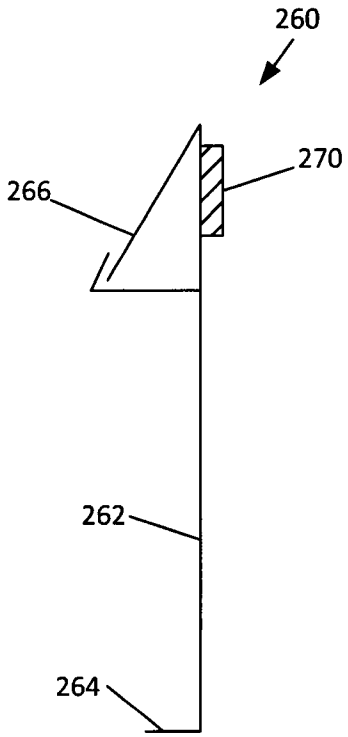


FIG. 18

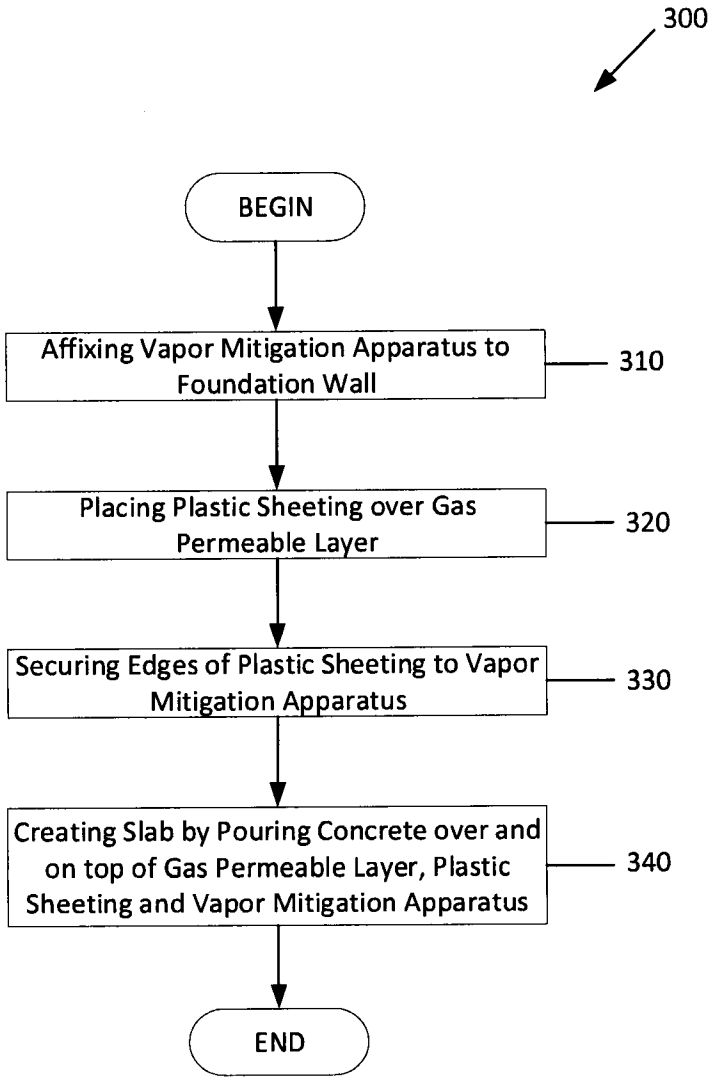

300
BEGIN
Affixing Vapor Mitigation Apparatus to Foundation Wall
310
Placing Plastic Sheeting over Gas Permeable Layer
320
Securing Edges of Plastic Sheeting to Vapor Mitigation Apparatus
330
Creating Slab by Pouring Concrete over and on top of Gas Permeable Layer, Plastic Sheeting and Vapor Mitigation Apparatus
340
END

FIG. 19

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2020/050242

A. CLASSIFICATION OF SUBJECT MATTER
IPC: ***E04B 1/66*** (2006.01) , ***E04B 1/62*** (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC: E04B 1/66 (2006.01) , E04B 1/62 (2006.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used)
Databases: Questel-Orbit, Espacenet
Keywords: Building, structure, floor, foundation, slab, footing, edge, wall, membrane, sheet, barrier, vapour, gas, moisture, radon, attach, clip, fasten, secure.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US7735271 B1 (SHIPSTON, L. et al.) 15 June 2010 (15-06-2010) *the whole document*	1-10
A	DE2043467 A1 (MAUERSBERGER, K.) 09 March 1972 (09-03-1972) *the whole document*	1-10
A	EP1403440 A1 (WEBER, J.) 31 March 2004 (31-03-2004) *the whole document*	1-10
A	EP0583858 A1 (HORN, W.) 23 February 1994 (23-02-1994) *the whole document*	1-10
A	DE9320264 U1 (HORN, W.) 28 April 1994 (28-04-1994) *the whole document*	1-10

☑ Further documents are listed in the continuation of Box C.

☑ See patent family annex.

*	Special categories of cited documents:
"A"	document defining the general state of the art which is not considered to be of particular relevance
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"O"	document referring to an oral disclosure, use, exhibition or other means
"P"	document published prior to the international filing date but later than the priority date claimed
"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&"	document member of the same patent family

Date of the actual completion of the international search
12 March 2020 (12-03-2020)

Date of mailing of the international search report
21 May 2020 (21-05-2020)

Name and mailing address of the ISA/CA
Canadian Intellectual Property Office
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US8720145 B2 (MARSHALL, III, H.) 13 May 2014 (13-05-2014) *the whole document*	1-10
A	GB2236127 A (SHILLABEER, J.) 27 March 1991 (27-03-1991) *the whole document*	1-10
A	DE29605031 U1 (HORN, W.) 23 May 1996 (23-05-1996) *the whole document*	1-10
A	DE29500184 U1 (HORN, W.) 09 March 1995 (09-03-1995) *the whole document*	1-10

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CA2020/050242

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		DE4325953A1	02 February 1995 (02-02-1995)
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US8720145B2	13 May 2014 (13-05-2014)	US2013125481A1	23 May 2013 (23-05-2013)
GB2236127A	27 March 1991 (27-03-1991)	GB9006518D0	23 May 1990 (23-05-1990)
		GB2236127B	10 February 1993 (10-02-1993)
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DE29500184U1	09 March 1995 (09-03-1995)	ATA3696A	15 October 1998 (15-10-1998)
		AT405199B	25 June 1999 (25-06-1999)
		DE19601956A1	11 July 1996 (11-07-1996)