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(54) **CASING ASSEMBLY SUITABLE FOR USE IN A HEAT EXCHANGE ASSEMBLY**

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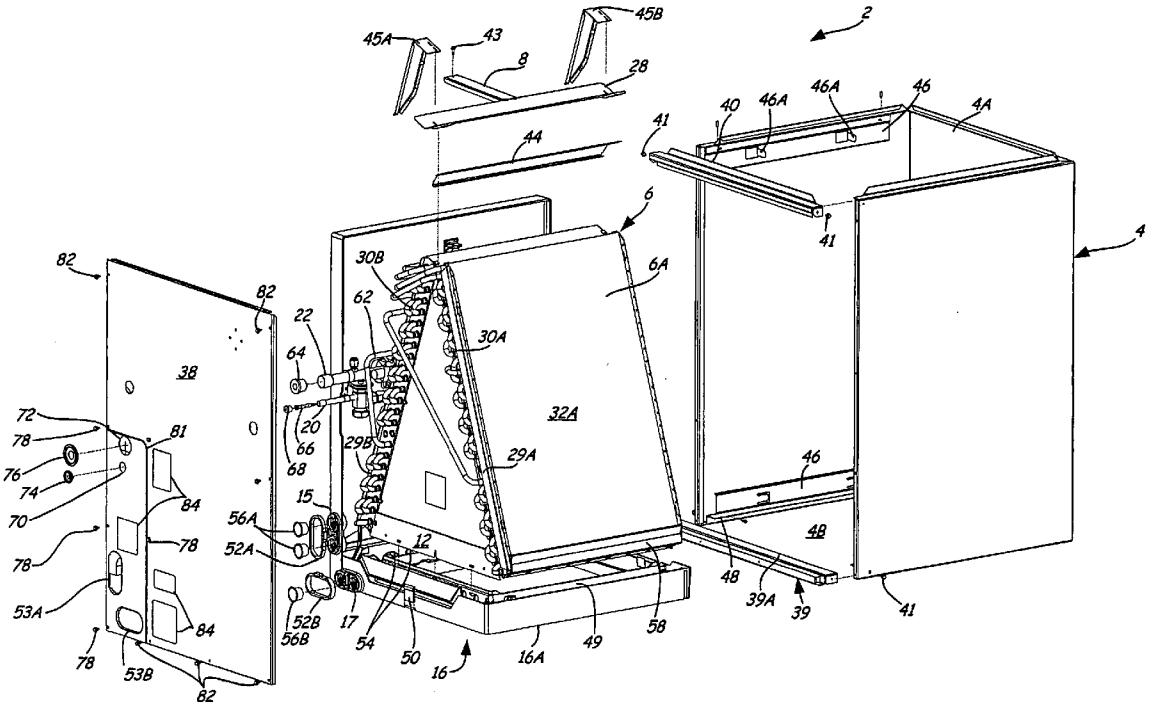
(57) **ABSTRACT**

A casing assembly suitable for use in a heat exchange assembly comprises a first panel including a first bottom portion, a second panel including a second bottom portion, and a third panel including a third bottom portion. The second bottom portion is interlocked with the first and third bottom portions.



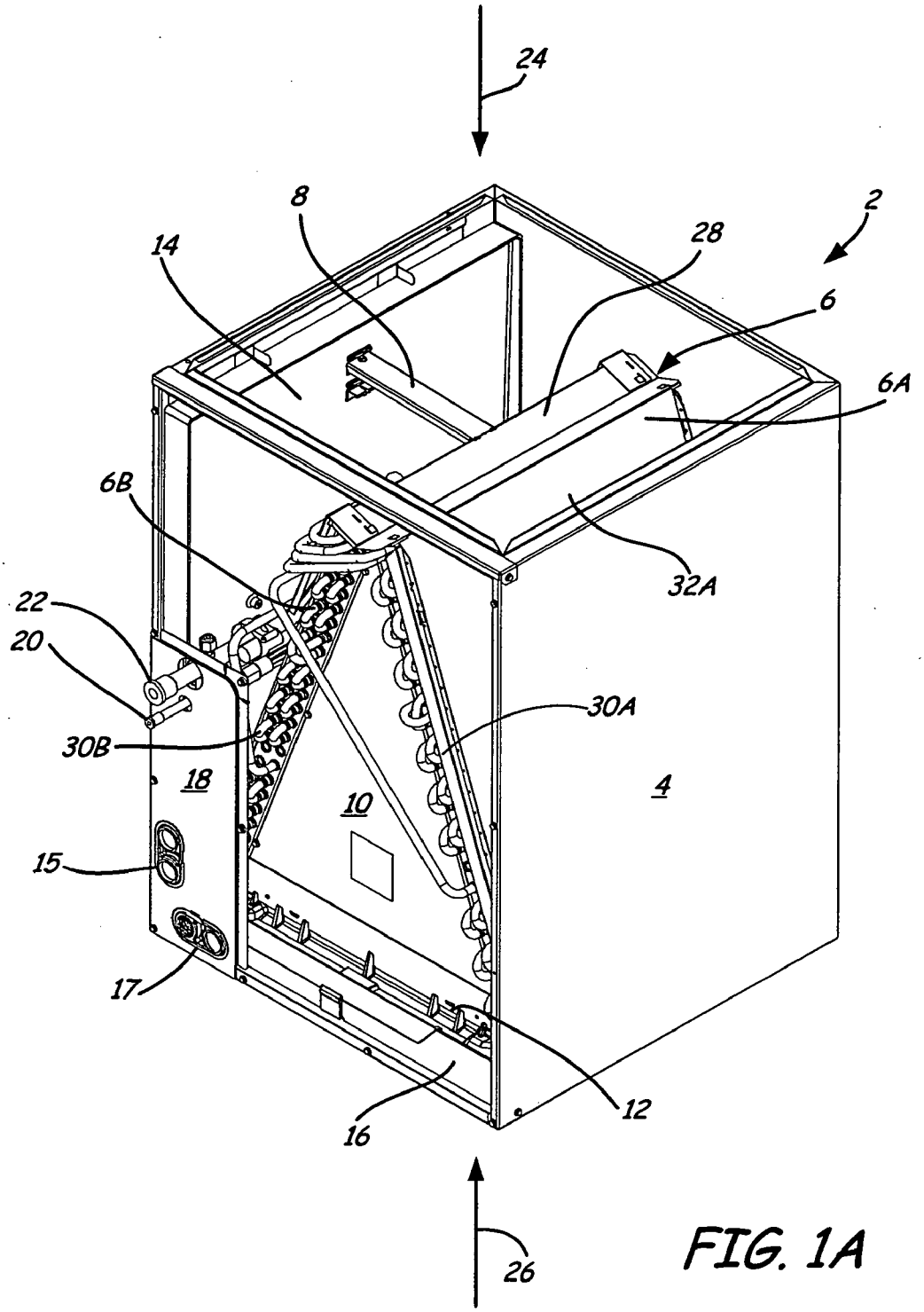


FIG. 1A

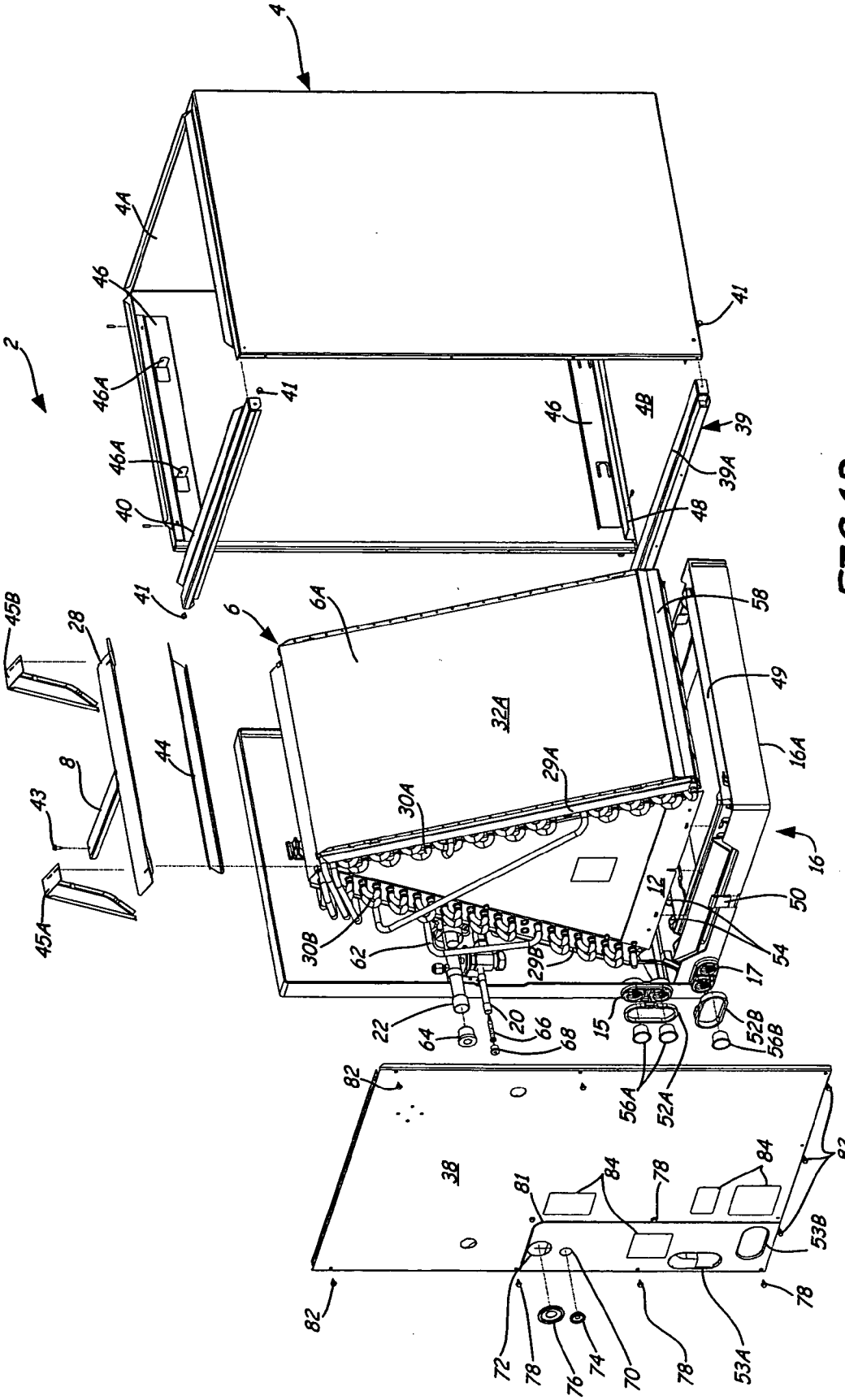

4
4A
46
41
2
46A
41
46
48
39
39A
40
48
41
6
6A
58
45B
28
49
32A
44
8
29A
16A
30A
43
16
12
50
45A
30B
62
29B
54
17
22
64
20
66
68
15
52B
56B
82
56A
52A
38
81
84
78
84
82
538
82
72
78
76
74
70
78
53A
78

FIG.1B

FIG. 2A

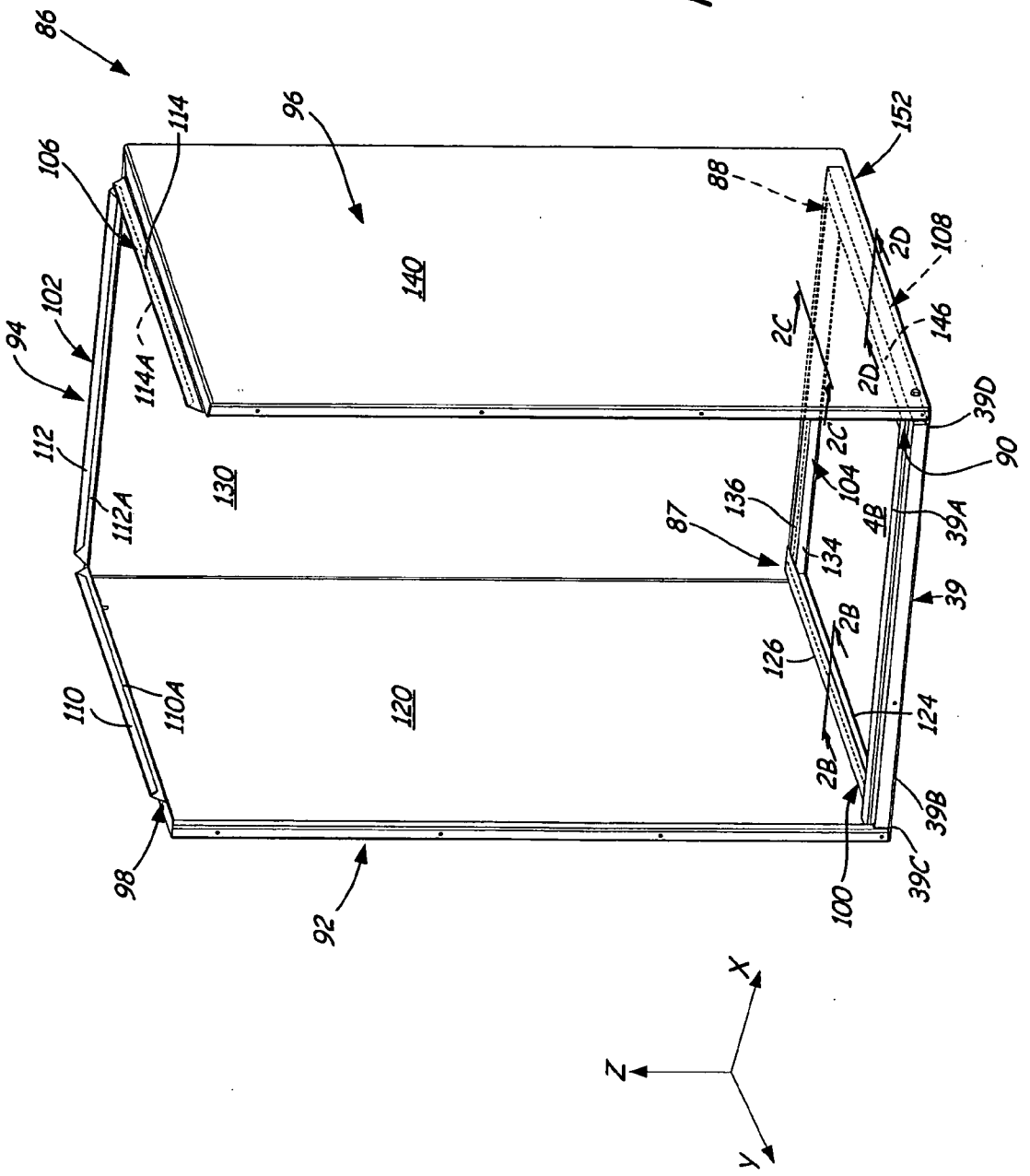

86
114
96
152
106
88
108
2D
102
140
146
94
2C
114A
2D
39D
112
2C
90
130
104
136
112A
48
39A
87
134
39
2B
126
110
110A
120
124
28
39B
98
92
100
39C
X
Z
Y

FIG. 2B

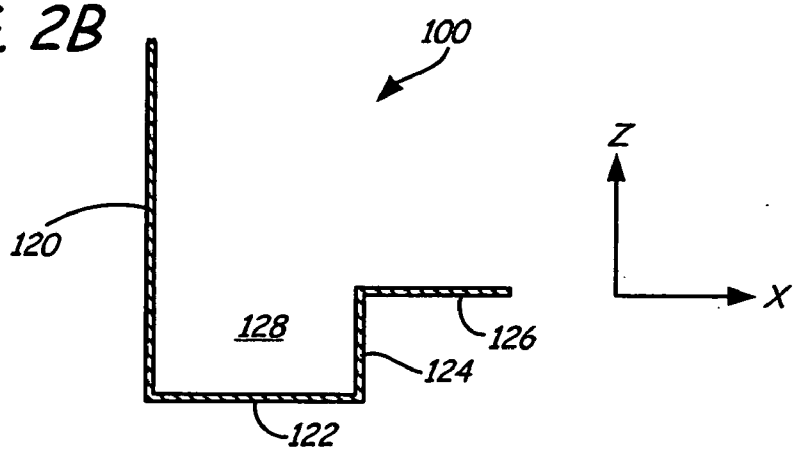


FIG. 2C

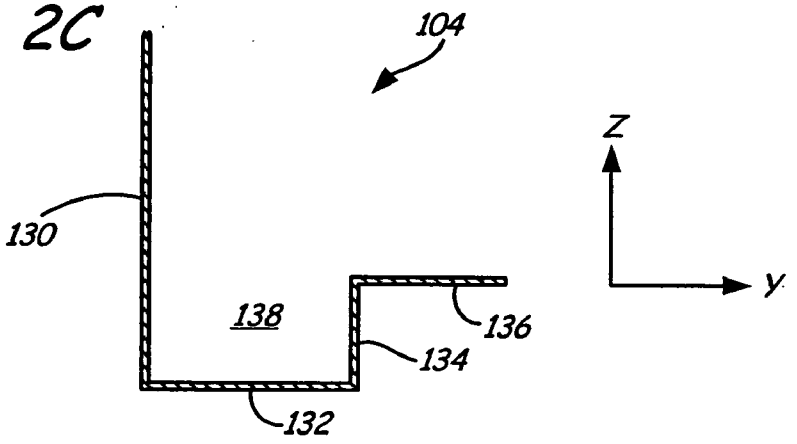
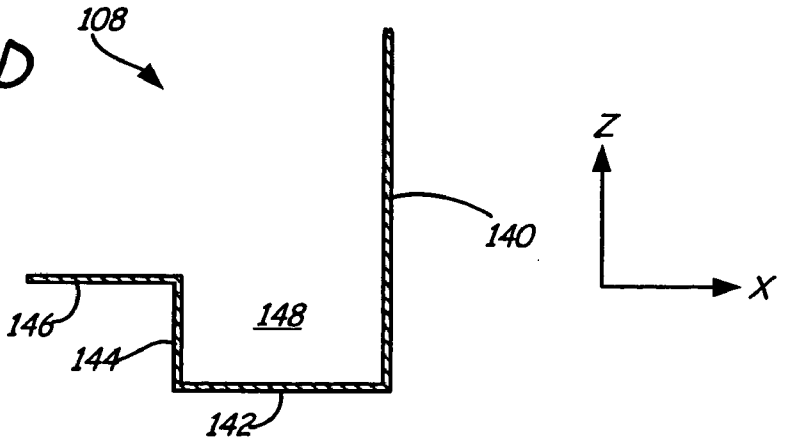


FIG. 2D



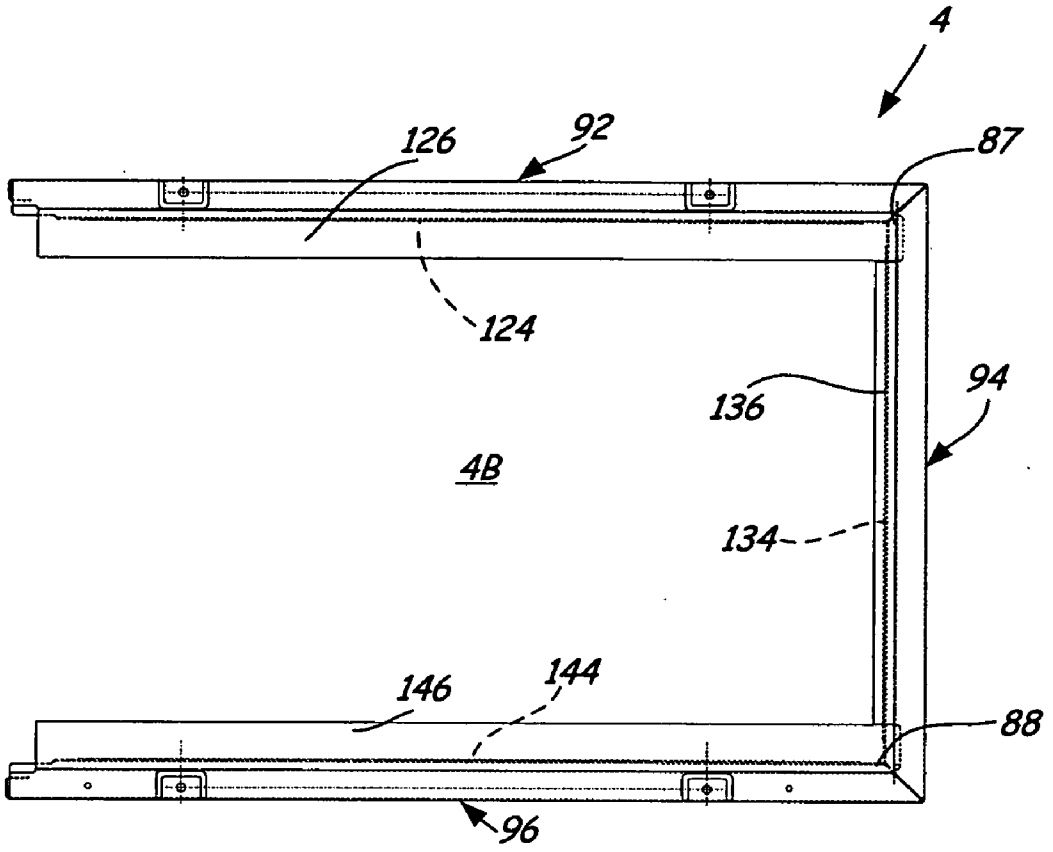


FIG. 3

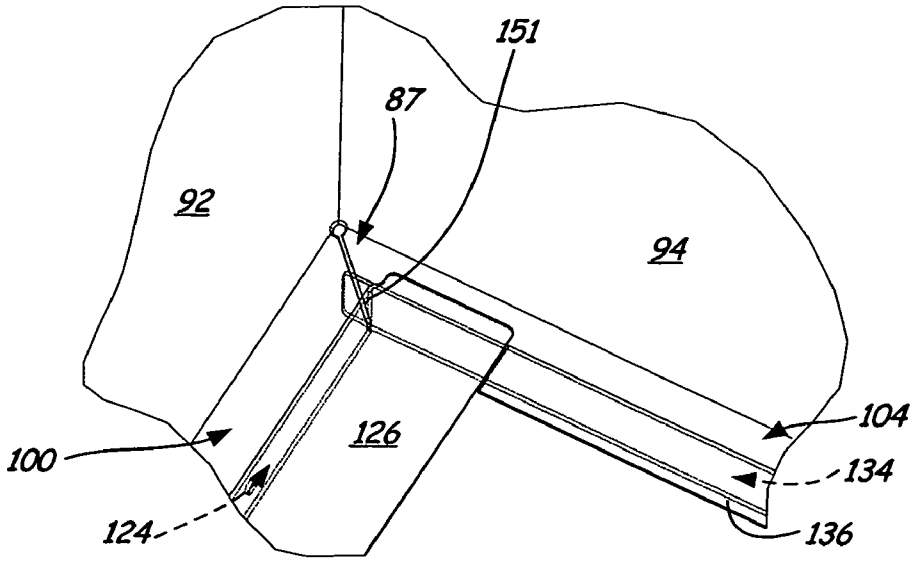
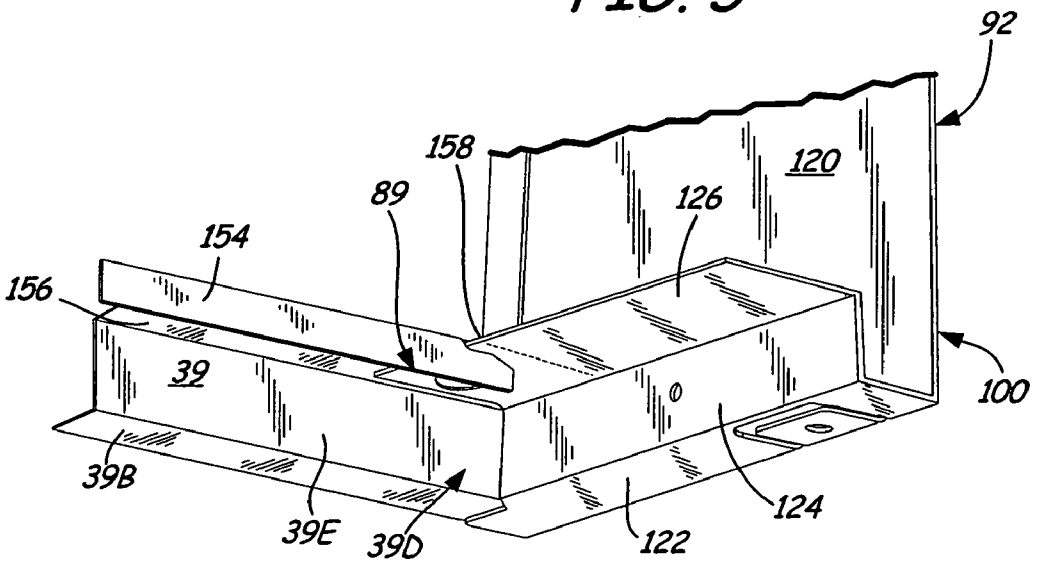

151
87
92
94
104
126
100
134
124
136

FIG. 4

FIG. 5


92
158
120
89
126
154
156
39
100
39B
39E
39D
122
124

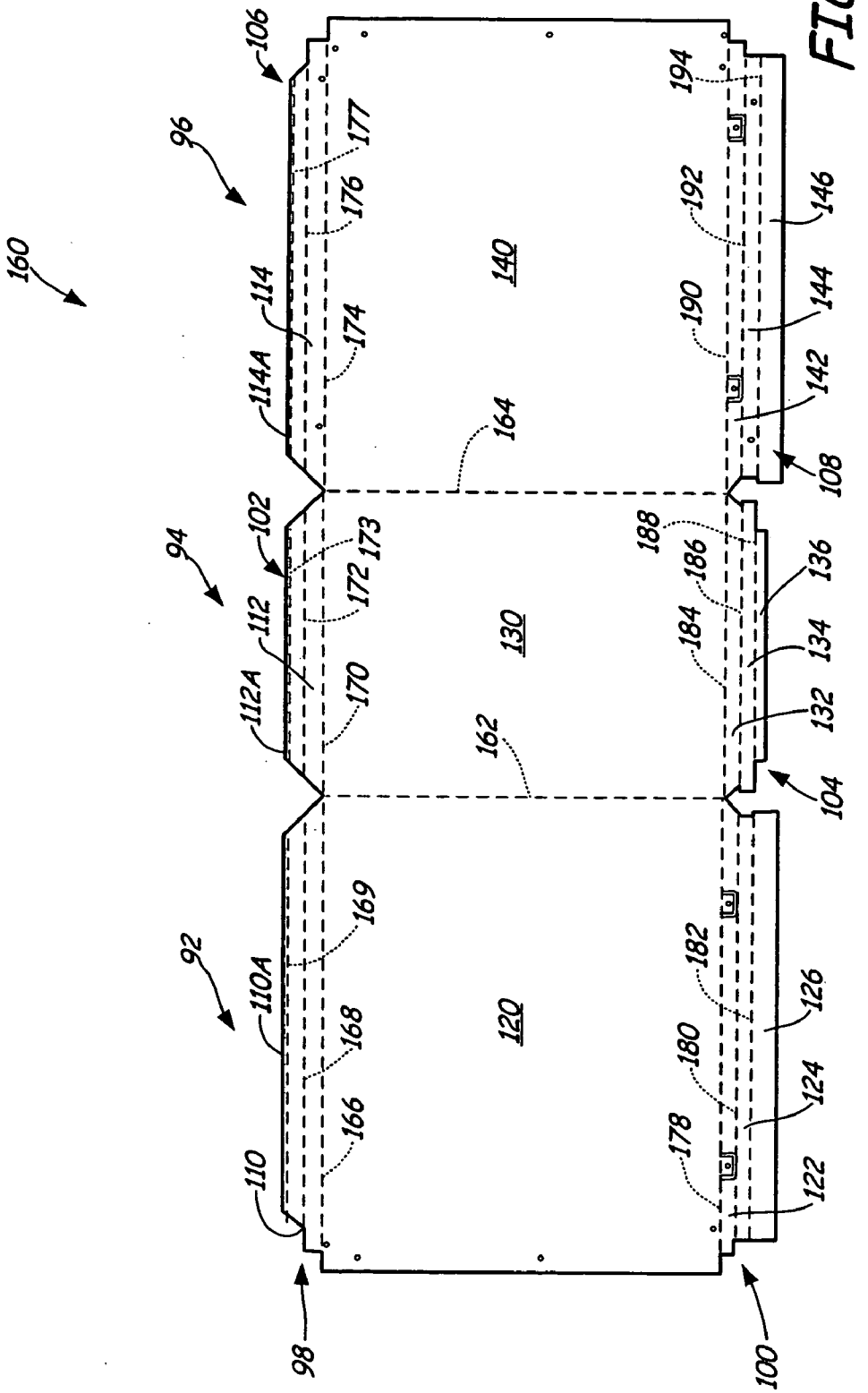

160
96
106
177
176
114
174
114A
140
164
194
192
146
190
144
142
108
94
102
173
172
112
112A
170
130
162
188
186
136
184
134
132
104
92
110A
169
168
166
110
120
182
126
180
124
178
122
98
100

FIG. 6

CASING ASSEMBLY SUITABLE FOR USE IN A HEAT EXCHANGE ASSEMBLY

CROSS-REFERENCE TO RELATED APPLICATION(S)

[0001] The following application is filed on the same day as the following co-pending applications: "METHOD AND SYSTEM FOR HORIZONTAL COIL CONDENSATE DISPOSAL" by inventors Arturo Rios, Floyd J. Frenia, Jason Michael Thomas, Michael V. Hubbard, and Thomas K. Rembold (attorney docket number U75.12-003); "CONDENSATE PAN INSERT" by inventors Jason Michael Thomas, Floyd J. Frenia, Thomas K. Rembold, Arturo Rios, Michael V. Hubbard, and Dale R. Bennett (attorney docket number U75.12-005); "METHOD AND SYSTEM FOR VERTICAL COIL CONDENSATE DISPOSAL" by inventors Thomas K. Rembold, Arturo Rios, Jason Michael Thomas, and Michael V. Hubbard (attorney docket number U75.12-006); "CASING ASSEMBLY SUITABLE FOR USE IN A HEAT EXCHANGE ASSEMBLY" by inventors Arturo Rios, Thomas K. Rembold, Jason Michael Thomas, Stephen R. Carlisle, and Floyd J. Frenia (attorney docket number U75.12-007); "LOW-SWEAT CONDENSATE PAN" by inventors Arturo Rios, Floyd J. Frenia, Thomas K. Rembold, Michael V. Hubbard, and Jason Michael Thomas (attorney docket number U75.12-008); "CONDENSATE PAN INTERNAL CORNER DESIGN" by inventor Arturo Rios (attorney docket number U75.12-009); "VERTICAL CONDENSATE PAN WITH NON-MODIFYING SLOPE ATTACHMENT TO HORIZONTAL PAN FOR MULTI-POISE FURNACE COILS" by inventor Arturo Rios (attorney docket number U75.12-010); "CONDENSATE SHIELD WITH FASTENER-FREE ATTACHMENT FOR MULTI-POISE FURNACE COILS" by inventor Arturo Rios (attorney docket number U75.12-011); and "SPLASH GUARD WITH FASTENER-FREE ATTACHMENT FOR MULTI-POISE FURNACE COILS" by inventor Arturo Rios (attorney docket number U75.12-012), which are incorporated herein by reference.

BACKGROUND

[0002] The present invention relates to a casing assembly. More particularly, the present invention relates to a casing assembly suitable for use in a heat exchange assembly.

[0003] In a conventional refrigerant cycle, a compressor compresses a refrigerant and delivers the compressed refrigerant to a downstream condenser. From the condenser, the refrigerant passes through an expansion device, and subsequently, to an evaporator. The refrigerant from the evaporator is returned to the compressor. In a split system heating and/or cooling system, the condenser may be known as an outdoor heat exchanger and the evaporator as an indoor heat exchanger, when the system operates in a cooling mode. In a heating mode, their functions are reversed.

[0004] In the split system, the evaporator is typically a part of an evaporator assembly coupled with a furnace. However, some cooling systems are capable of operating independent of a furnace. A typical evaporator assembly includes an evaporator coil (e.g., a coil shaped like an "A", which is referred to as an "A-frame coil") and a condensate pan disposed within a casing. An A-frame coil is typically referred to as a "multi-poise" coil because it may be oriented either horizontally or vertically in the evaporator assembly.

[0005] During a cooling mode operation, a furnace blower circulates air into the casing of the evaporator coil assembly, where the air cools as it passes over the evaporator coil. The blower then circulates the air to a space to be cooled. Depending on the particular application, an evaporator assembly including a vertically oriented A-frame coil may be an up flow or a down flow arrangement. In an up flow arrangement, air is circulated upwards, from beneath the evaporator coil assembly, whereas in a down flow arrangement, air is circulated downward, from above the evaporator coil assembly.

[0006] Refrigerant is enclosed in piping that is used to form the evaporator coil. If the temperature of the evaporator coil surface is lower than the dew point of air passing over it, the evaporator coil removes moisture from the air. Specifically, as air passes over the evaporator coil, water vapor condenses on the evaporator coil. The condensate pan of the evaporator assembly collects the condensed water as it drips off of the evaporator coil. The collected condensation then typically drains out of the condensate pan through a drain hole in the condensate pan.

BRIEF SUMMARY

[0007] The present invention is a casing assembly suitable for use in a heat exchange assembly. The casing assembly includes a casing, which includes at least one interlocking interior corner. The interlocking corner strengthens the casing and helps maintain the integrity of the casing.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. **1**A is a perspective view of an evaporator assembly, which includes an evaporator coil and condensate pan disposed within a casing.

[0009] FIG. **1**B is an exploded perspective view of the evaporator assembly of FIG. **1**A.

[0010] FIG. **2**A is a perspective view of a casing assembly, which includes a casing and a front deck.

[0011] FIG. **2**B is a cross-sectional view of a left bottom portion of the casing of FIG. **2**A.

[0012] FIG. **2**C is a cross-sectional view of a rear bottom portion of the casing of FIG. **2**A.

[0013] FIG. **2**D is a cross-sectional view of a right bottom portion of the casing of FIG. **2**A.

[0014] FIG. **3** is a bottom view of the casing of FIG. **2**A, illustrating a flange configured to receive a vertical condensate pan.

[0015] FIG. **4** is a partial perspective view of an interlocking design between a left inner surface of the left bottom portion and a rear inner surface of the rear bottom portion of the casing of FIG. **2**A.

[0016] FIG. **5** is a partial perspective view of an interlocking design between a right end of the front deck and a left flange of the left bottom portion of the casing assembly of FIG. **2**A.

[0017] FIG. **6** is a plan view of a sheet of material that is used to form the casing of FIG. **2**A.

DETAILED DESCRIPTION

[0018] FIG. **1**A is a perspective view of evaporator assembly **2**, which includes casing **4** in accordance with the present invention, A-frame evaporator coil ("coil") **6**, coil brace **8**, first delta plate **10**, second delta plate **12**, horizontal condensate pan **14**, drain holes **15**, vertical condensate pan **16**, drain holes **17**, first cover **18**, input refrigerant line **20**, and output refrigerant line **22**. When evaporator assembly **2** is integrated into a heating and/or cooling system, evaporator assembly **2** is typically mounted above an air handler. The air handler includes a blower that cycles air through evaporator assembly **2**. In a down flow application, the blower circulates air in a downward direction (indicated by arrow **24**) through casing **4** and over coil **6**. In an up flow application, the blower circulates air in an upward direction (indicated by arrow **26**) through casing **4**.

[0019] Coil **6**, condensate pan **14**, and condensate pan **16** are disposed within casing **4**, which is preferably a substantially airtight space for receiving and cooling air. That is, casing **4** is preferably substantially airtight except for openings **4**A and **4**B (shown in FIG. **1**B). In a down flow application, air is introduced into evaporator assembly **2** through opening **4**A and exits through opening **4**B. In an up flow application, air is introduced into evaporator assembly **2** through opening **4**B and exits through opening **4**A. In the embodiment shown in FIGS. **1**A and **1**B, casing **4** is constructed of a single piece of sheet metal that is folded into a three-sided configuration, and may also be referred to as a "wrapper". In alternate embodiments, casing **4** may be any suitable shape and configuration and/or formed of multiple panels of material.

[0020] Coil **6** is a multi-poise A-frame coil, and may be oriented either horizontally or vertically. The vertical orientation is shown in FIGS. **1**A and **1**B. In a horizontal orientation, casing **4** is rotated 90° in a counterclockwise direction. Coil brace **8** is connected to air seal **28** and helps supports coil **6** when coil **6** is in its horizontal orientation.

[0021] Coil **6** includes first slab **6**A and second slab **6**B connected by air seal **28**. A gasket may be positioned between air seal **28** and first and second slabs **6**A and **6**B, respectively, to provide an interface between air seal and slabs **6**A and **6**B that is substantially impermeable to water. First and second delta plates **10** and **12**, respectively, are positioned between first and second slabs **6**A and **6**B, respectively. First slab **6**A includes multiple turns of piping **30**A with a series of thin, parallel plate fins **32**A mounted on piping **30**A. Similarly, second slab **6**B includes multiple turns of piping **30**B with a similar series of thin, parallel fins mounted on piping **30**B. Tube sheet **29**A is positioned at an edge of slab **6**A, and tube sheet **29**B is positioned at an edge of slab **6**B. Delta plates **10** and **12**, and air seal **28** may be attached to tube sheets **29**A and **29**B.

[0022] In the embodiment shown in FIG. **1**A, coil **6** is a two-row coil. However, in alternate embodiments, coil **6** may include any suitable number of rows, such as three, as known in the art. Refrigerant is cycled through piping **30**A and **30**B, which are in fluidic communication with one another (through piping system **62**, shown in FIG. **1**B). As FIG. **1**A illustrates, coil **6** includes input and output lines **20** and **22**, respectively, which are used to recycle refrigerant to and from a compressor (which is typically located in a separate unit from evaporator assembly **2**). Refrigerant input and output lines **20** and **22** extend through first cover **18**. Evaporator assembly **2** also includes access cover **38** (shown in FIG. **1**B) adjacent to first cover **18**, and together, first cover **18** and access cover **38** fully cover the front face of evaporator assembly **2** (i.e., the face which includes first cover **18**). Access cover **38** will be described in further detail in reference to FIG. **1**B.

[0023] As discussed in the Background section, if the temperature of coil **6** surface is lower than the dew point of the air moving across coil **6**, water vapor condenses on coil **6**. If coil **6** is horizontally oriented, condensation from coil **6** drips into condensate pan **14**, and drains out of condensate pan **14** through drain holes **15**, which are typically located at the bottom of condensate pan **14**. If coil **6** is vertically oriented, condensate pan **16** collects the condensed water from coil **6**, and drains the condensation through drain holes **17**, which are typically located at the bottom of condensate pan **16**.

[0024] Because evaporator assembly **2** includes horizontal condensate pan **14** and vertical condensate pan **16**, evaporator assembly **2** is configured for applications involving both a horizontal and vertical orientation of coil **6**. In an alternate embodiment, evaporator assembly **2** is modified to be applicable to only a vertical orientation of coil **6**, in which case horizontal condensate pan **14** and brace **8** are absent from evaporator assembly **2**. In another alternate embodiment, evaporator assembly **2** excludes vertical condensate pan **16** such that evaporator assembly **2** is only applicable to horizontal orientations of coil **6**.

[0025] FIG. **1**B is an exploded perspective view of evaporator assembly **2** of FIG. **1**A. Front deck **39** and upper angle **40** are each connected to casing **4** with screws **41**. Another suitable method of connecting front deck **39** and upper angle **40** to casing **4** may also be used, such as welding, an adhesive or rivets. Front deck **39** and upper angle **40** provide structural integrity for casing **4** and provide a means for connecting front cover **18** and access cover **38** to casing **4**. Screw **43** attaches brace **8** (and thereby, air seal **28**) to horizontal condensate pan **14**. Of course, other suitable means of attachment may be used in alternate embodiments. In addition to air seal **28**, air splitter **44** is positioned between first slab **6**A and second slab **6**B of coil **6** and is attached by tabs on tube sheets **29**A and **29**B of coil **6**.

[0026] Horizontal and vertical condensate pans **14** and **16** are typically formed of a plastic, such as polyester, but may also be formed of any material that may be casted, such as metal (e.g., aluminum). Horizontal condensate pan **14** slides into casing **4** and is secured in position by pan supports **46**. Tabs **46**A of pan supports **46** define a space for condensate pan **14** to slide into. When coil **6** is in a horizontal orientation (and casing **4** is rotated about 90° in a counterclockwise direction), coil **6** is positioned above horizontal condensate pan **14** so that condensation flows from coil **6** into horizontal condensate pan **14**. Air splitter **44** and splash guards **45**A and **45**B also help guide condensation from coil **6** into horizontal condensate pan **14**.

[0027] Condensation that accumulates in horizontal condensate pan **14** eventually drains out of horizontal condensate pan **14** through drain holes **15**. Gasket **52**A is positioned around drain holes **15** prior to positioning first cover **18** over drain holes **15** in order to help provide a substantially airtight seal between drain holes **15** and first cover **18**. First cover **18**

includes opening **53**A, which corresponds to and is configured to fit over drain holes **15** and gasket **52**A. The substantially airtight seal helps prevent air from escaping from casing **4**, and thereby increases the efficiency of evaporator assembly **2**. Caps **56**A may be positioned over one or more drain holes **15**, such as when evaporator assembly **2** is used in an application in which coil **6** is vertically oriented.

[**0028**] Vertical condensate pan **16** slides into casing **4** and is supported, at least in part, by flange **48**, which is formed by protruding sheet metal on three-sides of casing **4** and top surface **39**A of front deck **39**. Specifically, bottom surface **16**A of condensate pan **16** rests on flange **48** and top surface **39**A of front deck **39**. Condensate pan **16** includes outer perimeter **49**, insert **50**, drain holes **17** (which are sealed by gasket **52**B) and plurality of ribs **54**.

[**0029**] One or more channels are positioned about outer perimeter **49** of vertical condensate pan **16** for receiving condensation from coil **6**. In the vertical orientation of coil **6** illustrated in FIGS. **1**A and **1**B, coil **6** is positioned above vertical condensate pan **16** to allow condensation to flow along one slab **6**A or **6**B and eventually into one or more of the channels along outer perimeter **49** of vertical condensate pan **16**. In this way, condensation collects in condensate pan **16**. In some applications, such as when coil **6** is a three row coil, insert **50** is positioned in condensate pan **16** to help shield coil **6** from condensate blow off from condensate pan **16**.

[**0030**] Evaporator assembly **2** includes features, such as ribs **54** and shield **58**, that are configured to help direct condensation into the one or more channels along outer perimeter **49** of vertical condensate pan **16** (when coil **6** is vertically oriented). Shield **58** is attached to tube sheet **29**A and is configured to both guide condensation into a channel along outer perimeter **49** of condensate pan **16** and help protect coil **6** from condensation blow-off, which occurs when condensation that is collected in condensate pan **16** is blown into the air stream moving through evaporator assembly **2**. A similar shield is attached to tube sheet **29**B.

[**0031**] Condensation that accumulates in vertical condensate pan **16** eventually drains out of vertical condensate pan **16** through drain holes **17**. Gasket **52**B is positioned around drain holes **17** prior to positioning first cover **18** over drain holes **17** in order to help provide a substantially airtight seal between drain holes **17** and first cover **18**. First cover **18** includes opening **53**B, which corresponds to and is configured to fit over drain holes **17** and gasket **52**B. The airtight seal helps prevent air from escaping from casing **4**, and thereby increases the efficiency of evaporator assembly **2**. Cap **56**B may be positioned over one or more drain holes **17**.

[**0032**] Piping system **62** fluidically connects piping **30**A of first slab **6**A and piping **30**B of second slab **6**B. Refrigerant flows through piping **30**A and **30**B, and is recirculated from and to a compressor through inlet and outlet tubes **20** and **22**, respectively. Specifically, refrigerant is introduced into piping **30**A and **30**B through inlet **20** and exits piping **30**A and **30**B through outlet **22**. As known in the art, refrigerant inlet **20** includes rubber plug **64**, and refrigerant outlet **22** includes strainer **66** and rubber plug **68**. Inlet **20** protrudes through opening **70** in first cover **18** and outlet **22** protrudes through opening **72** in first cover **18**. By protruding through first cover **18** and out of casing **4**, inlet **20** and outlet **22** may be connected to refrigerant lines that are fed from and to the compressor, respectively. Gasket **74** is positioned around inlet **20** in order to provide a substantially airtight seal around opening **70**. Similarly, gasket **76** is positioned around outlet **22**.

[**0033**] First cover **18** is attached to casing **4** with screws **78**. However, in alternate embodiments, other means of attachment are used, such as welding, an adhesive, or rivets. Further covering a front face of evaporator assembly **2** is access cover **38**, which is abutted with first cover **18**. Again, in order to help increase the efficiency of evaporator assembly **2**, it is preferred that joint **81** between first cover **18** and access cover **38** is substantially airtight. A substantially airtight connection may be formed by, for example, placing a gasket at joint **81**.

[**0034**] Access cover **38** is attached to casing **4** with screws **82**. However, in alternate embodiments, any means of removably attaching access cover **38** to casing **4** are used. Access cover **38** is preferably removably attached in order to provide access to coil **6**, condensate pan **16**, and other components inside casing **4** for maintenance purposes. One or more labels **84**, such as warning labels, may be placed on first cover **18** and/or access cover **38**.

[**0035**] FIG. **2**A is a perspective view of casing assembly **86** in accordance with the present invention, which includes casing **4** and front deck **39**. Casing assembly **86** includes left internal rear corner **87**, right internal rear corner **88**, left internal front corner **89**, and right internal front corner **90**. Each corner **87**, **88**, **89**, and **90** includes an interlocking structure that increases the strength of casing assembly **86**, and increases the integrity of casing assembly **86**, such that casing assembly **86** is able to substantially withhold its shape during shipping and handling (e.g., installation). In each internal rear corner **87** and **88**, two surfaces intersect, and thereby interlock. In each internal front corner **89** and **90**, two surfaces mate together to interlock. The interlocking structure and design of each internal corner **87**, **88**, **89**, and **90** will be described in further detail in reference to FIGS. **4** and **5**.

[**0036**] Casing **4** includes left panel **92**, rear panel **94**, and right panel **96**. Left panel **92** of casing **4** includes left top portion **98** and left bottom portion **100**, while rear panel **94** of casing **4** includes rear top portion **102** and rear bottom portion **104**, and right panel **96** of casing **4** includes right top portion **106** and right bottom portion **108**. Left top portion **98** includes left lip **110**, which is folded inward (toward opening **4**B of casing **4**) in order to tuck away edge **110**A of left lip **110**, which may be sharp. As previously discussed, in one embodiment, casing **4** is formed of sheet metal, which may form a sharp edge when cut. If edge **110**A of left lip **110** is sharp, certain problems may be presented. For example, if coil **6** (shown in FIGS. **1**A and **1**B) comes into contact with left lip **110**, such as during manufacture of evaporator assembly **2**, a sharp edge **110**A may damage coil **6**.

[**0037**] Rear top portion **102** includes rear lip **112**, and right top portion **106** includes right lip **114**. Just as with left lip **110**, rear lip **112** and right lip **114** are folded inward in order to help minimize potentially sharp edges **112**A and **114**A (shown in phantom), respectively. In an alternate embodiment, each lip **110**, **112**, and **114** folds outward, such that edges **110**A, **112**A, and **114**A, respectively, point away from opening **4**B of casing **4**. In yet another alternate embodiment, each lip **110**, **112**, and **114** includes multiple folds.

[0038] FIG. 2B is a cross-section of left bottom portion 100 of left panel 92 of casing 4 taken along line 2B-2B in FIG. 2A. Left bottom portion 100 is comprised of four generally planar surfaces: left outer surface 120, left bottom surface 122, left inner surface 124, and left flange 126. Left outer surface 120 and left inner surface 124 extend in a z-axis direction and left bottom surface 122 and left flange 126 extend in an x-axis direction. Outer, bottom, and inner surfaces 120, 122, and 124, respectively, define a channel 128. Casing 4 is often insulated in order to help maintain a temperature inside casing 4 within a preferred range. Insulation for left panel 92 of casing 4 may be introduced into channel 128, which supports the insulation and helps to hold the insulation flush with left outer surface 120. In an alternate embodiment, left bottom portion 100 includes at least one nonplanar surface.

[0039] As FIG. 2C illustrates, a cross-section of rear bottom portion 104 of casing 4 take along line 2C-2C in FIG. 2A is similar to FIG. 2B. Rear bottom portion 104 is comprised of four generally planar surfaces: rear outer surface 130, rear bottom surface 132, rear inner surface 134, and rear flange 136. Rear outer surface 130 and rear inner surface 134 extend in a z-axis direction and rear bottom surface 132 and rear flange 136 extend in a y-axis direction. Rear outer, bottom, and inner surfaces 130, 132, and 134, respectively, define a channel 138. Insulation for rear panel 94 of casing 4 may be introduced into channel 138, which supports the insulation and helps to hold the insulation flush with rear outer surface 130. In an alternate embodiment, rear bottom portion 104 includes at least one nonplanar surface.

[0040] FIG. 2D is a cross-sectional view of right bottom portion 108 of casing 4 taken along line 2D-2D in FIG. 2A. Again, FIG. 2D is similar to FIGS. 2B and 2C. Right bottom portion 108 is comprised of four generally planar surfaces: right outer surface 140, right bottom surface 142, right inner surface 144, and right flange 146. Right outer surface 140 and right inner surface 144 extend in a z-axis direction and right bottom surface 142 and right flange 146 extend in an x-axis direction. Right outer, bottom, and inner surfaces 140, 142, and 144, respectively, define a channel 148. Insulation for right panel 96 of casing 4 may be introduced into channel 148, which supports the insulation and helps to hold the insulation flush with right outer surface 140. In an alternate embodiment, right bottom portion 108 includes at least one nonplanar surface.

[0041] FIG. 3 is a bottom view of casing 4 of FIG. 2A. Left panel 92 is generally perpendicular to rear panel 94, which is generally perpendicular to right panel 96. Left, rear, and right flanges 126, 136, and 146, respectively, extend around an inner perimeter of casing 4 and define opening 4B in casing 4, through which air is either introduced into or moved out of evaporator assembly 2. Together with front deck 39 (shown in FIG. 2A), left, rear, and right flanges 126, 136, and 146, respectively, also define flange 48 (FIG. 1B), which is essentially a shelf that is configured to receive and support vertical condensate pan 16.

[0042] In order to strengthen casing 4 and help maintain the integrity of casing 4 during shipping and handling of casing 4 and/or evaporator assembly 2, casing 4 includes an interlocking design at left internal rear corner 87 and right internal rear corner 88. At left internal rear corner 87, left inner surface 124 of left bottom portion 100 and rear inner surface 134 of rear bottom portion 104 are designed to interlock. An embodiment of an interlocking design is shown in FIG. 4, which is a partial perspective view of casing 4, illustrating left internal rear corner 87 in which left panel 92 of casing 4 meets rear panel 94 of casing 4. FIG. 4 also shows left flange 126, which is adjacent to rear flange 136. At left internal rear corner 87 shown in FIG. 4, left inner surface 124 (shown in phantom) intersects with rear inner surface 134 (shown in phantom) at interface 151 to interlock left and rear bottom portions 100 and 104, respectively. Specifically, left inner surface 124 interfaces with rear inner surface 134, thereby distributing force between left and rear panels 92 and 94, respectively, which may help prevent casing 4 from warping (i.e., substantially changing shape). Rear inner surface 134 (shown in FIG. 3) similarly interlocks with right inner surface 144 (shown in FIG. 3) at right internal rear corner 88 (shown in FIG. 3).

[0043] In the embodiment shown in FIG. 4, left and rear inner surfaces 124 and 134, respectively, interlock by interfacing. In alternate embodiments, any suitable means of interlocking left and rear inner surfaces 124 and 134, respectively, to reinforce internal corners 87 and 88 (FIG. 3) may be incorporated into casing 4. For example, a mating design may be used. An example of a mating design includes, but is not limited to, a groove cut into rear inner surface 134, into which left inner surface 124 closely fits.

[0044] Returning to FIG. 2A, front deck 39 includes top surface 39A, bottom surface 39B, left end 39C, right end 39D, and rear surface 39E (shown in FIG. 5). Left end 39C of front deck 39 interlocks with left flange 126 of left bottom portion 100, while right end 39D of front deck 39 interlocks with right flange 146 of right bottom portion 108.

[0045] FIG. 5 is a partial perspective view showing an underside of casing assembly 86 of FIG. 2A. FIG. 5 illustrates an embodiment of an interlocking design between right end 39D of front deck 39 and left flange 126 of left bottom portion 100. In this embodiment, the interlocking design between left end 39C of front deck 39 and right flange 146 of right bottom portion 108 is similar.

[0046] Front deck 39 includes flange 154, which is integral with front deck surface 156. Flange 154 and front deck surface 156 are cut at right end 39D of front deck 39, such that groove 158 is formed between flange 154 and front deck surface 156. Left flange 126 of left bottom portion 100 of casing 4 is introduced into and engages with groove 158 to interlock left bottom portion 100 and front deck 39. As FIG. 5 illustrates in phantom, front deck surface 156 extends underneath left flange 126. Interlocking front deck 39 with left bottom portion 100 helps maintain the integrity of casing assembly 86 by reinforcing left front internal corner 89 of casing 4. In alternate embodiments, other means of interlocking front deck 39 with left bottom portion 100 may be used.

[0047] As known in the art, casing 4 is typically connected to an air handler (e.g., a furnace), and in typical residential configurations, casing 4 is mounted on top of the air handler. Left, rear, and right inner surfaces 124, 134, and 144, together with rear surface 39E of front deck 39 define a space that is configured to receive or be introduced into a corresponding part of an air handler. Bottom surface 152 of casing 4 and bottom surface 39B of front deck 39 typically engage with the air handler. Bottom surface 152 (shown in

FIG. **2**A) of casing **4** remains substantially flat due to the increased strength of casing **4**, which is attributable to interlocking rear corners **87** and **88**. Similarly, bottom surface **39**B of front deck **39** remains substantially flat and in the same plane as bottom surface **152** of casing **4** because of interlocking internal front corners **89** and **90**. Together, substantially flat bottom surface **152** of casing **4** and bottom surface **39**B of front deck **39** help minimize any potential gaps that may be created at an interface between bottom surface **152** and the air handler. By minimizing gaps between bottom surface **152** and the air handler, the efficiency of evaporator unit **2** increases because the amount of air that is lost between evaporator unit **2** and the air handler is minimized.

[**0048**] As previously described, casing **4** may be formed from a single sheet of material, as shown in FIG. **6**. However, casing **4** may also be formed of multiple pieces that are attached together. FIG. **6** is a plan view of a single sheet **160** of material that is cut to form casing **4** of casing assembly **86** of FIG. **2**A. The material may be, for example, sheet metal. Sheet **160** is folded to form the configuration of casing **4** shown in FIG. **2**A. Fold lines are illustrated in phantom. Sheet **160** is folded about 90° along fold line **162** to define left panel **92**. Rear and right panels **94** and **96**, respectively, are defined by folding sheet **160** about 90° along fold line **164**. Lip **110** along left top portion **98** of left panel **92** is defined by folding sheet **160** about 90° along fold line **166**. Sheet **160** is then folded about 90° along fold line **168**. Finally, lip **110** is folded along line **169** as close to about 180° as possible in order to tuck edge **110**A inward. Lip **112** along rear top portion **102** of rear panel **94** is defined by folding sheet **160** about 90° along fold line **170**, and along fold line **172** about 90°. Lip **112** is then folded along fold line **173** as close to about 180° in order to tuck edge **112**A inward. Lip **114** along right top portion **106** of right panel **96** is defined by folding sheet **160** about 90° along fold line **174**, and folding along line **176** about 90°. Lip **114** is then folded along fold line **177** as close to about 180° in order to tuck edge **114**A inward.

[**0049**] Left outer surface **120** of left bottom portion **100** of left panel **92** of casing **4** is defined by folding along fold line **178** about 90°. As FIG. **6** illustrates, left outer surface **120** of left bottom portion **100** is integral with a majority of left panel **92** of casing **4**. In an alternate embodiment, left outer surface **120** is distinct from a majority of left panel **92** of casing **4**. Similarly, in an alternate embodiment, rear outer surface **130** and right outer surface **140** are distinct from rear panel **94** and right panel **96**, respectively. Left bottom surface **122** of left bottom portion **100** of left panel **92** of casing **4** is defined by folding about 90° along fold line **180**. Left inner surface and left flange **124** and **126**, respectively, of left bottom portion **100** of left panel **92** of casing **4** are defined by folding about 90° along fold line **182**. Similarly, rear outer, bottom, and inner surfaces **130**, **132**, and **134**, respectively, and flange **136** of rear bottom portion **104** of rear panel **94** of casing **4** are defined by folding about 90° along lines **184**, **186**, and **188**. Right outer, bottom, and inner surfaces **140**, **142**, and **144**, respectively, and right flange **146** of right bottom portion **108** of right panel **96** of casing **4** are defined by folding about 90° along lines **190**, **192**, and **194**.

[**0050**] Terminology, such as references to "left", "right", "front", "rear", "bottom", and "top" throughout the description of the present invention is used for purposes of description, and not limitation. Specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as bases for teaching one skilled in the art to variously employ the present invention. While the present invention has been described with reference to evaporator unit **2**, a casing in accordance with the present invention is suitable for use with any heat exchanger.

[**0051**] Although the present invention has been described with reference to preferred embodiments, workers skilled in the art will recognize that changes may be made in form and detail without departing from the spirit and scope of the invention.

1. A casing assembly suitable for use in a heat exchange assembly, the casing assembly comprising:

a first panel comprising:

a first top portion; and

a first bottom portion opposite the first top portion;

a second panel adjacent to the first panel and comprising:

a second top portion; and

a second bottom portion opposite the second top portion and interlocked with the first bottom portion; and

a third panel adjacent to the second panel and comprising:

a third top portion; and

a third bottom portion opposite the third top portion and interlocked with the second bottom portion; and

a front deck extending from the first bottom portion to the third bottom portion.

2. The casing assembly of claim 1, wherein the first, second, and third panels are formed from a single sheet of material.

3. The casing assembly of claim 2, wherein the material is metal.

4. The casing assembly of claim 1, wherein the first top portion includes a first folded lip, the second top portion includes a second folded lip, and the third top portion includes a third folded lip.

5. The casing assembly of claim 1, wherein the front deck comprises:

a first end including a first groove configured to receive a first portion of the first bottom portion of the first panel; and

a second end opposite the first end and including a second groove configured to receive a second portion of the third bottom portion of the third panel.

6. The casing assembly of claim 1, and further comprising:

a upper angle extending between the first top portion of the first panel and the third top portion of the third panel.

7. The casing assembly of claim 1, wherein the first bottom portion of the first panel includes a first flange, the second bottom portion of the second panel includes a second flange, and the third bottom portion of the third panel includes a third flange, the first, second, and third flanges defining a shelf configured to support a condensate pan.

8. The casing assembly of claim 1, wherein the casing is configured to receive an evaporator coil.

9. The casing assembly of claim 1, wherein the second bottom portion intersects with and engages with the first bottom portion and the third bottom portion.

10. A casing assembly suitable for use in a heat exchange assembly, the casing assembly comprising:

a wrapper comprising:

a first panel comprising a first surface extending between a first end and a second end;

a second panel comprising a second surface extending between a third end and a fourth end, the third end intersecting with the second end of the first surface of the first panel.

a third panel comprising a third surface extending between a fifth end and a sixth end, the fifth end intersecting with the fourth end of the second surface of the second panel:

a front deck extending between a seventh end and an eighth end, the seventh end defining a first groove configured to receive the first end of the first surface of the first panel, and the eighth end defining a second groove configured to receive the sixth end of the third surface of the third panel.

11. The casing assembly of claim 10, wherein the first panel of the wrapper further comprises a first top portion opposite the first surface and including a first folded lip, the second panel further comprises a second top portion opposite the second surface and including a second folded lip, and the third panel further comprises a third top portion opposite the third surface and including a third folded lip.

12. The casing assembly of claim 11, and further comprising:

a upper angle extending between the first top portion of the first panel and the third top portion of the third panel.

13. The casing assembly of claim 10, wherein the wrapper is formed from a single sheet of material.

14. The casing assembly of claim 10, wherein the first surface of the first panel of the wrapper is oriented about 90° from the second surface, and the second surface is oriented about 90° from the third surface.

15. The casing assembly of claim 10, and wherein the wrapper further comprises:

a first flange extending from the first bottom portion of the first panel;

a second flange extending from the second bottom portion of the second panel; and

a third flange extending from the third bottom portion of the third panel, wherein the first, second, and third flanges define a shelf configured to support a condensate pan.

16. A wrapper suitable for use in a heat exchange assembly, the wrapper comprising:

a first panel comprising:

a first surface;

a second surface adjacent to the first surface;

a third surface adjacent to the second surface; and

a first flange extending from the third surface;

a second panel comprising:

a fourth surface;

a fifth surface adjacent to the fourth surface;

a sixth surface adjacent to the fifth surface configured to interlock with the third surface; and

a second flange surface extending from the sixth surface; and

a third panel comprising:

a seventh surface;

an eighth surface adjacent to the seventh surface;

a ninth surface adjacent to the eighth surface and configured to interlock with the sixth surface; and

a third flange extending from to the ninth surface;

wherein the first, second, and third surfaces define a shelf configured to support a condensate pan.

17. The wrapper of claim 16, wherein the sixth surface intersects and engages with the third and ninth surfaces.

18. The wrapper of claim 16, wherein the wrapper is formed from a single sheet of metal.

19. The wrapper of claim 16, wherein the first, second, and third surfaces define a channel configured to receive and support a first piece of insulation, the fourth, fifth, and sixth surfaces define a channel configured to receive and support a second piece of insulation, and the seventh, eighth, and ninth surfaces define a channel configured to receive and support a third piece of insulation.

20. The wrapper of claim 16, wherein the first flange and the third flange are each configured to mate with a front deck of a casing assembly.

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