(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 848 642 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
14.07.2021 Bulletin 2021/28

(51) Int Cl.:
F24F 1/22 *(2011.01)* ***F24F 11/89*** *(2018.01)*
F24F 13/20 *(2006.01)*

(21) Application number: **21150673.8**

(22) Date of filing: **08.01.2021**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
KH MA MD TN

(30) Priority: **13.01.2020 US 202016740833**

(71) Applicant: **Lennox Industries Inc.**
Richardson, TX 75080 (US)

(72) Inventors:
- **RAMASAMY, Surendran**
  600113 Tamil Nadu (IN)
- **DEN BOER, Pete**
  Carrollton, TX Texas 75006 (US)
- **MCHUGH, Chris**
  Carrollton, TX Texas 75006 (US)
- **HADZIDEDIC, Darko**
  Carrollton, TX Texas 75006 (US)

(74) Representative: **Barker Brettell LLP**
100 Hagley Road
Edgbaston
Birmingham B16 8QQ (GB)

(54) **CONDENSATION PROTECTION TRAY**

(57) A tray (186) for an HVAC controller (170) includes a tray base (200), a first mounting tab (204, 216) secured to the tray base (200) and configured to interlock with a corresponding mount of a cabinet (180) of an indoor unit (102) of an HVAC system (100), a mounting bracket (218) secured to the tray base (200) and comprising an aperture (219) for receiving a mounting screw therethrough, a drip wall (206) that extends up from the tray base, and a cover extending up from the tray base (200) that includes a wall and a top plate(212). The cover (208) is positioned to protect a component of the HVAC controller (170) from impact when the HVAC controller (170) is installed in the tray (186).

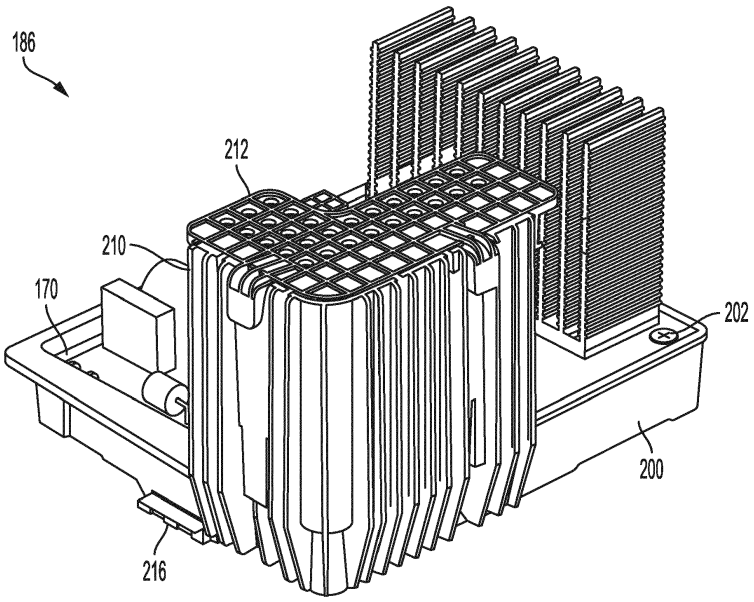

FIG. 4

EP 3 848 642 A1

Description

TECHNICAL FIELD

[0001] The present invention relates generally to a heating, ventilation, and air conditioning (HVAC) system and more particularly, but not by way of limitation, to a tray for protecting an HVAC controller from condensate.

BACKGROUND

[0002] This section provides background information to facilitate a better understanding of the various aspects of the disclosure. It should be understood that the statements in this section of this document are to be read in this light, and not as admissions of prior art.

[0003] HVAC systems typically include an indoor unit that provides heating and cooling duty to air that is circulated through an enclosed space. The indoor unit may include components such as a blower, an evaporator coil, a circuit breaker, and an HVAC controller. The HVAC controller controls the operation of the HVAC system and typically includes, for example, a printed circuit board (PCB) that comprises various components (e.g., capacitors, resisters, circuit traces, and the like). When providing cooling duty to the air that is circulated through the enclosed space, conditions can exist within the indoor unit that result in the formation of condensate on or around components within the indoor unit. The formation of condensate within the indoor unit can lead to a failure of the HVAC system due to electrical shorts. For example, if condensate contacts the PCB of the HVAC controller, the HVAC controller may suffer damage from electrical shorts.

BRIEF SUMMARY OF THE INVENTION

[0004] An illustrative tray for an HVAC controller includes a tray base, a first mounting tab secured to the tray base and configured to interlock with a corresponding mount of a cabinet of an indoor unit of an HVAC system, a mounting bracket secured to the tray base and comprising an aperture for receiving a mounting screw therethrough, a drip wall that extends up from the tray base, and a cover extending up from the tray base that includes a wall and a top plate. The cover is positioned to protect a component of the HVAC controller from impact when the HVAC controller is installed in the tray.

[0005] An illustrative HVAC system an indoor unit that includes an evaporator coil disposed within a cabinet of the indoor unit and configured to provide a cooling duty to air of an enclosed space, a blower configured to circulate the air of the enclosed space around the evaporator coil, an HVAC controller, a circuit breaker disposed within the cabinet and configured to provide electrical power to the indoor unit, and a tray configured to secure the HVAC controller thereto. The tray includes a tray base, a first mounting tab secured to the tray base and configured to interlock with a corresponding mount within the indoor unit, a mounting bracket secured to the tray base and comprising an aperture for receiving a mounting screw therethrough, a drip wall that extends up from the tray base, and a cover extending up from the tray base that includes a wall and a top plate. The cover is positioned to protect a component of the HVAC controller from impact when the HVAC controller is installed in the tray.

[0006] An illustrative method of protecting an HVAC controller from condensate includes securing the HVAC controller to a tray. The tray includes a tray base, a first mounting tab secured to the tray base and configured to interlock with a corresponding mount of a cabinet of an indoor unit of an HVAC system, a mounting bracket secured to the tray base and comprising an aperture for receiving a mounting screw therethrough, and a cover extending up from the tray base that includes a wall and a top plate. The cover is positioned to protect a component of the HVAC controller from impact when the HVAC controller is installed in the tray.

[0007] This summary is provided to introduce a selection of concepts that are further described below in the detailed description. This summary is not intended to identify key or essential features of the claimed subject matter, nor is it intended to be used as an aid in limiting the scope of claimed subject matter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The disclosure is best understood from the following detailed description when read with the accompanying figures. It is emphasized that, in accordance with standard practice in the industry, various features are not drawn to scale. In fact, the dimensions of various features may be arbitrarily increased or reduced for clarity of discussion.

FIGURE 1 is a block diagram of an illustrative HVAC system according to embodiments of the disclosure;

FIGURE 2 illustrates an indoor unit of an illustrative HVAC system according to embodiments of the disclosure;

FIGURES 3A-3F illustrate multiple views of a tray for an HVAC controller according to embodiments of the disclosure; and

FIGURE 4 illustrates a tray for an HVAC controller according to embodiments of the disclosure.

DETAILED DESCRIPTION OF THE INVENTION

[0009] Embodiment(s) of the invention will now be described more fully with reference to the accompanying Drawings. The invention may, however, be embodied in many different forms and should not be construed as

limited to the embodiment(s) set forth herein. The invention should only be considered limited by the claims as they now exist and the equivalents thereof.

[0010] FIGURE 1 illustrates an HVAC system 100. HVAC system 100 is configured to condition air via, for example, heating, cooling, humidifying, or dehumidifying air within an enclosed space 101. In a typical embodiment, enclosed space 101 is, for example, a house, an office building, a warehouse, and the like. Thus, HVAC system 100 can be a residential system or a commercial system such as, for example, a rooftop system. HVAC system 100 includes various components; however, in other embodiments, HVAC system 100 may include additional components that are not illustrated but typically included within HVAC systems.

[0011] HVAC system 100 includes an indoor fan or blower 110, an electric heat 103 typically associated with a blower 110, and an evaporator coil 120, also typically associated with blower 110. HVAC system 100 includes an expansion valve 112. Expansion valve 112 may be a thermal expansion valve or an electronic expansion valve. Blower 110, electric heat 103, expansion valve 112, and evaporator coil 120 are collectively referred to as an indoor unit 102. In a typical embodiment, indoor unit 102 is located within, or in close proximity to, enclosed space 101. HVAC system 100 also includes a compressor 104, an associated condenser coil 124, and an associated condenser fan 115, which are collectively referred to as an outdoor unit 106. In various embodiments, outdoor unit 106 and indoor unit 102 may be, for example, a rooftop unit or a ground-level unit. Compressor 104 and associated condenser coil 124 are connected to evaporator coil 120 by a refrigerant line 107.

[0012] Refrigerant line 107 includes, for example, a plurality of copper pipes that connect condenser coil 124 and compressor 104 to evaporator coil 120. Compressor 104 may be, for example, a single-stage compressor, a multi-stage compressor, a single-speed compressor, or a variable-speed compressor. Blower 110 is configured to operate at different capacities (e.g., variable motor speeds) to circulate air through HVAC system 100, whereby the circulated air is conditioned and supplied to enclosed space 101.

[0013] Still referring to FIGURE 1, HVAC system 100 includes an HVAC controller 170 configured to control operation of the various components of HVAC system 100 such as, for example, blower 110, electric heat 103, and compressor 104 to regulate the environment of enclosed space 101. In some embodiments, HVAC system 100 can be a zoned system. HVAC system 100 includes a zone controller 172, dampers 174, and a plurality of environment sensors 176. In a typical embodiment, HVAC controller 170 cooperates with zone controller 172 and dampers 174 to regulate the environment of enclosed space 101.

[0014] HVAC controller 170 may be an integrated controller or a distributed controller that directs operation of HVAC system 100. HVAC controller 170 includes an interface to receive, for example, thermostat calls, temperature setpoints, blower control signals, environmental conditions, and operating mode status for various zones of HVAC system 100. The environmental conditions may include indoor temperature and relative humidity of enclosed space 101. In a typical embodiment, HVAC controller 170 also includes a processor and a memory to direct operation of HVAC system 100 including, for example, a speed of blower 110.

[0015] Still referring to FIGURE 1, in some embodiments, the plurality of environment sensors 176 are associated with HVAC controller 170 and also optionally associated with a user interface 178. The plurality of environment sensors 176 provides environmental information within a zone or zones of enclosed space 101 such as, for example, temperature and/or humidity of enclosed space 101 to HVAC controller 170. The plurality of environment sensors 176 may also send the environmental information to a display of user interface 178. In some embodiments, user interface 178 provides additional functions such as, for example, operational, diagnostic, status message display, and a visual interface that allows at least one of an installer, a user, a support entity, and a service provider to perform actions with respect to HVAC system 100. In some embodiments, user interface 178 is, for example, a thermostat. In other embodiments, user interface 178 is associated with at least one sensor of the plurality of environment sensors 176 to determine the environmental condition information and communicate that information to the user. User interface 178 may also include a display, buttons, a microphone, a speaker, or other components to communicate with the user. Additionally, user interface 178 may include a processor and memory configured to receive user-determined parameters such as, for example, a relative humidity of enclosed space 101 and to calculate operational parameters of HVAC system 100 as disclosed herein.

[0016] HVAC system 100 is configured to communicate with a plurality of devices such as, for example, a communication device 155, a monitoring device 156, and the like. In a typical embodiment, and as shown in FIGURE 1, monitoring device 156 is not part of HVAC system 100. For example, monitoring device 156 is a server or computer of a third party such as, for example, a manufacturer, a support entity, a service provider, and the like. In some embodiments, monitoring device 156 is located at an office of, for example, the manufacturer, the support entity, the service provider, and the like.

[0017] In a typical embodiment, communication device 155 is a non-HVAC device having a primary function that is not associated with HVAC systems. For example, non-HVAC devices include mobile-computing devices configured to interact with HVAC system 100 to monitor and modify at least some of the operating parameters of HVAC system 100. Mobile computing devices may be, for example, a personal computer (e.g., desktop or laptop), a tablet computer, a mobile device (e.g., smart phone), and the like. In a typical embodiment, commu-

nication device 155 includes at least one processor, memory, and a user interface such as a display. One skilled in the art will also understand that communication device 155 disclosed herein includes other components that are typically included in such devices including, for example, a power supply, a communications interface, and the like.

[0018] Zone controller 172 is configured to manage movement of conditioned air to designated zones of enclosed space 101. Each of the designated zones includes at least one conditioning or demand unit such as, for example, electric heat 103 and user interface 178, only one instance of user interface 178 being expressly shown in FIGURE 1, such as, for example, the thermostat. HVAC system 100 allows the user to independently control the temperature in the designated zones. In a typical embodiment, zone controller 172 operates dampers 174 to control air flow to the zones of enclosed space 101.

[0019] A data bus 190, which in the illustrated embodiment is a serial bus, couples various components of HVAC system 100 together such that data is communicated therebetween. Data bus 190 may include, for example, any combination of hardware, software embedded in a computer readable medium, or encoded logic incorporated in hardware or otherwise stored (e.g., firmware) to couple components of HVAC system 100 to each other. As an example and not by way of limitation, data bus 190 may include an Accelerated Graphics Port (AGP) or other graphics bus, a Controller Area Network (CAN) bus, a front-side bus (FSB), a HYPERTRANSPORT (HT) interconnect, an INFINIBAND interconnect, a low-pin-count (LPC) bus, a memory bus, a Micro Channel Architecture (MCA) bus, a Peripheral Component Interconnect (PCI) bus, a PCI-Express (PCI-X) bus, a serial advanced technology attachment (SATA) bus, a Video Electronics Standards Association local bus (VLB), or any other suitable bus or a combination of two or more of these. In various embodiments, data bus 190 may include any number, type, or configuration of data buses 190, where appropriate. In particular embodiments, one or more data buses 190 (which may each include an address bus and a data bus) may couple HVAC controller 170 to other components of HVAC system 100. In other embodiments, connections between various components of HVAC system 100 are wired. For example, conventional cable and contacts may be used to couple HVAC controller 170 to the various components. In some embodiments, a wireless connection is employed to provide at least some of the connections between components of HVAC system 100 such as, for example, a connection between HVAC controller 170 and blower 110 or the plurality of environment sensors 176.

[0020] FIGURE 2 illustrates indoor unit 102 according to embodiments of the disclosure. Indoor unit 102 includes a cabinet 180 in which electric heat 103, blower 110, expansion valve 112, and evaporator coil 120 are housed. For the purposes of illustration, portions of cabinet 180 have been removed from the view in FIGURE 2. Indoor unit 102 includes a compartment 182 that houses, for example, HVAC controller 170 and a circuit breaker 184. HVAC controller 170 is shown installed in a tray 186.

[0021] As shown in FIGURE 2, indoor unit 102 is in an upflow configuration. In the upflow configuration, cabinet 180 is oriented vertically with blower 110 positioned above evaporator coil 120 and air flows through indoor unit 102 from evaporator coil 120 toward blower 110. In some embodiments, cabinet 180 may be oriented horizontally with either of a side 188 or a side 189 facing upward. In either horizontal orientation, airflow through indoor unit 102 follows the same general path from evaporator coil 120 to blower 110.

[0022] In some operating conditions, condensate can form within indoor unit 102. For example, when operating HVAC system 100 to provide cool air to enclosed space 101, condensate can form within compartment 182. Condensation occurs when air is cooled to the air's dew point temperature. At the dew point temperature, water within the air condenses from vapor into water (i.e., condensate). Formation of condensate within compartment 182 can be problematic as the condensate can short out and/or damage components of HVAC controller 170. In some embodiments, condensate tends to form on or around circuit breaker 184. When indoor unit 102 is configured for upflow (e.g., the orientation shown in FIGURE 2), condensate that forms on or around circuit breaker 184 tends to collect on a bottom wall 192 of compartment 182. HVAC controller 170 is mounted within compartment 182 to be positioned above bottom wall 192, preventing condensate that has settled on bottom wall 192 from damaging HVAC controller 170. Similarly, when indoor unit 102 is configured for horizontal operation with side 189 facing upward, condensate that forms on or around circuit breaker 184 tends to collect within compartment 182 underneath circuit breaker 184. As HVAC controller 170 is positioned above circuit breaker 184 in this orientation, condensate that has formed on or around circuit breaker 184 does not drip onto HVAC controller 170. When indoor unit 102 is configured for horizontal operation with side 188 facing upward, condensate that forms on or around circuit breaker 184 tends to drip down toward HVAC controller 170. HVAC controller 170 typically includes, for example, a printed circuit board (PCB) comprising various electronics components (e.g., capacitors, resistors, etc.). Condensate that drips onto HVAC controller 170 can lead to failure of HVAC controller 170 due to electrical shorts. To prevent this type of failure and to provide additional protection from physical impacts, HVAC controller 170 can be mounted to tray 186.

[0023] FIGURES 3A-3F illustrate multiple views of tray 186 according to various embodiments of the disclosure. FIGURES 3A-3F are top, bottom, front, back, and side views, respectively, of tray 186 with HVAC controller 170 installed therein. Tray 186 includes a tray base 200 to which HVAC controller 170 may be secured. In some embodiments, HVAC controller 170 is secured to tray

base 200 via a pair of mounting screws 202 and a pair of mounting tabs 204. Each mounting tab 204 extends up from tray base 200 to form a small hook-like or slot-like protrusion that is configured to receive an edge of the PCB of HVAC controller 170. To secure HVAC controller 170 to tray base 200, an edge of HVAC controller 170 is positioned so that an edge of the PCB of HVAC controller 170 engages the pair of mounting tabs 204 and the pair of mounting screws 202 are then fastened to mounting points (e.g., threaded bores) of tray base 200 to secure HVAC controller 170 to tray base 200. Prior HVAC system designs secured HVAC controllers to the indoor unit using a plurality of screws (i.e., without mounting tabs). Compared to those prior designs, the design illustrated in FIGURES 3A-3F simplifies the process of attaching HVAC controller 170 to tray 186, reducing the time and cost to assemble indoor unit 102. In some embodiments, HVAC controller 170 may be secured to tray base 200 via a single mounting screw 202 and a single mounting tab 204 (e.g., similar to the way tray 186 is secured to indoor unit 102).

[0024] Tray 186 includes a drip wall 206 that extends outward from tray base 200. Drip wall 206 is oriented at an angle θ that is less than 90° (best seen in FIGURES 3C and 3D). When indoor unit 102 is oriented with side 188 facing upward, drip wall 206 acts as a drain pan for condensate that drips off of circuit breaker 184. Orienting drip wall 206 at an angle that is less than 90° causes condensate that has fallen onto drip wall 206 to drain off of drip wall 206 toward a back side 201 of tray base 200 and away from HVAC controller 170. In some embodiments, drip wall 206 includes guides 207 that form walls that prevent condensate that has fallen onto drip wall 206 from draining over the sides of drip wall 206 (best seen in FIGURES 3A and 3B). As illustrated in FIGURES 3A-3F, guides 207 are positioned near the edges of drip wall 206. In other embodiments, drip wall 206 may include a single guide 207 or may include more than two guides 207.

[0025] Tray 186 includes a cover 208 that provides impact protection for components 214 of HVAC controller 170 that are positioned beneath cover 208. Components 214 can be, for example, various electronic components such as capacitors or the like. Cover 208 includes a wall 210 that extends up from tray base 200 and a top plate 212 that is removably coupled to wall 210. As illustrated in FIGURES 3A-3F, wall 210 wraps around a corner of tray base 200 to partially surround components 214 to provide protection from impacts from the top and sides of components 214. Top plate 212 includes one or more locking tabs 213 that engage wall 210 to allow top plate 212 to be removably secured to wall 210. Top plate 212 optionally includes a plurality of perforations 220 that allow for improved heat dissipation.

[0026] The removability of top plate 212 allows for technicians to more easily access components 214 and HVAC controller 170 to perform an inspection or maintenance.

[0027] Tray 186 is secured to indoor unit 102 via a mounting tab 216 and a mounting bracket 218 that includes an aperture 219 for receiving a mounting screw. Mounting tab 216 extends down from back side 201 of tray base 200 and is configured to engage/interlock with a corresponding mount (e.g., a tab or slot) within compartment 182. Mounting bracket 218 extends from tray base 200 so that HVAC controller 170 does not cover aperture 219 when HVAC controller 170 is installed in tray 186. With mounting tab 216 engaged with the corresponding mount within compartment 182, the mounting screw can then be used to secure tray 186 by passing the mounting screw through aperture 219 of mounting bracket 218 and threading the mounting screw into a corresponding mounting hole positioned on a wall of compartment 182. The design of tray 186 with mounting tab 216 and mounting bracket 218 allows for tray 186 to be quickly and easily installed or removed, making both assembly and maintenance simpler and cheaper.

[0028] FIGURE 4 illustrates tray 186 according to various embodiments of the disclosure. In the embodiment of FIGURE 4, tray 186 does not include drip wall 206 but is otherwise similar to the embodiment of tray 186 illustrated in FIGURES 3A-3F. In some embodiments of HVAC system 100, the inclusion of drip wall 206 may be optional. For example, in the configuration of indoor unit 102 shown in FIGURE 2, tray 186 is not positioned beneath circuit breaker 184 and the inclusion of drip wall 206 is optional. Similarly, when indoor unit 102 is configured with side 189 facing up, tray 186 is positioned above circuit breaker 184 and the inclusion of drip wall 206 is optional.

[0029] In this patent application, reference to encoded software may encompass one or more applications, bytecode, one or more computer programs, one or more executables, one or more instructions, logic, machine code, one or more scripts, or source code, and vice versa, where appropriate, that have been stored or encoded in a computer-readable storage medium. In particular embodiments, encoded software includes one or more application programming interfaces (APIs) stored or encoded in a computer-readable storage medium. Particular embodiments may use any suitable encoded software written or otherwise expressed in any suitable programming language or combination of programming languages stored or encoded in any suitable type or number of computer-readable storage media. In particular embodiments, encoded software may be expressed as source code or object code.

[0030] In particular embodiments, encoded software is expressed in a higher-level programming language, such as, for example, C, Python, Java, or a suitable extension thereof. In particular embodiments, encoded software is expressed in a lower-level programming language, such as assembly language (or machine code). In particular embodiments, encoded software is expressed in JAVA. In particular embodiments, encoded software is expressed in Hyper Text Markup Language

(HTML), Extensible Markup Language (XML), or other suitable markup language.

[0031] Depending on the embodiment, certain acts, events, or functions of any of the algorithms described herein can be performed in a different sequence, can be added, merged, or left out altogether (e.g., not all described acts or events are necessary for the practice of the algorithms). Moreover, in certain embodiments, acts or events can be performed concurrently, e.g., through multi-threaded processing, interrupt processing, or multiple processors or processor cores or on other parallel architectures, rather than sequentially. Although certain computer-implemented tasks are described as being performed by a particular entity, other embodiments are possible in which these tasks are performed by a different entity.

[0032] Conditional language used herein, such as, among others, "can," "might," "may," "e.g.," and the like, unless specifically stated otherwise, or otherwise understood within the context as used, is generally intended to convey that certain embodiments include, while other embodiments do not include, certain features, elements and/or states. Thus, such conditional language is not generally intended to imply that features, elements and/or states are in any way required for one or more embodiments or that one or more embodiments necessarily include logic for deciding, with or without author input or prompting, whether these features, elements and/or states are included or are to be performed in any particular embodiment.

[0033] While the above detailed description has shown, described, and pointed out novel features as applied to various embodiments, it will be understood that various omissions, substitutions, and changes in the form and details of the devices or algorithms illustrated can be made without departing from the spirit of the disclosure. As will be recognized, the processes described herein can be embodied within a form that does not provide all of the features and benefits set forth herein, as some features can be used or practiced separately from others. The scope of protection is defined by the appended claims rather than by the foregoing description. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope. It will be recognized by those having skill in the art that the various screws discussed herein may be replaced with various types of fasteners, such as a nut and bolt, a rivet, and the like.

Claims

1. A tray (186) for an HVAC controller (170), the tray (186) comprising:

a tray base (200);
a first mounting tab (204, 216) secured to the tray base (200) and configured to interlock with a corresponding mount of a cabinet of an indoor unit (102) of an HVAC system (100);
a mounting bracket (218) secured to the tray base (200) and comprising an aperture (219) for receiving a mounting screw therethrough;
a drip wall (206) that extends up from the tray base (200);
a cover (208) extending up from the tray base (200), the cover (208) comprising a wall (210) and a top plate (212); and
wherein the cover (208) protects a component of the HVAC controller (170) from impact when the HVAC controller (170) is installed in the tray (186).

2. The tray (186) of claim 1, comprising:

a second mounting tab (204, 216) secured to the tray base (200) and configured to receive an edge of the HVAC controller (170); and
a mounting point formed into the tray base (200) for receiving a fastener to secure the HVAC controller (170) to the tray (186).

3. The tray (186) of claim 1, wherein the top plate (212) comprises a locking tab (213) that removably secures the top plate (212) to the wall (210).

4. The tray (186) of claim 1, wherein the top plate (212) comprises a plurality of perforations (220).

5. The tray (186) of claim 1, wherein the wall (210) wraps around a corner of the tray (186).

6. The tray (186) of claim 1, wherein the drip wall (206) comprises at least one guide (207) configured to prevent condensate from dripping off either side of the drip wall (206).

7. The tray (186) of claim 1, wherein the drip wall (206) extends up from the tray base (200) at an angle so that condensate that drips onto the drip wall (206) drains off of the drip wall (206) toward a back side of the tray base (200).

8. The tray (186) of claim 7, wherein the angle is less than 90°.

9. An HVAC system (100) comprising:
an indoor unit (102) comprising:

an evaporator coil (120) disposed within a cabinet (180) of the indoor unit (102) and configured to provide a cooling duty to air of an enclosed space;
a blower (110) configured to circulate the air of the enclosed space around the evaporator coil (120);

an HVAC controller (170);

a circuit breaker (184) disposed within the cabinet (180) and configured to provide electrical power to the indoor unit (102); and
a tray (186) according to any one of claims 1 to 8, the tray (186) configured to secure the HVAC controller (170) thereto.

10. The HVAC system (100) of claim 9, wherein the indoor unit (102) is oriented so that the circuit breaker (184) is positioned above the tray (186).

11. A method of protecting an HVAC controller (170) from condensate, the method comprising:

securing the HVAC controller (170) to a tray (186), the tray (186) comprising:

a tray base (200);
a first mounting tab (204, 216) secured to the tray base (200) and configured to interlock with a corresponding mount of a cabinet (180) of an indoor unit (102) of an HVAC system (100);
a mounting bracket (218) secured to the tray base (200) and comprising an aperture (219) for receiving a mounting screw therethrough; and
a cover (208) extending up from the tray base (200), the cover (208) comprising a wall (206) and a top plate (212); and

wherein the cover (208) protects a component of the HVAC controller (170) from impact when the HVAC controller (170) is installed in the tray (186).

12. The method of claim 11, wherein the securing comprises inserting an edge of a PCB of the HVAC controller (170) into a second mounting tab associated with a tray base (200) of the tray (186).

13. The method of claim 11, comprising securing the tray (186) within a cabinet (180) of an indoor unit (102) of an HVAC system (100).

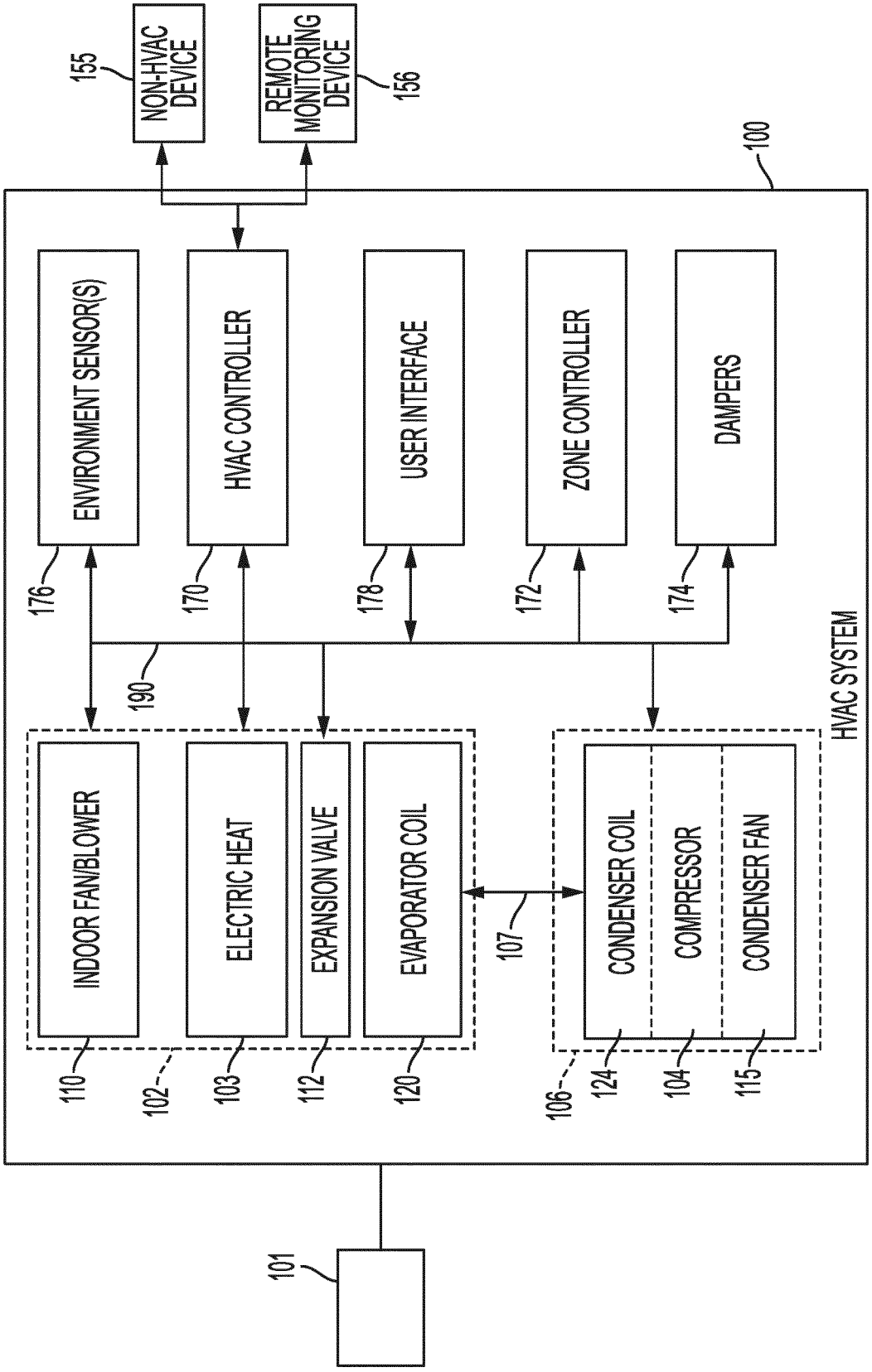
NON-HVAC DEVICE
155
REMOTE MONITORING DEVICE
156
100
ENVIRONMENT SENSOR(S)
HVAC CONTROLLER
USER INTERFACE
ZONE CONTROLLER
DAMPERS
176
170
178
172
174
190
INDOOR FAN/BLOWER
ELECTRIC HEAT
EXPANSION VALVE
EVAPORATOR COIL
CONDENSER COIL
COMPRESSOR
CONDENSER FAN
HVAC SYSTEM
107
110
102
103
112
120
106
124
104
115
101

FIG. 1

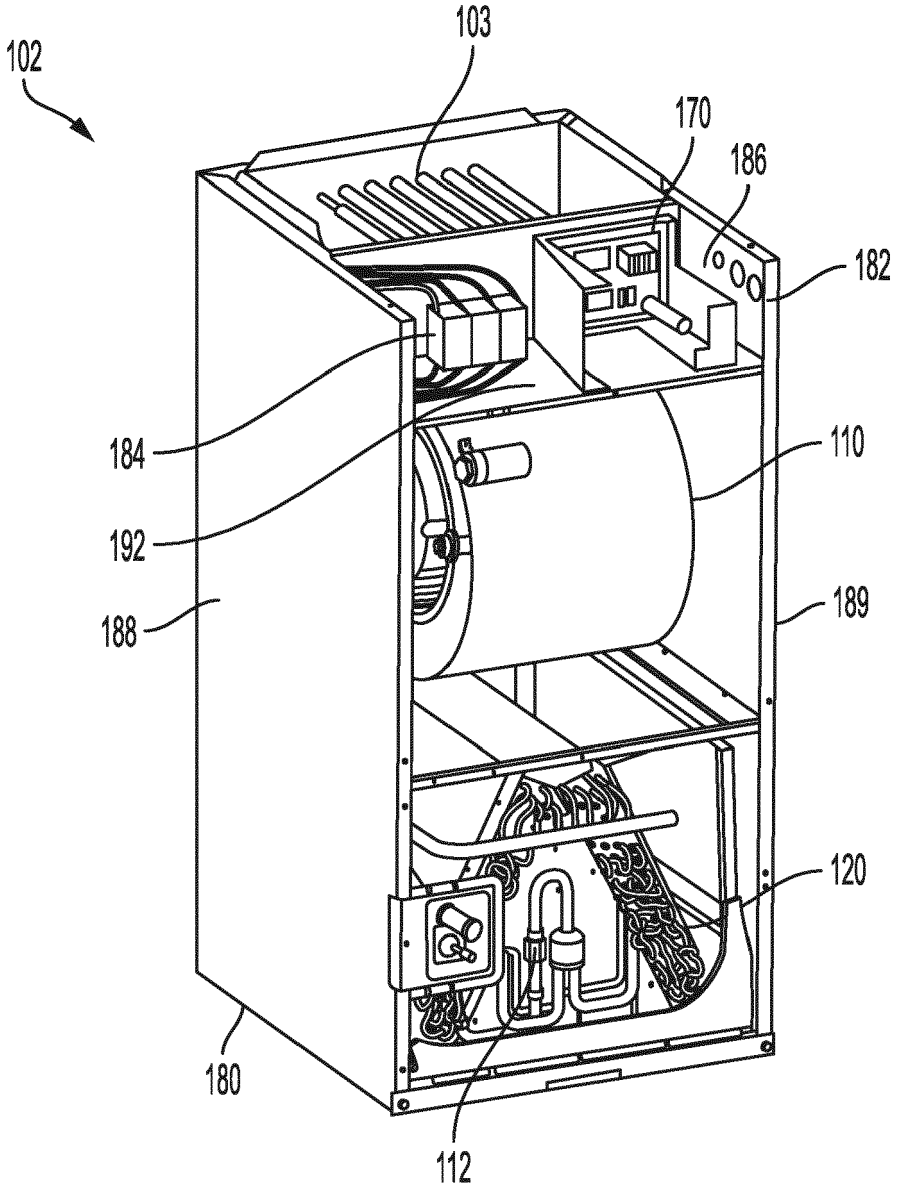

FIG. 2

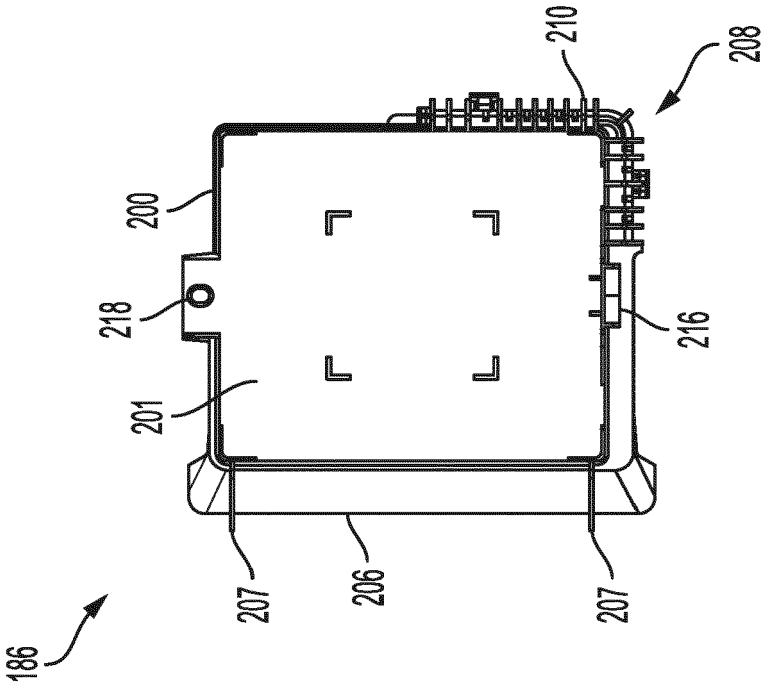
210
208
200
218
216
201
207
206
207
186

FIG. 3B

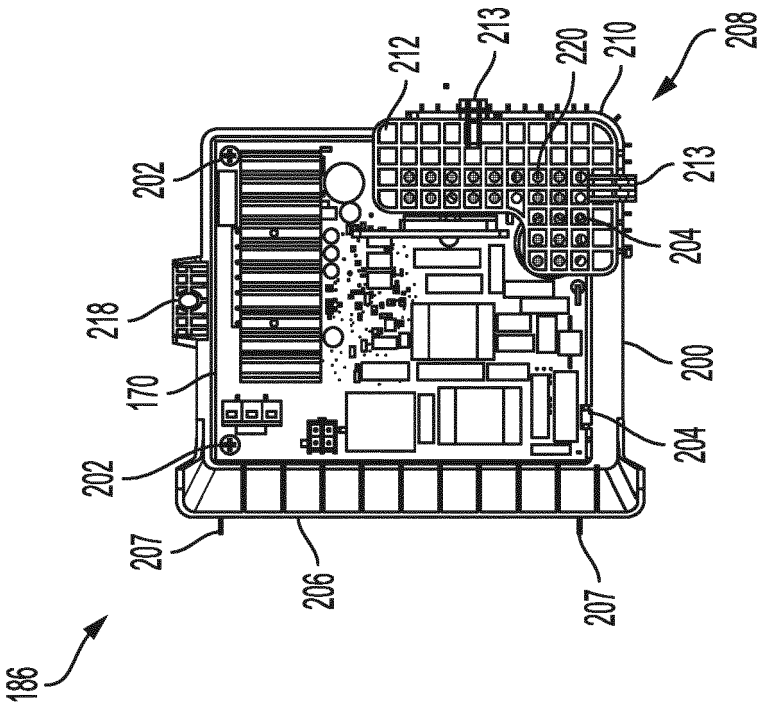
213
212
220
210
208
202
213
218
204
170
200
202
204
207
206
207
186

FIG. 3A

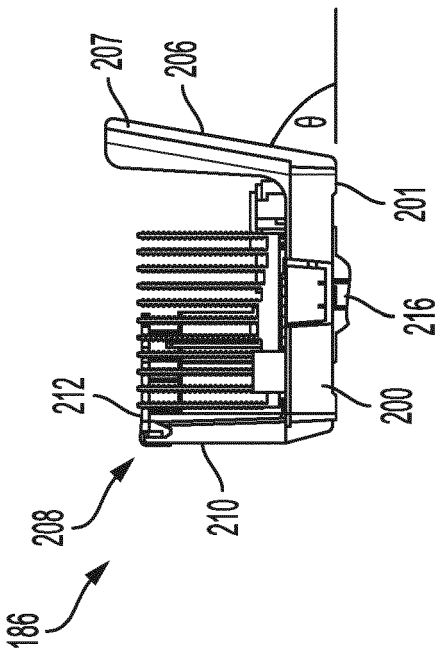

FIG. 3D

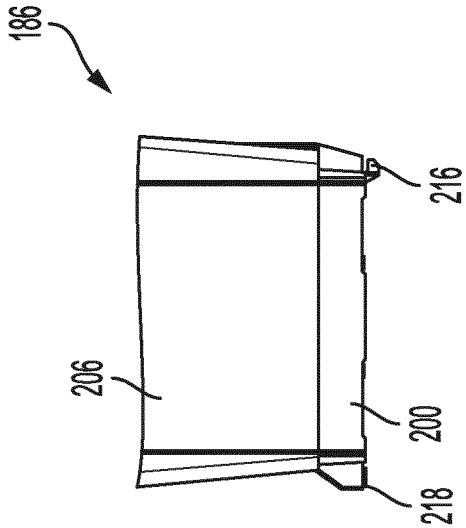

FIG. 3F

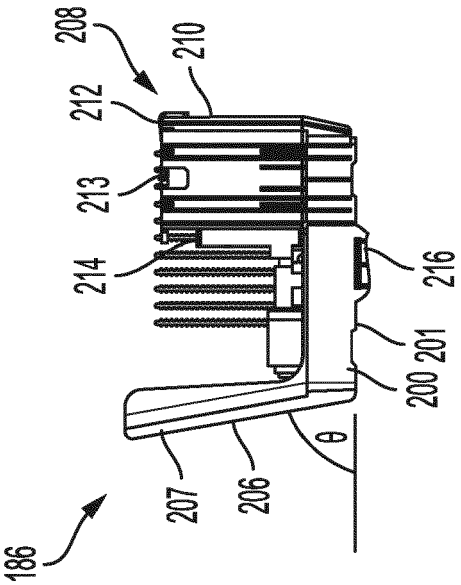

FIG. 3C

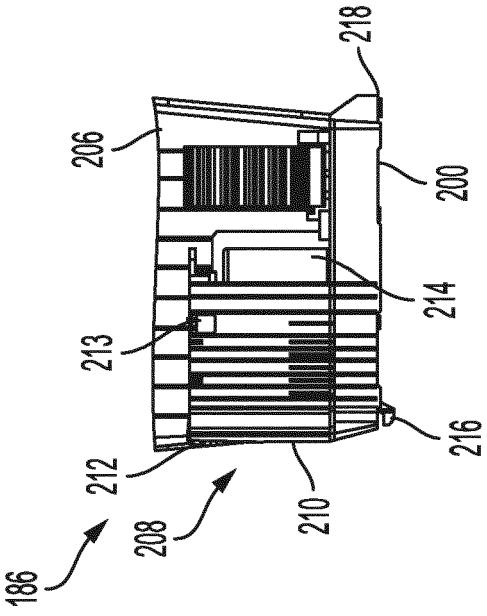

FIG. 3E

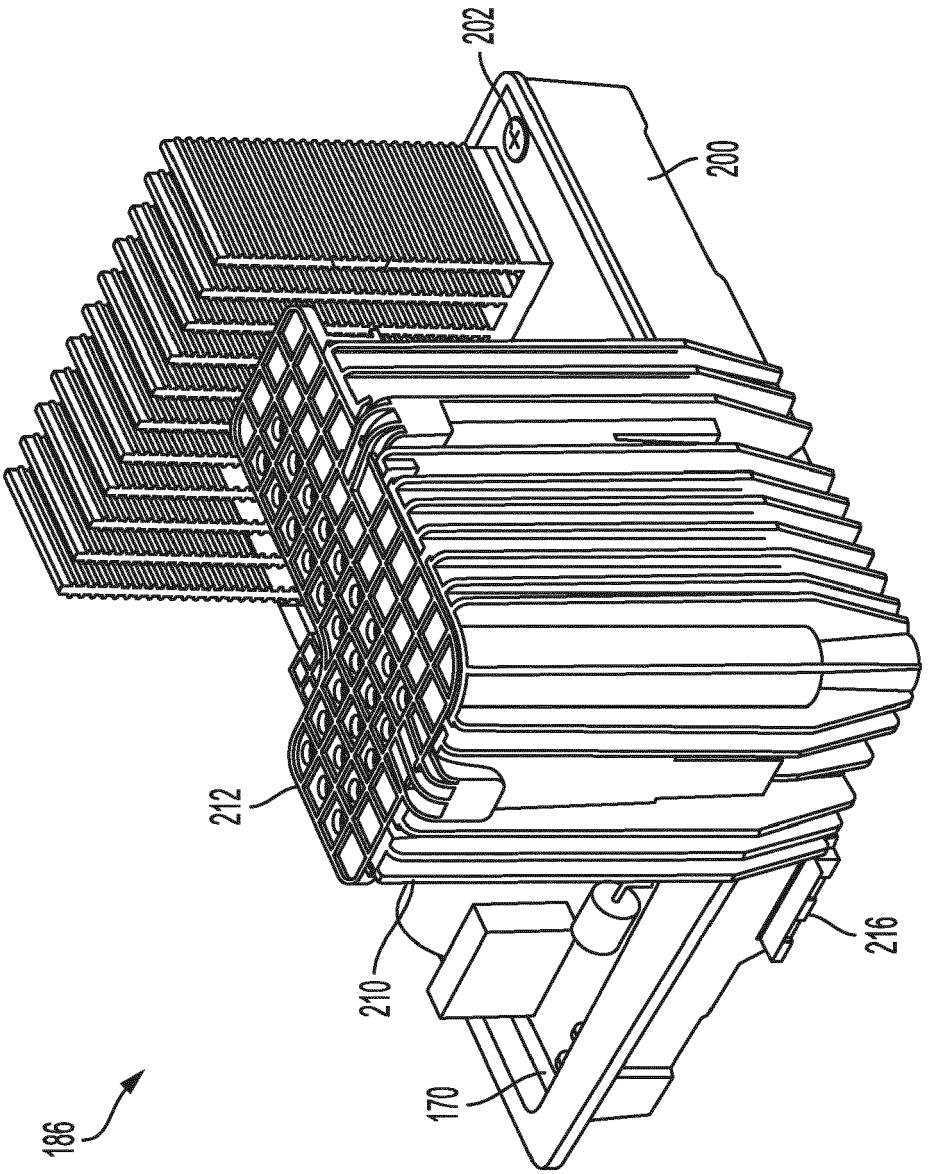

FIG. 4

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 21 15 0673

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	GB 2 304 400 A (TOSHIBA KK [JP]) 19 March 1997 (1997-03-19) * abstract; figures 1-4 *	1,2,4,5, 7,11-13 3,6,8-10	INV. F24F1/22 F24F11/89 F24F13/20
X A	EP 1 837 609 A1 (TOSHIBA CARRIER CORP [JP]; ADVANCED AIR CONDITIONING RES [JP]) 26 September 2007 (2007-09-26) * abstract; figures 1-6 *	1,2,5,7, 11-13 3,4,6, 8-10	
X A	KR 2003 0055725 A (LG ELECTRONICS INC [KR]) 4 July 2003 (2003-07-04) * figures 3, 4, 5 *	1,2,5,7, 11-13 3,4,6, 8-10	
X A	CN 209 639 146 U (LG ELECTRONICS INC) 15 November 2019 (2019-11-15) * abstract; figure 7 *	1,2,5,7, 11-13 3,4,6, 8-10	
A	WO 2018/137425 A1 (GREE ELECTRIC APPLIANCES INC ZHUHAI [CN]) 2 August 2018 (2018-08-02) * abstract *	1-13	TECHNICAL FIELDS SEARCHED (IPC) F24F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	26 May 2021	Valenza, Davide

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 21 15 0673

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

26-05-2021

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2304400 A	19-03-1997	CN 1143733 A	26-02-1997
		GB 2304400 A	19-03-1997
		JP 3322778 B2	09-09-2002
		JP H0960928 A	04-03-1997
		KR 970011610 A	27-03-1997
		TW 362755 U	21-06-1999
EP 1837609 A1	26-09-2007	CN 101087979 A	12-12-2007
		EP 1837609 A1	26-09-2007
		JP WO2006068147 A1	12-06-2008
		WO 2006068147 A1	29-06-2006
KR 20030055725 A	04-07-2003	NONE	
CN 209639146 U	15-11-2019	CN 209639146 U	15-11-2019
		KR 20190084864 A	17-07-2019
		KR 20200080215 A	06-07-2020
WO 2018137425 A1	02-08-2018	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82