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(54) Title: FAN ENCLOSURE WITH ADJUSTABLE SIDE VENTING

(57) Abstract: Particular embodiments described herein provide for an electronic device that can be configured to include a first heat source, a second heat source, and a fan inside a fan enclosure between the first heat source and the second heat source. The fan enclosure includes a main vent to direct air from the fan towards a heatsink and one or more side vents to direct air from the fan towards the first heat source or the second heat source.

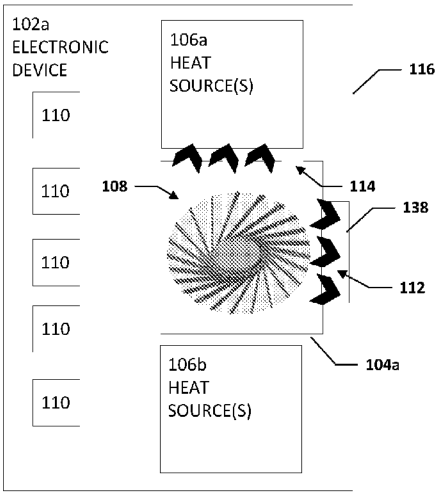

FIGURE 1A

[Continued on next page]

TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

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FAN ENCLOSURE WITH ADJUSTABLE SIDE VENTING

TECHNICAL FIELD

[0001] This disclosure relates in general to the field of computing and/or device cooling, and more particularly, to a fan enclosure with adjustable side venting.

BACKGROUND

[0002] Emerging trends in electronic devices are changing the expected performance and form factor of devices as devices and systems are expected to increase performance and function while having a relatively thin profile. However, the increase in performance and/or function causes an increase in the thermal challenges of the devices and systems. Insufficient cooling can cause a reduction in device performance, a reduction in the lifetime of a device, and delays in data throughput.

BRIEF DESCRIPTION OF THE DRAWINGS

[0003] To provide a more complete understanding of the present disclosure and features and advantages thereof, reference is made to the following description, taken in conjunction with the accompanying figures, wherein like reference numerals represent like parts, in which:

[0004] FIGURE 1A is a simplified block diagram of a system to enable a fan enclosure with adjustable side venting, in accordance with an embodiment of the present disclosure;

[0005] FIGURE 1B is a simplified block diagram of a system to enable a fan enclosure with adjustable side venting, in accordance with an embodiment of the present disclosure;

[0006] FIGURE 2 is a simplified block diagram perspective view of a fan enclosure with adjustable side venting, in accordance with an embodiment of the present disclosure;

[0007] FIGURE 3 is a simplified block diagram perspective view of a fan enclosure with adjustable side venting, in accordance with an embodiment of the present disclosure;

[0008] FIGURE 4 is a simplified block diagram perspective view of a fan enclosure with adjustable side venting, in accordance with an embodiment of the present disclosure;

[0009] FIGURE 5 is a simplified block diagram perspective view of a portion of a fan enclosure with adjustable side venting, in accordance with an embodiment of the present disclosure;

[0010] FIGURE 6 is a simplified block diagram perspective view of a portion of a fan enclosure with adjustable side venting, in accordance with an embodiment of the present disclosure;

[0011] FIGURE 7 is a simplified block diagram perspective view of a portion of a fan enclosure with adjustable side venting, in accordance with an embodiment of the present disclosure;

[0012] FIGURE 8 is a simplified block diagram perspective view of a portion of a fan enclosure with adjustable side venting, in accordance with an embodiment of the present disclosure;

[0013] FIGURE 9 is a simplified block diagram perspective view of a portion of a fan enclosure with adjustable side venting, in accordance with an embodiment of the present disclosure;

[0014] FIGURE 10 is a simplified block diagram of a portion of a system that includes a fan enclosure with adjustable side venting, in accordance with an embodiment of the present disclosure;

[0015] FIGURE 11 is a simplified block diagram of a portion of a system that includes a fan enclosure with adjustable side venting, in accordance with an embodiment of the present disclosure;

[0016] FIGURE 12 is a simplified block diagram of a portion of a system that includes a fan enclosure with adjustable side venting, in accordance with an embodiment of the present disclosure;

[0017] FIGURE 13 is a simplified block diagram of a portion of a system that includes a fan enclosure with adjustable side venting, in accordance with an embodiment of the present disclosure;

[0018] FIGURE 14 is a simplified block diagram of a portion of a system that includes a fan enclosure with adjustable side venting, in accordance with an embodiment of the present disclosure;

[0019] FIGURE 15 is a simplified block diagram perspective view of a portion of a fan enclosure with adjustable side venting, in accordance with an embodiment of the present disclosure;

[0020] FIGURE 16 is a simplified block diagram perspective view of a portion of a fan enclosure with adjustable side venting, in accordance with an embodiment of the present disclosure;

[0021] FIGURES 17A and 17B are a simplified block diagram of a system to enable a fan enclosure with adjustable side venting, in accordance with an embodiment of the present disclosure;

[0022] FIGURE 18 is a simplified block diagram of a system that includes a fan enclosure with adjustable side venting, in accordance with an embodiment of the present disclosure;

[0023] FIGURE 19 is a simplified block diagram of a system that includes a fan enclosure with adjustable side venting, in accordance with an embodiment of the present disclosure;

[0024] FIGURE 20 is a simplified block diagram of a portion of a fan enclosure with adjustable side venting, in accordance with an embodiment of the present disclosure;

[0025] FIGURE 21 is a simplified block diagram of a portion of a fan enclosure with adjustable side venting, in accordance with an embodiment of the present disclosure;

[0026] FIGURE 22 is a simplified block diagram of a portion of a fan enclosure with adjustable side venting, in accordance with an embodiment of the present disclosure;

[0027] FIGURE 23 is a simplified flowchart illustrating potential operations that may be associated with the system in accordance with an embodiment of the present disclosure;

[0028] FIGURE 24 is a simplified flowchart illustrating potential operations that may be associated with the system in accordance with an embodiment of the present disclosure; and

[0029] FIGURE 25 is a simplified block diagram of devices that includes a fan enclosure with adjustable side venting, in accordance with an embodiment of the present disclosure.

[0030] The FIGURES of the drawings are not necessarily drawn to scale, as their dimensions can be varied considerably without departing from the scope of the present disclosure.

DETAILED DESCRIPTION

[0031] The following detailed description sets forth examples of apparatuses, methods, and systems relating to enabling a fan enclosure with adjustable side venting. Features such as structure(s), function(s), and/or characteristic(s), for example, are described with reference to one embodiment as a matter of convenience; various embodiments may be implemented with any suitable one or more of the described features.

[0032] In the following description, various aspects of the illustrative implementations will be described using terms commonly employed by those skilled in the art to convey the substance of their work to others skilled in the art. However, it will be apparent to those skilled in the art that the embodiments disclosed herein may be practiced with only some of the described aspects. For purposes of explanation, specific numbers, materials, and configurations are set forth in order to provide a thorough understanding of the illustrative implementations. However, it will be apparent to one skilled in the art that the embodiments disclosed herein may be practiced without the specific details. In other instances, well-known features are omitted or simplified in order not to obscure the illustrative implementations.

[0033] The terms "over," "under," "below," "between," and "on" as used herein refer to a relative position of one layer or component with respect to other layers or components. For example, one layer or component disposed over or under another layer or component may be directly in contact with the other layer or component or may have one or more intervening layers or components. Moreover, one layer or component disposed between two layers or components may be directly in contact with the two layers or components or may have one or more intervening layers or components. In contrast, a first layer or first component "directly on" a second layer or second component is in direct contact with that second layer or second component. Similarly, unless explicitly stated otherwise, one feature disposed between two features may be in direct contact with the adjacent features or may have one or more intervening layers.

[0034] In the following detailed description, reference is made to the accompanying drawings that form a part hereof wherein like numerals designate like parts throughout, and in which is shown, by way of illustration, embodiments that may be practiced. It is to be understood that other embodiments may be utilized and structural or logical changes may be made without departing from the scope of the present disclosure. Therefore, the following detailed description is not to be taken in a limiting sense. For the purposes of the present disclosure, the phrase "A and/or B" means (A), (B), or (A and B). For the purposes of the present disclosure, the phrase "A, B, and/or C" means (A), (B), (C), (A and B), (A and C), (B and C), or (A, B, and C). Reference to “one embodiment” or “an embodiment” in the present disclosure means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment. The appearances of the phrase “in one embodiment” or “in an embodiment” are not necessarily all referring to the same embodiment. The appearances of the phrase “for example,” “in an example,” or “in some examples” are not necessarily all referring to the same example.

[0035] Furthermore, the term "connected" may be used to describe a direct connection between the things that are connected, without any intermediary devices, while the term "coupled" may be used to describe either a direct connection between the things that are connected, or an indirect connection through one or more intermediary devices. The terms “substantially,” “close,” “approximately,” “near,” and “about,” generally refer to being within +/- 20% of a target value based on the context of a particular value as described herein or as known in the art. Similarly, terms indicating orientation of various elements, e.g., “coplanar,” “perpendicular,” “orthogonal,” “parallel,” or any other angle between the elements, generally refer to being within +/- 5-20% of a target value based on the context of a particular value as described herein or as known in the art.

[0036] Turning to FIGURE 1A, FIGURE 1A is a simplified block diagram of an electronic device 102a configured with a fan enclosure with adjustable side venting, in accordance with an embodiment of the present disclosure. In an example, the electronic device 102a can include a fan enclosure with adjustable side venting 104a, a one or more first heat sources 106a, one or more second heat sources 106b, a fan 108, and one or more electronic components 110. The fan 108 can be in the fan enclosure with adjustable side venting 104a. The fan enclosure with adjustable side venting 104a can include a main vent 112 and a plurality of side vents 114.

[0037] A chassis 116 is the enclosure, outer body, outer structure, etc. of the electronic device 102a that contains the components of the electronic device 102a (excluding a keyboard, mouse, peripherals, etc. if present). Each of the first heat sources 106a and the second heat sources 106b may be a heat generating device (e.g., processor, logic unit, field programmable gate array (FPGA), chip set, integrated circuit (IC), a graphics processor, graphics card, battery, memory, or some other type of heat generating device). Each of the electronic components 110 can be a device or group of devices available to assist in the operation or function of the electronic device 102a. The main vent 112 can direct air over a heatsink 138, or more specifically, fins of a heatsink or some other cooling means.

[0038] Turning to FIGURE 1B, FIGURE 1B is a simplified block diagram of an electronic device 102b configured with a fan enclosure with adjustable side venting, in accordance with an embodiment of the present disclosure. In an example, the electronic device 102b can include a fan enclosure with adjustable side venting 104b, the one or more first heat sources 106a, the one or more second heat sources 106b, the fan 108, and one or more electronic components 110. The fan 108 can be in the fan enclosure with adjustable side venting 104b. The main vent 112 can direct air over a heatsink 138, or more specifically, fins of a heatsink or some other cooling means. The fan enclosure with adjustable side venting 104b can include the main vent 112 and the plurality of side vents 114. Each of the first heat sources 106a and the second heat sources 106b may be a heat generating device (e.g., processor, logic unit, field programmable gate array (FPGA), chip set, integrated circuit (IC), a graphics processor, graphics card, battery, memory, or some other type of heat generating device). Each of the electronic components 110 can be a device or group of devices available to assist in the operation or function of the electronic device 102b.

[0039] The fan enclosure with adjustable side venting 104 can be used to cool specific components and areas and lower the skin temperature of hot spots areas in the chassis 116. The position of side venting can be adjusted to meet board placement requirements. The fan enclosure with adjustable side venting 104 provides an active cooling solution for some components and areas that are not covered by a thermal heat spreader (e.g., cold plate and heat pipe or vapor chamber). The size and quantity of venting in the fan enclosure with adjustable side venting 104 can be adjusted base on placement, component, and hot spots requirements. The angle of venting also can be adjusted base on air flow distribution. In an example, a slide mechanism (described below), side vent plugs (described below), or some other means may be used during manufacturing of the electronic device to adjust the size and quantity of the open side vents 114 in the fan enclosure with adjustable side venting 104 and to direct airflow from the side vents 114 to the identified hot spots in the component layout.

[0040] In an illustrative example, when a layout for an electronic device is designed, one or more hot spots can be identified as areas that may require additional cooling. For example, areas around a central processing unit (CPU) and graphics processing unit (GPU) may be identified as areas that require additional cooling. Typically, a heat pipe, vapor chamber, cold plate, etc. are added to the areas to provide additional cooling to components. Sometimes, the heat pipe, vapor chamber, cold plate, etc. may not be able to provide the necessary cooling or adding the heat pipe, vapor chamber, cold plate, etc. may not be economically feasible or possible due to design constraints. If additional cooling to components is needed and the heat pipe, vapor chamber, cold plate, etc. are not able to provide the additional cooling, the air from the side vents 114 can be used to cool the areas or components that need additional cooling. More specifically, in one example, if during a system layout design, it is determined that a solid-state drive (SSD), battery, voltage regulator, CPU, and/or the skin of the chassis around a specific area (e.g., the CPU area) may not be properly cooled, the air from the side vents 114 can be used to cool the SSD, the battery, voltage regulator, CPU, and/or the skin of the chassis around the specific area. The side venting position, quantity, and size can be adjusted to provide anticipated cooling needs. For example, a slide mechanism can be used to adjust venting hole size and position to dynamical adjust the volume of air flow for different board configurations. The fan enclosure with adjustable side venting 104 can be used to cool almost any components or areas by using different volumes of air flow to try and help improve system performance.

[0041] For example, when the layout for electronic device 102a is designed, the first heat sources 106a be identified as areas that may require additional cooling. Heat pipes, vapor chambers, cold plates, etc. may be added to the area around the first heat sources 106a but the heat pipe, vapor chamber, cold plate, etc. may not provide enough cooling due to design constraints. As illustrated in FIGURE 1A, side vents 114 of the fan enclosure with adjustable side venting 104a can be used to adjust the volume of air flow from the fan enclosure with adjustable side venting 104a for different board configurations and to cool the first heat sources 106a.

[0042] In another example, when the layout for electronic device 102b is designed, the second heat sources 106b may be identified as areas that may require additional cooling. Heat pipes, vapor chambers, cold plates, etc. may be added to the area around the second heat sources 106b but the heat pipe, vapor chamber, cold plate, etc. may not provide enough cooling due to design constraints. As illustrated in FIGURE 1B, side vents 114 of the fan enclosure with adjustable side venting 104b can be used to adjust the volume of air flow from the fan enclosure with adjustable side venting 104b for different board configurations and to cool the second heat sources 106b.

[0043] In some examples, if the first heat sources 106a or the second heat sources 106b are processors and the fan enclosure with adjustable side venting 104 can allow the processors to operate with an increased clock frequency for a longer period of time than if the fan enclosure with adjustable side venting 104 was not providing additional cooling. A processor’s clock frequency represents how many cycles per second the processor can execute. The higher the clock frequency of the processor, the more "switching" can be done per time-unit by the processor. To increase the clock frequency of the processor, the voltage to the processor is increased. As the voltage increases so does the power and the amount of heat that is generated by the heat source. The clock frequency is also referred to as clock speed, clock rate, PC frequency, CPU frequency, and other similar terms.

[0044] As used herein, the term “when” may be used to indicate the temporal nature of an event. For example, the phrase “event ‘A’ occurs when event ‘B’ occurs” is to be interpreted to mean that event A may occur before, during, or after the occurrence of event B, but is nonetheless associated with the occurrence of event B. For example, event A occurs when event B occurs if event A occurs in response to the occurrence of event B or in response to a signal indicating that event B has occurred, is occurring, or will occur. Reference to “one embodiment" or "an embodiment" in the present disclosure means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment. The appearances of the phrase "in one embodiment" or "in an embodiment" are not necessarily all referring to the same embodiment.

[0045] It is to be understood that other embodiments may be utilized, and structural changes may be made without departing from the scope of the present disclosure. Substantial flexibility is provided in that any suitable arrangements and configuration may be provided without departing from the teachings of the present disclosure.

[0046] For purposes of illustrating certain example techniques, the following foundational information may be viewed as a basis from which the present disclosure may be properly explained. End users have more media and communications choices than ever before. A number of prominent technological trends are currently afoot (e.g., more computing elements, more online video services, more Internet traffic, more complex processing, etc.), and these trends are changing the expected performance and form factor of devices as devices and systems are expected to increase performance and function while having a relatively thin profile. However, the increase in performance and/or function causes an increase in the thermal challenges of the devices and systems. For example, in some devices, it can be difficult to cool a particular heat source or area.

[0047] System level thermal and mechanical engineering is critical and can be difficult to balance, especially in thin and/or light devices, where a system needs to provide a sustained and transient power performance while providing a long battery life. For example, a high chassis skin temperature will often result in CPU throttling even if the CPU has not reached a critical temperature and still has a temperature margin that would allow the CPU to operate at a high sustained power level.

[0048] To try and obtain better system performance, some systems attempt to optimize the thermal module design including the fan, heat pipe, vapor chamber, chassis material, system air inlet and outlet to increase their performance and cooling capacity. Some devices, especially thin and/or light devices, have system component placement constraints which limits the size of the fan. Often the curve of the fan blade is designed to try and obtain more air flow.

Some gaming systems use a fan with dual air outlets to try and obtain more cooling capability, but dual air outlets occupy a larger space which impacts board design, I/O connectors' placement, etc. In many cases, the design of the fan blade to increase airflow and/or dual air outlets will increase the noise from the fan and the increased noise can be large enough to impact the user experience.

[0049] Some systems increase the Z-height of the heat pipe to try and obtain maximum heat carrying capacity (Qmax). However, increasing the Z-height of the heat pipe will impact the overall system Z-height and is not a desired solution. A vapor chamber is a good temperature equalization material, it has better spreading performance, but the cost of currently designed vapor chambers is relatively high and can increase the overall cost of a device that includes a vapor chamber. Currently, only premium, and limited gaming designs use a vapor chamber due to the relatively high cost of the vapor chamber. Some systems use air inlets with high air permeability however, these inlets typically have a relatively high cost and low yield rate. Also, air inlets need a sealing mesh to avoid exposing inner components to end users. The air outlet is limited by the fan size and fin quantity and there is not much flexibility to optimize the air outlet once the fan size is fixed. What is needed is a system to enable a fan enclosure with adjustable side venting.

[0050] A system to enable a fan enclosure with adjustable side venting, as outlined in FIGURES 1A and 1B, can resolve these issues (and others). In an example, a fan enclosure with adjustable side venting (e.g., the fan enclosure with adjustable side venting 104) can be configured to provide cooling air to cool specific components directionally and lower the skin temperature of hot spot areas so that a processor (e.g., CPU or GPU) can run at higher PL1 power to improve performance before throttling. The fan can include one or more slidable windows around the side venting areas. The side venting size and location can be adjusted by use of slidable windows to satisfy board placement requirements. The adjustable venting size and location can help the cooling capability of the fan outlet area without any space increase and cost additions for extra heat pipes or vapor chambers. In some examples, the fan enclosure with adjustable side vents can improve system performance by ten to fifteen percent without changing the system placement of components and increasing the Z-height by directionally cooling specific area or components to lower the skin temperature of the chassis

[0051] In an example, a slidable window can be used to adjust side venting to accommodate for difference system component placement requirements. Existing fans typically have one or two air outlets to cool the fin and heat pipe which used to transfer the heat generated by a CPU or GPU. Hot spots of skin of the chassis are normally located around CPU or GPU areas. In addition, the CPU and GPU are not the only heat source, as memory, voltage regulators, battery, SSD, WLAN also will bring more heat into the system and, in some systems, cannot be covered by thermal spreader. These bring more thermal constrains to system design. The fan enclosure with adjustable side venting can be used to cool areas that can be difficult to cool in current system designs.

[0052] The fan with side venting can be used to cool specific components and areas and lower the skin temperature of hot spots areas in the chassis. The position of side venting can be adjusted to meet board placement requirements. The fan with side venting provides an active cooling solution for some components and areas that is not covered by a thermal spreader or vapor chamber. The size and quantity of venting in the fan with side venting can be adjusted base on placement, component, and hot spots requirements. The angle of venting also can be adjusted base on air flow distribution.

[0053] In one example, if during a system layout design, it is determined that an SSD may not be properly cooled, the air from the side venting can be used to cool the SSD. In another example, if during a system layout design, it is determined that the battery, voltage regulator, CPU, and/or the skin of the chassis around a specific area (e.g., the CPU area) may not be properly cooled, the air from side venting can be used to cool the battery, voltage regulator, CPU, and/or the skin of the chassis around the specific area. The side venting position, quantity, and size can be adjusted to provide anticipated cooling needs. For example, a slide mechanism can be used to adjust venting hole size and position to adjust the volume of air flow for different board configurations. The fan enclosure with adjustable side vents can be used to cool almost any components or areas by using different volumes of air flow to try and help improve system performance.

[0054] In an illustrative example, the fan enclosure with adjustable side vents can include a slide mechanism that can be adjusted to a position to create different venting hole sizes and adjust the volume of air from the side vents. The slide mechanism may be a metal slide or some other material with though holes (or windows). The fan enclosure with adjustable side vents can include a fan encloser that can be used to guide the slide mechanism and seal the though holes if the through holes are not needed for a particular system design. The slide mechanism can be adjusted along the slideway of the fan encloser to close off a through hole or narrow the through hole to create different volumes of air from the fan enclosure with adjustable side vents. If the slide mechanism moves counterclockwise relative to the blades of the fan, the air flow direction will change, and if the slide mechanism moves to cover some of the through holes, the through holes will be sealed by the fan encloser, the size of venting holes becomes smaller, and the volume of air flow will be smaller. In the same way, if the slide mechanism moves clockwise relative to the blades of the fan, the air flow direction will change, and the slide mechanism moves to cover some of the through holes, the size of venting holes becomes smaller, so the volume of air flow will be smaller. The counterclockwise and clockwise movement of the slide mechanism can create different cooling directions and cooling capability base on the different position of the slide mechanism. When the slide mechanism position is adjusted, the cooling air direction and volume will be changed. Base on the board placement of components, the position of the slide mechanism can be used to cool specific components and/or areas.

[0055] In some current systems, particularly gaming systems, component placement, especially the GPU, the CPU, memory, and voltage regulators are all typically close to one or more fans. This is because the components that significantly create more heat due to running at higher frequency and higher voltage need more cooling and for thin and light systems, it is preferable to located the components close to a fan so a minimum length of heat pipe and vapor chamber are needed to move the heat collected from the components to the heatsink and the fan. The system can take advantage of the placement of the components close to the fan and use air from side venting of the fan enclosure to directly cool the hot components. The size, direction, angle, and quantity of side venting can be customized for different systems.

[0056] Turning to FIGURE 2, FIGURE 2 is a simplified perspective view of a block diagram of a fan enclosure with adjustable side venting 104c, in accordance with an embodiment of the present disclosure. In an example, the fan enclosure with adjustable side venting 104c can include the main vent 112, side vents 114a and 114b, a top cover 120, a main body 122, and attachment tabs 124. As illustrated in FIGURE 2, the top cover 120 can be over the main body 122 to help protect the fan 108 (not shown) that is inside the fan enclosure with adjustable side venting 104c and to help force the air from the fan out of the main vent 112 and any open side vents 114. For example, as illustrated in FIGURE 2, the side vents 114b are open to allow the air from the fan 108 in the enclosure with adjustable side venting 104c to escape and help cool heat sources and/or hot spots near the side vents 114b. The side vents 114a can be closed the help increase the airflow out of side vents 114b. The attachment tabs 118 can help secure the fan enclosure with adjustable side venting 104c to the chassis 116 (not shown) of the electronic device 100 (not shown).

[0057] Turning to FIGURE 3, FIGURE 3 is a simplified perspective view of a block diagram of a fan enclosure with adjustable side venting 104d, in accordance with an embodiment of the present disclosure. In an example, the fan enclosure with adjustable side venting 104d can include the main vent 112, side vents 114a and 114b, the top cover 120, the main body 122, and attachment tabs 124. As illustrated in FIGURE 3, the top cover 120 can be over the main body 122 to help protect the fan 108 (not shown) that is inside the fan enclosure with adjustable side venting 104d and to help force the air from the fan 108 out of the main vent 112 and any open side vents 114. For example, as illustrated in FIGURE 3, the side vents 114a are open to allow the air from the fan 108 in the enclosure with adjustable side venting 104d to escape and help cool heat sources and/or hot spots near the side vents 114a. The side vents 114b can be closed to help increase the airflow out of the side vents 114a. The attachment tabs 118 can help secure the fan enclosure with adjustable side venting 104d to the chassis 116 (not shown) of the electronic device 100 (not shown).

[0058] Turning to FIGURE 4, FIGURE 4 is a simplified perspective view of a block diagram of a fan enclosure with adjustable side venting 104e, in accordance with an embodiment of the present disclosure. In an example, the fan enclosure with adjustable side venting 104e can include the main vent 112, side vents 114a and 114b, the top cover 120, the main body 122, attachment tabs 124, and a slide mechanism 126. As illustrated in FIGURE 4, the top cover 120 can be over the main body 122 to help protect the fan 108 (not shown) that is inside the fan enclosure with adjustable side venting 104e and to help force the air from the fan 108 out of the main vent 112 and any open the side vents 114. For example, as illustrated in FIGURE 4, the side vents 114b are open to allow the air from the fan 108 in the enclosure with adjustable side venting 104e to escape and help cool heat sources and/or hot spots near the side vents 114b. The side vents 114a can be closed to help increase the airflow out of side vents 114b. The attachment tabs 118 can help secure the fan enclosure with adjustable side venting 104e to the chassis 116 (not shown) of the electronic device 100 (not shown). The slide mechanism 126 can be used to adjust the venting hole size of side vents 114b to adjust the volume of air flow out of side vents 114b. In some examples, the slide mechanism 126 can be used to close off one or more of the side vents 114b. For example, the slide mechanism 126 can be used to close the side vents 114a.

[0059] Turning to FIGURE 5, FIGURE 5 is a simplified perspective view of a block diagram of the slide mechanism 126, in accordance with an embodiment of the present disclosure. In an example, the slide mechanism 126 can include a main body 128, a plurality of windows 130, and slide/attachment mechanism 132. The windows 130 can allow air from the fan 108 (not shown) to pass through the main body 128. The slide/attachment mechanism 132 can extend perpendicularly from the main body 128 and provide a means of sliding the slide mechanism 126 into place or a tab or handle to allow a user or a tool or device to slide the slide mechanism 126 into place. The slide/attachment mechanism 132 can also help to secure the slide mechanism 126 once the slide mechanism 126 is positioned to a desired location.

[0060] Turning to FIGURE 6, FIGURE 6 is a simplified perspective view of a block diagram of a portion of the fan enclosure with adjustable side venting 104, in accordance with an embodiment of the present disclosure. In an example, the fan enclosure with adjustable side venting 104 can include the main body 122. The main body 122 can include the plurality of side vents 114, the attachment tabs 124, a slide mechanism channel 134, and a slide mechanism attachment area 136.

[0061] Turning to FIGURE 7, FIGURE 7 is a simplified perspective view of a block diagram of a portion of the fan enclosure with adjustable side venting 104, in accordance with an embodiment of the present disclosure. In an example, the fan enclosure with adjustable side venting 104 can include the main body 122 and the slide mechanism 126. The main body 122 can include the plurality of side vents 114, the attachment tabs 124, the slide mechanism channel 134, and the slide mechanism attachment area 136. The slide mechanism 126 can include the main body 128, the plurality of windows 130, and the slide/attachment mechanism 132.

[0062] During construction or assembly of the fan enclosure with adjustable side venting 104, the main body 128 of the slide mechanism 126 can be inserted into the slide mechanism channel 134. The slide mechanism 126 can move back and forth in the slide mechanism channel 134 to position the windows 130 of the slide mechanism 126 at a desired location to help create the desired air flow through the side vents 114 or line up the windows 130 of the slide mechanism 126 to help create the desired air flow through the side vents 114 and to control the amount of air from the side vents 114. For example, if a relatively large amount of air is desired to flow through the side vents 114, then as illustrated in FIGURE 7, two of the windows 130 can be positioned to allow a relatively large amount of air to flow through the side vents 114. If a relatively small amount of air is desired to flow through the side vents 114, then only one of the windows 130 may be positioned in each of side vents 114 to allow a relatively small amount of air to flow through the side vents 114. The number of windows and position of the windows illustrated in FIGURE 7 is for illustration purposes only and the number and position of windows depends on the desired amount of air to flow through the side vents 114 and design constrains. The slide/attachment mechanism 132 can help provide a means of sliding the slide mechanism 126 into place. The slide/attachment mechanism 132 can also help to secure the slide mechanism 126 to slide mechanism attachment area 136 and secure the slide mechanism 126 once the slide mechanism 126 is positioned to a desired location. The slide/attachment mechanism 132 can be secured to the slide mechanism attachment area 136 using friction or some other means that can secure the slide mechanism 126 in a desired location.

[0063] Turning to FIGURE 8, FIGURE 8 is a simplified perspective view of a block diagram of a portion of the fan enclosure with adjustable side venting 104, in accordance with an embodiment of the present disclosure. In an example, the fan enclosure with adjustable side venting 104 can include the main body 122 and the slide mechanism 126. The main body 122 can include the plurality of side vents 114, the slide mechanism channel 134, and the slide mechanism attachment area 136. The slide mechanism 126 can include the main body 128, the plurality of windows 130, and the slide/attachment mechanism 132.

[0064] During construction or assembly of the fan enclosure with adjustable side venting 104, the main body 128 of the slide mechanism 126 can be inserted into the slide mechanism channel 134. The slide mechanism 126 can move back and forth in the slide mechanism channel 134 to position the windows 130 of the slide mechanism 126 at a desired location to help create the desired air flow through the side vents 114. The number of windows and position of the windows illustrated in FIGURE 8 is for illustration purposes only and the number and position of windows depends on the desired amount of air to flow through the side vents 114 and design constrains. The slide/attachment mechanism 132 can help provide a means of sliding the slide mechanism 126 into place. The slide/attachment mechanism 132 can also help to secure the slide mechanism 126 to slide mechanism attachment area 136 and secure the slide mechanism 126 once the slide mechanism 126 is positioned to a desired location.

[0065] Turning to FIGURE 9, FIGURE 9 is a simplified perspective front view of a block diagram of a portion of the fan enclosure with adjustable side venting 104, in accordance with an embodiment of the present disclosure. In an example, the fan enclosure with adjustable side venting 104 can include the main body 122, the slide mechanism 126, and top cover 120. The main body 122 can include the plurality of side vents 114, the slide mechanism channel 134 (not shown), and the slide mechanism attachment area 136. The slide mechanism 126 can include the main body 128, the plurality of windows 130, and the slide/attachment mechanism 132.

[0066] During construction or assembly of the fan enclosure with adjustable side venting 104, the main body 128 of the slide mechanism 126 can be inserted into the slide mechanism channel 134. The slide mechanism 126 can move back and forth in the slide mechanism channel 134 to position the windows 130 of the slide mechanism 126 at a desired location to help create the desired air flow through the side vents 114. The number of windows and position of the windows illustrated in FIGURE 9 is for illustration purposes only and the number and position of windows depends on the desired amount of air to flow through the side vents 114 and design constrains. The slide/attachment mechanism 132 can help provide a means of sliding the slide mechanism 126 into place. The slide/attachment mechanism 132 can also help to secure the slide mechanism 126 to slide mechanism attachment area 136 and secure the slide mechanism 126 once the slide mechanism 126 is positioned to a desired location. In some examples, the slide mechanism 126 can be positioned to the desired location and secured in place even with the top cover 120 over the main body 122 of the fan enclosure with adjustable side venting 104.

[0067] Turning to FIGURE 10, FIGURE 10 is a simplified a block diagram of a portion of the electronic device 102a, in accordance with an embodiment of the present disclosure. In an example, the electronic device 102a can include fan enclosure with adjustable side venting 104a, the first heat sources 106a, the second heat sources 106b, and one or more heat pipes 140. The fan enclosure with adjustable side venting 104a can include side vents 114a and 114b and attachment tabs 124. In an example, attachment tabs 124 can help to secure the fan enclosure with adjustable side venting 104a to a support structure 142. The first heat sources 106a and the second heat sources 106b can also be coupled to the support structure 142. The support structure 142 can be a printed circuit board or substrate. The heat pipe 140 can help to remove heat and cool down one or more components (e.g., a CPU or a GPU) in electronic device 102a. As illustrated in FIGURE 10, the heat pipe is not over the first heat sources 106a and the second heat sources 106b. If it is determined that the first heat sources 106a need additional cooling, the side vents 114a can allow the air from the fan in the enclosure with adjustable side venting 104a to be directed towards the first heat sources 106a and help cool the first heat sources 106a heat sources and hot spots near the side vents 114a. The side vents 114b can be closed the help increase the airflow out of side vents 114a.

[0068] Turning to FIGURE 11, FIGURE 11 is a simplified a block diagram of a portion of the electronic device 102b, in accordance with an embodiment of the present disclosure. In an example, the electronic device 102b can include fan enclosure with adjustable side venting 104b, the first heat sources 106a, the second heat sources 106b, and one or more heat pipes 140. The fan enclosure with adjustable side venting 104b can include side vents 114a and 114b and attachment tabs 124. In an example, attachment tabs 124 can help to secure the fan enclosure with adjustable side venting 104b to the support structure 142. The first heat sources 106a and the second heat sources 106b can also be coupled to the support structure 142. The heat pipe 140 can help to remove heat and cool down one or more components (e.g., a CPU or a GPU) in electronic device 102b. As illustrated in FIGURE 11, the heat pipe is not over the first heat sources 106a and the second heat sources 106b. If it is determined that the second heat sources 106b need additional cooling, the side vents 114b can allow the air from the fan in the enclosure with adjustable side venting 104b to be directed towards the second heat sources 106b and help cool the second heat sources 106b heat sources and hot spots near the side vents 114b. The side vents 114a can be closed the help increase the airflow out of side vents 114b.

[0069] Turning to FIGURE 12, FIGURE 12 is a simplified a block diagram of a portion of an electronic device 102c, in accordance with an embodiment of the present disclosure. In an example, the electronic device 102c can include fan enclosure with adjustable side venting 104f, the first heat sources 106a, the second heat sources 106b, and one or more heat pipes 140. The fan enclosure with adjustable side venting 104f can include side vents 114a and 114b, attachment tabs 124, and slide mechanism 126. In an example, attachment tabs 124 can help to secure the fan enclosure with adjustable side venting 104f to the support structure 142. The first heat sources 106a and the second heat sources 106b can also be coupled to the support structure 142. The heat pipe 140 can help to remove heat and cool down one or more components (e.g., a CPU or a GPU) in electronic device 102c. As illustrated in FIGURE 12, the heat pipe is not over the first heat sources 106a and the second heat sources 106b. If it is determined that the second heat sources 106b need additional cooling, the slide mechanism 126 can be positioned such that the side vents 114b can allow the air from the fan in the enclosure with adjustable side venting 104f to be directed towards the second heat sources 106b and help cool the second heat sources 106b heat sources and hot spots near the side vents 114b. The side vents 114a can be closed the help increase the airflow out of side vents 114b. In some examples, the slide mechanism 126 can be positioned to direct the focus of the airflow out of side vents 114b. For examples, as illustrated in FIGURE 12, the airflow out of side vents 114b is in a first direction (as opposed to a second direction illustrated in FIGURE 13 described below).

[0070] Turning to FIGURE 13, FIGURE 13 is a simplified a block diagram of a portion of an electronic device 102d, in accordance with an embodiment of the present disclosure. In an example, the electronic device 102d can include fan enclosure with adjustable side venting 104g, the first heat sources 106a, the second heat sources 106b, and one or more heat pipes 140. The fan enclosure with adjustable side venting 104g can include side vents 114a and 114b, attachment tabs 124, and slide mechanism 126. In an example, attachment tabs 124 can help to secure the fan enclosure with adjustable side venting 104g to the support structure 142. The first heat sources 106a and the second heat sources 106b can also be coupled to the support structure 142. The heat pipe 140 can help to remove heat and cool down one or more components (e.g., a CPU or a GPU) in electronic device 102d. As illustrated in FIGURE 13, the heat pipe is not over the first heat sources 106a and the second heat sources 106b. If it is determined that the second heat sources 106b need additional cooling, the slide mechanism 126 can be positioned such that the side vents 114b can allow the air from the fan in the enclosure with adjustable side venting 104g to be directed towards the second heat sources 106b and help cool the second heat sources 106b heat sources and hot spots near the side vents 114b. The side vents 114a can be closed the help increase the airflow out of side vents 114b. In some examples, the slide mechanism 126 can positioned to direct the focus of the airflow out of side vents 114b. For examples, as illustrated in FIGURE 13, the airflow out of side vents 114b is in a second direction (as opposed to a first direction illustrated in FIGURE 12 described above).

[0071] Turning to FIGURE 14, FIGURE 14 is a simplified a block diagram of a portion of an electronic device 102e, in accordance with an embodiment of the present disclosure. In an example, the electronic device 102e can include a fan enclosure with adjustable side venting 104h, a fan enclosure with adjustable side venting 104i, the first heat sources 106a and the second heat sources 106b. The fan enclosure with adjustable side venting 104h, the fan enclosure with adjustable side venting 104i, the first heat sources 106a, and the second heat sources 106b can be on support structure 142. The fan enclosure with adjustable side venting 104h can include side vents 114c and one or more main vents 112. The side vents 114c can allow the air from the fan 108 (not shown) in the enclosure with adjustable side venting 104h to be directed towards the first heat sources 106a and help cool the first heat sources 106a heat sources and hot spots near the side vents 114c. The fan enclosure with adjustable side venting 104i can include side vents 114d and one or more main vents 112. The side vents 114d can allow the air from the fan 108 (not shown) in the enclosure with adjustable side venting 104i to be directed towards the second heat sources 106b and help cool the second heat sources 106b heat sources and hot spots near the side vents 114d.

[0072] Turning to FIGURE 15, FIGURE 15 is a simplified perspective view of a block diagram of a portion of the fan enclosure with adjustable side venting 104j, in accordance with an embodiment of the present disclosure. In an example, the fan enclosure with adjustable side venting 104j can include the main body 122. The main body 122 can include the main vent 112 (or the vent area for the main vent), the plurality of side vents 114f, and the attachment tabs 124.

[0073] During construction or assembly of the fan enclosure with adjustable side venting 104j, one or more side vent plugs 180 can be inserted into one or more of the pluralities of side vents 114f to help create the desired air flow through the side vents 114f. For example, as illustrated in FIGURE 15, two of the side vent plugs 180 have been inserted into two of the side vents 114f. The number of the side vents 114f and the side vent plugs 180 illustrated in FIGURE 15 is for illustration purposes only and the number and position of the side vents 114f and the side vent plugs 180 depends on the desired amount of air to flow through the side vents 114f and design constrains.

[0074] Turning to FIGURE 16, FIGURE 16 is a simplified perspective view of a block diagram of a portion of the fan enclosure with adjustable side venting 104j, in accordance with an embodiment of the present disclosure. In an example, the fan enclosure with adjustable side venting 104j can include the main body 122. The main body 122 can include the plurality of side vents 114f. During construction or assembly of the fan enclosure with adjustable side venting 104j, one or more side vent plugs 180 can be inserted into one or more of the pluralities of side vents 114f to help create the desired air flow through the side vents 114f. The side vent plugs 180 can include one or more plug windows 182 to help create the desired air flow through the side vents 114f. For example, as illustrated in FIGURE 16, two of the side vent plugs 180 have been inserted into two of the side vents 114f. Each of the side vent plugs 180 have two plug windows 182. The size and shape of the plug windows 182 can depend on the size and shape that will create the desired air flow through the side vents 114f. The number of the side vents 114f, the side vent plugs 180, and plug windows 182 illustrated in FIGURE 16 is for illustration purposes only and the number and position of the side vents 114f, the side vent plugs 180, and plug windows 182 depends on the desired amount of air to flow through the side vents 114f and design constrains.

[0075] Turning to FIGURES 17A and 17B, FIGURES 17A and 17B are a simplified a block diagram of an electronic device 102f, in accordance with an embodiment of the present disclosure. In an example, the electronic device 102f can include a fan enclosure with adjustable side venting 104k, the one or more first heat sources 106a, the one or more second heat sources 106b, one or more electronic components 110, a thermal management engine 144, and a slide mechanism engine 146. The fan enclosure with adjustable side venting 104k can include the main vent 112, the plurality of side vents 114, and the slide mechanism 126.

[0076] The thermal management engine 144 can be configured to collect data or thermal parameters related to the first heat sources 106a and the second heat sources 106b and other components, elements, devices (e.g., electronic components 110) in electronic device 102f. The term “thermal parameters” includes a measurement, range, indicator, etc. of an element or condition that affects the thermal response, thermal state, and/or thermal transient characteristics of the heat source associated with the thermal parameters. The thermal parameters can include a temperature of a specific heat source, the air temperature (e.g., ambient air temperature, temperature of the air inside the platform, etc.), power dissipation of a heat source, a platform workload intensity, a CPU workload or processing speed, a data workload of a neighboring device, fan speed, or other indicators that may affect the thermal condition of a heat source. Based on the collect data or thermal parameters related to the first heat sources 106a and the second heat sources 106b and other components, the thermal management engine 144 can cause the slide mechanism engine 146 to move slide mechanism 126 and open or close the side vents 114 to control the air from the fan enclosure with adjustable side venting 104k. For example, if the thermal management engine 144 determines that the first heat sources 106a need to cool down, the thermal management engine 144 can cause the slide mechanism engine 146 to move slide mechanism 126 to open the side vents 114a to allow the air from the fan 108 (not shown) in the enclosure with adjustable side venting 104k to escape and help cool heat sources and/or hot spots near the side vents 114a, as illustrated in FIGURE 17A. In another example, if the thermal management engine 144 determines that the second heats sources 106b need to cool down, the thermal management engine 144 can cause the slide mechanism engine 146 to move slide mechanism 126 to open side vents 114b to allow the air from the fan in the enclosure with adjustable side venting 104k to escape and help cool heat sources and/or hot spots near the side vents 114b, as illustrated in FIGURE 17B.

[0077] Turning to FIGURE 18, FIGURE 18 is a simplified a block diagram of an electronic device 102f, in accordance with an embodiment of the present disclosure. In an example, the electronic device 102f can include the fan enclosure with adjustable side venting 104k, the one or more first heat sources 106a, the one or more second heat sources 106b, the thermal management engine 144, and the slide mechanism engine 146. The fan enclosure with adjustable side venting 104k can include the plurality of side vents 114, the attachment tabs 124, and the slide mechanism 126. The attachment tabs 124 can help secure the fan enclosure with adjustable side venting 104k to the support structure 142.

[0078] Based on the collect data or thermal parameters related to the first heat sources 106a and the second heat sources 106b and other components, the thermal management engine 144 can cause the slide mechanism engine 146 to move slide mechanism 126 and open or close the side vents 114 to control the air from the fan enclosure with adjustable side venting 104k. For example, if the thermal management engine 144 determines that the second heats sources 106b need to cool down, the thermal management engine 144 can cause the slide mechanism engine 146 to move slide mechanism 126 to open side vents 114b to allow the air from the fan 108 (not shown) in the enclosure with adjustable side venting 104k to escape and help cool heat sources and/or hot spots near the side vents 114b.

[0079] Turning to FIGURE 19, FIGURE 19 is a simplified a block diagram of an electronic device 102f, in accordance with an embodiment of the present disclosure. In an example, the electronic device 102f can include the fan enclosure with adjustable side venting 104k, the one or more first heat sources 106a, the one or more second heat sources 106b, the thermal management engine 144, and the slide mechanism engine 146. The fan enclosure with adjustable side venting 104k can include the plurality of side vents 114, the attachment tabs 124, and the slide mechanism 126. The attachment tabs 124 can help secure the fan enclosure with adjustable side venting 104k to the support structure 142.

[0080] Based on the collect data or thermal parameters related to the first heat sources 106a and the second heat sources 106b and other components, the thermal management engine 144 can cause the slide mechanism engine 146 to move slide mechanism 126 and open or close the side vents 114 to control the air from the fan enclosure with adjustable side venting 104k. For example, if the thermal management engine 144 determines that the first heats sources 106a need to cool down, the thermal management engine 144 can cause the slide mechanism engine 146 to move slide mechanism 126 to open side vents 114a to allow the air from the fan 108 (not shown) in the enclosure with adjustable side venting 104k to escape and help cool heat sources and/or hot spots near the side vents 114a.

[0081] Turning to FIGURE 20, FIGURE 20 is a simplified a block diagram of a fan enclosure with adjustable side venting 104l, in accordance with an embodiment of the present disclosure. In an example, the fan enclosure with adjustable side venting 104l, can include the side vents 114a and 114b, a first slide mechanism 126a, and a second slide mechanism 126b. The first slide mechanism 126a can include a main body 128a and a plurality of windows 130a. The second slide mechanism 126b can include a main body 128b and a plurality of windows 130b. The slide mechanism engine 146 can be connected to the first slide mechanism 126a and the second slide mechanism 126b to move the first slide mechanism 126a and/or the second slide mechanism 126b to control the air flow out of side vents 114a and 114b.

[0082] For example, as illustrated in FIGURE 20, the windows 130a in the main body 128a of the first slide mechanism 126a line up with the side vents 114a to allow air to flow out of the side vents 114a and help cool heat sources and/or hot spots near the side vents 114a. Also, as illustrated in FIGURE 20, the windows 130b in the main body 128b of the second slide mechanism 126b do not line up with the side vents 114b and do not allow air to flow out of the side vents 114b. The slide mechanism engine 146 can be connected to the first slide mechanism 126a using a first actuator 148a and can be connected to the second slide mechanism 126b using a second actuator 148b. The first actuator 148a and the second actuator 148b may be a mechanical actuator, an electrical actuator, or some other type of mechanism that can move the first slide mechanism 126a and the second slide mechanism 126b, respectively. Note that the spacing in FIGURE 20 is for illustration purposes only and is not drawn to scale.

[0083] Turning to FIGURE 21, FIGURE 21 is a simplified a block diagram of the fan enclosure with adjustable side venting 104l, in accordance with an embodiment of the present disclosure. In an example, the fan enclosure with adjustable side venting 104l, can include the side vents 114a and 114b, the first slide mechanism 126a, and the second slide mechanism 126b. The first slide mechanism 126a can include the main body 128a and the plurality of windows 130a. The second slide mechanism 126b can include the main body 128b and the plurality of windows 130b. The slide mechanism engine 146 can be connected to the first slide mechanism 126a and the second slide mechanism 126b to move the first slide mechanism 126a and/or the second slide mechanism 126b to control the air flow out of side vents 114a and 114b.

[0084] For example, as illustrated in FIGURE 21, the windows 130a in the main body 128a of the first slide mechanism 126a do not line up with the side vents 114a and do not allow air to flow out of the side vents 114a. Also, as illustrated in FIGURE 21, the windows 130b in the main body 128b of the second slide mechanism 126b line up with the side vents 114b to allow air to flow out of the side vents 114b and help cool heat sources and/or hot spots near the side vents 114b. Note that the spacing in FIGURE 21 is for illustration purposes only and is not drawn to scale.

[0085] Turning to FIGURE 22, FIGURE 22 is a simplified a block diagram of a portion of the fan enclosure with adjustable side venting 104, in accordance with an embodiment of the present disclosure. In an example, as the fan 108 rotates, air can be drawn into a middle portion or area of the fan enclosure with adjustable side venting 104. The air that was drawn in can then exit the fan enclosure with adjustable side venting 104 through the main vent(s) 112 and the side vent(s) 114.

[0086] Turning to FIGURE 23, FIGURE 23 is an example flowchart illustrating possible operations of a flow 2300 that may be associated with creating a fan enclosure with adjustable side venting, in accordance with an embodiment. At 2302, a board layout for an electronic device is created. At 2304, the board layout is tested, and it is determined that a hot spot area exists that needs cooling. The hot spot area can be a heat source (e.g., processor, logic unit, field programmable gate array (FPGA), chip set, integrated circuit (IC), a graphics processor, graphics card, battery, memory, or some other type of heat generating device) or an area around a heat source. At 2306, a fan enclosure with side venting is used in the board layout. In an example, the fan enclosure with side venting is used to replace a fan that was used in the board layout that does not have side venting. At 2308, one or more side vents of the fan enclosure with side venting are adjusted to force air onto the hot spot area. For example, a slide mechanism can be used to adjust the venting hole size of side vents to adjust the volume of air flow out of the side vents. In another example, one or more of the side vent plugs 180 can be used to adjust the venting hole size of side vents to adjust the volume of air flow out of side vents. In an example, the slide mechanism, the side vent plugs, or some other means may be used during manufacturing to adjust the size and quantity of open side vents in the fan enclosure with adjustable side venting 104 and to direct airflow from the side vents to the identified hot spots in the component layout.

[0087] Turning to FIGURE 24, FIGURE 24 is an example flowchart illustrating possible operations of a flow 2400 that may be associated with creating a fan enclosure with adjustable side venting, in accordance with an embodiment. At 2402, a thermal management engine in an electronic device determines that a hot spot in an electronic device needs to be cooled down. The hot spot can be a heat source (e.g., processor, logic unit, field programmable gate array (FPGA), chip set, integrated circuit (IC), a graphics processor, graphics card, battery, memory, or some other type of heat generating device) or an area around a heat source. At 2404, the thermal management engine causes a slide mechanism engine to move a slide mechanism in a fan enclosure with adjustable side venting. At 2406, the slide mechanism engine moves the slide mechanism and causes the air flow out of the fan enclosure with adjustable side venting to change. At 2408, the air flow out of the fan enclosure with adjustable side venting is directed to the hot spot.

[0088] Turning to FIGURE 25, FIGURE 25 is a simplified block diagram of an electronic device 100g configured with the fan enclosure with adjustable side venting and an electronic device 102h configured with the fan enclosure with adjustable side venting, in accordance with an embodiment of the present disclosure. In an example, electronic device 102g can include a first housing 150, a second housing 152, and a third housing 154. The first housing 150 can be pivotably or rotatably coupled to the third housing 154 using a first hinge 156. The third housing 154 can be pivotably or rotatably coupled to the second housing 152 using a second hinge 158. The first housing 150 can include a display 160. The second housing 152 can include a second display 164. The third housing 154 can include a third display 162. Electronic device 100g can also include the fan enclosure with adjustable side venting 104, the one or more first heat sources 106a, the one or more second heat sources 106b, a fan 108 (not shown), and the one or more electronic components 110.

[0089] In an example, electronic device 102h may only include a first housing 166. For example, electronic device 102h may be a tablet, smartphone, wearable, or some other portable device. The first housing 166 can include a display 168, the fan enclosure with adjustable side venting 104, the one or more first heat sources 106a, the one or more second heat sources 106b, a fan 108 (not shown), and the one or more electronic components 110.

[0090] Electronic device 102g and 102h (and electronic devices 102a-102f) may each be a standalone device or in communication with cloud services 170, one or more servers 172 and/or one or more network elements 174 using network 176. The network 176 represents a series of points or nodes of interconnected communication paths for receiving and transmitting packets of information. The network 176 offers a communicative interface between nodes, and may be configured as any local area network (LAN), virtual local area network (VLAN), wide area network (WAN), wireless local area network (WLAN), metropolitan area network (MAN), Intranet, Extranet, virtual private network (VPN), and any other appropriate architecture or system that facilitates communications in a network environment, or any suitable combination thereof, including wired and/or wireless communication.

[0091] In the network 176, network traffic, which is inclusive of packets, frames, signals, data, etc., can be sent and received according to any suitable communication messaging protocols. Suitable communication messaging protocols can include a multi-layered scheme such as Open Systems Interconnection (OSI) model, or any derivations or variants thereof (e.g., Transmission Control Protocol/Internet Protocol (TCP/IP), user datagram protocol/IP (UDP/IP)). Messages through the network could be made in accordance with various network protocols, (e.g., Ethernet, Infiniband, OmniPath, etc.). Additionally, radio signal communications over a cellular network may also be provided. Suitable interfaces and infrastructure may be provided to enable communication with the cellular network.

[0092] The term “packet” as used herein, refers to a unit of data that can be routed between a source node and a destination node on a packet switched network. A packet includes a source network address and a destination network address. These network addresses can be Internet Protocol (IP) addresses in a TCP/IP messaging protocol. The term “data” as used herein, refers to any type of binary, numeric, voice, video, textual, or script data, or any type of source or object code, or any other suitable information in any appropriate format that may be communicated from one point to another in electronic devices and/or networks.

[0093] In an example implementation, the electronic device 102 (e.g., electronic devices 102a-102h), can encompass a computer, a personal digital assistant (PDA), a laptop or electronic notebook, a cellular telephone, an iPhone, a tablet, an IP phone, network elements, network appliances, servers, routers, switches, gateways, bridges, load balancers, processors, modules, or any other device, component, element, or object that includes a heat source and/or hot spots. The electronic device 102 may include any suitable hardware, software, components, modules, or objects that facilitate the operations thereof, as well as suitable interfaces for receiving, transmitting, and/or otherwise communicating data or information in a network environment. This may be inclusive of appropriate algorithms and communication protocols that allow for the effective exchange of data or information. The electronic device 102 may include virtual elements.

[0094] In regards to the internal structure, the electronic device 102 can include memory elements for storing information to be used in operations. The electronic device 102 may keep information in any suitable memory element (e.g., random access memory (RAM), read-only memory (ROM), erasable programmable ROM (EPROM), electrically erasable programmable ROM (EEPROM), application specific integrated circuit (ASIC), etc.), software, hardware, firmware, or in any other suitable component, device, element, or object where appropriate and based on particular needs. Any of the memory items discussed herein should be construed as being encompassed within the broad term 'memory element.' Moreover, the information being used, tracked, sent, or received could be provided in any database, register, queue, table, cache, control list, or other storage structure, all of which can be referenced at any suitable timeframe. Any such storage options may also be included within the broad term 'memory element' as used herein.

[0095] In certain example implementations, functions may be implemented by logic encoded in one or more tangible media (e.g., embedded logic provided in an ASIC, digital signal processor (DSP) instructions, software (potentially inclusive of object code and source code) to be executed by a processor, or other similar machine, etc.), which may be inclusive of non-transitory computer-readable media. In some of these instances, memory elements can store data used for operations described herein. This includes the memory elements being able to store software, logic, code, or processor instructions that are executed to carry out activities or operations.

[0096] Additionally, the heat source 106 (e.g., the one or more first heat sources 106a and the one or more second heat sources 106b) may be or include one or more processors that can execute software or an algorithm. In one example, the processors can transform an element or an article (e.g., data) from one state or thing to another state or thing. In another example, activities may be implemented with fixed logic or programmable logic (e.g., software/computer instructions executed by a processor) and the heat elements identified herein could be some type of a programmable processor, programmable digital logic (e.g., a field programmable gate array (FPGA), an erasable programmable read-only memory (EPROM), an electrically erasable programmable read-only memory (EEPROM)) or an ASIC that includes digital logic, software, code, electronic instructions, or any suitable combination thereof. Any of the potential processing elements, modules, and machines described herein should be construed as being encompassed within the broad term 'processor.'

[0097] Implementations of the embodiments disclosed herein may be formed or carried out on a substrate, such as a non-semiconductor substrate or a semiconductor substrate. In one implementation, the non-semiconductor substrate may be silicon dioxide, an inter-layer dielectric composed of silicon dioxide, silicon nitride, titanium oxide and other transition metal oxides. Although a few examples of materials from which the non-semiconducting substrate may be formed are described here, any material that may serve as a foundation upon which a non-semiconductor device may be built falls within the spirit and scope of the embodiments disclosed herein.

[0098] In another implementation, the semiconductor substrate may be a crystalline substrate formed using a bulk silicon or a silicon-on-insulator substructure. In other implementations, the semiconductor substrate may be formed using alternate materials, which may or may not be combined with silicon, that include but are not limited to germanium, indium antimonide, lead telluride, indium arsenide, indium phosphide, gallium arsenide, indium gallium arsenide, gallium antimonide, or other combinations of group III-V or group IV materials. In other examples, the substrate may be a flexible substrate including 2D materials such as graphene and molybdenum disulphide, organic materials such as pentacene, transparent oxides such as indium gallium zinc oxide poly/amorphous (low temperature of dep) III-V semiconductors and germanium/silicon, and other non-silicon flexible substrates. Although a few examples of materials from which the substrate may be formed are described here, any material that may serve as a foundation upon which a semiconductor device may be built falls within the spirit and scope of the embodiments disclosed herein.

[0099] Elements of FIGURE 25 may be coupled to one another through one or more interfaces employing any suitable connections (wired or wireless), which provide viable pathways for network (e.g., the network 176, etc.) communications. Additionally, any one or more of these elements of FIGURE 25 may be combined or removed from the architecture based on particular configuration needs. The network 176 may include a configuration capable of transmission control protocol/Internet protocol (TCP/IP) communications for the transmission or reception of packets in a network. The electronic device 102 may also operate in conjunction with a user datagram protocol/IP (UDP/IP) or any other suitable protocol where appropriate and based on particular needs.

[00100] Turning to the infrastructure of FIGURE 25, the network 176 represents a series of points or nodes of interconnected communication paths for receiving and transmitting packets of information. The network 176 offers a communicative interface between nodes, and may be configured as any local area network (LAN), virtual local area network (VLAN), wide area network (WAN), wireless local area network (WLAN), metropolitan area network (MAN), Intranet, Extranet, virtual private network (VPN), and any other appropriate architecture or system that facilitates communications in a network environment, or any suitable combination thereof, including wired and/or wireless communication.

[00101] Although the present disclosure has been described in detail with reference to particular arrangements and configurations, these example configurations and arrangements may be changed significantly without departing from the scope of the present disclosure. Moreover, certain components may be combined, separated, eliminated, or added based on particular needs and implementations. Additionally, although the fan enclosure with adjustable side venting 104 has been illustrated with reference to particular elements and operations, these elements and operations may be replaced by any suitable architecture, protocols, and/or processes that achieve the intended functionality of the fan enclosure with adjustable side venting 104.

[00102] Numerous other changes, substitutions, variations, alterations, and modifications may be ascertained to one skilled in the art and it is intended that the present disclosure encompass all such changes, substitutions, variations, alterations, and modifications as falling within the scope of the appended claims. In order to assist the United States Patent and Trademark Office (USPTO) and, additionally, any readers of any patent issued on this application in interpreting the claims appended hereto, Applicant wishes to note that the Applicant: (a) does not intend any of the appended claims to invoke paragraph six (6) of 35 U.S.C. section 112 as it exists on the date of the filing hereof unless the words "means for" or "step for" are specifically used in the particular claims; and (b) does not intend, by any statement in the specification, to limit this disclosure in any way that is not otherwise reflected in the appended claims.

OTHER NOTES AND EXAMPLES

[00103] In Example A1, an electronic device can include a first heat source, a second heat source, and a fan inside a fan enclosure. The fan enclosure includes a main vent to direct air from the fan towards a heatsink and one or more side vents to direct air from the fan towards the first heat source or the second heat source.

[00104] In Example A2, the subject matter of Example A1 can optionally include where a slide mechanism is used to control airflow from the one or more side vents.

[00105] In Example A3, the subject matter of any one of Examples A1-A2 can optionally include where the slide mechanism includes a main body and windows and the slide mechanism is located in a channel of the fan enclosure.

[00106] In Example A4, the subject matter of any one of Examples A1-A3 can optionally include where the windows of the slide mechanism line up with the side vents to control an amount of air from the side vents.

[00107] In Example A5, the subject matter of any one of Examples A1-A4 can optionally include where a component layout of the electronic device is used to identified hot spots in the component layout and the slide mechanism is adjusted during manufacturing of the electronic device to direct airflow from the side vents to the identified hot spots in the component layout.

[00108] In Example A6, the subject matter of any one of Examples A1-A5 can optionally include where the first heat source is a central processing unit and the second heat source is a graphics processing unit.

[00109] In Example A7, the subject matter of any one of Examples A1-A6 can optionally include where an air intake of the fan is in a middle portion of the fan enclosure.

[00110] Example AA1 is a device including a first heat source, a second heat source, a fan between the first heat source and the second heat source, the fan being inside a fan enclosure. The fan enclosure includes a main vent to direct air from the fan towards a heatsink, a plurality of side vents, and a slide mechanism, wherein the slide mechanism is used to control airflow from the plurality of side vents.

[00111] In Example AA2, the subject matter of Example AA1 can optionally include where the slide mechanism includes a main body and windows and the slide mechanism is located in a channel of the fan enclosure.

[00112] In Example AA3, the subject matter of any one of Examples AA1-AA2 can optionally include where the windows of the slide mechanism line up with the side vents to control an amount of air from the plurality of side vents.

[00113] In Example AA4, the subject matter of any one of Examples AA1-AA3 can optionally include a slide mechanism engine, wherein the slide mechanism engine moves the slide mechanism inside the fan enclosure to adjust air flow from the plurality of side vents.

[00114] In Example AA5, the subject matter of any one of Examples AA1-AA4 can optionally include a thermal management engine to detect hot spots around the first heat source and the second heat source, wherein the thermal management engine is configured to cause the slide mechanism engine to move the slide mechanism to direct air from the fan towards the first heat source or the second heat source.

[00115] In Example AA6, the subject matter of any one of Examples AA1-AA5 can optionally include where the first heat source is a central processing unit and the second heat source is a graphics processing unit.

[00116] Example M1 is a method including creating a board layout for an electronic device, testing the board layout to determine a hot spot area of the board layout that will need cooling during operation of the electronic device, adding a fan enclosure with side venting to the board layout, and adjusting one or more side vents of the fan enclosure with side venting to force air onto the hot spot area of the board layout.

[00117] In Example M2, the subject matter of Example M1 can optionally include where the fan enclosure with adjustable side venting includes a main vent to direct air from a fan towards a heatsink and the one or more side vents.

[00118] In Example M3, the subject matter of any one of the Examples M1-M2 can optionally include where the fan enclosure with side venting is between a first heat source and a second heat source.

[00119] In Example M4, the subject matter of any one of the Examples M1-M3 can optionally include where a slide mechanism is used to control a size of the one or more side vents and airflow from the one or more side vents.

[00120] In Example M5, the subject matter of any one of the Examples M1-M4 can optionally include where the slide mechanism includes a main body and windows and the slide mechanism is located in a channel of the fan enclosure with side venting.

[00121] In Example, M6, the subject matter of any one of the Examples M1-M5 can optionally include where the windows of the slide mechanism line up with the one or more side vents to control an amount of air from the one or more side vents.

[00122] In Example, M7, the subject matter of any one of the Examples M1-M6 can optionally include where the slide mechanism is adjusted during manufacturing.

WHAT IS CLAIMED IS:

1. An electronic device comprising:

a first heat source;

a second heat source; and

a fan inside a fan enclosure, wherein the fan enclosure includes a main vent to direct air from the fan towards a heatsink and one or more side vents to direct air from the fan towards the first heat source or the second heat source.

2. The electronic device of Claim 1, wherein a slide mechanism is used to control airflow from the one or more side vents.

3. The electronic device of Claim 2, wherein the slide mechanism includes a main body and windows and the slide mechanism is located in a channel of the fan enclosure.

4. The electronic device of Claim 3, wherein the windows of the slide mechanism line up with the side vents to control an amount of air from the side vents.

5. The electronic device of Claim 2, wherein a component layout of the electronic device is used to identified hot spots in the component layout and the slide mechanism is adjusted during manufacturing of the electronic device to direct airflow from the side vents to the identified hot spots in the component layout.

6. The electronic device of any one of Claims 1-5, wherein the first heat source is a central processing unit and the second heat source is a graphics processing unit.

7. The electronic device of any one of Claims 1-6, wherein an air intake of the fan is in a middle portion of the fan enclosure.

8. A device comprising:

a first heat source;

a second heat source;

a fan between the first heat source and the second heat source, the fan being inside a fan enclosure, wherein the fan enclosure includes:

a main vent to direct air from the fan towards a heatsink;

a plurality of side vents; and

a slide mechanism, wherein the slide mechanism is used to control airflow from the plurality of side vents.

9. The device of Claim 8, wherein the slide mechanism includes a main body and windows and the slide mechanism is located in a channel of the fan enclosure.

10. The device of Claim 9, wherein the windows of the slide mechanism line up with the side vents to control an amount of air from the plurality of side vents.

11. The device of any one of Claims 8-10, further comprising:

a slide mechanism engine, wherein the slide mechanism engine moves the slide mechanism inside the fan enclosure to adjust air flow from the plurality of side vents.

12. The device of Claim 11, further comprising:

a thermal management engine to detect hot spots around the first heat source and the second heat source, wherein the thermal management engine is configured to cause the slide mechanism engine to move the slide mechanism to direct air from the fan towards the first heat source or the second heat source.

13. The device of any one of Claims 8-11, wherein the first heat source is a central processing unit and the second heat source is a graphics processing unit.

14. A method comprising:

creating a board layout for an electronic device;

testing the board layout to determine a hot spot area of the board layout that will need cooling during operation of the electronic device;

adding a fan enclosure with side venting to the board layout; and

adjusting one or more side vents of the fan enclosure with side venting to force air onto the hot spot area of the board layout.

15. The method of Claim 14, wherein the fan enclosure with adjustable side venting includes a main vent to direct air from a fan towards a heatsink and the one or more side vents.

16. The method of any one of Claims 14 and 15, wherein the fan enclosure with side venting is between a first heat source and a second heat source.

17. The method of any one of Claims 14-16, wherein a slide mechanism is used to control a size of the one or more side vents and airflow from the one or more side vents.

18. The method of any one of Claims 14-17, wherein the slide mechanism includes a main body and windows and the slide mechanism is located in a channel of the fan enclosure with side venting.

19. The method of Claim 18, wherein the windows of the slide mechanism line up with the one or more side vents to control an amount of air from the one or more side vents.

20. The method of any one of Claims 14-19, wherein the slide mechanism is adjusted during manufacturing of the electronic device.

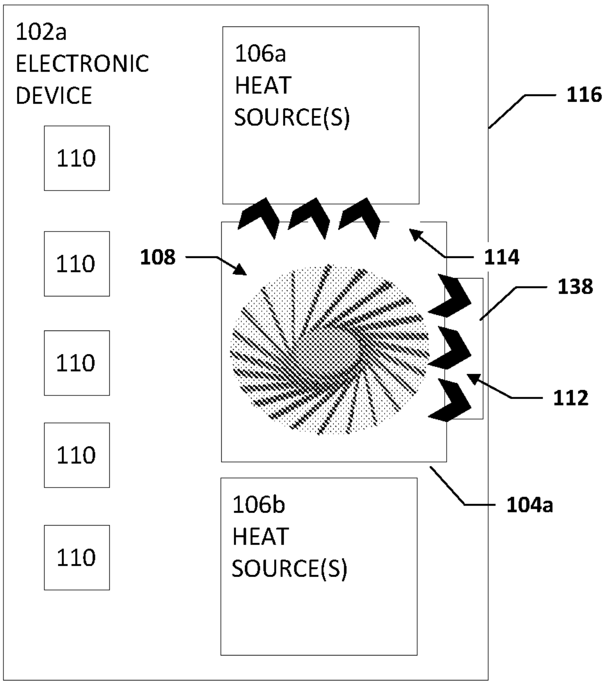

FIGURE 1A

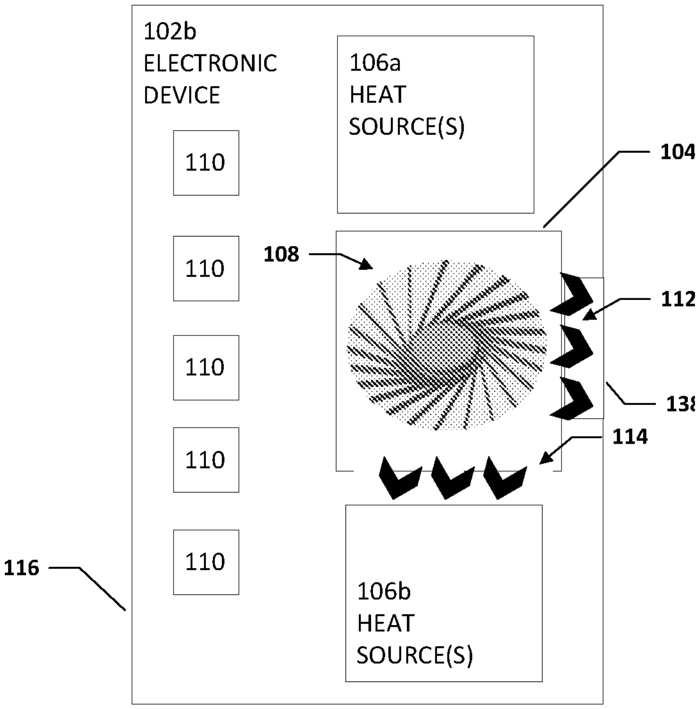

FIGURE 1B

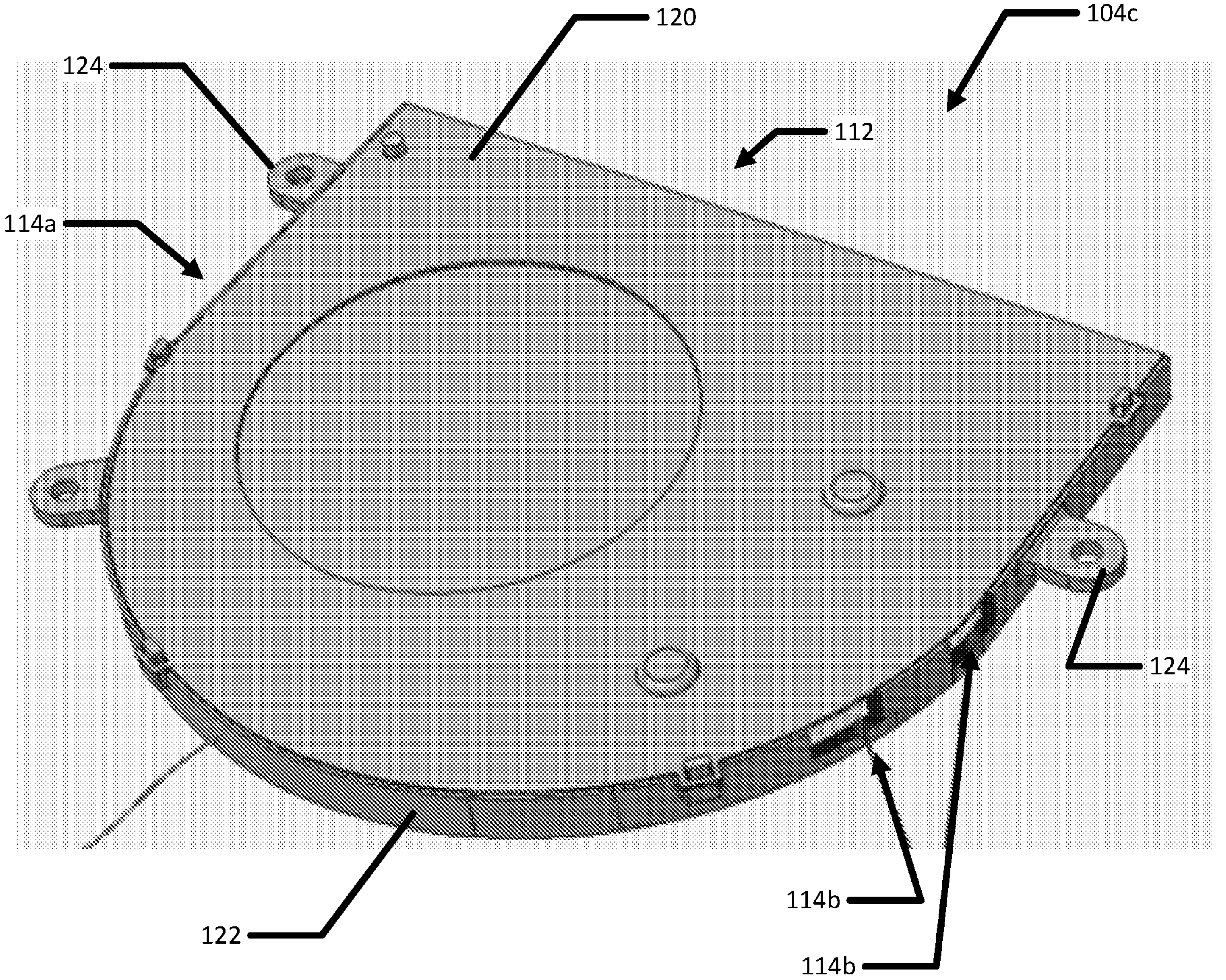

FIGURE 2

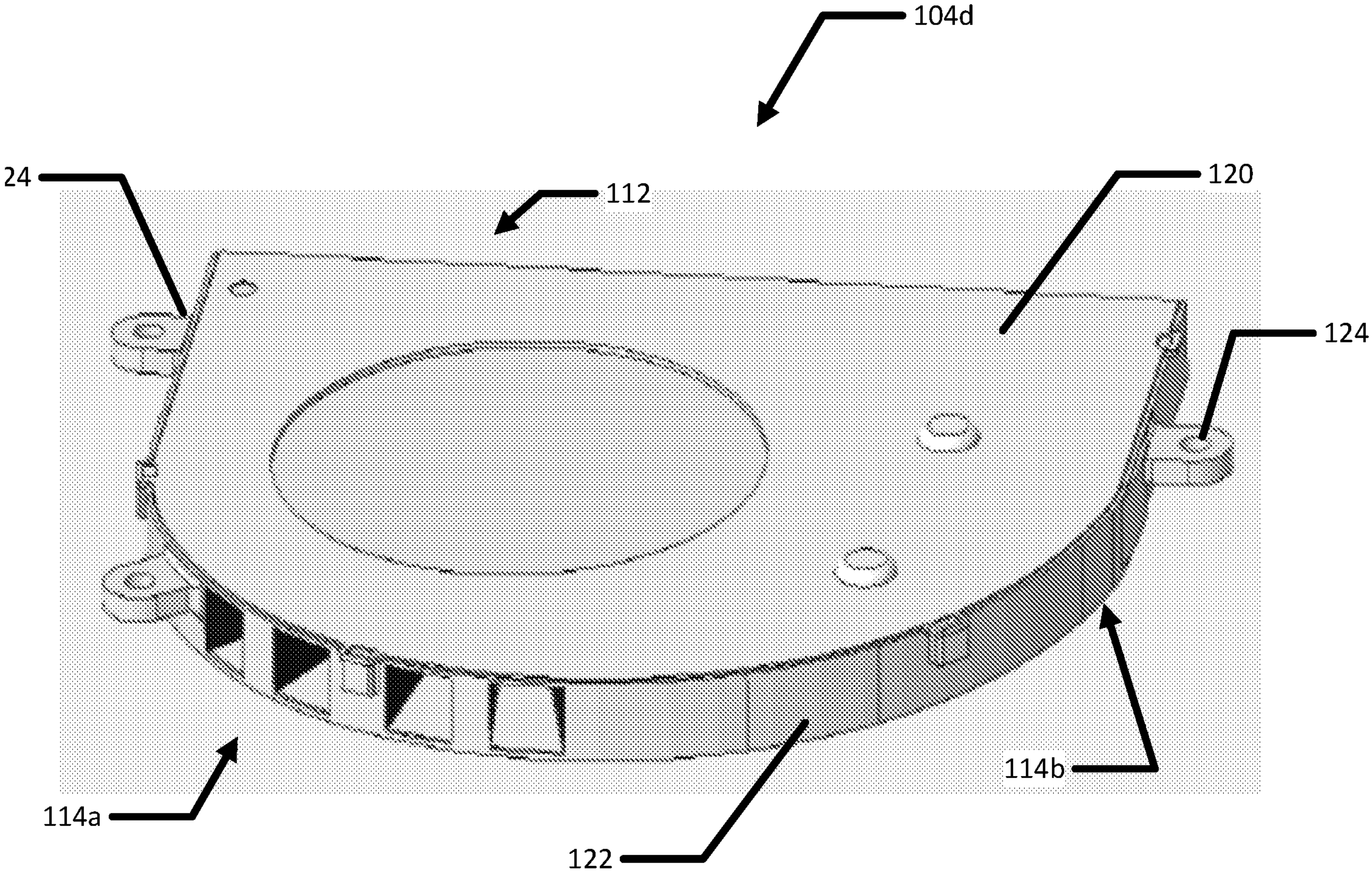

FIGURE 3

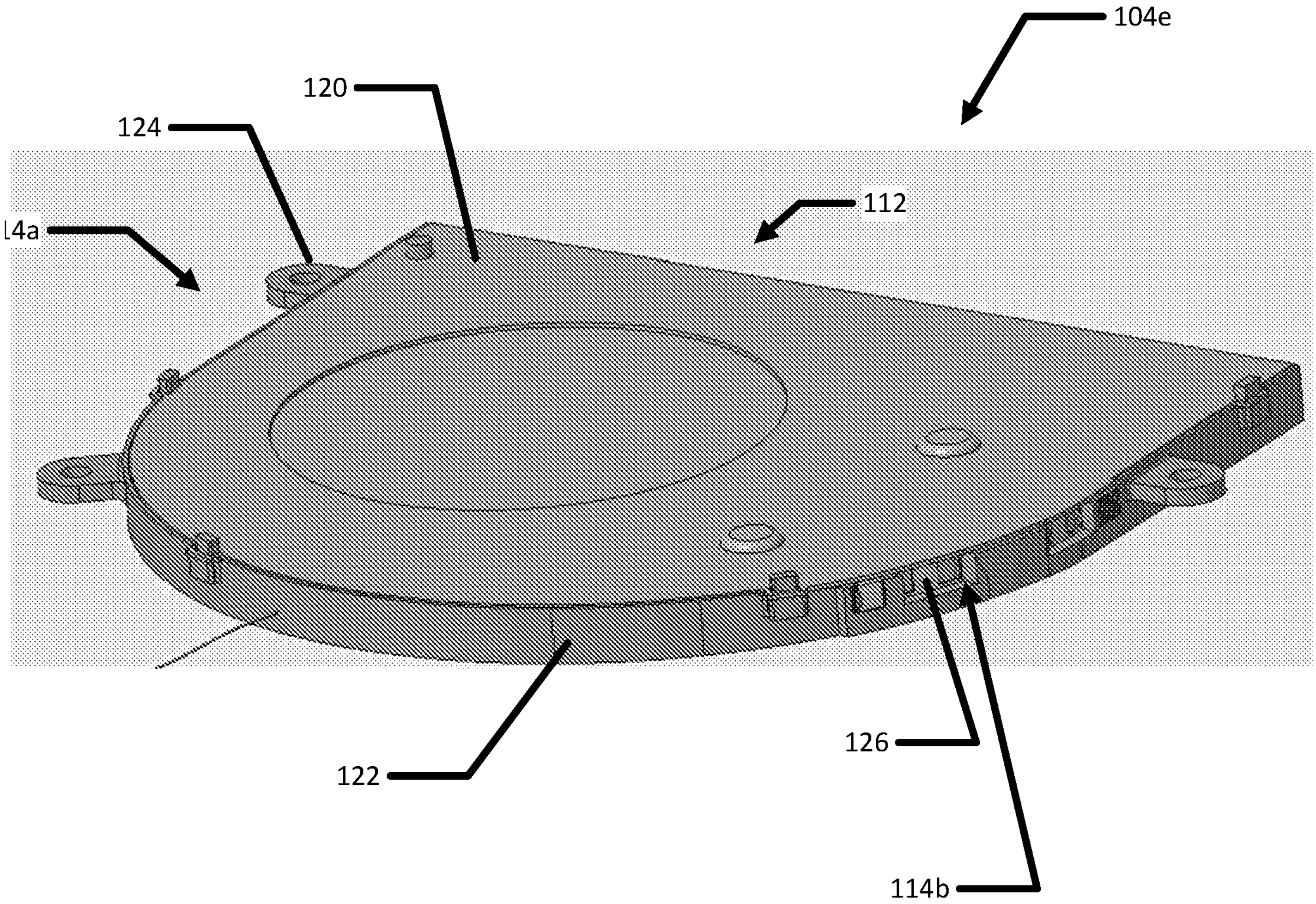

FIGURE 4

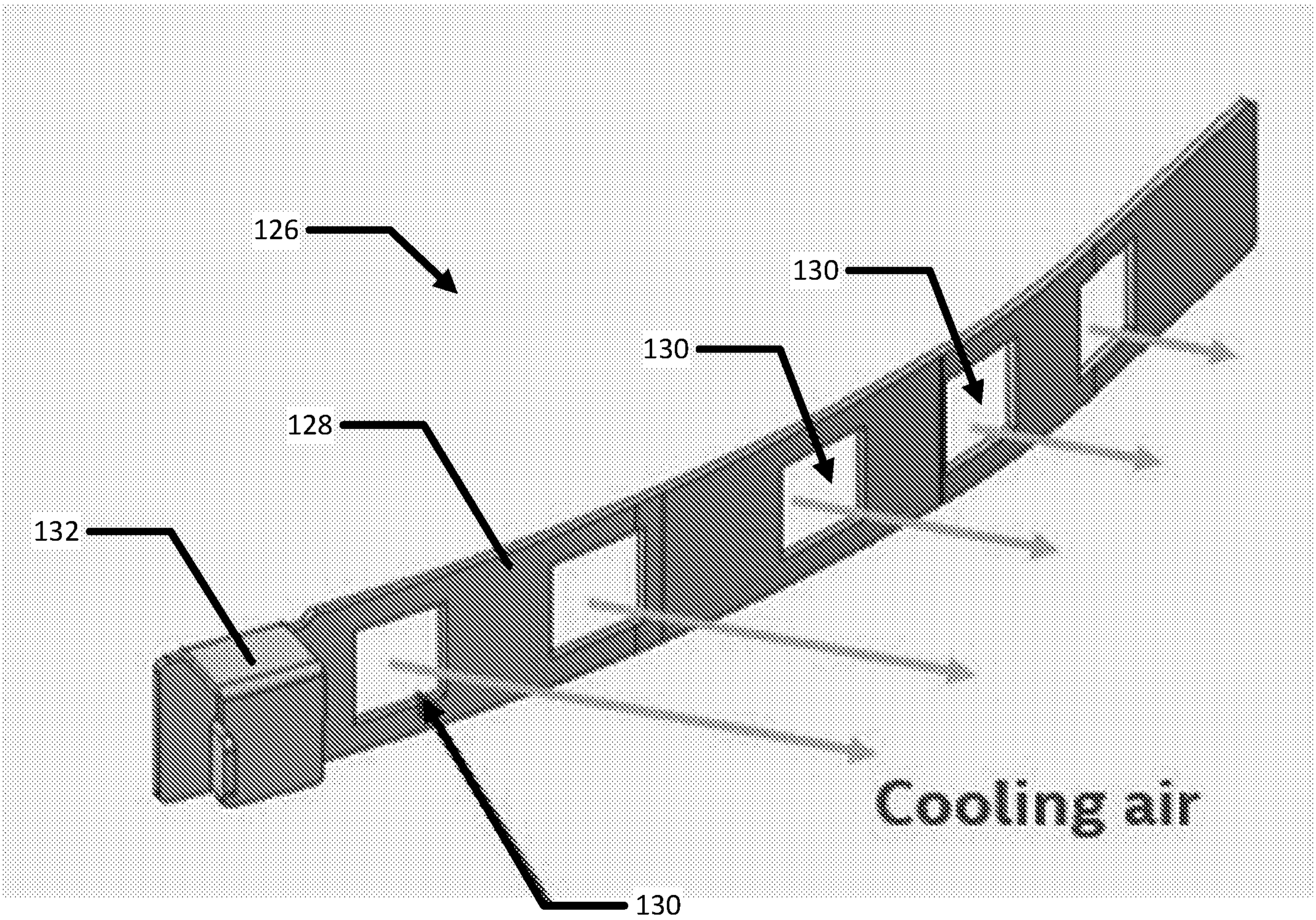

FIGURE 5

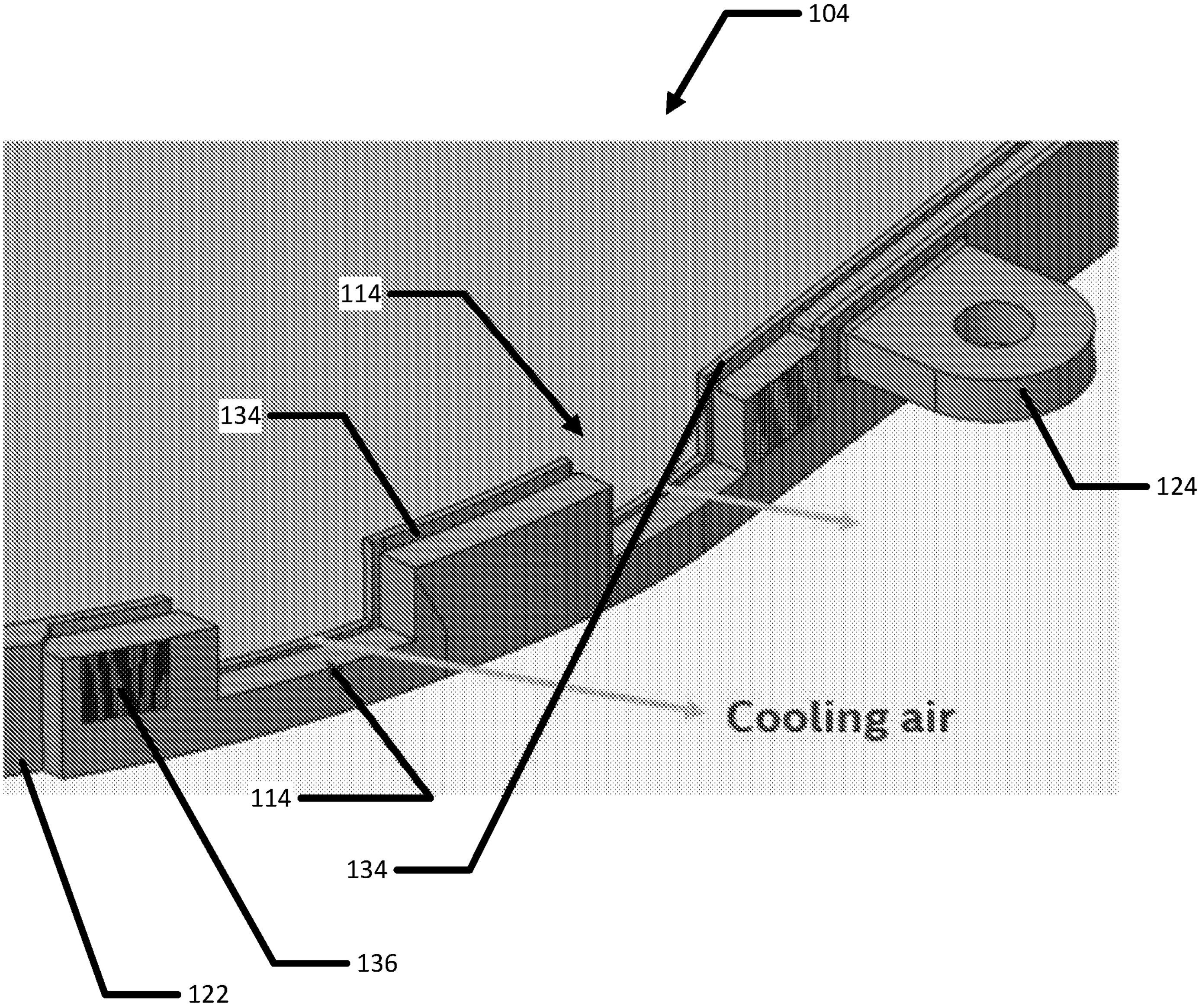

FIGURE 6

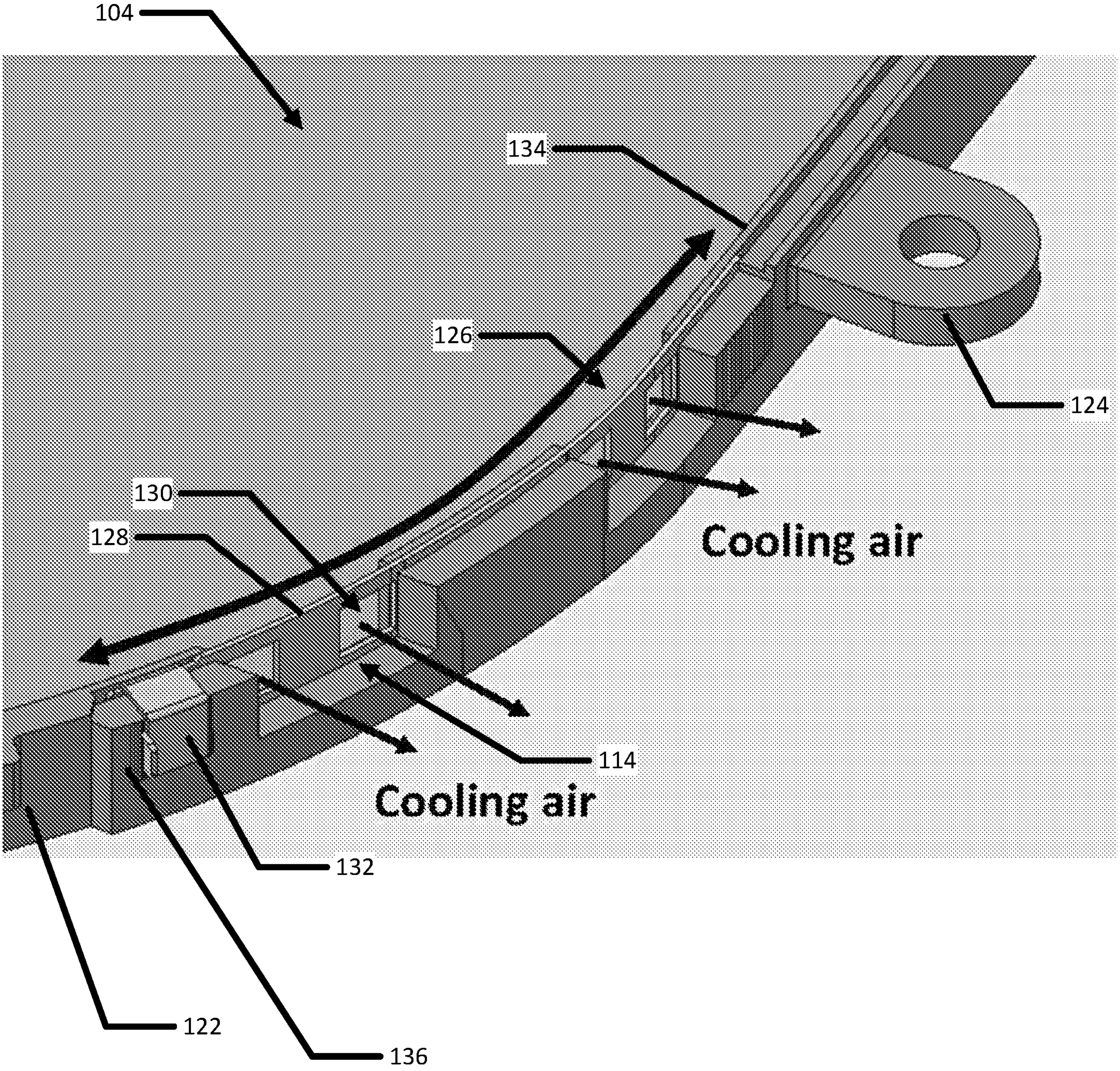
104
134
126
124
130
128
Cooling air
114
Cooling air
132
122
136

FIGURE 7

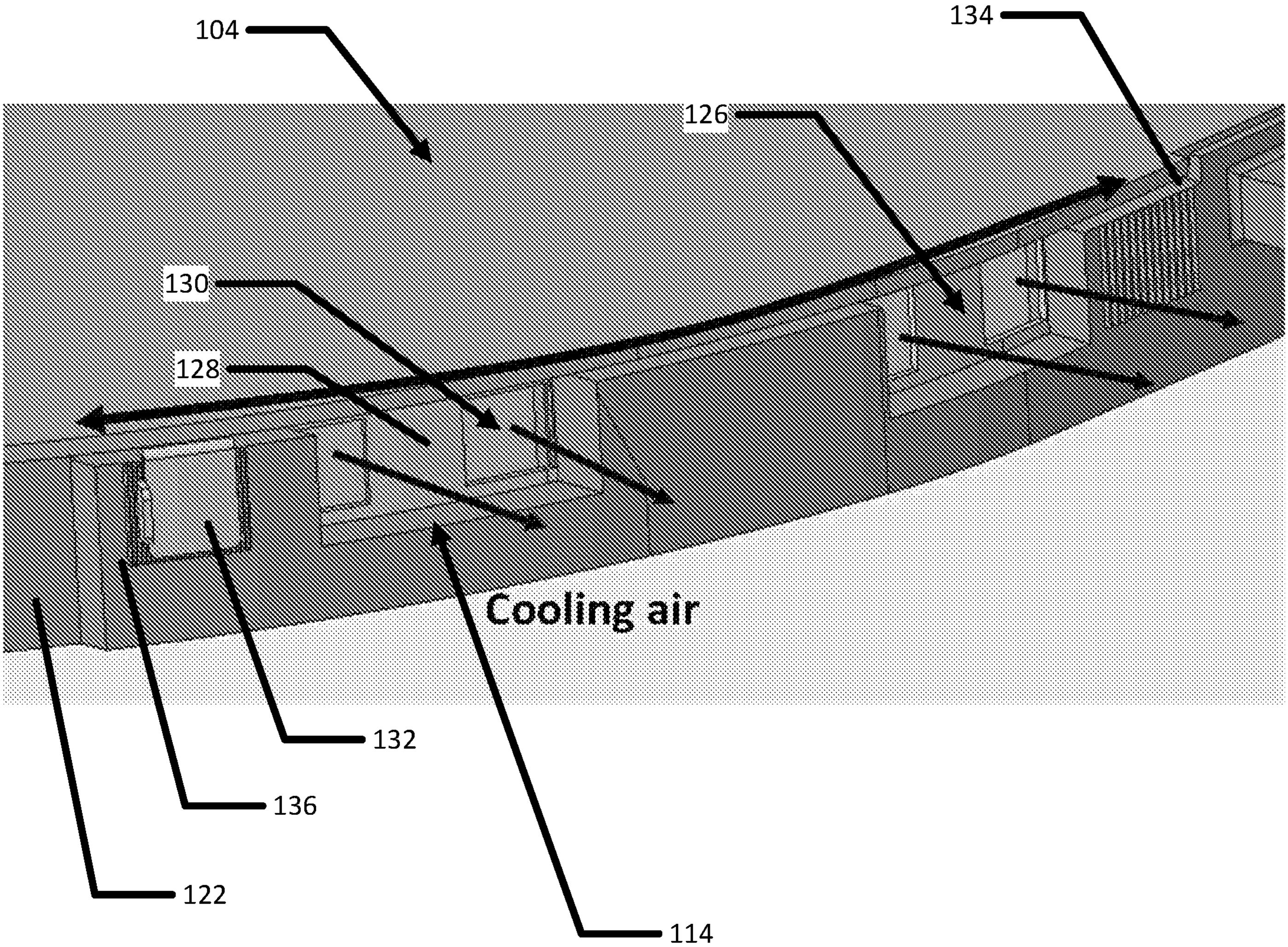

FIGURE 8

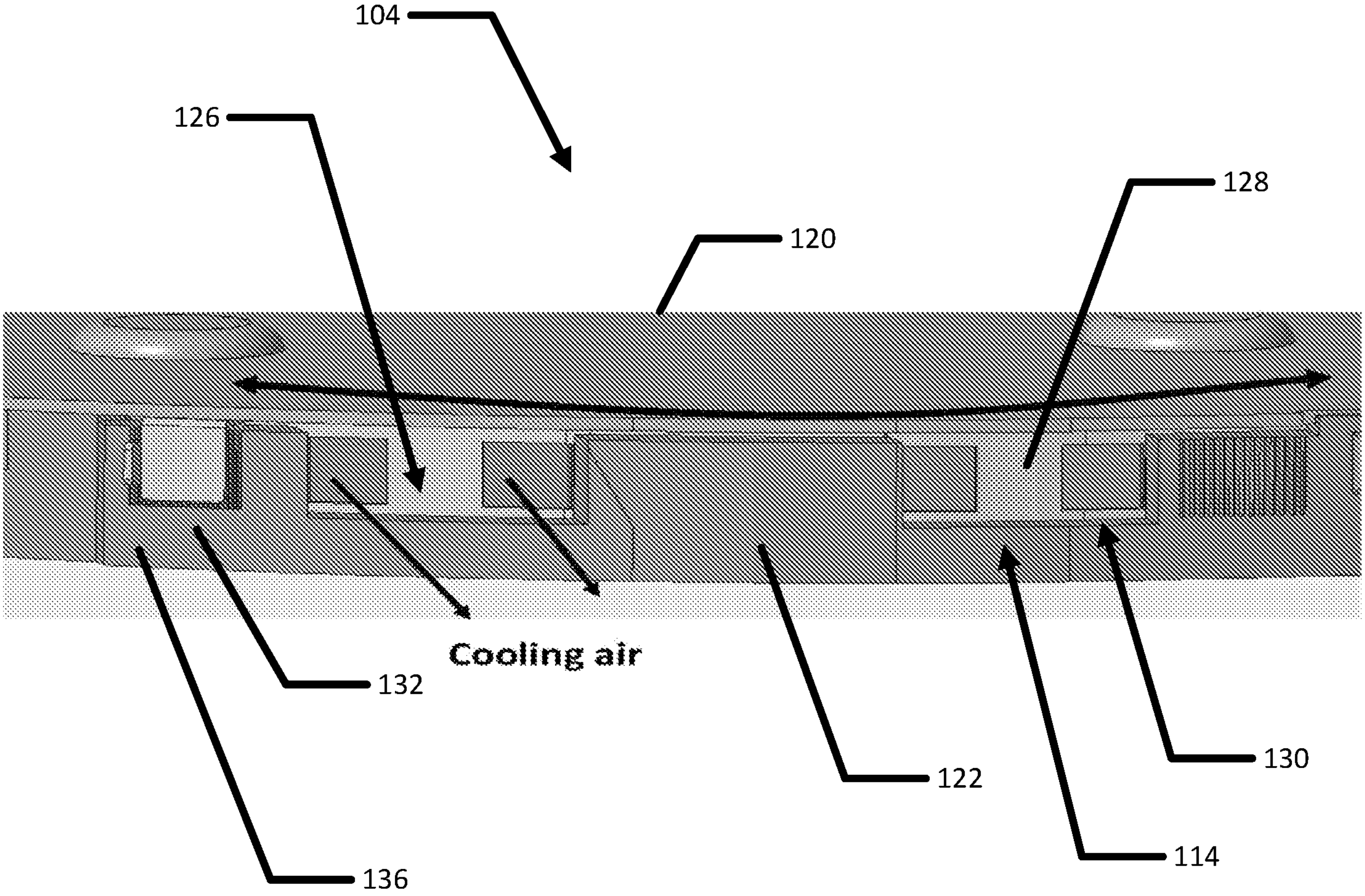

FIGURE 9

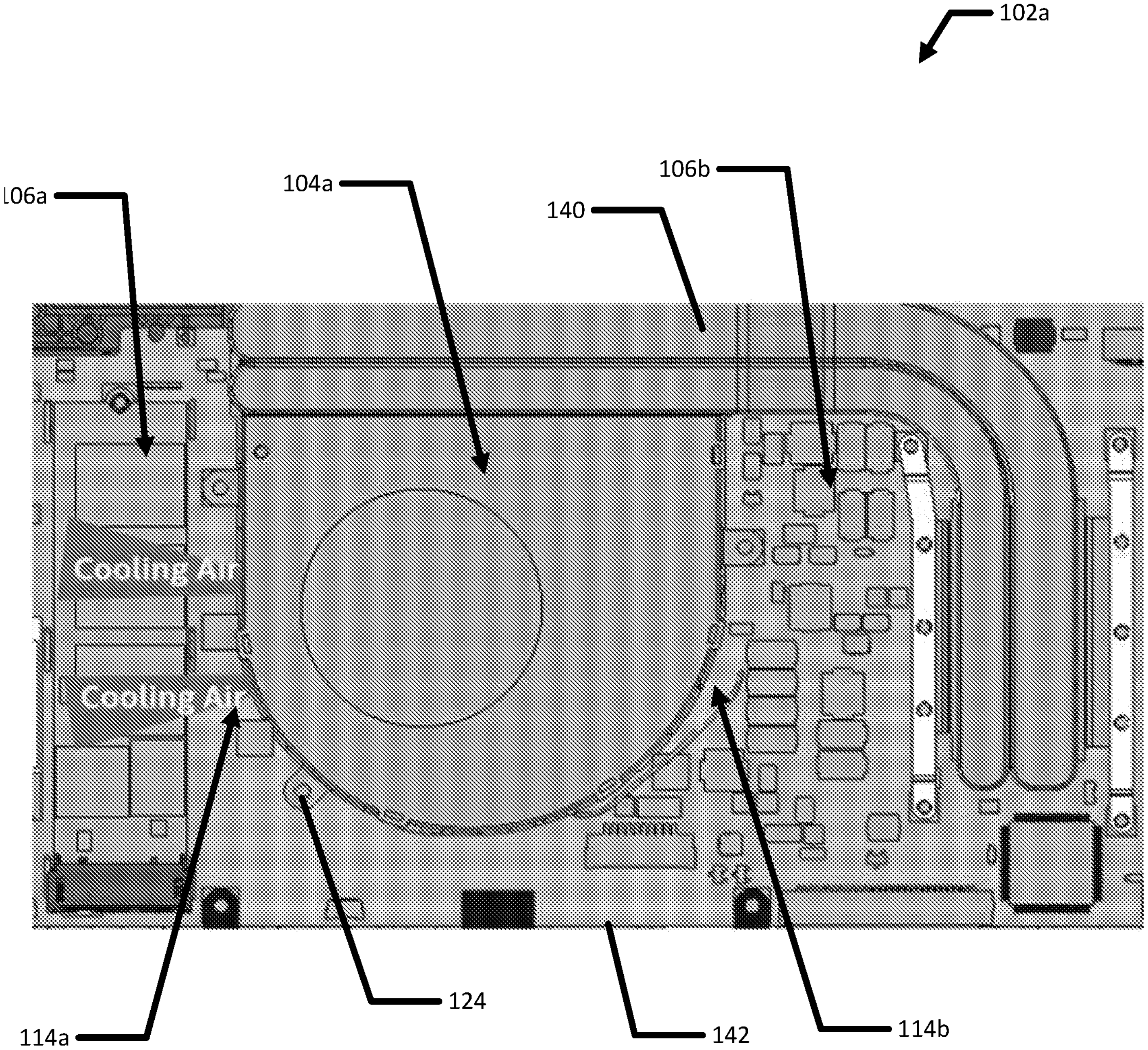
102a
106a
104a
140
106b
Cooling Air
Cooling Air
114a
124
142
114b

FIGURE 10

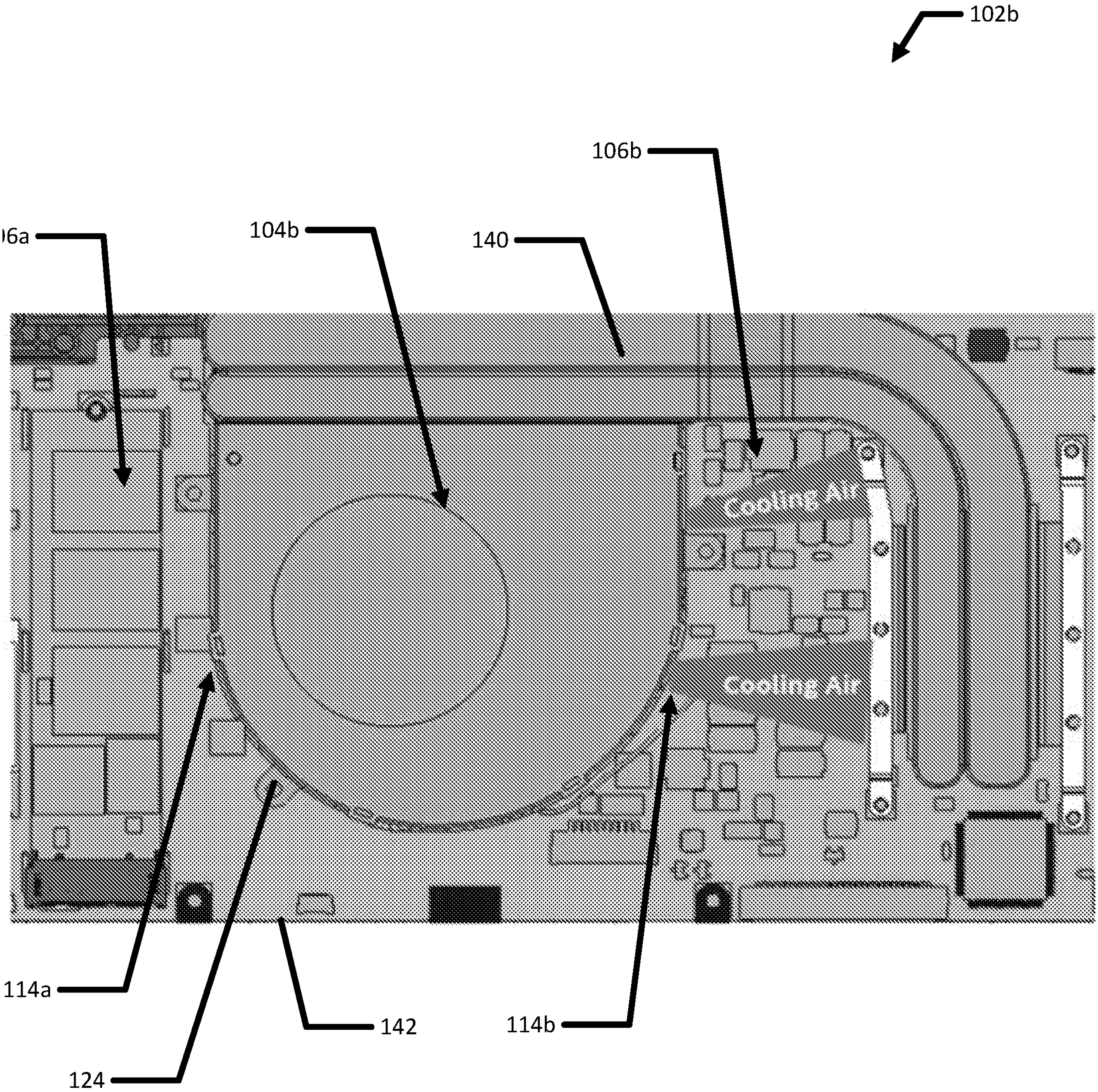
102b
106b
)6a
104b
140
Cooling Air
Cooling Air
114a
142
114b
124

FIGURE 11

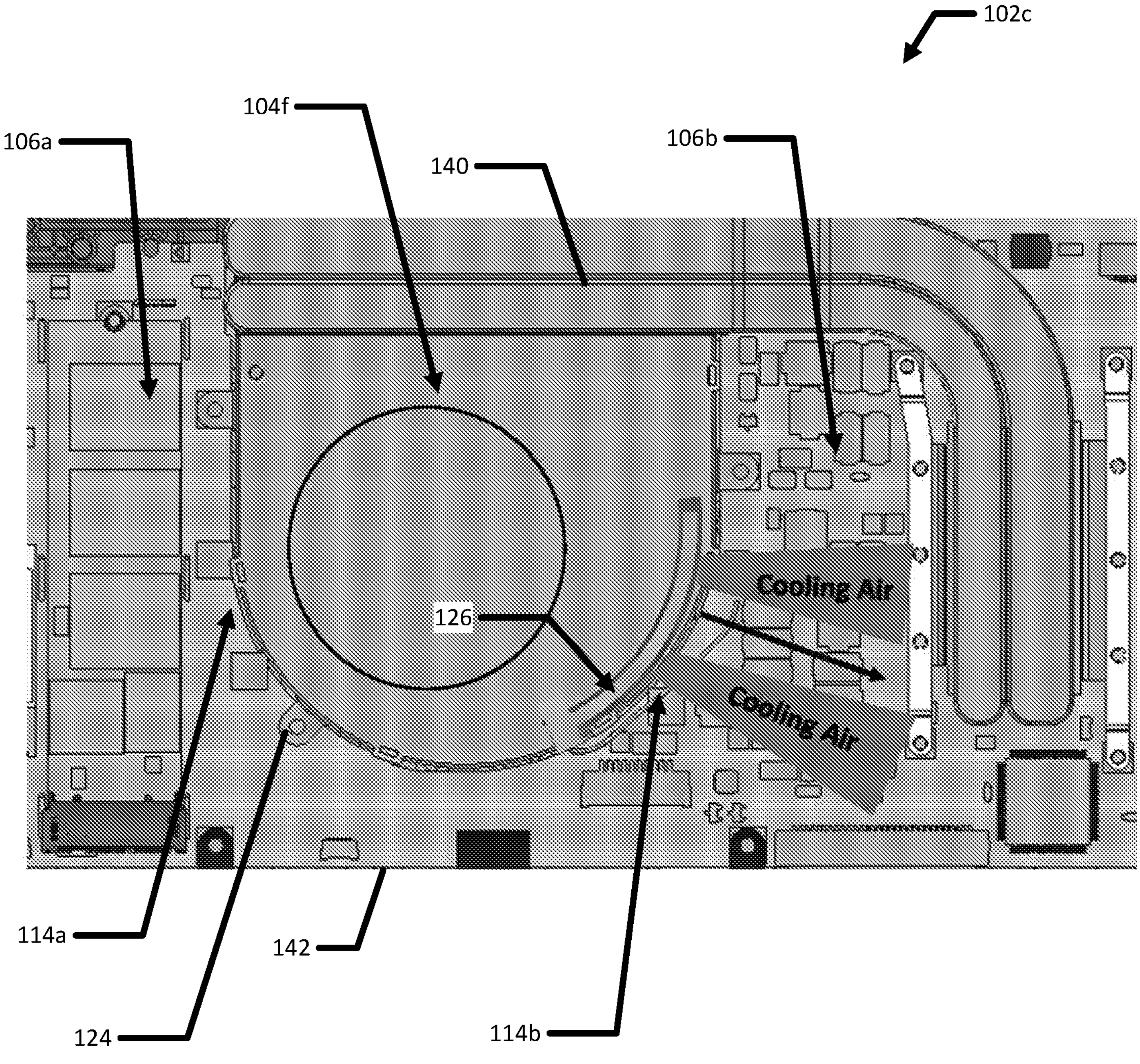
102c
104f
106a
140
106b
Cooling Air
126
Cooling Air
114a
142
124
114b

FIGURE 12

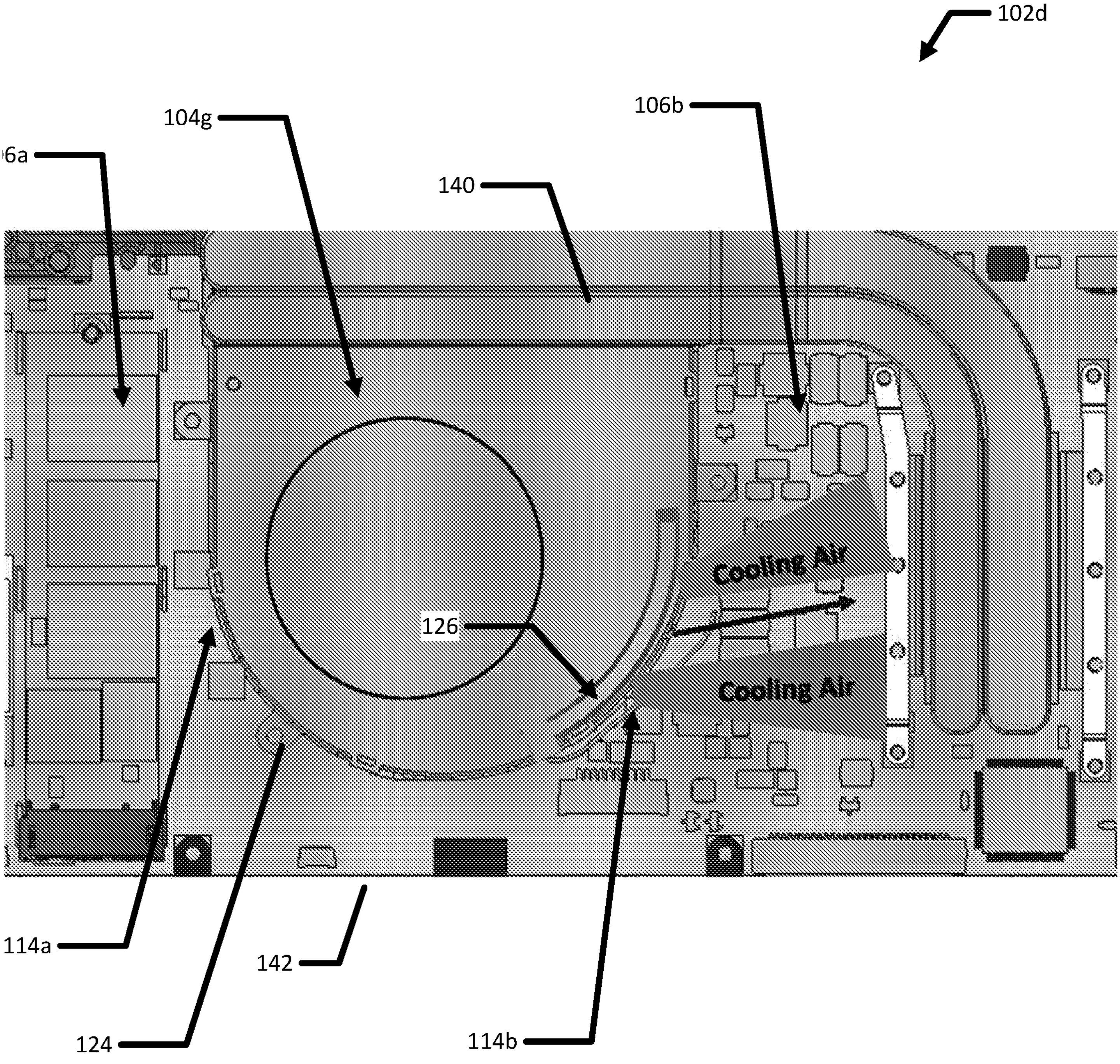
102d
106b
104g
6a
140
Cooling Air
126
Cooling Air
114a
142
124
114b

FIGURE 13

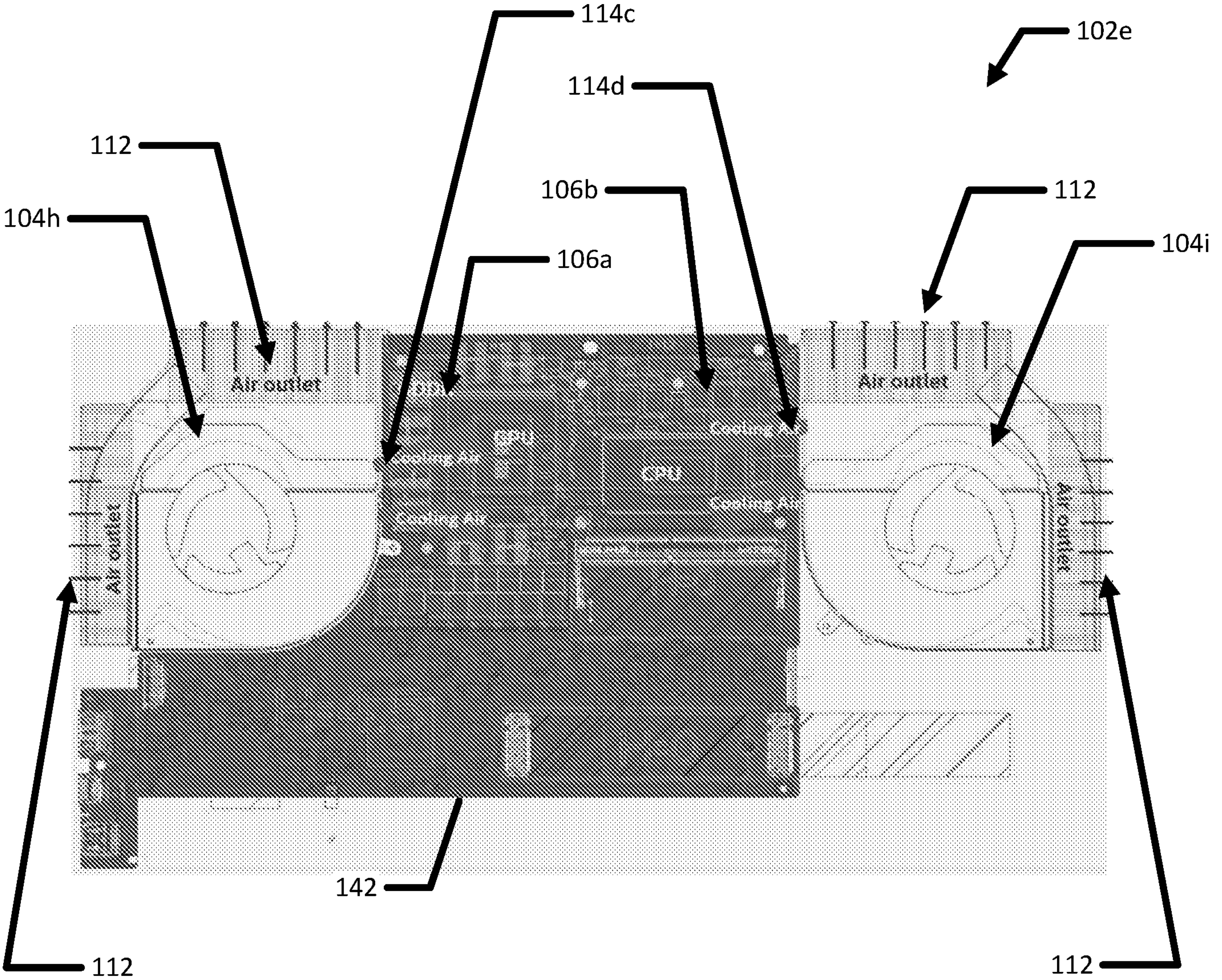
114c
102e
114d
112
106b
112
104h
104i
106a
Air outlet
Air outlet
Cooling Air
GPU
Cooling Air
CPU
Cooling Air
Cooling Air
Air outlet
Air outlet
142
112
112

FIGURE 14

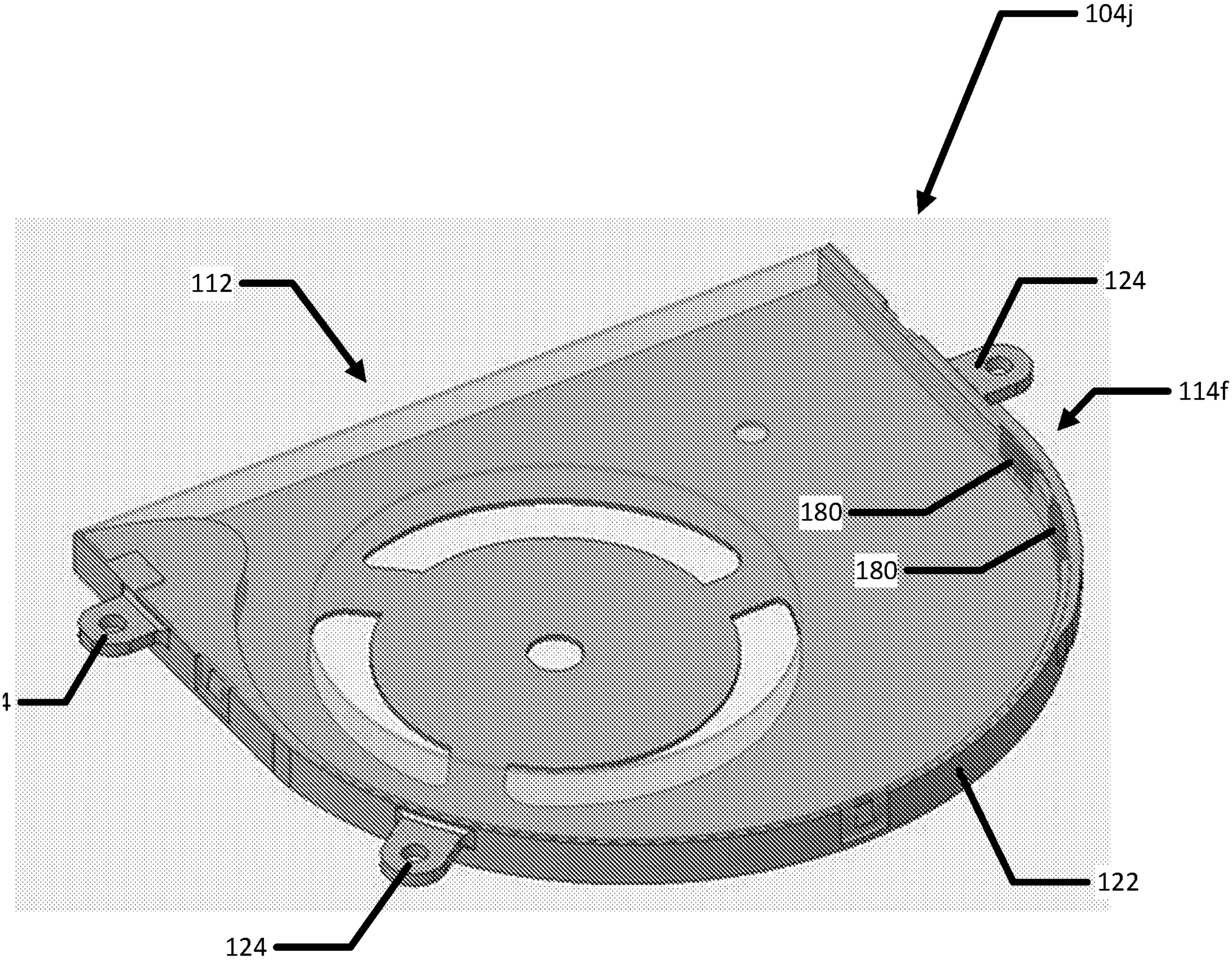

FIGURE 15

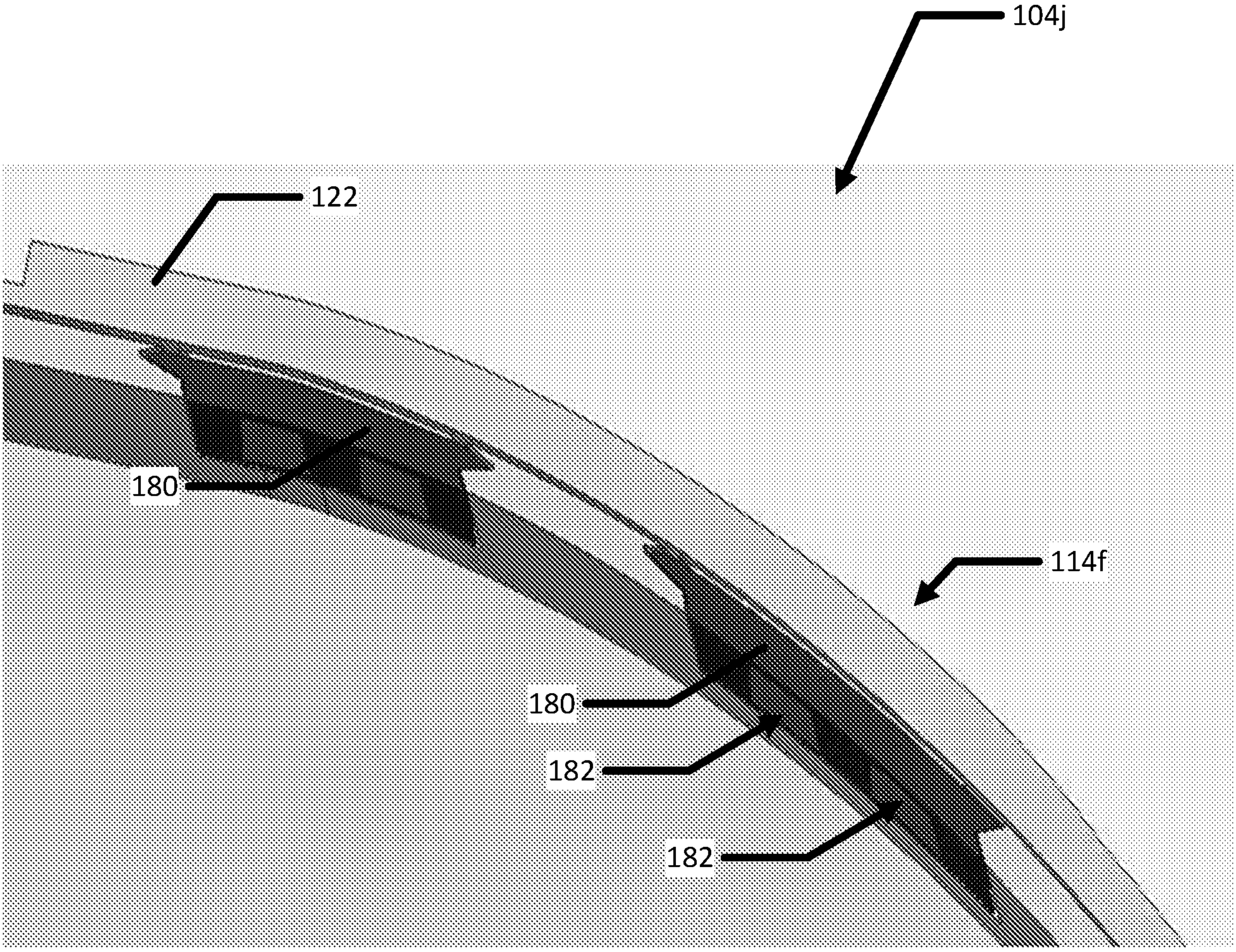

FIGURE 16

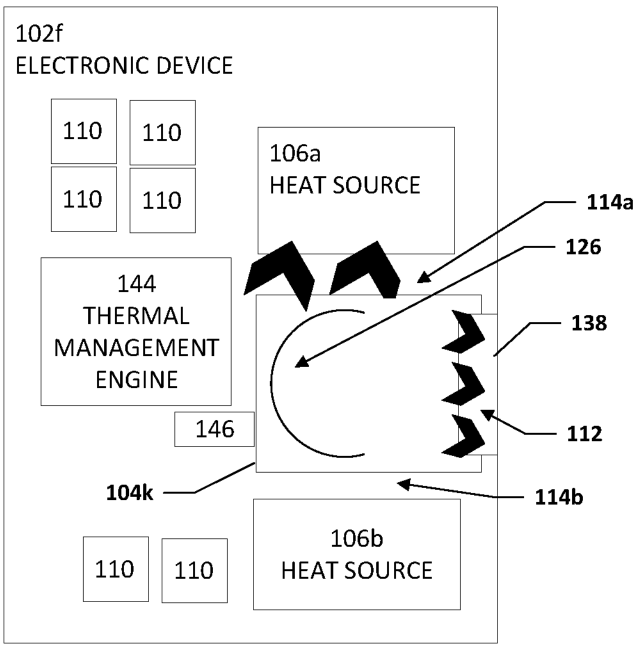

FIGURE 17A

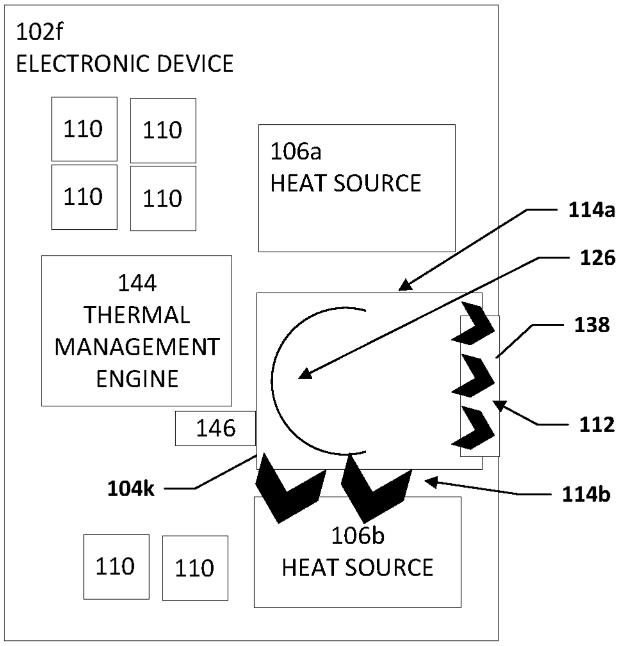

FIGURE 17B

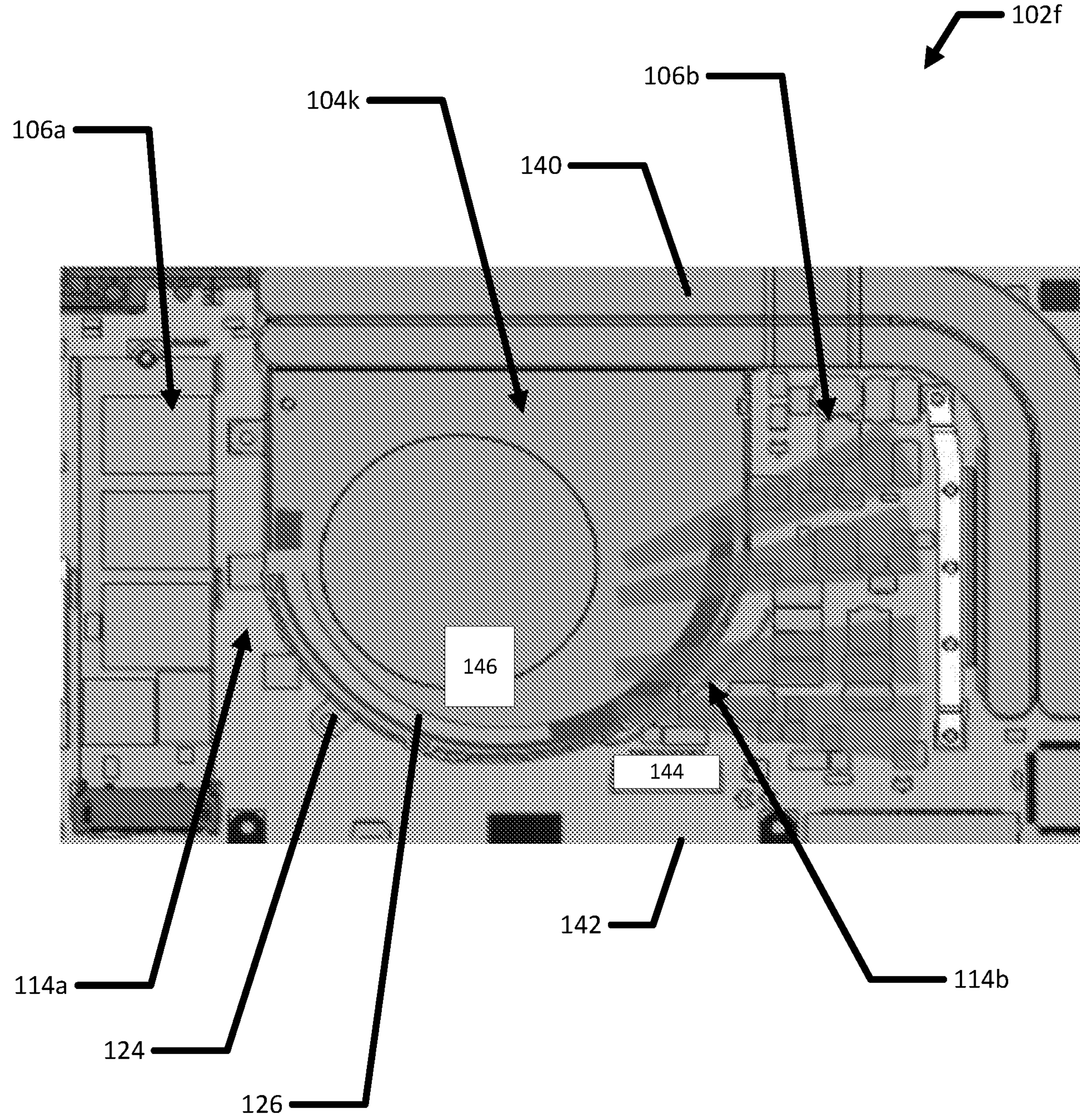

FIGURE 18

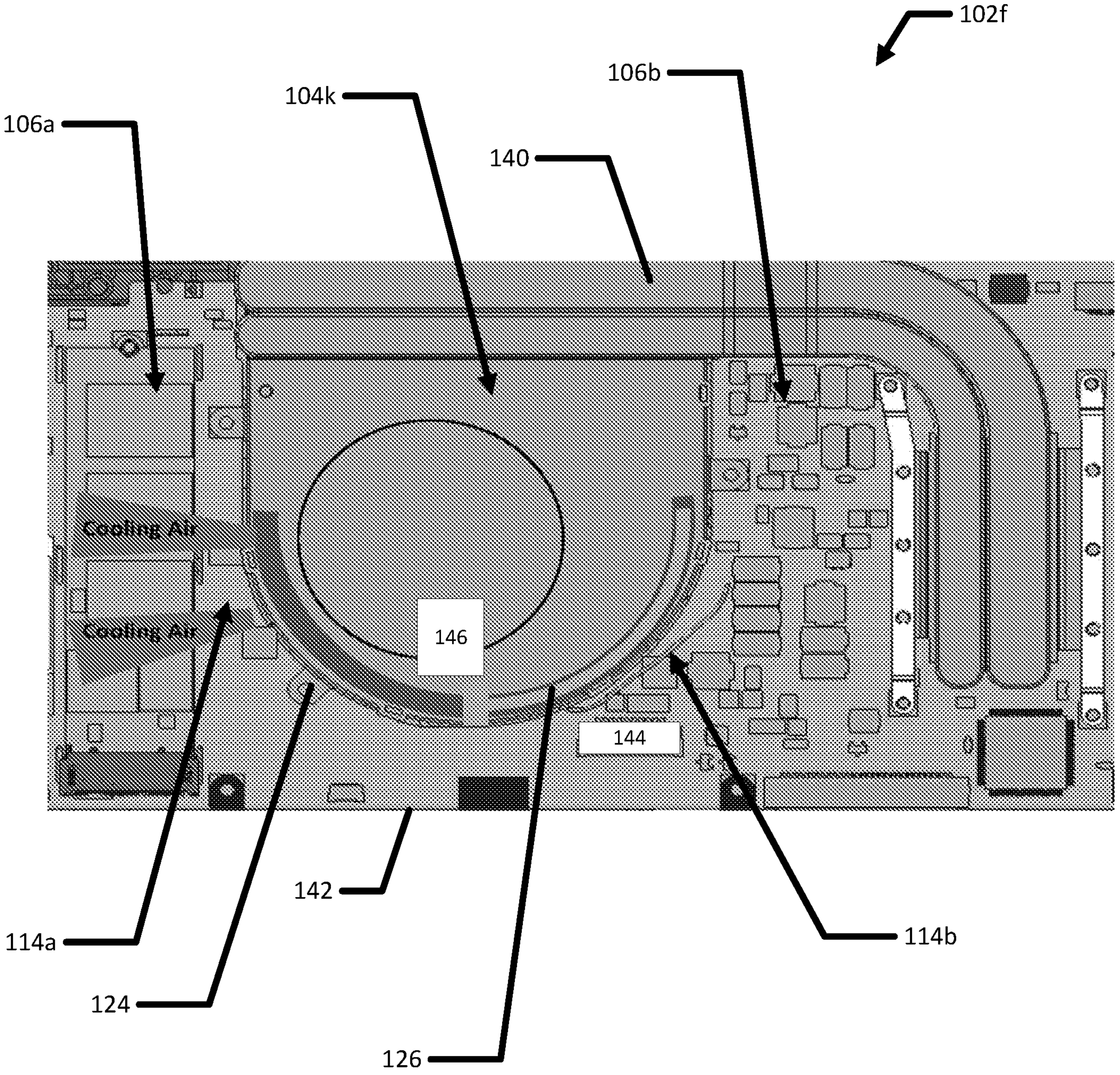
102f
106b
104k
106a
140
Cooling Air
Cooling Air
146
144
142
114a
124
126
114b

FIGURE 19

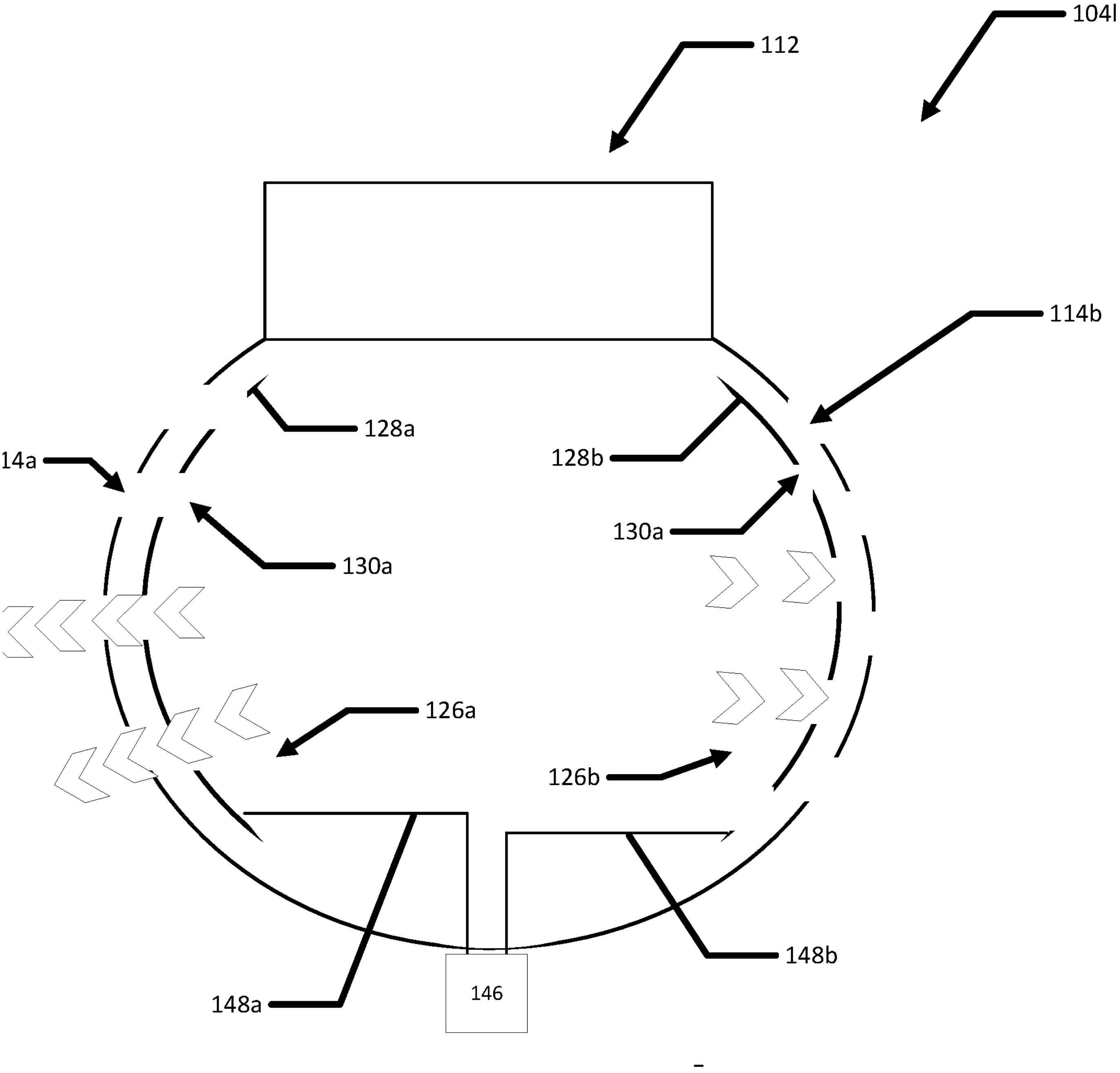

FIGURE 20

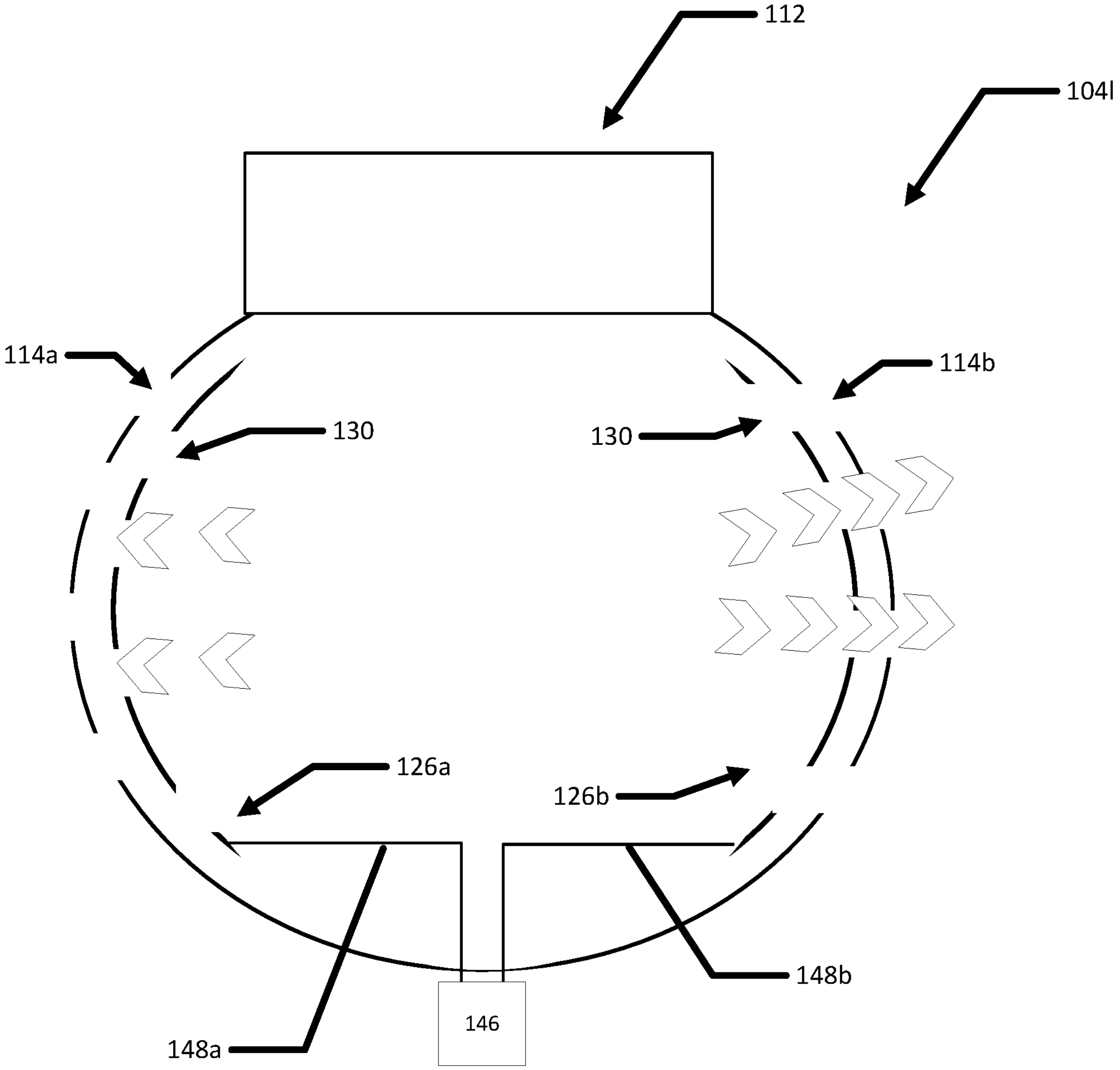

FIGURE 21

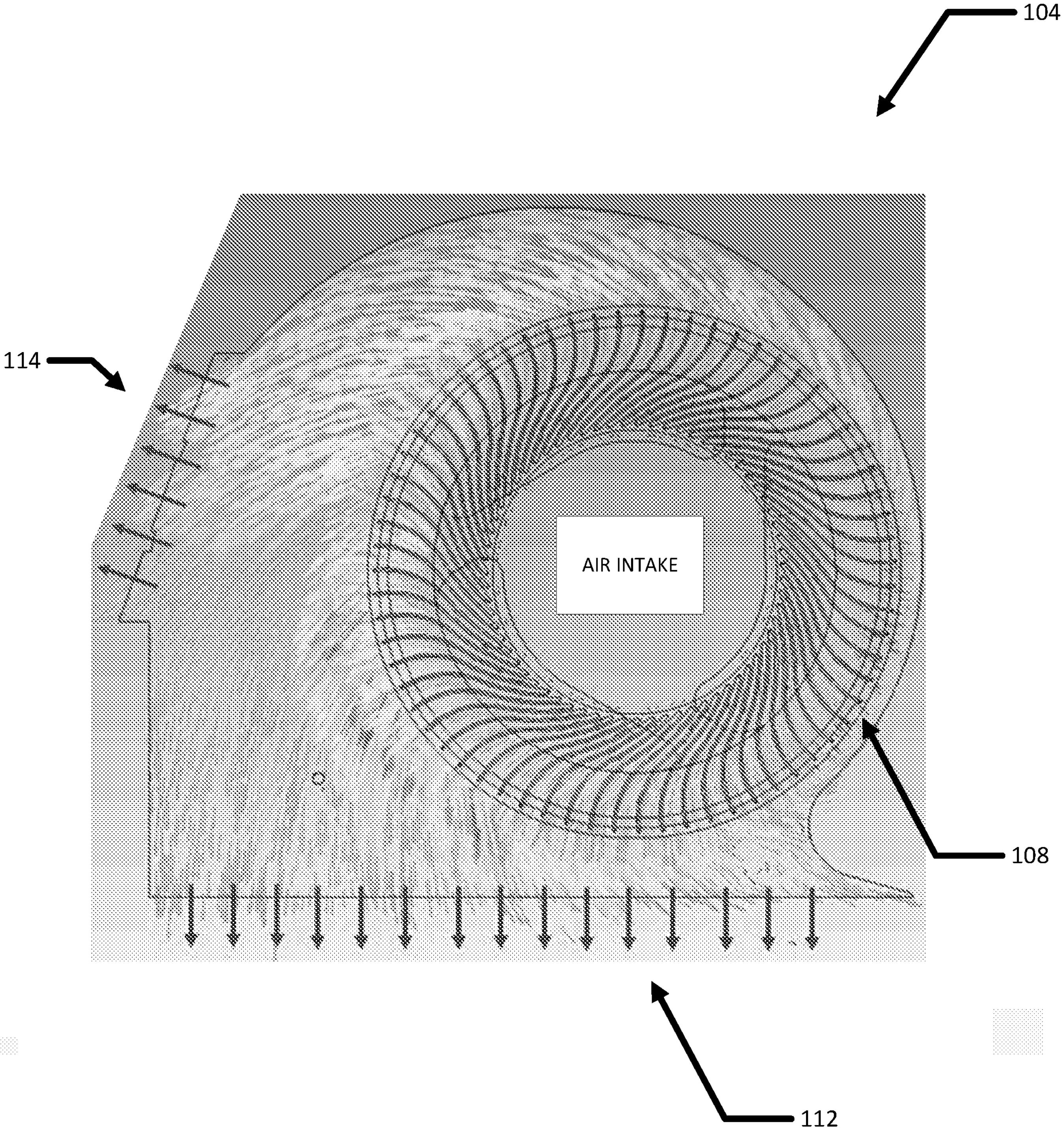

FIGURE 22

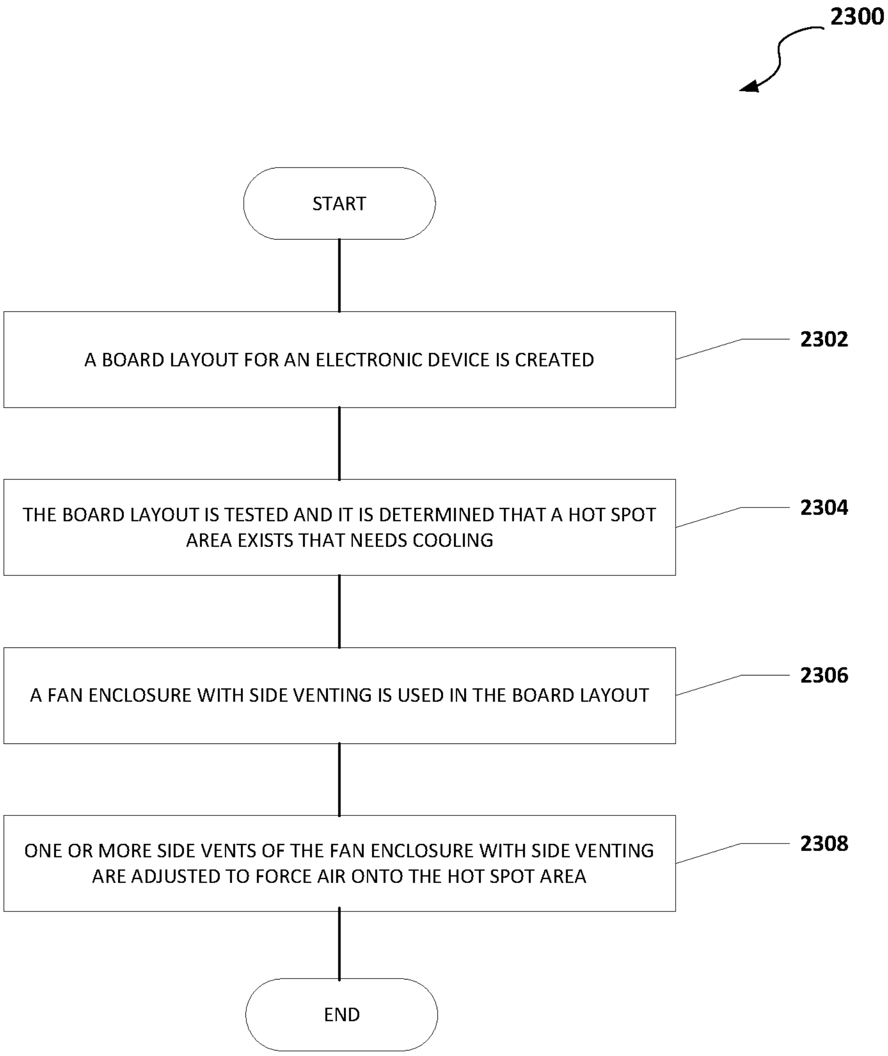
2300
START
A BOARD LAYOUT FOR AN ELECTRONIC DEVICE IS CREATED
2302
THE BOARD LAYOUT IS TESTED AND IT IS DETERMINED THAT A HOT SPOT AREA EXISTS THAT NEEDS COOLING
2304
A FAN ENCLOSURE WITH SIDE VENTING IS USED IN THE BOARD LAYOUT
2306
ONE OR MORE SIDE VENTS OF THE FAN ENCLOSURE WITH SIDE VENTING ARE ADJUSTED TO FORCE AIR ONTO THE HOT SPOT AREA
2308
END

FIGURE 23

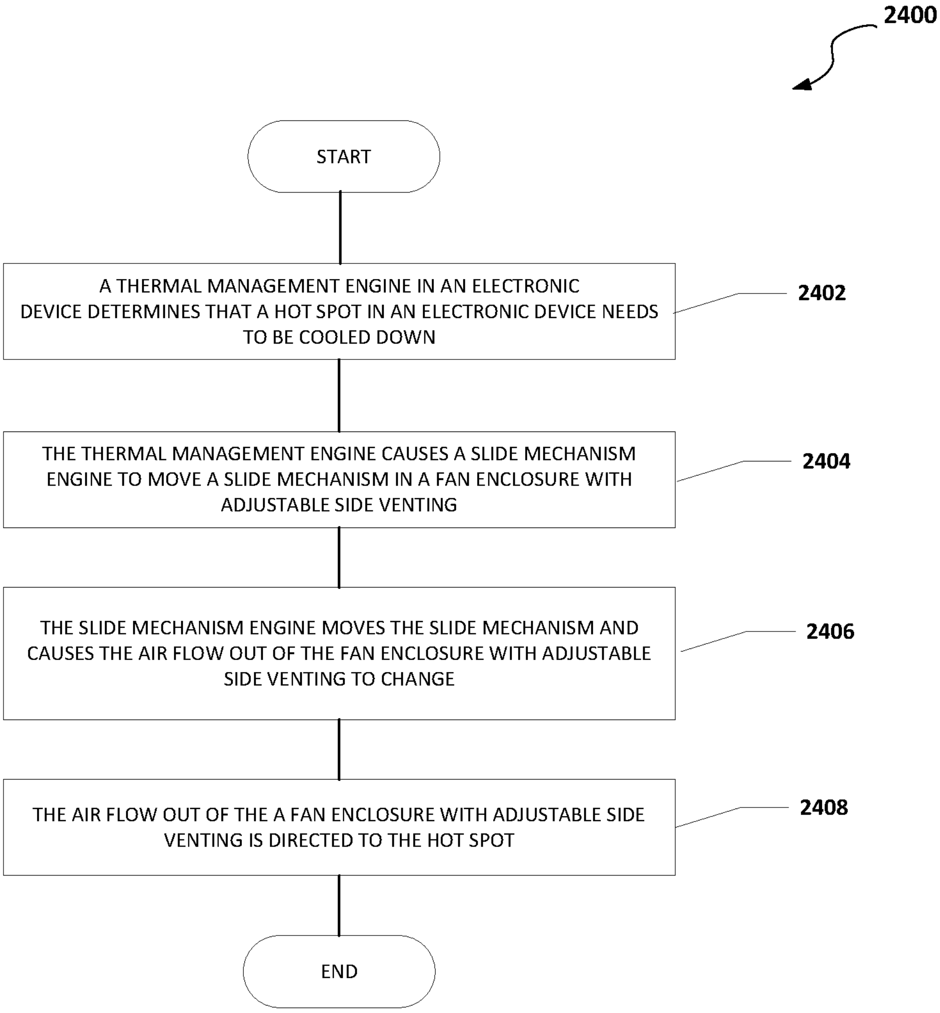
2400
START
A THERMAL MANAGEMENT ENGINE IN AN ELECTRONIC DEVICE DETERMINES THAT A HOT SPOT IN AN ELECTRONIC DEVICE NEEDS TO BE COOLED DOWN
2402
THE THERMAL MANAGEMENT ENGINE CAUSES A SLIDE MECHANISM ENGINE TO MOVE A SLIDE MECHANISM IN A FAN ENCLOSURE WITH ADJUSTABLE SIDE VENTING
2404
THE SLIDE MECHANISM ENGINE MOVES THE SLIDE MECHANISM AND CAUSES THE AIR FLOW OUT OF THE FAN ENCLOSURE WITH ADJUSTABLE SIDE VENTING TO CHANGE
2406
THE AIR FLOW OUT OF THE A FAN ENCLOSURE WITH ADJUSTABLE SIDE VENTING IS DIRECTED TO THE HOT SPOT
2408
END

FIGURE 24

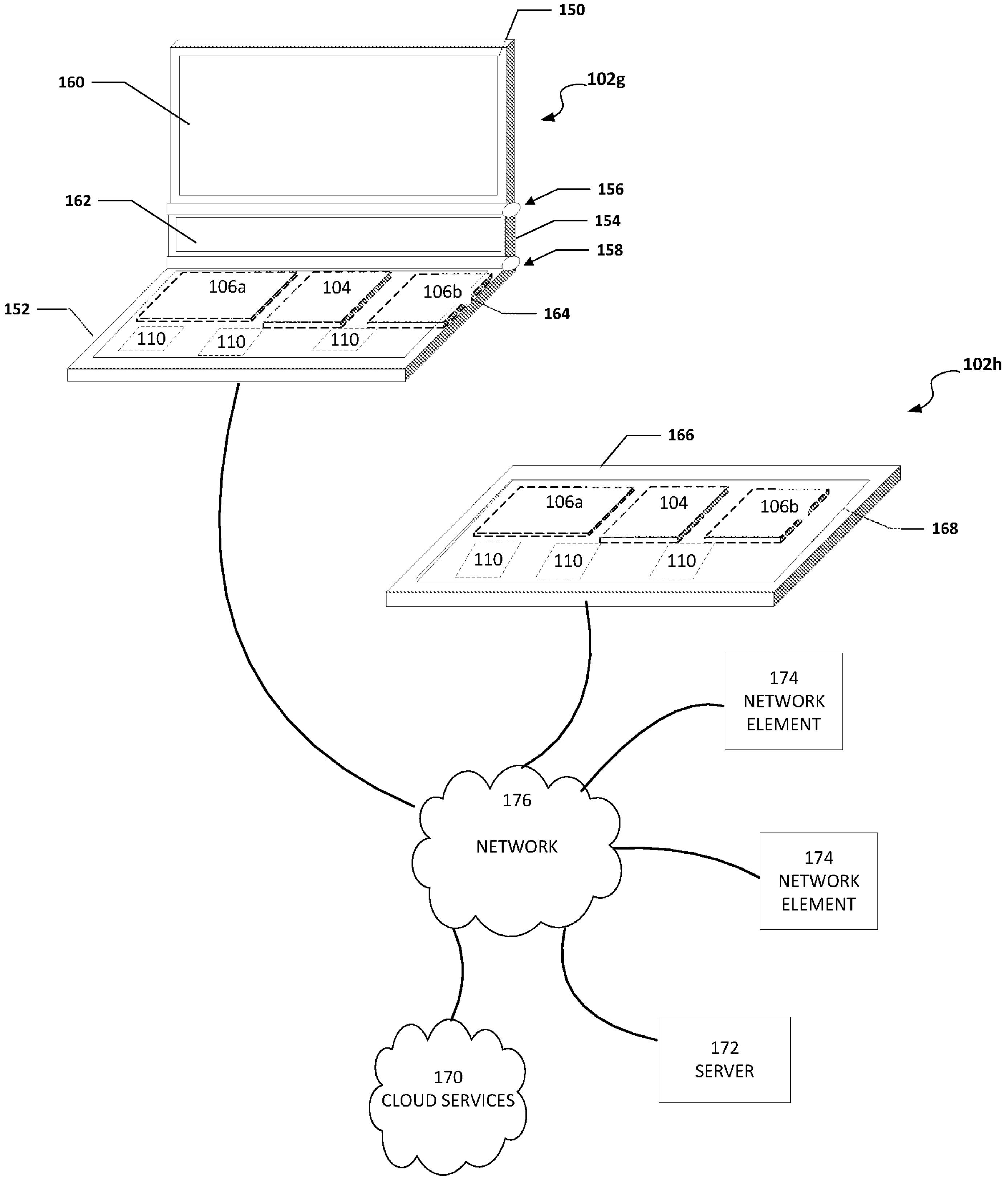
150
160
102g
156
162
154
158
106a
104
106b
152
164
110
110
110
102h
166
106a
104
106b
168
110
110
110
174
NETWORK
ELEMENT
176
NETWORK
174
NETWORK
ELEMENT
170
CLOUD SERVICES
172
SERVER

FIGURE 25

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2021/102421

A. CLASSIFICATION OF SUBJECT MATTER

H05K 7/20(2006.01)i; G06F 1/20(2006.01)i

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)

H05K; G06F

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

VEN;USTXT;WOTXT;EPTXT;CNABS;CNTXT;CNKI: fan, vent, window, air, flow, cool, dissipat+, radiat+, heat sink, heat, slid+, mov+, adjust+, two, second+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 101419492 A (LENOVO BEIJING CO LTD) 29 April 2009 (2009-04-29) description, page 3, line 32 to page 4, line 4, figures 1-3	1, 6, 7, 14-16
Y	CN 101419492 A (LENOVO BEIJING CO LTD) 29 April 2009 (2009-04-29) description, page 3, line 32 to page 4, line 4, figures 1-3	2-5, 8-13, 17-20
X	CN 111970892 A (SHENZHEN BACHAO TECHNOLOGY CO LTD) 20 November 2020 (2020-11-20) description, paragraghs [0017]-[0028], figures 1-6	1, 6, 7, 14-16
Y	CN 111970892 A (SHENZHEN BACHAO TECHNOLOGY CO LTD) 20 November 2020 (2020-11-20) description, paragraghs [0017]-[0028], figures 1-6	2-5, 8-13, 17-20
Y	CN 102103396 A (WISTRON CORP) 22 June 2011 (2011-06-22) description, paragraghs [0035]-[0043], figures 1-3	2-5, 8-13, 17-20
A	US 2006181851 A1 (FRANK WANG et al.) 17 August 2006 (2006-08-17) the whole document	1-20
A	KR 20160116255 A (FABRICSYS CO LTD) 07 October 2016 (2016-10-07) the whole document	1-20

☐ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

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Date of the actual completion of the international search **29 October 2021**	Date of mailing of the international search report **08 February 2022**
Name and mailing address of the ISA/CN **National Intellectual Property Administration, PRC** **6, Xitucheng Rd., Jimen Bridge, Haidian District, Beijing 100088, China** Facsimile No. **(86-10)62019451**	Authorized officer **YU,Wenqing** Telephone No. **86-(010)-62411450**

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2021/102421

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