

PORTABLE ELECTRONIC DEVICE**Technical Field**

[0001] Various embodiments relate to a portable electronic device. In particular, various embodiments relate to a portable electronic device with enhanced heat-dissipation capability.

Background

[0002] Portable electronic devices, such as laptops, notebooks, tablets, and mobile phones, are increasingly desired to be slimmer and thinner for enhanced portability. However, reducing the thickness of these devices negatively impacts their thermal management. Effective heat dissipation is a critical challenge in the development of portable electronic devices. Particularly, the heat generated by internal components in the confined internal spaces of these portable electronic devices needs to be managed to prevent overheating.

[0003] Traditional portable electronic device designs typically employ static cooling systems. However, they generally do not adapt well to varying thermal loads, leading to suboptimal cooling efficiency. Additionally, the compact form factor of these devices limits the integration of larger cooling systems.

[0004] Recognizing the above limitations, there is a need for a portable electronic device that addresses these issues while maintaining a slim design.

Summary

[0005] According to various embodiments, there may be provided a portable electronic device which may include a housing defining an internal space. The housing may include an outer face with an external bay. The housing may further include at least one air vent at the external bay which enables fluid communication therethrough between the internal space and outside of the housing. The portable electronic device may further include a heat-dissipation assembly disposed within the internal space of the housing. The portable electronic device may further include a user-interface

assembly movably coupled to the housing in a manner such that the user-interface assembly is movable relative to the housing between a closed position of the user-interface assembly in which the user-interface assembly seats within the external bay to cover the at least one air vent, and an opened position of the user-interface assembly in which the user-interface assembly is displaced from the external bay to uncover the at least one air vent for fluid to flow therethrough to interact with the heat-dissipation assembly.

Brief description of the drawings

[0006] In the drawings, like reference characters generally refer to the same parts throughout the different views. The drawings are not necessarily to scale, emphasis instead generally being placed upon illustrating the principles of the invention. In the following description, various embodiments are described with reference to the following drawings:

FIG. 1A depicts schematically a portable electronic device, with a user-interface assembly thereof seated within an external bay of the portable electronic device, in a closed position of the user-interface assembly, according to various embodiments;

FIG. 1B depicts schematically the user-interface assembly of FIG. 1A displaced from the external bay to an opened position of the user-interface assembly, to uncover at least one air vent at the external bay, according to various embodiments;

FIG. 2A and FIG. 2B are schematic side views of a portable electronic device, with a user-interface assembly pivotably coupled to a housing of the portable electronic device, according to various embodiments;

FIG. 2C shows a perspective view of a portable electronic device in the form of a laptop, having a user-interface assembly in the form of a keyboard, in its closed position, according to various embodiments;

FIG. 2D shows a perspective view of the laptop of FIG. 2C, with its keyboard pivoted to an opened position, according to various embodiments;

FIG. 2E shows an exploded perspective view of the laptop of FIG. 2C, according to various embodiments;

FIG. 2F and FIG. 2G show perspective views of an operative coupling mechanism for operatively coupling a display assembly of the laptop to the keyboard of the laptop, according to various embodiments;

FIG. 2H is an isolated perspective view of an intermittent motion mechanism of the operative coupling mechanism of FIG. 2F and FIG. 2G, according to various embodiments;

FIG. 3A and FIG. 3B are schematic side views of a portable electronic device, with a user-interface assembly being both pivotably and slidably coupled to a housing of the portable electronic device, according to various embodiments;

FIG. 3C and FIG. 3D are schematic side views of the portable electronic device of FIG. 3A, with the housing having a gliding surface for guiding the user-interface assembly to an opened position, according to various embodiments;

FIG. 3E shows a perspective view of a portable electronic device in the form of a laptop, having a user-interface assembly in the form of a keyboard, in a closed position, according to various embodiments;

FIG. 3F shows a perspective view of the laptop of FIG. 3E, with its keyboard slid and pivoted to an opened position, according to various embodiments;

FIG. 3G is an exploded perspective view of the laptop of FIG. 3E, according to various embodiments;

FIG. 3H and FIG. 3I show perspective views of a sliding-and-pivot-mechanism for coupling the keyboard to a housing of the laptop, according to various embodiments;

FIG. 3J shows a cross-sectional perspective view of the laptop of FIG. 3E, with its keyboard in the closed position, according to various embodiments;

FIG. 3K shows a cross-sectional perspective view of the laptop of FIG. 3F, with its keyboard in the opened position, according to various embodiments;

FIG. 3L shows an isolated perspective view of a support stand of the laptop, according to various embodiments; and

FIG. 3M shows a close-up perspective view of a sliding portion of the support stand in an elongate channel of a support-stand-guide-element of the housing of the laptop, according to various embodiments.

Detailed description

[0007] Embodiments described below in context of the apparatus are analogously valid for the respective methods, and vice versa. Furthermore, it will be understood that the embodiments described below may be combined, for example, a part of one embodiment may be combined with a part of another embodiment.

[0008] It should be understood that the terms “on”, “over”, “top”, “bottom”, “down”, “side”, “back”, “left”, “right”, “front”, “lateral”, “up” etc., when used in the following description are used for convenience and to aid understanding of relative positions or directions, and not intended to limit the orientation of any device, or structure or any part of any device or structure. In addition, the singular terms “a”, “an”, and “the” include plural references unless context clearly indicates otherwise. Similarly, the word “or” is intended to include “and” unless the context clearly indicates otherwise.

[0009] The embodiments described herein relate to a portable electronic device (e.g. a laptop, a portable personal computer, a notebook (e.g. electronic notebook), a tablet (e.g. electronic tablet), a palmtop, handphone, smartphone, etc., designed to enhance user experience through improved thermal management and ergonomic design of its user-interface assembly.

[0010] According to various embodiments, the portable electronic device may include a base part and a top part. The base part may include a housing. The housing may be for containing various internal components as well as for supporting an external user-interface assembly, such as a keyboard or keypad.

[0011] In various embodiments, the user-interface assembly of the portable electronic device may be movable to uncover one or more strategically positioned air vents on the housing. This arrangement significantly enhances thermal performance and operational efficiency. Additionally, the user-interface assembly may be linked (e.g. mechanically linked) to a display assembly of the portable electronic device, in a manner such that moving the display assembly may shift or cause the user-interface assembly to move between a “closed” position, in which the air vents of the housing are covered by the user-interface assembly, and an “opened” position, in which the air vents are uncovered for fluid to flow freely therethrough.

[0012] Furthermore, in various embodiments, an orientation of the user-interface assembly may change as it moves between the closed and opened positions. For instance, in the closed position, the user-interface assembly may be aligned (e.g. parallel) with a surface (e.g. an upper surface and/or a base surface) of the housing of

the portable electronic device, and in the opened position, the user-interface assembly may be non-parallel (e.g. diagonally inclined) with respect to the aforesaid surface of the housing.

[00013] Specifically, in various embodiments, in the opened position, the user-interface assembly may maintain an ergonomic tilt for enhanced user comfort. When the user-interface assembly is not in use, it may be conveniently stowed away in an external bay of the housing of the portable electronic device, ensuring a streamlined and compact form factor.

[00014] FIG. 1A depicts schematically a portable electronic device 100, with a user-interface assembly 117 stowed within an external bay 109 of the portable electronic device 100, in a closed position of the user-interface assembly 117, according to various embodiments.

[00015] FIG. 1B depicts schematically the user-interface assembly 117 of FIG. 1A displaced from the external bay 109 to an opened position of the user-interface assembly 117, to uncover at least one air vent 111 at the external bay 109, according to various embodiments.

[00016] According to various embodiments, there may be provided the portable electronic device 100. As some examples, the portable electronic device 100 may include or may be any one of a laptop, a portable personal computer, a notebook (e.g. electronic notebook), a tablet (e.g. electronic tablet), a palmtop, handphone, smartphone, etc. For ease of illustration, various embodiments may be described with reference to the portable electronic device 100 being a laptop. Nevertheless, it is understood that the various embodiments described as such are not limited thereto. Accordingly, in various other embodiments, the portable electronic device 100 may, for example, be a tablet or a smartphone.

[00017] Referring to FIG. 1A, according to various embodiments, the portable electronic device 100 may include a housing 101 (e.g. a main housing, or a base housing of a laptop). In particular, the housing 101 may be a casing, an outer shell, or a chassis of the portable electronic device 100. Accordingly, the housing 101 may give physical form and/or shape to the portable electronic device 100 and may define a hollow internal space 107 (or an enclosure) for accommodating (e.g. housing, containing, encasing, enclosing, etc.) one or more other components (e.g. a controller, a Motherboard, etc.) of the portable electronic device 100.

[00018] According to various embodiments, as an illustration, the housing 101 may include a top panel and a base panel opposite the top panel. According to various embodiments, the base panel and the top panel may both be planar (e.g. substantially flat) and/or may be parallel to each other. The housing 101 may further include a front wall, a rear wall opposite the front wall, and a pair of side walls respectively adjoining opposite edges of the front wall and the rear wall. According to various embodiments, each of the front wall, the rear wall, and the pair of side walls of the housing 101 may be planar or may be non-planar (e.g. curved). Further, the front wall, the rear wall, and the pair of side walls of the housing 101 may be extending between the top panel and the base panel of the housing 101. According to various embodiments, any portion of the housing 101 serving as an outer shell or casing, such as the top panel, the base panel, the front wall, the rear wall, and/or the side wall(s), etc., of the housing 101 may be referred to as an “outer face” of the housing.

[00019] According to various embodiments, the outer face of the housing 101 may include or may define an external bay 109. In particular, the external bay 109 may be on an outer surface 108 of the housing 101. According to various embodiments, the outer surface 108 of the housing 101 may be an upper surface of the top panel of the housing 101. As such, according to various embodiments, the external bay 109 may be situated on the upper surface of the top panel of the housing 101 of the portable electronic device 100. As an example, when the portable electronic device 100 is a laptop, the upper surface of the housing 101 may be a palm rest region of the housing 101 of the laptop. It is also envisaged that, in various other embodiments (not shown), the external bay 109 may be situated at any other suitable location (e.g. at another panel, wall, etc.) of the housing 101.

[00020] According to various embodiments, the external bay 109 of the housing 101 may be configured to accommodate (e.g. receive) a user-interface assembly 117 of the portable electronic device 100. For example, the external bay 109 may be (e.g. formed or shaped as) a receptacle, that is recessed inwardly from the outer surface 108 (e.g. upper surface) of the housing 101. In other words, the external bay 109 may be a recessed portion or a receded portion of the housing 101 (e.g. forming a depression or a receptacle or a socket). As another example, according to various other embodiments, the external bay 109 may simply be an area or section of the outer surface 108 (e.g. the upper surface) of the housing 101, designated for disposing the user-interfaces

assembly thereon. In particular, this designated area or section may be flush or level with a surrounding area or region of the outer surface 108 (e.g. a flat upper surface) of the housing 101 where the external bay 109 may be situated.

[00021] According to various embodiments, the user-interface assembly 117 may be an input and/or output component (or device) configured to receive input from a user and/or to output (e.g. display, play, etc.) information (e.g. content, sound, etc.) to the user. For example, the user-interface assembly 117 may include or may be any one or more (e.g. a combination, arrangement, etc.) of a keyboard (e.g. a physical keyboard having physical actuatable keys), a touch pad, a trackpad, a touch screen (e.g. sensitive to touch from a user and which may be capable of displaying information and/or displaying interactive elements such as a virtual keyboard), a display screen, a monitor, etc. For ease of illustration, various embodiments may be described with reference to the user-interface assembly 117 including or being a keyboard (e.g. a physical keyboard). Nevertheless, it is understood that the various embodiments described as such are not limited thereto. Accordingly, in various other embodiments, the user-interface assembly 117 may, for example, be a touch screen.

[00022] With reference to FIG. 1A and FIG. 1B, according to various embodiments, the user-interface assembly 117 may be movably coupled to the housing 101, such that the user-interface assembly 117 may be movable or displaceable (e.g. as a whole, as a unified entity, or as a single piece / body, etc.) relative to the housing 101 between a “closed” position of the user-interface assembly 117 (see FIG. 1A), in which the user-interface assembly 117 (e.g. the entire user-interface assembly 117) is seated within (and/or on) (in other words, stowed in) the external bay 109, and an “opened” position of the user-interface assembly 117 (see FIG. 1B), in which the user-interface assembly 117 (e.g. at least a portion or segment of the user-interface assembly 117) may be unseated and/or displaced from the external bay 109. According to various embodiments, the closed position and the opened position of the user-interface assembly 117 may correspond to different positions and/or orientations of the user-interface assembly 117 with respect to the outer surface 108 (e.g. upper surface) of the housing 101. Specifically, in the opened position of the user-interface assembly 117, at least a portion of the user-interface assembly 117 (e.g. at least a portion of its base surface) and the outer surface 108 of the housing 101 (i.e. where the external bay 109 may be situated) may be spaced apart so as to define a gap therebetween. Further,

according to various embodiments, in the opened position of the user-interface assembly 117, the user-interface assembly 117 may be non-parallel (e.g. diagonally inclined) with respect to the outer surface 108 of the housing 101, to provide an ergonomic tilt for enhanced user comfort. In particular, the user-interface assembly 117 may be inclined upwards and diagonally away from the external bay 109 of the housing 101 and away from a front of the portable electronic device 100 (see, for example, FIG. 2B). It is also envisaged that in various other embodiments (not shown), in the opened position of the user-interface assembly 117, the user-interface assembly 117 (e.g. at least its base surface or board, or the entire user-interface assembly 117 itself) may be spaced apart or elevated from the outer surface 108 of the housing 101, while being parallel to the outer surface 108 of the housing 101. According to various embodiments, in the closed position of the user-interface assembly 117, the user-interface assembly 117 (e.g. at least the entire base surface of the user-interface assembly 117) may be interfaced with (e.g. engaged, in contact, etc.) and/or may be parallel (or coplanar) with the outer surface 108 (e.g. upper surface) of the housing 101 (or with the external bay 109). Accordingly, in the closed position of the user-interface assembly 117, the user-interface assembly 117 may be parallel to the outer surface 108 (e.g. upper surface) of the housing 101 (or to the external bay 109) when a panel (e.g. a support panel, back panel, board, etc.) of the user-interface assembly 117 and the outer surface 108 of the housing 101 (or the external bay 109) are respectively oriented and positioned to lie in two parallel planes. Further, in the closed position of the user-interface assembly 117, the user-interface assembly 117 may be coplanar with the outer surface 108 of the housing 101 (or with the external bay 109) when the panel (e.g. support panel, back panel, board, etc.) of the user-interface assembly 117 and the outer surface 108 (e.g. upper surface) of the housing 101 (or the external bay 109) are respectively oriented and positioned side-by-side or alongside or lined abreast each other in a same plane.

[00023] According to various embodiments, the user-interface assembly 117 may be movably coupled to the housing 101 in a manner which allows pivotal movement of the user-interface assembly 117 with respect to the housing 101, and/or which allows slidable (or sliding) movement of the user-interface assembly 117 with respect to the housing 101, and/or in any other suitable manner (e.g. which allows linear upward / downward movements of the user-interface assembly 117 away from / towards the external bay 109). As some examples, according to various embodiments, the user-

interface assembly 117 may be movably coupled to the housing 101 via any one or more (e.g. a combination, arrangement, etc.) of a hinge mechanism, a folding mechanism, a sliding mechanism, a swivel mechanism, a rotating mechanism, a telescopic mechanism, a scissors mechanism, a Push-Push mechanism (e.g. such that each push of the user-interface assembly 117 towards the housing 101 changes the position of the user-interface assembly 117 and retains the user-interface assembly 117 in that position), a biasing mechanism, a magnetic mechanism, etc., and/or any other suitable mechanism.

[00024] According to various embodiments, the user-interface assembly 117 may be configured to be operable in (both or either of) the closed position and/or the opened position of the user-interface assembly 117 relative to the housing 101. For instance, the user-interface assembly 117 may utilize wired or wireless electrical connection and/or communication with other components (e.g. a controller, a Motherboard, etc.) of the portable electronic device 100 (e.g. which may be disposed in the internal space 107 of the housing 101).

[00025] Furthermore, according to various embodiments, the user-interface assembly 117 may be selectively (or independently) movable between the closed position and the opened position. In other words, when the portable electronic device 100 is in a “use” or “operating” mode, the user of the portable electronic device 100 may selectively move the user-interface assembly 117 from the closed position to the opened position, or vice versa, at any point of time. Accordingly, in the use or operating mode of the electronic device, the user may operate the user-interface assembly 117 (e.g. a keyboard) of the portable electronic device 100 in either the closed position or the opened position, as desired.

[00026] According to various other embodiments (described in detail later with reference to FIG. 2A and FIG. 2B), the portable electronic device 100 may be configured in a manner such that the user-interface assembly 117 operatively moves in tandem with (or upon) movement of another component (e.g. physical component) of the portable electronic device 100, such as upon rotation or unfolding of a display assembly (see, for example, reference 270 in FIG. 2A and FIG. 2B) of the portable electronic device 100. In other words, in various other embodiments, movement of the user-interface assembly 117 may be controlled by moving another component (such as a display assembly) of the portable electronic device 100.

[00027] Additionally, according to various embodiments, the portable electronic device 100 may include a support mechanism configured to support (e.g. retain or hold) the user-interface assembly 117 in the opened position. As an illustration, the support mechanism may include a support stand (see, for example, reference 250 in FIG. 2B) that connects (or that is coupled or engaged to) the user-interface assembly 117 and the housing 101, via opposite portions (e.g. end portions) of the support stand. According to various embodiments, the support stand may thereby support the user-interface assembly 117 in the opened position by propping it against a surface of the external bay 109. In this manner, according to various embodiments, the user-interface assembly 117 may be functional for use by the user, in the opened position (e.g. in addition to the closed position) of the user-interface assembly 117. According to various embodiments, as an illustration, the support stand may be movably coupled to (or engaged with) either one or both of the user-interface assembly 117 and the housing 101. Such a configuration may enable the support stand to be stowed away when the user-interface assembly 117 is in the closed position.

[00028] According to various embodiments, referring to FIG. 1B, the housing 101 may include at least one air vent 111 at the external bay 109. According to various embodiments, each air vent 111 may be an opening or a through-hole that opens or leads to the internal space 107 of the housing 101. In particular, each air vent 111 may extend through the external bay 109, between its inner surface and outer surface to fluidly connect the internal space 107 of the housing 101 (or the inside of the housing 101) and an external space or environment outside of the housing 101. In other words, the at least one air vent 111 may allow fluid communication, between the internal space 107 and outside of the housing 101. As some illustrations, according to various embodiments, when the at least one air vent 111 is unobstructed by the user-interface assembly 117, cool or cooler ambient air from outside of the housing 101 may enter the internal space 107 through the at least one air vent 111, or heated or warmer air in the internal space 107 may be expelled to the outside of the housing 101 through the at least one air vent 111. Accordingly, each air vent 111 of the housing 101 may define a fluid path or airflow path which passes the air vent 111 and the internal space 107 of the housing 101.

[00029] With reference to FIG. 1A, according to various embodiments, in the closed position of the user-interface assembly 117, the user-interface assembly 117 (e.g. entire

user-interface assembly 117) may be seated within (and/or on) the external bay 109 in a manner which covers (e.g. entirely covers) the at least one air vent 111 (e.g. cover its opening at the external bay 109, thereby blocking or obstructing fluid from flowing freely through the at least one air vent 111). On the other hand, with reference to FIG. 1B, in the opened position of the user-interface assembly 117, the user-interface assembly 117 (e.g. at least a portion or segment thereof) may be displaced (e.g. shifted, moved away, unseated, put out of position, dislocated, etc.) from the external bay 109 to uncover and/or expose the at least one air vent 111 at the external bay 109 so that fluid can flow freely therethrough (e.g. to interact with a heat-dissipation assembly 113 or arrangement of the portable electronic device 100, which may be disposed in the internal space 107 of the housing 101, described in detail below). According to various embodiments, in the opened position of the user-interface assembly 117, as shown in FIG. 1B, the user-interface assembly 117 (or at least a portion or segment thereof) may be protruding from the housing 101 (or outward or upward from the external bay 109 of the housing 101).

[00030] According to various embodiments, the user-interface assembly 117 may include a heat-dissipation assembly (or arrangement) 113 disposed in the internal space 107 of the housing 101. According to various embodiments, the heat-dissipation assembly 113 may function as a “cooling system” or “thermal management system” configured to dissipate heat generated by one or more internal components (herein referred to as “heat-generating components”) of the portable electronic device 100. According to various embodiments, these heat-generating components may be disposed in the internal space 107 of the housing 101 (i.e. along with the heat-dissipation assembly 113). According to various embodiments, any one or more of the heat-generating components may process information and/or perform operation(s), and generate heat as a result. As some examples, the heat-generating components may include any one or more of a controller, a Motherboard, a Central Processing Unit (CPU) and/or a Graphics Processing Unit (GPU) (e.g. on a Printed Circuit Board), etc., and/or any other electronic or electrical component (e.g. such as an internal battery) of the portable electronic device 100. According to various embodiments, the heat-dissipation assembly 113 may be configured to regulate (e.g. control, maintain, or cool, etc.) a temperature of the heat-generating components as well as the internal space 107 of the housing 101. As some examples, the heat-dissipation assembly 113 may include any

one or more (e.g. a combination, arrangement, etc.) of at least one fan unit (e.g. at least one fan, cooling fan, CPU fan, GPU fan, etc.), at least one heat sink (e.g. configured to adsorb and dissipate heat), thermal duct(s), and/or heat pipe(s), etc., and/or any other suitable thermal management mechanism or component.

[00031] According to various embodiments, the heat-dissipation assembly 113 may cooperate with the at least one air vent 111 at the external bay 109 to facilitate fluid flow across the at least one air vent 111. In particular, according to various embodiments, the heat-dissipation assembly 113 may include at least one fan unit configured (e.g. positioned, arranged, oriented, fluidly connected, etc., relative to the at least one air vent 111) to draw in (e.g. suck) ambient air from outside of the housing 101 into the internal space 107 of the housing 101 via the at least one air vent 111. In various other embodiments, the at least one fan unit may be configured to expel heated (or warmer) air from the internal space 107 of the housing 101 to the outside of the housing 101 via the at least one air vent 111 (i.e. when the at least one air vent 111 is unobstructed by the user-interface assembly 117 being in the opened position). According to various other embodiments, the heat-dissipation assembly 113 may include (e.g. optionally and/or further include) at least one heat sink or thermal duct disposed proximal (e.g. immediately adjacent) to the at least one air vent 111 at the external bay 109. According to various other embodiments, such a placement of the at least one heat sink or thermal duct proximal to the at least one air vent 111 may facilitate thermal transfer, by utilizing ambient air from outside of the housing 101 that enters the at least one air vent 111.

[00032] FIG. 2A and FIG. 2B are schematic side views of a portable electronic device 200, with a user-interface assembly 217 pivotably coupled to a housing 201 of the portable electronic device 200, according to various embodiments.

[00033] According to various embodiments, the portable electronic device 200 may contain any one or more or all the features and/or limitations of the portable electronic device 100 of FIG. 1A and FIG. 1B. In the following, the portable electronic device 200 is described with like reference characters generally referring to the same or corresponding parts/features of the portable electronic device 100 of FIG. 1A and FIG. 1B. The description of the parts/features made with respect to the portable electronic device 200 may also be applicable with respect to the portable electronic device 100, and vice versa.

[00034] According to various embodiments, with reference to FIG. 2A and FIG. 2B, the portable electronic device 200 may, similar to the portable electronic device 100 of FIG. 1A and FIG. 1B, include a housing 201. In particular, the housing 201 may define an internal space 207 as well as include an external bay 209 at an outer surface 208 (e.g. upper surface) of the housing 201.

[00035] According to various embodiments, the housing 201 of the portable electronic device 200 may, similar to the housing 101 of the portable electronic device 100 of FIG. 1A and FIG. 1B, include at least one air vent 211 at the external bay 209. As shown in FIG. 2B, the external bay 209 of the portable electronic device 200 may be shaped as a receptacle, with the at least one air vent 211 located at a base of the receptacle. It is also envisaged that, in various other embodiments, the at least one air vent 211 may be located at any suitable location on the external bay 209, for instance, on the side wall(s) of the receptacle (i.e. the external bay 209).

[00036] According to various embodiments, with reference to FIG. 2A and FIG. 2B, the housing 201 of the portable electronic device 200 may further include one or more other air vents (herein referred to as “primary air vents”) 212 positioned outside of (or away from) the external bay 209. In other words, the one or more primary air vents 212 may be at another region of the housing 201 other than the external bay 209 (or where the external bay 209 is not located and/or which does not overlap nor coincide with the external bay 209). As an example, with reference to FIG. 2A and FIG. 2B, the housing 201 may (i.e. optionally) include at least one primary air vent 212 at a base panel, and/or may include at least one primary air vent 212 at a top panel, and/or may include at least one primary air vent 212 at a front wall, and/or may include at least one primary air vent 212 at a rear wall, and/or may include at least one primary air vent 212 at either or both side wall(s) of the housing 201. According to various embodiments, as an illustration, the at least one primary air vent 212 may serve as primary (or main) ventilation hole(s) for fluid exchange between the internal space 207 and the outside of the housing 201. On the other hand, the at least one air vent 211 at the external bay 209 may serve as secondary (or auxiliary) ventilation hole(s) for increasing a volume of fluid exchange between the internal space 207 and the outside of the housing 201 (i.e. when the user-interface assembly 217 is unscated from the external bay 209 to uncover the at least one air vent 211).

[00037] According to various embodiments, with reference to FIG. 2A and FIG. 2B, the portable electronic device 200 may, similar to the portable electronic device 100 of FIG. 1A and FIG. 1B, include at least one heat-generating component 216 disposed in the internal space 207 of the housing 201.

[00038] Further, with reference to FIG. 2A and FIG. 2B, the portable electronic device 200 may, similar to the portable electronic device 100 of FIG. 1A and FIG. 1B, include a heat-dissipation assembly 213 disposed in the internal space 207 of the housing 201 to dissipate heat generated by the at least one heat-generating component 216. For instance, the heat-dissipation assembly 213 may be thermally coupled (e.g. directly or indirectly) to the at least one heat-generating component 216. The heat-dissipation assembly 213 may then cooperate with (or utilize) the primary air vent(s) 212 and/or the at least one air vent 211 located at the external bay 209, to dissipate heat generated by the at least one heat-generating component 216 (i.e. that is disposed in the internal space 207 of the housing 201).

[00039] To illustrate, with reference to FIG. 2B, according to various embodiments, the heat-dissipation assembly 213 of the portable electronic device 200 may include a heat sink 215, which may be thermally coupled to the heat-generating component 216. As an example, according to various embodiments, the heat sink 215 may include or may be a finned heat sink 215, in particular, having at least one or a plurality (e.g. an array) of fins (e.g. cooling fins). According to various embodiments, the heat sink 215 may be positioned along a fluid path (e.g. an airflow path) which passes through the primary air vent(s) 212 and/or the at least one air vent 211. As an example, according to various embodiments, the heat sink 215 may be positioned proximal (e.g. adjacent or immediately next to) at least any one or more primary air vent(s) 212. As a non-limiting example, depicted in FIG. 2B, these primary air vent(s) 212 may be located at a rear wall of the housing 201 of the portable electronic device 200. In this manner, the heat sink 215 may be disposed or interposed between the primary air vent(s) 212 (e.g. at the rear wall of the housing 201) and the heat-generating component 216 in the internal space 207 of the housing 201. In this setup, heat may be efficiently dissipated from the heat sink 215 and then transferred away from the internal space 207 of the housing 201 through the primary air vent(s) 212. It is also envisaged that fluid (e.g. air) may enter the internal space 207 through the primary air vent(s) 212 (e.g. at the rear wall of the housing 201, and/or through any one or more other primary air vent(s) 212

at another region of the housing 201) to cool both the heat sink 215 and the heat-generating component 216.

[00040] As another illustration, with reference to FIG. 2B, according to various embodiments, the heat-dissipation assembly 213 may include a fan unit 214. According to various embodiments, this fan unit 214 may be configured (e.g. positioned, arranged, oriented, fluidly connected, etc.) to expel air through (e.g. out) any one or more primary air vent(s) 212 (e.g. the primary air vent(s) 212 located at the rear wall of the housing 201). Accordingly, these primary air vent(s) 212 may function as exhaust port(s). According to various embodiments, the fan unit 214 and the exhaust port(s) 212 may be arranged to enable the fan unit 214 to expel or drive fluid (e.g. air) out these exhaust port(s) 212. According to various embodiments, when the heat-dissipation assembly 213 includes the heat sink 215, the heat sink 215 may be disposed or interposed between the fan unit 214 and the exhaust port(s) 212. In such a setup, the fan unit 214 may direct air to flow over the heat sink 215 and, subsequently, out the exhaust port(s) 212, thereby expelling heated air out of the housing 201 to regulate a temperature of the internal space 207 of the housing 201.

[00041] According to various embodiments, with reference to FIG. 2A and FIG. 2B, the portable electronic device 200 may, similar to the portable electronic device 100 of FIG. 1A and FIG. 1B, include a user-interface assembly 217. As an illustration, according to various embodiments, the user-interface assembly 217 may function as at least an input component (or device), such as a physical keyboard or a touch screen, operable to receive input from a user.

[00042] Similar to the user-interface assembly 117 of the portable electronic device 100 of FIG. 1A and FIG. 1B, the user-interface assembly 217 of the portable electronic device 200 may be movably coupled to the housing 201 so as to be movable between a closed position (see FIG. 2A), in which the user-interface assembly 217 sits within the external bay 209 to cover the at least one air vent 211 at the external bay 209, and an opened position (see FIG. 2B), in which the user-interface assembly 217 is displaced from the external bay 209 to uncover the at least one air vent 211 at the external bay 209 so that fluid (e.g. air) may flow freely therethrough (e.g. to interact with the heat-dissipation assembly 213 disposed in the internal space 207 of the housing 201).

[00043] In particular, with reference to FIG. 2A and FIG. 2B, the user-interface assembly 217 may be pivotably coupled to the housing 201, so as to be pivotable about

a pivot axis 817a. Specifically, as an example, with reference to FIG. 2A and FIG. 2B, the user-interface assembly 217 may be only pivotable (i.e. without being slidable) with respect to the outer surface 208 (e.g. the upper surface) of the housing 201. As an example, this pivot axis 817a may be fixedly associated or fixed with respect to the portable electronic device 200 (in other words, may be at a fixed point or location of the portable electronic device 200). As an illustration, with reference to FIG. 2A and FIG. 2B, this pivot axis 817a may be fixedly and/or immovably located at (or proximal) an edge or edge region (e.g. a front edge or edge region) of the user-interface assembly 217 (e.g. proximal to the front wall of the housing 201). Additionally, with reference to FIG. 2A and FIG. 2B, this pivot axis 817a may be parallel (e.g. at least substantially parallel) to a base panel (e.g. flat base panel) of the housing 201 and/or the base of the receptacle (i.e. the external bay 209). Further, the pivot axis 817a may also be parallel to said edge or edge region (e.g. front edge or edge region) of the user-interface assembly 217. Accordingly, according to various embodiments, when the user-interface assembly 217 is pivoted about the pivot axis 817a (e.g. at the first edge or edge region of the user-interface assembly 217) from the closed position to the opened position of the user-interface assembly 217, an opposite edge or edge region (e.g. a rear edge or edge region) of the user-interface assembly 217 may be displaced (or moved) away or unseated from the external bay 209, thereby uncovering and unblocking the at least one air vent 211 at the external bay 209, as shown in FIG. 2B.

[00044] Further, as shown in FIG. 2B, according to various embodiments, with the user-interface assembly 217 in the opened position, the fan unit 214 of the heat-dissipation assembly 213 may be capable of drawing air into the internal space 207 of the housing 201 via the at least one air vent 211 at the external bay 209. Additionally, according to various embodiments, the fan unit 214 may be configured (e.g. arranged) to expel the (drawn) air over the heat-generating component 216 and/or the heat sink 215 and, subsequently, out any one or more primary air vent(s) 212 of the housing 201.

[00045] According to various other embodiments, while the portable electronic device 200 is being operated by a user with the user-interface assembly 217 in the closed position, the fan unit 214 of the heat-dissipation assembly 213 may draw in air via a first sub-set of primary air vent(s) 212 (e.g. located at the front wall the housing 201) and then expel the (drawn) air through another (e.g. second) sub-set of (other,

distinct) primary air vent(s) 212 (e.g. located elsewhere of the housing 201 other than the external bay 209).

[00046] Accordingly, according to various embodiments, the at least one air vent 211 at the external bay 209, when uncovered by the user-interface assembly 217 in the opened position of the user-interface assembly 217, may function to increase a volume of fluid exchange between the internal space 207 and the outside of the housing 201 (i.e. in addition to fluid exchange which may occur via the primary air vent(s) 212).

[00047] According to various embodiments, with reference to FIG. 2A and FIG. 2B, the portable electronic device 200 may include (e.g. optionally and/or further include) a display assembly 270. As an example, according to various embodiments, this display assembly 270 may include a monitor or a display screen, which may be encased with a display cover of the display assembly 270.

[00048] According to various embodiments, with reference to FIG. 2A and FIG. 2B, the display assembly 270 may be movably coupled to the housing 201 so as to be movable (e.g. as a whole, as a unified entity, or as a single piece / body, etc.) relative to the housing 201, between a “folded” position of the display assembly 270 and an “unfolded position”. In the folded position of the display assembly 270, shown in FIG. 2A, a display (or front or output) face of the display assembly 270 (e.g. for displaying content) may interface with or engage (or may be folded against or onto) and/or may be parallel with the upper surface of the housing 201. On the other hand, in the unfolded position of the display assembly 270, shown in FIG. 2B, the display face of the display assembly 270 may be spaced apart from and/or may be non-parallel (e.g. forming an angle of 90° or more) with the upper surface of the housing 201.

[00049] According to various embodiments, the display assembly 270 may be pivotably coupled to the housing 201, so as to be pivotable about a pivot axis 870a (herein referred to as “display-assembly-pivot-axis 870a”) (see FIG. 2A). According to various embodiments, this display-assembly-pivot-axis 870a may be parallel with the pivot axis 817a of the user-interface assembly 217 and may be located at (or proximal) the rear wall of the housing 201. This arrangement may facilitate folding of the display assembly 270 onto the user-interface assembly 217 and the housing 201 when the user-interface assembly 217 is in the closed position (as shown in FIG. 2A).

[00050] According to various embodiments, with reference to FIG. 2A and FIG. 2B, the display assembly 270 may be operatively and/or mechanically coupled to the user-

interface assembly 217 in a manner such that moving the display assembly 270 from the folded position to the unfolded position, moves the user-interface assembly 217 from the closed position to the opened position. In other words, according to various embodiments, the portable electronic device 200 may be configured such that, when (or if) the display assembly 270 is in the folded position, the user-interface assembly 217 would be in the closed position. Conversely, when (or if) the display assembly 270 is in the unfolded position, the user-interface assembly 217 would be in the opened position.

[00051] In other words, according to various embodiments, the display assembly 270 and the user-interface assembly 217 may be operatively coupled in a manner such that unfolding the display assembly 270 to its unfolded position moves the user-interface assembly 217 (or causes the user-interface assembly 217 to be moved) to its opened position from its closed position. Conversely, when the display assembly 270 is moved from its unfolded position to its folded position, the user-interface assembly 217 would be moved from its opened position to its closed position. Accordingly, according to various embodiments, folding the display assembly 270 to its folded position may move the user-interface assembly 217 (or may cause the user-interface assembly 217 to be moved) to its closed position.

[00052] With the above setup, according to various embodiments, the user-interface assembly 217 may be moved between its closed and opened positions simply by moving the display assembly 270 between the folded and unfolded positions. Such a configuration, according to various embodiments, may ensure that the at least one air vents 211 at the external bay 209 would be uncovered for enhancing “cooling” of the internal space 207 of the housing 201 and/or for improving ventilation, when the display assembly 270 is deployed (e.g. unfolded) for use by the user.

[00053] To elaborate, as an illustration, with reference to FIG. 2A and FIG. 2B, according to various embodiments, the portable electronic device 200 may include (e.g. optionally and/or further include) a support stand 250. As shown, a first portion (or first end portion) of the support stand 250 may be movably coupled (e.g. pivotably coupled) to the housing 201, while a second portion (or second end portion) of the support stand 250 may be engaged (e.g. slidably engaged) or in contact with the user-interface assembly 217 (e.g. with the bottom surface of the user-interface assembly 217). Additionally, the display assembly 270 may be operatively coupled (e.g. via a

synchronous belt, belt drive, etc.) to the support stand 250 (e.g. to the first portion of the support stand 250) in a manner such that pivotal movement of the display assembly 270 in a first rotational direction (e.g. away from the upper surface of the housing 201 to its unfolded position) would cause or lead to the support stand 250 pivoting about its first portion in a same rotational direction (e.g. upwards and away from the external bay 209 of the housing 201). As a result, the opposite, second portion of the support stand 250 would protrude from the external bay 209, thereby displacing the user-interface assembly 217 from the external bay 209. Conversely, folding the display assembly 270 towards the upper surface of the housing 201 to its folded position in an opposite, second rotational direction would cause or lead to the support stand 250 pivoting about its first portion in the same second rotational direction inwards of the housing 201. As a result, the second portion of the support stand 250 would be lowered towards or inwards of the housing 201, thereby lowering the user-interface assembly 217 into the external bay 209 of the housing 201.

[00054] As some examples, according to various other embodiments, the display assembly 270 may be operatively coupled to the user-interface assembly 217 via one or more (e.g. a combination, arrangement, etc.) of connecting gear(s) or gear train(s), movable or pivotable joint(s), bearing(s), sliding mechanism(s), cam and follower, linkage(s), threaded engagement(s), Geneva mechanism, etc., and/or any other suitable operative coupling mechanism.

[00055] FIG. 2C shows a perspective view of a portable electronic device in the form of a laptop 200A, having a user-interface assembly in the form of a keyboard 217A, in its closed position, according to various embodiments.

[00056] FIG. 2D shows a perspective view of the laptop 200A of FIG. 2C, with its keyboard 217A pivoted to an opened position, according to various embodiments.

[00057] According to various embodiments, the portable electronic device 200 of FIG. 2A and FIG. 2B may be configured or implemented as a laptop, such as the laptop 200A shown in FIG. 2C and FIG. 2B. In other words, the laptop 200A may include one or more features similar or identical to that of the portable electronic device 200 of FIG. 2A and FIG. 2B.

[00058] According to various embodiments, with reference to FIG. 2C and FIG. 2D, the laptop 200A may, similar to the portable electronic device 200 of FIG. 2A and FIG. 2B, include a housing 201A (e.g. corresponding to a bottom part of the laptop 200A)

as well as a display assembly 270A (e.g. corresponding to a top part or a lid of the laptop 200A). As shown, the display assembly 270A may be coupled to the housing 201A so as to be pivotable about a display-assembly-pivot-axis 870b located at or proximal to a rear (e.g. rear wall) of the housing 201A.

[00059] FIG. 2E shows an exploded perspective view of the laptop 200A of FIG. 2C, according to various embodiments.

[00060] Referring to FIG. 2E, according to various embodiments, the housing 201A (e.g. bottom part of the laptop 200A) may include a bottom section (or bottom cover) 202 and a top section (or top cover) 203. According to various embodiments, the bottom section 202 and the top section 203 may be assembled (e.g. joined, coupled, secured, affixed, etc.) together to form the housing 201A (e.g. the bottom part of the laptop 200A), which defines an internal space for housing or containing a heat-dissipation assembly (as previously described) and one or more heat-generating components (as previously described) of the laptop 200A. As an example, according to various embodiments, each of the bottom section 202 and top section 203 of the housing 201A may be composed of a rigid or substantially rigid material (or material composite), such as metal, plastic, etc.

[00061] According to various embodiments, with reference to FIG. 2E, the top section 203 of the housing 201A, in particular a top panel or an upper surface thereof, may include or may define an external bay 209A.

[00062] According to various embodiments, the housing 201A may include a plurality of air vents 211A at the external bay 209A. As shown in FIG. 2E, the external bay 209A may be shaped as a receptacle, with the plurality of air vents 211A situated at a base of the receptacle. In particular, as an example, as shown, the external bay 209A may have four air vents 211A situated at a peripheral region of the base of the receptacle (i.e. the external bay 209A). Nevertheless, it is also envisaged that, in various other embodiments, the external bay 209A may have any other number of air vent(s) 211A, which may be positioned at any other suitable location on the external bay 209A.

[00063] It is also envisaged that, according to various other embodiments, the plurality of air vents 211A at the external bay 209A may be arranged in an orderly arrangement or array, or they may be arranged in a random or irregular manner.

[00064] Furthermore, according to various other embodiments, at least two or more of the plurality of air vents 211A at the external bay 209A may differ in size and/or

shape from one another, or at least two or more of the plurality of air vents 211A at the external bay 209A may be similar or identical in size and/or shape as one another.

[00065] It is also envisaged that, according to various other embodiments (not shown), the external bay 209A may include at least one enlarged cutout (e.g. enlarged through-hole) serving as an enlarged air vent at the external bay 209A. According to various other embodiments, this enlarged air vent may be larger than half the size or a (horizontal) cross-sectional area of the keyboard 217A but smaller than the total cross-sectional area of the keyboard 217A itself. In this manner, the housing 201A having the external bay 209A with the enlarged air vent may still be capable of supporting the keyboard 217A in its closed position.

[00066] Referring back to FIG. 2C and FIG. 2D, according to various embodiments, the laptop 200A may, similar to the portable electronic device 200 of FIG. 2A and FIG. 2B, include a user-interface assembly, such as a keyboard (or keyboard assembly) 217A. According to various embodiments, the keyboard 217A may include a panel (e.g. a support panel, back panel, board, etc.) having a plurality of keys mounted thereon. Accordingly, according to various embodiments, the keyboard 217A may be of a panel structure. As shown, the panel of the keyboard 217A may be of an elongate shape, and the plurality of keys may be arranged in multiple rows of keys, each row being parallel to a longitudinal axis (not shown) of the panel. As shown, the keyboard 217A may be disposed at the housing 201A of the portable electronic device 200A, with the keys of the keyboard 217A exposed for use by the user. The keyboard 217A may thus serve as a user interface (or input component) for the user to provide inputs to the portable electronic device 200A (or for the portable electronic device 200A to receive inputs from the user).

[00067] Similar to the user-interface assembly 217 of the portable electronic device 200 of FIG. 2A and FIG. 2B, the keyboard 217A of the laptop 200A may be movably coupled to the housing 201A in a manner so as to be movable between a closed position of the keyboard 217A (as shown in FIG. 2C) in which the keyboard 217A sits within the external bay 209A (see FIG. 2E) to cover the at least one air vent 211A at the external bay 209A and an opened position of the keyboard 217A (as shown in FIG. 2D) in which the keyboard 217A is displaced (e.g. at least partially displaced) from the external bay 209A to uncover the at least one air vent 211A at the external bay 209A.

so that fluid (e.g. air) may flow freely therethrough (e.g. to enter the internal space of the housing 201A and/or to exit from the internal space of the housing 201A).

[00068] In particular, with reference to FIG. 2C and FIG. 2D, according to various embodiments, the keyboard 217A may be pivotably coupled to the housing 201A, so as to be pivotable about a pivot axis 817b. According to various embodiments, this pivot axis 817b may be immovable with respect to the laptop 200A. In other words, the pivot axis 817b may be fixedly associated or fixed with respect to the laptop 200A. In other words, it may be at a fixed point or location of the laptop 200A. Additionally, as shown, this pivot axis 817b may be parallel to the display-assembly-pivot-axis 870b.

[00069] As shown in FIG. 2D, with the keyboard 217A pivoted to the opened position, at least a portion (e.g. a rear portion) of the keyboard 217A may be displaced from the external bay 209A. In particular, in its opened position, the keyboard 217A may be inclined in an ascending or diagonally upward manner relative to a front (e.g. front wall) and a base (e.g. base panel) of the housing 201A, with the rear portion of the keyboard 217A being further away from the external bay 209A than a front portion of the keyboard 217A. The base of the external bay 209A (i.e. receptacle) may be a horizontal, planar base which may be substantially parallel to the base of the housing 201A. Accordingly, with the keyboard 217A inclined in its opened position, as shown in FIG. 2D, fluid (e.g. air) may flow freely through the plurality of air vents 211A (see FIG. 2E) at the external bay 209A via the gaps (or spacing or opening) defined between (i) the side edges of the keyboard 217A and the external bay 209A and/or (ii) the rear edge of the keyboard 217A and the external bay 209A.

[00070] Referring to FIG. 2E, according to various embodiments, the keyboard 217A may be pivotably coupled to the housing 201A via a hinge mechanism. As an example, this hinge mechanism may include one or more hinges (e.g. spring hinges) 290A. As an illustration, the hinge mechanism (e.g. each spring hinge) 290A may include a first rigid member and a second rigid member, which are pivotably coupled to one another. Additionally, the first rigid member may be coupled (e.g. detachably coupled, secured, or affixed, etc.) to the housing 201A (e.g. at or proximal to a front edge region of the external bay 209A of the housing 201A), while the second rigid member may be coupled to the front edge or edge region of the keyboard 217A. In this configuration, the pivot axis 817b (see FIG. 2D) may thus be extending across the hinge mechanism (i.e. where its first rigid member and the second rigid member are pivotably coupled).

[00071] FIG. 2F and FIG. 2G show perspective views of an operative coupling mechanism 280A for operatively coupling the display assembly 270A to the keyboard 217A, according to various embodiments.

[00072] FIG. 2F depicts the operative coupling mechanism 280A in a configuration which seats the keyboard 217A in the closed position, while FIG. 2G depicts the operative coupling mechanism 280A in another configuration for displacing the keyboard 217A to its opened position.

[00073] FIG. 2H is an isolated perspective view of an intermittent motion mechanism 281 of the operative coupling mechanism 280A of FIG. 2F and FIG. 2G, according to various embodiments.

[00074] Additionally, according to various embodiments, with reference to FIG. 2E and FIG. 2F to FIG. 2H, the display assembly 270A of the laptop 200A may be operatively coupled to the keyboard 217A of the laptop 200A, in a manner such that movement of the keyboard 217A may be controlled via (or may be dependent on) movement of the display assembly 270A. According to various embodiments, the operative coupling between the display assembly 270A and the keyboard 217A may be a mechanical operative coupling (e.g. consisting essentially of mechanical parts, and/or without any electrical components). Thus, according to various embodiments, the keyboard 217A may be associated with the display assembly 270A such that moving the display assembly 270A may cause the keyboard 217A to move as a result.

[00075] To illustrate, with reference to FIG. 2F and FIG. 2G, the portable electronic device 200A may include an operative coupling mechanism 280A configured to operatively couple the display assembly 270A and the user-interface assembly 217A.

[00076] Referring to FIG. 2F, FIG. 2G and FIG. 2H, this operative coupling mechanism 280A may include a rotatable drive member 282 (e.g. a drive wheel), which may include a rotatable main body 282a with a pin 282b (e.g. driving pin) (see FIG. 2H) immovably coupled to, or integrally formed with, the main body 282a. In particular, the rotatable drive member 282 may include an elongate extension arm member 282c (see FIG. 2H) which adjoins the pin 282b to the rotatable main body 282a. According to various embodiments, the main body 282a may be rotatable about a rotational axis 882a (herein referred to as “drive-member-rotational-axis 882a”). Furthermore, the rotatable main body 282a may be configured as a gear having a plurality of teeth at its outer or peripheral edge for meshing with teeth of another gear

283, described later. Additionally, as shown in FIG. 2H, the pin 282b may be oriented such that its longitudinal axis may be parallel with the drive-member-rotational-axis 882a.

[00077] With reference to FIG. 2F to FIG. 2H, according to various embodiments, the operative coupling mechanism 280A may further include a rotatable driven member 284 (e.g. a driven wheel, Geneva wheel, etc.). In particular, as shown in FIG. 2H, the rotatable driven member 284 may be configured as a rotatable Geneva structure (or a Geneva drive) 284 which includes at least one slot into which the pin 282b of the rotatable drive member 282 may engage (or be slotted in and/or slide along). Specifically, as shown in FIG. 2H, the rotatable Geneva structure 284 may include a rotatable main body 284a and a pair of prongs 284b extending therefrom. The rotatable main body 284a of the Geneva structure 284 may be configured to be rotatable about a rotational axis 884a (herein referred to as “driven-member-rotational-axis 884a”) which may be parallel with the drive-member-rotational-axis 882a. According to various embodiments, the pair of prongs 284b may be immovably coupled to, or integrally formed with, the rotatable main body 284a of the Geneva structure 284. As shown, this pair of prongs 284b may be spaced apart and adjacent to one another, defining the slot therebetween.

[00078] According to various embodiments, with reference to FIG. 2H, the rotatable drive member 282 and the rotatable driven member 284 may together form or may be an intermittent motion mechanism (e.g. a Geneva mechanism) 281. Specifically, the rotatable drive member 282 and the rotatable driven member 284 may be operatively coupled to one another in a manner such that a rotational motion of the rotatable drive member 282 may lead to its pin 282b engaging and moving the pair of prongs 284b of the rotatable driven member 284, to thereby advance (in other words, to rotate) the rotatable driven member 284. Specifically, the pin 282b of the rotatable drive member 282 may be slotted between the pair of prongs 284b of the rotatable driven member 284, so that when the rotatable drive member 282 is rotated in a first rotational direction about the drive-member-rotational-axis 882a, its pin 282b may engage and push a first prong of the pair of prongs 284b of the rotatable driven member 284 (e.g. via an inner edge of the first prong) to cause the entire rotatable driven member 284 (e.g. a unified rotatable driven member 284) to rotate as a whole (i.e. in an opposite rotational direction from the rotatable drive member 282). Conversely, when the rotatable drive

member 282 is rotated in an opposite, second rotational direction about the drive-member-rotational-axis 882a, its pin 282b may engage and push a second prong of the pair of prongs 284b of the rotatable driven member 284 to cause the entire rotatable driven member 284 to rotate as a whole (i.e. in an opposite rotational direction from the rotatable drive member 282).

[00079] According to various embodiments, the rotatable drive member 282 may be coupled to the display assembly 270A, while the rotatable driven member 284 may be coupled to the keyboard 217A.

[00080] In particular, as an example, with reference to FIG. 2F and FIG. 2G, the display assembly 270A may be coupled to a rotatable gear 283, with a rotational axis 883a of the rotatable gear 283 being parallel with and/or coinciding with the display-assembly-pivot-axis 870b (shown in FIG. 2C). In particular, the rotatable gear 283 may be configured to rotate in tandem with and in a same rotational direction as (in other words, move synchronously with) a pivot motion of the display assembly 270A about the display-assembly-pivot-axis 870b. According to various embodiments, the teeth of this rotatable gear 283 may be meshed with the teeth of the main body 282a of the rotatable drive member 282. Consequently, when the display assembly 270A pivots about the display-assembly-pivot-axis 870b, the rotatable gear 283 may in turn be rotated to transmit motion through its teeth to the rotatable drive member 282 which drives the rotatable driven member 284 which is coupled to the keyboard 217A.

[00081] The rotatable driven member 284 may be coupled to the keyboard 217A via a support stand (or push rod) 250A. A first portion of the support stand 250A may be coupled (e.g. immovably or fixedly coupled, secured, affixed, etc.) to the Geneva structure 284 (c.g. to the rotatable main body 284a) of the rotatable driven member 284. Accordingly, the support stand 250A may be pivotable or rotatable about the driven-member-rotational-axis 884a in tandem with and in a same rotational direction as (in other words, move synchronously with) the rotatable driven member 284. According to various embodiments, an opposite, second portion of the support stand 250A may be slidably engaged with the keyboard 217A (e.g. with a base surface of the keyboard 217A, or within a slot (not shown) of the keyboard 217A). It is also envisaged that, in various other embodiments, the second portion of the support stand 250A may (c.g. may further) be pivotably or hingedly coupled to the keyboard 217A (e.g. in addition to being slidably engaged therewith).

[00082] In the above manner, according to various embodiments, the second portion of the support stand 250A may be moved in a same rotational direction as the display assembly 270A when the display assembly 270A is pivoted about the display-assembly-pivot-axis 870b.

[00083] According to various embodiments, the intermittent motion mechanism 281 may be configured to cause the second portion of the support stand 250A to move at the same time (or simultaneously) as when the display assembly 270A is first moved from the folded position or the unfolded position. For instance, this instantaneous or “synchronous” movement may be achieved by positioning the pair of prongs 284b of the rotatable driven member 284 closer to the pin 282b.

[00084] Alternatively, according to various other embodiments the intermittent motion mechanism 281 may be configured to delay movement of the second portion of the support stand 250A, in other words, cause it to move after a period of time from when the display assembly 270A is first moved from the folded position or the unfolded position. According to various other embodiments, this “asynchronous” movement may be achieved, for example, by spacing the pair of prongs 284b of the rotatable driven member 284 further from the pin 282b. In this manner, the intermittent motion mechanism 281 may cause the keyboard 217A to move non-synchronously with the display assembly 270A. As an example, according to various embodiments, the motion mechanism 281 may be configured such that the second portion of the support stand 250A begins moving after (or once) the display assembly 270A is unfolded (i.e. from the folded position) to form an angle between approximately 10° to 30° (e.g. approximately 20°) with respect to the housing 201A (or the upper surface of the housing 201A). Furthermore, the motion mechanism 281 may also be configured such that the second portion of the support stand 250A stops moving after (or once) the display assembly 270A is unfolded (i.e. from the folded position) to form an angle between approximately 80° to 110° (e.g. approximately 90°) with respect to the housing 201A (or the upper surface of the housing 201A).

[00085] With reference to FIG. 2F, according to various embodiments, with the display assembly 270A is in the folded position, the support stand 250A may be in a position, as shown in FIG. 2F, in which it may be parallel with a base of the housing 201A (and/or the external bay 209A) or recessed into the housing 201A (at a height lower than the external bay 209A, measured from the base of the housing 201A). In

other words, the second portion of the support stand 250A may be lower than the base of the external bay 209A, thereby causing the keyboard 217A to sit within and/or on (e.g. directly on) the external bay 209A.

[00086] Conversely, when the display assembly 270A is in the unfolded position, the support stand 250A may be in a position, as shown in FIG. 2G, in which it may be inclined with respect to the base of the housing 201A and/or the external bay 209A, with the second portion of the support stand 250A in a raised position (e.g. higher than, or protruding above, the base of the external bay 209A), thereby displacing or unseating the keyboard 217A from the external bay 209A.

[00087] According to various embodiments, the support stand 250A may be configured (e.g. dimensioned, oriented, positioned, etc.) based on a desired amount of displacement of the keyboard 217A from the external bay 209A in the opened position of the keyboard 217A. For instance, the support stand 250A may be configured such that a maximum angular displacement of the keyboard 217A from the external bay 209A (e.g. measured between the base surface of the keyboard 217A and the base of the external bay 209A) may be between approximately 3° to 10° (e.g. approximately 5°).

[00088] FIG. 3A and FIG. 3B are schematic side views of a portable electronic device 300, with a user-interface assembly 317 being both pivotably and slidably coupled to a housing 301 of the portable electronic device 300, according to various embodiments.

[00089] According to various embodiments, the portable electronic device 300 may contain any one or more or all the features and/or limitations of the portable electronic device 100 of FIG. 1A and FIG. 1B and/or the portable electronic device 200 of FIG. 2A and FIG. 2B and/or the portable electronic device 200A of FIG. 2C and FIG. 2D. In the following, the portable electronic device 300 is described with like reference characters generally referring to the same or corresponding parts/features of the portable electronic device 100 of FIG. 1A and FIG. 1B and/or the portable electronic device 200 of FIG. 2A and FIG. 2B and/or the portable electronic device 200A of FIG. 2C and FIG. 2D. The description of the parts/features made with respect to the portable electronic device 300 may also be applicable with respect to the portable electronic device 100 and/or the portable electronic device 200 and/or the portable electronic device 200A, and vice versa.

[00090] According to various embodiments, the portable electronic device 300 may differ from the portable electronic device 200 of FIG. 2A and FIG. 2B and/or the portable electronic device 200A of FIG. 2C and FIG. 2D in that the user-interface assembly 317 of the portable electronic device 300 may be both slidably and pivotably coupled to the housing 301 of the portable electronic device 300. Accordingly, the user-interface assembly 317 may be both slidable and pivotable (i.e. with respect to the housing 301) between a closed position of the user-interface assembly 317 (as shown in FIG. 3A) and an opened position of the user-interface assembly 317 (as shown in FIG. 3B). In particular, according to various embodiments, a slidable (or sliding) motion of the user-interface assembly 317 may be independent of a pivotal (or pivoting) motion of the user-interface assembly 317. In other words, the user-interface assembly 317 may simultaneously slide and pivot (or the slidable motion and pivotal motion may occur concurrently).

[00091] With reference to FIG. 3A and FIG. 3B, according to various embodiments, the user-interface assembly 317 may be configured to be slidable with respect to the housing 301, along a sliding axis 820c, or in a sliding direction parallel to the sliding axis 820c. According to various embodiments, the sliding axis 820c may be perpendicular to a front (e.g. front wall) and/or a rear (e.g. rear wall) of the housing 301. Additionally, the sliding axis 820c may be parallel (e.g. at least substantially parallel) to a base panel (e.g. a flat base panel) of the housing 301, and/or the outer surface 308 (e.g. the upper surface) of the housing 301 (i.e. where the external bay 309 may be situated), and/or the base of the receptacle (i.e. the external bay 309). Accordingly, according to various embodiments, the user-interface assembly 317 may be slidable in a “forward” sliding direction (i.e. parallel with the sliding axis 820c, which may be perpendicular to the front and/or rear of the housing 301) towards the front of the housing 301 (or towards a display assembly 270 at the front) of the portable electronic device 300, and/or in an opposite, “rearward” sliding direction (i.e. parallel with the sliding axis 820c) away from the front of the housing 301 (or towards the rear of the housing 301 and/or away from the display assembly 270 at the front) of the portable electronic device 300. In particular, at least a portion of the user-interface assembly 317 (e.g. its front edge or edge region) may be slidable along (e.g. on, across, etc.) the external bay 309 in the forward sliding direction until the user-interface assembly 317 (e.g. its rear edge or edge region) is displaced from the external bay 309

in the opened position of the user-interface assembly 317, and/or slidable in the rearward sliding direction until the user-interface assembly 317 is seated (e.g. completely or entirely seated) within the external bay 309 in the closed position of the user-interface assembly 317.

[00092] Hence, according to various embodiments, to move the user-interface assembly 317 from the closed position to the opened position, a user may simply slide the user-interface assembly 317 in the forward sliding direction. Conversely, to move the user-interface assembly 317 from the opened position to the closed position, the user may simply slide the user-interface assembly 317 in the rearward sliding direction.

[00093] Referring to FIG. 3A and FIG. 3B, according to various embodiments, the user-interface assembly 317 may be slidably coupled to the housing 301 via a sliding mechanism. As an example, illustrated in FIG. 3A and FIG. 3B, the sliding mechanism may include a slider 320, which may be disposed along the sliding axis 820c. Accordingly, the slider 320 may be slidable along the sliding axis 820c. Further, the sliding mechanism may include a slider-guide-element (e.g. a passage, channel, elongate bore, slot, or track, etc.) (see, for example, reference 330A in FIG. 3I) configured to constrain the slider 320 in a manner such that the slider 320 is movable along (e.g. along only) the sliding axis 820c (e.g. a linear sliding axis 820c). In other words, the slider 320 may be slidably engaged or coupled with the slider-guide-element 330A. Additionally, according to various embodiments, the slider 320 may be coupled (e.g. detachably coupled, secured, or affixed, etc.) to the user-interface assembly 317 (e.g. to a fixed point or location thereof, such as to a front edge or edge region of the user-interface assembly 317). Accordingly, a sliding movement of the slider 320 along the sliding axis 820c may lead to a corresponding and simultaneous sliding movement of the user-interface assembly 317 in a direction parallel to the sliding axis 820c.

[00094] According to various embodiments, the user-interface assembly 317 may further be configured to be pivotable with respect to the housing 301. In particular, the user-interface assembly 317 may be configured to be pivotable about a pivot axis 817c that may be non-parallel or perpendicular (e.g. at least substantially perpendicular) to the sliding axis 820c. As such, according to various embodiments, the pivot axis 817c may be parallel to the front (e.g. front wall) and/or the rear (e.g. rear wall) of the housing 301. According to various embodiments, the pivot axis 817c may be parallel (e.g. at least substantially parallel) to the base panel (e.g. planar or flat base panel) of the

housing 301 and/or the base of the receptacle (i.e. the external bay 309). According to various embodiments, a pivotal movement of the user-interface assembly 317 about the pivot axis 817c with respect to the housing 301 may facilitate displacement of the user-interface assembly 317 from the external bay 309 (i.e. to uncover at least one air vent 311 at the external bay 309) as well as to provide an ergonomic tilt for enhanced user comfort during use of the user-interface assembly 317 (e.g. a keyboard).

[00095] Referring to FIG. 3A and FIG. 3B, according to various embodiments, the user-interface assembly 317 may be pivotably coupled to the housing 301 via the sliding mechanism. For instance, the user-interface assembly 317 (e.g. its front edge or edge region) may be pivotably coupled to the slider 320. Accordingly, the user-interface assembly 317 may be pivotable with respect to the slider 320, with the pivot axis 817c extending across a point where the user-interface assembly 317 and the slider 320 are pivotably coupled. Thus, this pivot axis 817c may be fixedly associated or fixed with respect to the slider 320 (i.e. that is movable / slidable with respect to the housing 301). Accordingly, the pivot axis 817c may also be movable with respect to the housing 301 (i.e. in tandem with sliding movement of the slider 320 along the sliding axis 820c).

[00096] According to various embodiments, the portable electronic device 300 may include a guide arrangement 340 configured to guide the user-interface assembly 317 to the opened position, when (or as) the user-interface assembly 317 is slid along the forward sliding direction from the closed position of the user-interface assembly 317.

[00097] To illustrate, referring to FIG. 3A and FIG. 3B, according to various embodiments, this guide arrangement 340 may include a support stand 350. As shown, a first portion of the support stand 350 may be coupled (e.g. pivotably coupled and/or fixedly associated) to the housing 301, while a second portion (i.e. opposite the first portion) of the support stand 350 may be coupled (e.g. pivotably coupled and/or fixedly associated) or attached to or engaged with the user-interface assembly 317. According to various embodiments, the support stand 350 may be configured such that when the user-interface assembly 317 is slid along the forward sliding direction (i.e. from an initial closed position of the user-interface assembly 317), the support stand 350 would also be moved (e.g. pivoted about its first end) with respect to the housing 301, to displace the user-interface assembly 317 (e.g. at least a rear portion thereof) away from the external bay 309 via the second portion of the support stand 350 (i.e. that is coupled

to the user-interface assembly 317) which would protrude upwards of the external bay 309, as shown in FIG. 3B.

[00098] FIG. 3C and FIG. 3D are schematic side views of the portable electronic device 300 of FIG. 3A, with the housing 301 having a gliding surface 341 for guiding the user-interface assembly 317 to the opened position from the closed position, according to various embodiments.

[00099] As another example, according to various embodiments, with reference to FIG. 3C and FIG. 3D, the guide arrangement 340 may include a gliding surface 341 of the housing 301. Such a gliding surface 341 may serve as a ramp, that the user-interface assembly 317 may glide along, as a user pushes or slides the user-interface assembly 317 in the forward sliding direction (i.e. from the closed position of the user-interface assembly 317).

[000100] To illustrate, with reference to FIG. 3C and FIG. 3D, the gliding surface 341 may be formed on a top panel of the housing 301, in particular, where the external bay 309 is located on the housing 301. As shown, the external bay 309 may be in the form of a receptacle 309. The gliding surface 341 may be located at a rear portion of the receptacle 309, opposite the pivot axis 817c and/or the slider 320. One end (e.g. a starting end) of the gliding surface 341 may be adjoined to a base of the receptacle 309, while another, opposite end (e.g. a terminating end) of the gliding surface 341 may be adjoined to the upper surface 308 of the housing 301 (or top edge of the receptacle 309). As shown, the gliding surface 341 may be inclined upwards with respect to the forward sliding direction. Specifically, the gliding surface 341 may be ascending from the base of the receptacle 309, sloping (or diagonally inclined) upwards, away from the base of the receptacle 309 to the upper surface 308 of the housing 301.

[000101] As shown in FIG. 3C, when the user-interface assembly 317 is in the closed position, the entire user-interface assembly 317 (including its rear edge) may be seated on the base of the receptacle (i.e. the external bay 309). Subsequently, with reference to FIG. 3D, as the user-interface assembly 317 is being moved or slid in the forward sliding direction, the user-interface assembly 317 (e.g. its rear edge) may glide upwards along the inclined gliding surface 341, resulting in displacement of at least the rear portion of the user-interface assembly 317 away from the external bay 309 (i.e. to an opened position of the user-interface assembly 317). In other words, the gliding surface 341 may guide the user-interface assembly 317 upwards, away from the base of the

receptacle 309, such that (or until) the user-interface assembly 317 becomes displaced or unseated from the receptacle 309 (i.e. to uncover at least one air vent 311 at the external bay 309, in the opened position of the user-interface assembly 317).

[000102] FIG. 3E shows a perspective view of a portable electronic device in the form of a laptop 300A, having a user-interface assembly 317A in the form of a keyboard 317A, in a closed position, according to various embodiments.

[000103] FIG. 3F shows a perspective view of the laptop 300A of FIG. 3E, with its keyboard 317A slid and pivoted to an opened position, according to various embodiments.

[000104] According to various embodiments, the portable electronic device 300 of FIG. 3A to FIG. 3D may be configured or implemented as a laptop, such as the laptop 300A shown in FIG. 3E and FIG. 3F. In other words, the laptop 300A may include one or more features similar or identical to that of the portable electronic device 300 of FIG. 3A to FIG. 3D.

[000105] According to various embodiments, with reference to FIG. 3E and FIG. 3F, the laptop 300A may include a housing 301A (e.g. corresponding to a bottom part of the laptop 300A) as well as a display assembly 370A (e.g. corresponding to a top part or a lid of the laptop 300A). As shown, the display assembly 370A may be coupled to the housing 301A so as to be pivotable about a display-assembly-pivot-axis 870d located at or proximal to a rear (e.g. rear wall) of the housing 301A.

[000106] FIG. 3G is an exploded perspective view of the laptop 300A of FIG. 3E, according to various embodiments.

[000107] Referring to FIG. 3G, according to various embodiments, the housing 301A may include a bottom section (or bottom cover) 302 and a top section (or top cover) 303. According to various embodiments, the bottom section 302 and the top section 303 may be assembled (e.g. joined, coupled, secured, affixed, etc.) together to form the housing 301A, defining an internal space for housing or containing a heat-dissipation assembly (as previously described) and one or more heat-generating components (as previously described).

[000108] According to various embodiments, with reference to FIG. 3G, the top section 303 of the housing 301A, in particular a top panel or an upper surface thereof, may include or may define an external bay 309A.

[000109] According to various embodiments, the housing 301A may include a plurality of air vents 311A at the external bay 309A. As shown in FIG. 3G, the external bay 309A may be shaped as a receptacle, with the plurality of air vents 311A situated at a base of the receptacle. In particular, as an example shown in FIG. 3G, the external bay 309A may have four air vents 311A situated at a peripheral region of the base of the receptacle (i.e. the external bay 309A). Nevertheless, it is also envisaged that, in various other embodiments, the external bay 309A may have any other number of air vent(s) 311A which may be positioned at any other suitable location along the external bay 309A.

[000110] It is also envisaged that, according to various other embodiments, the plurality of air vents 311A at the external bay 309A may be arranged in an orderly arrangement or array, or they may be arranged in a random or irregular manner.

[000111] Furthermore, according to various other embodiments, at least two or more of the plurality of air vents 311A at the external bay 309A may differ in size and/or shape from one another, or at least two or more of the plurality of air vents 311A at the external bay 309A may be similar or identical in size and/or shape as one another.

[000112] It is also envisaged that, according to various other embodiments (not shown), the external bay 309A may include at least one enlarged cutout (e.g. enlarged through-hole) serving as an enlarged air vent at the external bay 309A. According to various other embodiments, this enlarged air vent may be larger than half the size or a (horizontal) cross-sectional area of the keyboard 317A but smaller than the total cross-sectional area of the keyboard 317A itself. In this manner, the housing 301A having the external bay 309A with the enlarged air vent may still be capable of supporting the keyboard 317A in its closed position.

[000113] Referring back to FIG. 3E and FIG. 3F, according to various embodiments, the laptop 300A may, similar to the portable electronic device 300 of FIG. 3A to FIG. 3D, include a user-interface assembly, such as the keyboard 317A.

[000114] Similar to the user-interface assembly 317 of the portable electronic device 300 of FIG. 3A to FIG. 3D, the keyboard 317A of the laptop 300A may be movably coupled to the housing 301A so as to be movable between the closed position of the keyboard 317A, as shown in FIG. 3E, in which the keyboard 317A sits within the external bay 309A to cover the at least one air vent 311A at the external bay 309A and the opened position of the keyboard 317A, as shown in FIG. 3F, in which the keyboard

317A is displaced (e.g. at least partially displaced) from the external bay 309A to uncover the at least one air vent 311A at the external bay 309A so that fluid may flow freely therethrough (e.g. to enter the internal space of the housing 301A and/or to exit from the internal space of the housing 301A).

[000115] In particular, according to various embodiments, the keyboard 317A may be movably coupled to the housing 301A, in a manner such that it may be both slidable along (or in a direction parallel with) a sliding axis 820d (see FIG. 3K) as well as pivotable about a pivot axis 817d. According to various embodiments, the pivot axis 817d may be perpendicular to the sliding axis 820d. Accordingly, with the sliding axis 820d perpendicular to the display-assembly-pivot-axis 870d, as shown in FIG. 3E and FIG. 3F, the pivot axis 817d may be parallel to the display-assembly-pivot-axis 870d.

[000116] Additionally, according to various embodiments, the sliding axis 820d may be fixedly associated or fixed with respect to the laptop 300A (in other words, may be at a fixed point or location of the laptop 300A). On the other hand, the pivot axis 817d may be movable with respect to the housing 301A, along a direction parallel to the sliding axis 820d. For example, the pivot axis 817d may be fixedly associated or fixed with respect to a slider 320A (see FIG. 3K) that is slidable with respect to the housing 301A (described in detail below).

[000117] FIG. 3H and FIG. 3I show perspective views of a sliding-and-pivot-mechanism 325A for coupling the keyboard 317A to the housing 301A, according to various embodiments.

[000118] Referring to FIG. 3G, FIG. 3H and FIG. 3I, according to various embodiments, the keyboard 317A may be pivotably coupled to the housing 301A via a combination or an assembly which includes a sliding mechanism and a pivot (or hinge) mechanism (herein collectively referred to as a “sliding-and-pivot-mechanism 325A”).

[000119] With reference to FIG. 3H and FIG. 3I, the sliding-and-pivot-mechanism 325A may include a slider 320A. According to various embodiments, this slider 320A may be disposed along the sliding axis 820d. Further, the sliding-and-pivot-mechanism 325A may include a slider-guide-element 330A (e.g. a rail, track, etc.) to which the slider 320A may be slidably coupled or slidably engaged. As an example, with reference to FIG. 3H and FIG. 3I, the slider-guide-element 330A may include or may be a bracket-shaped (e.g. a “C”-shaped) guide rail. The slider 320A may include a pair of elongate grooves on (or recessed into) a pair of opposite outer surfaces (e.g. left outer

surface and right outer surface) of the slider 330A. This pair of elongate grooves may be, but is not limited to being, directly opposite each other. Accordingly, a pair of free ends (e.g. opposing free ends) of the bracket-shaped guide rail (i.e. the slider-guide-element 330A) may be inserted into the pair of grooves of the slider 320A, to slidably couple the bracket-shaped guide rail and the slider 330A.

[000120] According to various embodiments, the slider-guide-element 330A may be coupled (e.g. immovably coupled, secured, affixed, etc.) to the housing 301A, while the slider 320A is slidably coupled to or slidably engaged with the slider-guide-element 330A. Furthermore, the slider-guide-element 330A may be extending parallel with and/or along the sliding axis 820d. In this manner, the slider-guide-element 330A may constrain the slider 320A to be movable along (e.g. along only) the sliding axis 820d. As a non-limiting example, according to various embodiments, the slider-guide-element 330A may constrain the slider 320A to be movable up to a maximum displacement (e.g. a maximum linear displacement) or distance of between approximately 5 mm to 20 mm (e.g. approximately 10 mm).

[000121] According to various embodiments, the sliding-and-pivot-mechanism 325A may further include a coupling member 331A (e.g. a rigid coupling plate) which may be pivotably coupled to the slider 320A. The coupling member 331A may, in turn, be coupled (e.g. secured, affixed, etc., for example, using fasteners, welding joints, etc.,) to the user-interface assembly 317A (e.g. to its front edge or edge region). In this configuration, the user-interface assembly 317A may be pivotable with respect to the slider 320A, about the pivot axis 817d extending across a point where the coupling member 331A and the slider 320A are pivotably coupled.

[000122] FIG. 3J shows a cross-sectional perspective view of the laptop 300A of FIG. 3E, with its keyboard 317A in the closed position, according to various embodiments.

[000123] FIG. 3K shows a cross-sectional perspective view of the laptop 300A of FIG. 3F, with its keyboard 317A in the opened position, according to various embodiments.

[000124] According to various embodiments, the portable electronic device 300A may include a guide arrangement 340A configured to guide the keyboard 317A to the opened position when (or as) the keyboard 317A is pushed or slid along the forward sliding direction from an initial closed position of the keyboard 317A.

[000125] To illustrate, with reference to FIG. 3J and FIG. 3K, according to various embodiments, the guide arrangement 340A may include a support stand 350A. According to various embodiments, this support stand 350A may be (e.g. constructed) as a single (e.g. integral and/or unified) entity. Furthermore, according to various embodiments, the entire support stand 350A may be rigid or may form a rigid structure or entity. Accordingly, the entire support stand 350A may be moved about as a single piece or body. According to various embodiments, the support stand 350A may be movably coupled to the housing 301A, so as to be movable as a whole (or as a single piece or body) with respect to the housing 301A.

[000126] As shown in FIG. 3K, according to various embodiments, the housing 301A may include a support-stand-guide-element 360A (e.g. a passage, channel, elongate bore, slot, track, gliding surface, etc.). According to various embodiments, the support stand 350A may be configured to be movable along (or with respect to) the support-stand-guide-element 360A. According to various embodiments, the support-stand-guide-element 360A (or each of its various segments, described in detail later) may be perpendicular to the pivot axis 817d. Accordingly, according to various embodiments, the support stand 350A may be movable along the support-stand-guide-element 360A, in a direction (or in one or more directions) or in a movement axis (or a sliding path) which may be perpendicular to the pivot axis 817d.

[000127] To illustrate, with reference to FIG. 3K, the support-stand-guide-element 360A may be in the form of an elongate channel (or bore or slot). As shown, the elongate channel (or each of its segments) may be perpendicular to the pivot axis 817d.

[000128] FIG. 3L shows an isolated perspective view of the support stand 350A (e.g. a right-sided support-stand 350A, for supporting a right portion of the keyboard 317A), according to various embodiments.

[000129] According to various embodiments, the support-stand-guide-element 360A may define a sliding path to guide a sliding motion of the first portion of the support stand, and the support stand 350A may be slidably engaged with the support-stand-guide-element 360A. For example, with reference to FIG. 3L, the support stand 350A may include a sliding or gliding portion 351 (e.g. shaped or in the form of a cylindrical shaft), at a first portion of the support stand 350A. According to various embodiments, this sliding portion 351 of the support stand 350A may be inserted into and slidably engaged with the elongate channel (i.e. the support-stand-guide-element 360A). In

particular, a longitudinal axis 851d of the sliding portion 351 (e.g. cylindrical shaft) may be perpendicular to the movement axis (or sliding path) extending along (e.g. longitudinally along) the elongate channel (i.e. the support-stand-guide-element 360A). In this manner, the sliding portion 351 of the support stand 350A may be slidable within and along the elongate channel (i.e. the support-stand-guide-element 360A).

[000130] Furthermore, according to various embodiments, the sliding portion 351 of the support stand 350A may also be rotatable (e.g. freely rotatable) within the elongate channel (i.e. the support-stand-guide-element 360A). As such, according to various embodiments, the entire support stand 350A may be pivotable (e.g. freely pivotable), or may “tilt”, about its sliding portion 351 at the first portion of the support stand 350A (or about a corresponding pivot axis 850d extending across the first portion of the support stand 350A). That is, the support stand 350A may be pivotable about a pivot axis 850d (herein referred to as “support-stand-pivot-axis 850d”). As shown, the support-stand-pivot-axis 850d may be parallel and/or coinciding with the pivot axis 817d. Further, the support-stand-pivot-axis 850d may be perpendicular to the sliding axis 820d, as shown in FIG. 3K. Accordingly, according to various embodiments, the support stand 350A may be engaged to the housing 301A in a manner such that the support stand 350A is slidable and pivotable with respect to the housing 301A.

[000131] It is also envisaged that, in various other embodiments, the sliding portion 351 of the support stand 350A may be discrete from a main portion 352 (e.g. an elongate and/or rigid main body) of the support stand 350A. Further, according to various other embodiments, the sliding portion 351 may be rotatably coupled to the main portion 352 of the support stand 350A (e.g. at an end of the main portion 352). According to various other embodiments, such a configuration may facilitate pivoting or tilting (or “rocking”) movement (or motion) of the support stand 350A (e.g. at least its main portion 352) relative to the housing 301A.

[000132] As shown in FIG. 3J, according to various embodiments, an opposite, second portion of the support stand 350A (i.e. opposite the sliding portion 351) may be coupled (e.g. secured, affixed, etc., for example, using fasteners, welding joints, etc., in other words, fixedly coupled) to the keyboard 317A. Specifically, referring back to FIG. 3L, the support stand 350A may include a coupling portion 353 (e.g. a plate-like portion) at its second end. According to various embodiments, this coupling portion

353 may be fixedly coupled to a base surface of the keyboard 317A (e.g. using fasteners, such as screws, bolts, etc., or a welding joint).

[000133] Referring back to FIG. 3K, according to various embodiments, the coupling portion 353 of the support stand 350A may be coupled to a central or middle segment of the keyboard 317A, between the front edge and rear edge of the keyboard 317A. Nevertheless, it is also envisaged that according to various other embodiments, the coupling portion 353 of the support stand 350A may be coupled to any other segment of the keyboard 317A, for instance, at a segment further from the pivot axis 817d at the front edge of the keyboard 317A, or nearer to the pivot axis 817d at the front edge of the keyboard 317A.

[000134] FIG. 3M shows a close-up perspective view of the sliding portion 351 of the support stand 350A (e.g. a left-sided support-stand 350A, for supporting a left portion of the keyboard 317A) in the elongate channel of the support-stand-guide-element 360A of the housing 301A of the laptop 300A of FIG. 3E, according to various embodiments.

[000135] As shown in FIG. 3M, according to various embodiments, the support-stand-guide-element 360A (e.g. the elongate channel) may include an inclined segment 361 that may be inclined upwards with respect to the forward sliding direction. Accordingly, referring to FIG. 3K, the inclined segment 361 may be diagonally inclined upwards with respect to the sliding axis 820d (e.g. away from the base of the housing 301A). In particular, the inclined segment 361 may slope (e.g. linearly) upwards, diagonally away from the base of the housing 301A and towards the upper surface (or the top) of the housing 301A. As an example, shown in FIG. 3M, the start (or lower end) of the inclined segment 361 may form or may be a first end (or start) of the support-stand-guide-element 360A. In this configuration, when the keyboard 317A is slid in the forward sliding direction from its closed position, the sliding portion 351 of the support stand 350A may immediately slide (or glide) up the inclined segment 361 of the support-stand-guide-element 360A, causing the entire support stand 350A to move upwards (i.e. as a single or unified body) to displace (e.g. lift, push, etc.) the keyboard 317A away from the external bay 309A. It is also envisaged that, in various other embodiments (not shown), the inclined segment 361 of the support-stand-guide-element 360A may form or may be an intermediate or middle segment of the support-stand-guide-element 360A (e.g. if it is desired to delay displacement of the keyboard

317A from the external bay 309A, from when the keyboard 317A is first pushed in the forward sliding direction from its closed position).

[000136] According to various embodiments, when the keyboard 317A is in the closed position, the sliding portion 351 of the support stand 350A may be situated or resting at the start (or at a lower end) of the inclined segment 361 of the support-stand-guide-element 360A. In this position, according to various embodiments, the other portion of the support stand 350A (i.e. that is coupled to the base surface of the keyboard 317A) may be substantially level or flush with the external bay 309A (c.g. flush with a base of the receptacle serving as the external bay 309A).

[000137] Consequently, when the sliding portion 351 of the support stand 350A is slid or glided upwards along the inclined segment 361 of the support-stand-guide-element 360A, to the terminating end (or an upper or higher end) of the inclined segment 361 of the support-stand-guide-element 360A, the entire support stand 350A ascends with respect to the housing 301A to displace the keyboard 317A away from the external bay 309A of the housing 301A, to an opened position of the keyboard 317A.

[000138] According to various embodiments, with reference to FIG. 3M, the support-stand-guide-element 360A (c.g. the elongate channel) may further include a non-inclined (e.g. level) segment 362 which may be adjoined to the terminating end (or upper or higher end) of the inclined segment 361 of the support-stand-guide-element 360A. In other words, the non-inclined segment 362 may be adjoined to a highest point of the inclined segment 361 that may be furthest from a base surface of the housing 301A. Referring back to FIG. 3K, this non-inclined segment 362 may be parallel (c.g. at least substantially parallel) with the base surface of the housing 301A. Further, the non-inclined segment 362 may also be parallel with the sliding axis 820d. According to various embodiments, the non-inclined segment 362 at the top of the inclined segment 361 may serve to hold the keyboard 317A in its opened position by preventing the sliding portion 351 of the support stand 350A from sliding down the inclined segment 361 of the support-stand-guide-element 360A. Accordingly, according to various embodiments, once the keyboard 317A reaches (or achieves) a maximum displacement corresponding to its opened position (i.e. with the sliding portion 351 of the support stand 350A at a peak of the inclined segment 361), the keyboard 317A may be slid further forward so as to move the sliding portion 351 of the support stand 350A

into the non-inclined segment 362 of the support-stand-guide-element 360A to support the keyboard 317A at the opened position.

[000139] According to various embodiments, with reference to FIG. 3M, another end of the non-inclined segment 362 may correspond to or may be a terminating end of the support-stand-guide-element 360A. According to various embodiments, this other end of the non-inclined segment 362 may further include a catch 363 (e.g. a recess, depression, groove, etc.) which may be shaped to accommodate (e.g. receive) the sliding portion 351 of the support stand 350A.

[000140] Various embodiments have thus described a portable electronic device with enhanced cooling capabilities, without any compromise in size and portability of the device. In particular, the portable electronic device may be capable of cooling an internal space of a housing of the portable electronic device efficiently, while maintaining a compact size. This efficient cooling, in turn, extends the lifespan of internal components, ensuring consistent performance and reliability.

[000141] While the invention has been particularly shown and described with reference to specific embodiments, it should be understood by those skilled in the art that various changes, modification, variation in form and detail may be made therein without departing from the scope of the invention as defined by the appended claims. The scope of the invention is thus indicated by the appended claims and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced.

CLAIMS

1. A portable electronic device comprising:
 - a housing defining an internal space, the housing comprising an outer face with an external bay,
 - wherein the housing further comprises at least one air vent at the external bay which enables fluid communication therethrough between the internal space and outside of the housing;
 - a heat-dissipation assembly disposed within the internal space of the housing;
 - a user-interface assembly movably coupled to the housing in a manner such that the user-interface assembly is movable relative to the housing between
 - a closed position of the user-interface assembly in which the user-interface assembly seats within the external bay to cover the at least one air vent, and
 - an opened position of the user-interface assembly in which the user-interface assembly is displaced from the external bay to uncover the at least one air vent for fluid to flow therethrough to interact with the heat-dissipation assembly.
2. The portable electronic device of claim 1,
 - wherein the user-interface assembly is operable, for a user to provide input, in both the closed position and the opened position of the user-interface assembly.
3. The portable electronic device of claim 1,
 - wherein the user-interface assembly comprises a physical keyboard.
4. The portable electronic device of claim 1,
 - wherein the user-interface assembly comprises a touch screen.
5. The portable electronic device of claim 1,
 - wherein the heat-dissipation assembly comprises at least one fan unit disposed within the internal space in a manner such that, with the user-interface assembly in the

opened position, the at least one fan unit is capable of drawing air into the internal space via the at least one air vent at the external bay.

6. The portable electronic device of claim 5,
wherein the housing further comprises at least one other air vent positioned at a region of the housing other than the external bay;
wherein the at least one fan unit and the at least one other air vent are arranged in a manner which enables the at least one fan unit to expel air through the at least one other air vent.
7. The portable electronic device of claim 6,
wherein the heat-dissipation assembly further comprises a heat sink disposed between the at least one fan unit and the at least one other air vent.
8. The portable electronic device of claim 1,
wherein the user-interface assembly is pivotable with respect to the housing.
9. The portable electronic device of claim 8, further comprising:
a support stand with a first portion pivotably coupled to the housing and a second portion slidably engaged with the user-interface assembly
10. The portable electronic device of claim 1,
wherein the user-interface assembly is pivotable about a pivot axis and slidable along a sliding direction with respect to the housing,
wherein the pivot axis is perpendicular to the sliding direction.
11. The portable electronic device of claim 1, further comprising:
a slider, the slider being slidable with respect to the housing along a sliding axis,
wherein the user-interface assembly is pivotably coupled to the slider so as to be pivotable with respect to the slider about a pivot axis,
wherein the pivot axis is perpendicular to the sliding axis.

12. The portable electronic device of claim 11, further comprising:
a slider-guide-element coupled to the housing,
wherein the slider is slidably engaged with the slider-guide-element.
13. The portable electronic device of claim 1, further comprising:
a support stand with a first portion pivotably coupled to the housing and a
second portion pivotably coupled to the user-interface assembly.
14. The portable electronic device of claim 1, further comprising:
a support stand with a first portion engaged to the housing in a manner such
that the support stand is slidable with respect to the housing and pivotable with
respect to the housing,
wherein the support stand is slidable along a sliding path and pivotable about a
support-stand-pivot-axis extending through the first portion of the support stand, the
support-stand-pivot-axis being perpendicular to the sliding path,
wherein a second portion of the support stand is fixedly coupled to the user-
interface assembly.
15. The portable electronic device of claim 14,
wherein the housing comprises a support-stand-guide-element in engagement
with the support stand, the support-stand-guide-element defining the sliding path to
guide a sliding motion of the first portion of the support stand,
wherein the sliding path comprises an inclined segment that is inclined
diagonally away from a base of the housing, towards a top of the housing.
16. The portable electronic device of claim 15,
wherein the sliding path further comprises a non-inclined segment,
wherein the non-inclined segment is adjoined to the inclined segment at an end
of the inclined segment that is furthest from the base of the housing.
17. The portable electronic device of claim 1, further comprising:
a display assembly pivotably coupled to the housing so as to be pivotable with
respect to the housing between a folded position of the display assembly in which a

display face of the display assembly is folded onto the housing and an unfolded position of the display assembly in which the display face of the display assembly is apart from the housing.

18. The portable electronic device of claim 17,
wherein the display assembly is operatively coupled to the user-interface assembly in a manner such that when the display assembly is in the folded position, the user-interface assembly is in the closed position, and
when the display assembly is moved from the folded position to the unfolded position, the user-interface assembly is moved from the closed position to the opened position.

19. The portable electronic device of claim 18,
wherein the display assembly is operatively coupled to the user-interface assembly in a manner such that the user-interface assembly moves synchronously with the display assembly.

20. The portable electronic device of claim 18, further comprising:
an operative coupling mechanism comprising an intermittent motion mechanism which operatively couples the display assembly and the user-interface assembly,
wherein the intermittent motion mechanism is configured to cause the user-interface assembly to move non-synchronously with the display assembly.