CLAIMS

1. An electronic device having an internal cooling fan, the electronic device comprising:

a fan assembly attached to a keyboard assembly, the fan assembly comprising:

a fan enclosure having, on a surface, an inlet opening and an external protrusion; and

an impeller at least partially inside the fan enclosure; and

a bottom case, the fan assembly positioned between the keyboard assembly and the bottom case and oriented such that the inlet opening and the external protrusion face the bottom case,

wherein the external protrusion maintains a passage between the fan enclosure and the bottom case that allows air to enter the inlet opening.

2. The device of claim 1, wherein a cross-section of the external protrusion has a teardrop shape.

3. The device of claim 2, wherein the cross-section of the external protrusion tapers toward the inlet opening.

4. The device of any of claims 1-3, wherein the external protrusion is separated from the bottom case by a gap.

5. The device of any of claims 1-4, wherein the inlet opening is positioned between the external protrusion and a diffuser portion of the fan enclosure.

6. The device of any of claims 1-5, wherein the external protrusion is positioned closer to a sidewall of the fan enclosure than the inlet opening, and wherein at least a portion of the sidewall of the fan enclosure is parallel to a rotation axis of the impeller.

7. The device of any of claims 1-6, wherein a portion of the impeller extends out from within the fan enclosure through the inlet opening.

8. The device of any of claims 1-7, wherein at least a portion of a wall on which the surface is disposed increases in thickness radially outward from the inlet opening.

9. The device of any of claims 1-8, wherein the inlet opening is disposed on a wall of the fan enclosure, wherein the impeller comprises a plurality of blades, each blade of the plurality of blades includes an edge proximate to a portion of the wall surrounding the inlet opening, and wherein the edge of each blade of the plurality of blades is sloped away from a rotation axis of the impeller.

10. The device of claim 9, wherein an inner surface of the portion of the wall surrounding the inlet opening is approximately parallel to the edge of each blade of the plurality of blades.

11. The device of claim 10, wherein the edge of each blade of the plurality of blades is positioned no more than approximately 0.6 mm from the inner surface of the portion of the wall surrounding the inlet opening.

12. The device of any of claims 1-11, wherein the fan enclosure comprises a diffuser portion having:

a diffuser channel; and

an outlet opening through which air exits the fan assembly, the outlet opening disposed at an end of the diffuser channel,

wherein the diffuser channel diverges toward the outlet opening with respect to a plane of rotation of the impeller.

13. The device of claim 12, wherein at least a wall of the diffuser channel diverges toward the outlet opening at an angle of 5-7 degrees with respect to the plane of rotation of the impeller.

14. The device of any of claims 12-13, wherein:

an inner surface of the diffuser portion is linearly sloped toward the outlet opening and with respect to the plane of rotation of the impeller.

15. The device of any of claims 12-14, wherein:

a height of a cross-section of the outlet opening is perpendicular to a width of the cross-section of the outlet opening; and

the height of the cross-section of the outlet opening varies across the width of the cross-section of the outlet opening.

16. The device of any of claims 12-15, wherein:

a thickest portion of a wall of the diffuser portion is disposed between opposite sidewalls of the diffuser portion; and

a thickness of the wall of the diffuser portion tapers from the thickest portion toward each sidewall of the opposite sidewalls.

17. The device of claim 16, wherein an inner surface of the wall of the diffuser portion has a topography that is independent of a topography of an outer surface of the wall of the diffuser portion.

18. The device of any of claims 1-17, wherein the fan enclosure comprises at least two discrete pieces.

19. The device of any of claims 1-17, wherein the fan enclosure consists of a first piece and a second piece that are attached to each other using one or more attaching components.

20. The device of any of claims 1-19, further comprising a motherboard, wherein the fan assembly is disposed between the keyboard assembly and the motherboard.

21. The device of claim 20, wherein:

the fan enclosure comprises a first piece and a second piece that are disposed on opposite sides of the impeller;

the first piece of the fan enclosure has the inlet opening; and

the motherboard is directly attached to the first piece of the fan enclosure.

22. The device of claim 20, wherein:

the fan enclosure comprises a first piece and a second piece that are disposed on opposite sides of the impeller;

the first piece of the fan enclosure has the inlet opening; and

the motherboard is directly attached to the second piece of the fan enclosure without being attached to the first piece of the fan enclosure.

23. The device of any of claims 1-22, wherein:

the fan enclosure includes a second wall disposed on a side of the fan enclosure opposite of the inlet opening; and

a majority of an outer surface of the second wall is positioned flush against a bottom surface of the keyboard assembly.

24. The device of claim 23, wherein:

the fan assembly includes a flexible printed circuit configured to transmit a back electromotive force signal generated by a motor of the fan assembly;

the flexible printed circuit is disposed between the outer surface of the second wall of the fan enclosure and the bottom surface of the keyboard assembly; and

the flexible printed circuit does not include an electromagnetic interference (EMI) shielding layer.

25. The device of any of claims 1-24, wherein:

a base layer of the keyboard assembly includes a plurality of openings configured to allow air to pass through the base layer; and

a recessed portion of the base layer and an outer surface of the fan enclosure form a venting channel, the venting channel coupling two or more openings of the plurality of openings.

26. The device of claim 25, wherein an edge of the recessed portion of the base layer extends beyond a perimeter of the fan assembly.