EXTERNAL HEAT DISSIPATING DEVICE FOR ELECTRICAL OR ELECTRONIC DEVICES

FIELD OF INVENTION

[0001] This application relates to a heat dissipating device for cooling components that generate heat in electrical or electronic devices.

BACKGROUND OF THE INVENTION

[0002] Modern electrical or electronic devices generally include components such as processors, power supply, batteries and hard disk drives that generate heat during operation. Examples of electrical or electronic devices are notebook, laptop, netbook, ultrabook, tablet computer, smart phone, Playstation game console, Xbox game console, computer server, fridge and etc.

[0003] The excessive heat generated by an electronic device can raise the operating temperature of its components above a manufacturer recommended threshold temperature. In some cases, the electronic device becomes quite hot during operation. If the heat is not properly dissipated, it can lead to components malfunction or performance slow down or reliability degradation. It is important to dissipate the heat generated by the electronic device. Additionally, if the user is using the electronic device on their lap, it becomes uncomfortable to continue working.

[0004] Some manufacturers accommodate this by providing vents for air exchange on the base of the electronic device. FIG. 3D shows an example of a electronic device, a laptop 302. To get rid of the excess heat accumulated within the laptop 302, a numbers of ventilation holes 322 are placed on the bottom of the laptop 302. The ventilation

holes 322 are usually located near a hotspot region 320 of the laptop 302. The hotspot regions 320 are location where heat accumulation is the highest due to close proximity to heat generating components like processor, power supply, batteries and hard disk drive.

[0005] Cooling or heat dissipating systems have been employed in prior electronic device to dissipate the heat generated. These systems are generally designed to dissipate a sufficient amount of heat to maintain the operating temperature of the electronic device below the recommended threshold temperature.

[0006] In FIG. 2A , U.S. Pat. No. 7,038,909 to Chen (2006) attempt to cool a laptop 208 by docking it with a laptop cooler 210. The laptop 208 is placed on top of a main shell body 202. A number of protruding ribs 206 elevate the laptop 208 such that there is sufficient gap between the bottom of the laptop 208 and the main shell body 202. A number of cooling fans 204 are switched on to induce airflow over the bottom of the laptop 208, enhancing the heat dissipation effect. The main disadvantage of this device is that the cooling fans 204 usually draw its power from the laptop 208 USB hub. This method reduces battery power and shortens the span of mobile operation of the laptop 208.

[0007] In FIG. 2B, U.S. Pat. No. 6,466,438 to Lim (2002), a laptop 222 is place on top of a laptop cooling device 220. The device 220 being formed from a material of high thermal conductivity, has two levels of corrugated surface. The laptop 222 bottom contacts the device 220 with free passage of air across the support. Heat generated from the laptop 222 is transferred to the device 220 by mean of conduction and convection. The device 220 suffers from a number of disadvantages:

[0008] (a) There is minimum contact between the laptop cooling device 220 and the bottom of the laptop 222 due to its corrugated surface. Heat transfer by conduction is not optimize, especially around the hotspot regions 320 (FIG. 3D) of the laptop.

[0009] (b) The corrugated surface of the device 220 limit the free flow of air in one direction. Heat dissipation by convection is seriously hindered.

[0010] (c) The ventilation holes 322 (FIG. 3D) of the laptop may overlap with the corrugated surface of the device 220. This will essentially block the flow of hot air from the ventilation holes 322 and reduce heat dissipation efficiency.

SUMMARY OF THE INVENTION

[0011] In accordance with one embodiment of a heat dissipation device that comprises of a number of heat sinks, a number of resilient means or springs and a heat-conductive plate.

BRIEF DESCRIPTION OF THE DRAWING

[0012] In the drawings, closely related figures have the same number but different alphabetic suffixes.

[0013] FIG. 1A is an exploded view of a heat dissipation device in accordance with one embodiment.

[0014] FIG. 1B is a perspective view of a number of elastic holders.

[0015] FIG. 1C is a perspective view of a number of heat sinks.

[0016] FIG. 1D is a perspective view of a number of stabilizers.

[0017] FIG. 1E is a perspective view of a heat sink extender.

[0018] FIG. 1F is a perspective view of a heat-conductive plate.

[0019] FIG. 1G is a perspective view of a heat-insulating base.

[0020] FIG. 2A is a perspective view of a laptop cooler found in the prior art (US 7,038,909).

[0021] FIG. 2B is a perspective view of a laptop cooler found in the prior art (US 6,466,438).

[0022] FIG. 3A, 3B and 3C show various aspects of the heat dissipation device in FIG. 1A used with a laptop.

[0023] FIG. 3D is a perspective view of the laptop, the heat sink and the heat-conductive plate in FIG. 3A

[0024] FIG. 4 is a perspective view of the heat sink in FIG. 1A

[0025] FIG. 5 is a perspective view of the heat sinks and the heat sink extenders in FIG. 1A

[0026] FIG. 6 is a perspective view of the stabilizer in FIG. 1A

[0027] FIG. 7A and 7B show various aspects of the elastic holder and the heat-insulating base in FIG. 1A used with the laptop.

[0028] FIG. 8A and 8B show various aspects of a cross sectional view of the heat dissipation device used with the laptop in FIG. 3A..

[0029] FIG. 9 is a perspective view of the heat sink, the spring and the heat-conductive base in FIG. 1A used with a thermal grease.

[0030] FIG. 21 and 22 show various aspects of a similar heat dissipation device in accordance with another embodiment used with a tablet computer.

[0031] FIG. 23 and 24 show various aspects of the heat dissipation device in FIG. 21 used with the tablet computer.

[0032] FIG. 25 is a perspective view of the heat sinks, the springs and the heat-conductive plate in FIG. 21.

[0033] FIG. 26 is a perspective view of the tablet computer, the heat sinks and the springs in FIG. 21.

[0034] FIG. 27 is a perspective view of the heat-conductive plate in FIG. 21.

[0035] FIG. 28A and 28B show various aspects of a cross sectional view of the heat dissipation device used with the tablet computer in FIG. 21.

[0036] FIG. 29 is a perspective view of the tablet computer and the casing in FIG. 21.

[0037] FIG. 41 and 42 show various aspects of a similar heat dissipation device in accordance with another embodiment used with a game console (Example Playstation 4).

[0038] FIG. 43 is a cross sectional view of the heat dissipation device used with the game console in FIG. 41.

[0039] FIG. 44 is a perspective view of the heat sink in FIG. 41.

[0040] FIG. 51 is a perspective view of a heat sink and a resilient means in accordance with another embodiment.

[0041] FIG. 52 is a perspective view of a heat sink and a resilient means in accordance with another embodiment.

[0042] FIG. 53 is an exploded view of a heat sink and a heat sink extender in accordance with another embodiment.

[0043] FIG. 54 is an assembled view of the heat sink and the heat sink extenders in FIG. 53.

[0044] FIG. 55 is a perspective view of a heat sink clamps used with the heat sinks and the heat-conductive plate of FIG. 1A

[0045] FIG. 56 is a cross sectional view of another embodiment of the heat dissipating device.

[0046] FIG. 57A to 57D show various aspects of another embodiment of the heat dissipating device of FIG. 1A.

[0047] FIG. 58A to 58G show various aspects of the heat dissipating device of FIG.1A used with a computer server

[0048] FIG. 58H to 58K show various aspects of another embodiment of the heat dissipating device used with a computer server

[0049] FIG. 59A to 59C show various aspects of another embodiment of the heat dissipating device.

[0050] FIG. 60A to 60B show various aspects of another embodiment of the heat sinks in FIG. 1A

[0051] FIG. 61 is a perspective view of another embodiment of the heat-conductive

plate in FIG. 1A

[0052] FIG. 62A to 62B show various aspects of another embodiment of the heat dissipating device.

[0053] FIG. 63 is a perspective view of another embodiment of the heat sink in FIG. 1A.

[0054] FIG. 64A to 64E show various aspects of another embodiment of the elastic holder in FIG. 1A

[0055] FIG. 65A to 65F show various aspects of another embodiment of the heat dissipating device used with a fridge.

DRAWINGS - Reference Numerals

100 Heat dissipation device

102 Elastic holder

104 Anti-slip attachment or stabilizer

106 Heat sinks

108 Resilient means or spring

110 Heat-conductive plate

112 Heat-insulating base

114 Heat sink extender

202 Main shell body

204 Cooling fan

206 Protruding ribs

208 Laptop

210 Laptop cooler

220 Laptop cooling device

222 Laptop

302 Laptop

304 Square-blind hole

320 Hot spot regions

322 Ventilation holes

402 Contact surface

404 Fins

406 Elongated-heat-conductive support

408 Hole

504 Extender fin

506 Male extender holder

508 Female extender holder

510 Clip hole

512 Clip

602 Anti-slip surface

604 Elongated-heat-conductive support

606 Hole

702 Elastic band

704 Hook

706 Loop

708 Heat-release hole

802 Sliding surface

804 Pressure-release hole

806 Hollow air channel

904 Thermal grease container

906 Thermal grease (also called thermal gel, thermal compound, thermal paste, heat paste, heat sink paste, thermal interface material, or heat sink compound)

2100 Heat dissipation device

2102 Tablet computer

2104 Heat sink

2106 Heat-conductive plate

2108 Casing

2110 Resilient means or spring

2602 Side wall

2604 Fin

2606 Hole

2702 Sliding surface

2704 Pressure-release hole

2708 Square-blind hole

2902 Protrusion lock

4100 Heat dissipation device

4102 Game console

4104 Heat-conductive plate

4202 Heat sink

4304 Pressure-release hole

4308 Hole

4310 Spring

4312 Square-blind hole

4402 Contact surface

4404 Fins

5102 Heat sink

5104 Pressure-release slot

5106 Hole

5108 Resilient means

5110 Base

5112 Vertical leg

5114 Flexible-U-Shaped bend

5202 Resilient means

5204 Flexible legs

5206 Base

5208 Heat sink

5302 Heat sink

5304 Heat sink extender

5306 Fins

5308 Attachment slot

5310 Heat-conductive support

5312 Attachment

5314 Attachment slot

5316 Rectangle-through hole

5318 Hole

5502 Heat sink clamp

5504 Screw

5506 Screw-threaded hole

5508 Leg

5510 Square-through hole

5600 Heat dissipating device

5602 Heat sink

5604 Square-through hole

5606 Heat-conductive plate

5608 Elongated-heat-conductive support

5700 Heat dissipating device

5702 Heat sink

5704 K-shaped resilient means

5706 Heat-conductive plate

5708 Bend-able frame

5710 Rectangle-blind hole

5802 Computer server

5804 Server rack

5806 Plate extender

5808 Screw

5810 Screw-threaded hole

5812 Slot

5814 Server room

5816 Air conditioner vents

5818 Floor

5820 Server rack

5822 Heat-conductive plate

5824 Heat sink

5826 Slot

5828 Screw-threaded hole

5830 Heat dissipation device

5900 Heat dissipating device

5902 Heat-conductive sheets

5904 Heat-conductive plate

6000 Heat dissipating device

6002 Heat sink

6004 Elongated-heat-conductive first support

6006 Elongated-heat-conductive second support

6100 Heat dissipating device

6102 Heat-conductive first plate

6104 Heat-conductive second plate

6106 Heat-insulating base

6200 Heat dissipating device

6202 Heat sink

6204 Heat-conductive plate

6206 Slot

6208 Protrusion

6302 Heat sink

6304 Female swivel

6306 Fins

6308 Male swivel

6310 Heat-conductive support

6312 Contact surface

6402 Clamp holder

6404 Holder stand

6406 Holder mount

6408 Clamp

6410 Clamp screw

6412 Mount screw

6414 Stand screw

6416 Sliding bar

6418 Sliding slot

6420 Screw-threaded hole

6422 Screw-threaded hole

6424 Hole

6426 Screw-threaded hole

6428 Sliding slot

6502 Fridge

6504 Heat dissipating device

6506 Magnet

6508 Heat sink

6510 Heat-conductive beam

6512 Heat-conductive plate

6514 Square-blind hole

6516 Square-through hole

6518 Magnetic buffer

6520 Pressure-release hole

6522 Pressure-release hole

6524 Magnetic buffer

DETAILED DESCRIPTION OF THE INVENTION

[0056] One embodiment of a heat dissipation device 100 is illustrated in FIG. 1A to FIG. 1G. The heat dissipation device 100 comprises of a plurality of heat sinks 106, a plurality of resilient means or springs 108, a plurality of elastic holders 102, a plurality of

anti-slip attachments or stabilizers 104, a plurality of heat sink extenders 114, a heat-conductive plate 110 and a heat-insulating base 112.

[0057] Referring to FIG. 3D, the laptop 302 generate heat during operation. Most of the heat accumulation occur on the underside of the laptop 302. The ventilation holes 322 serve to expel heat that accumulate within the laptop 302. During operation, heat built up faster than it can be expelled from the ventilation holes 322. As a result, the hot spot regions 320 are formed. The heat dissipation device 100 in FIG. 1A will make use of these hot spot regions 320 to dissipate heat efficiently.

[0058] Turning now to FIG. 3A and 3B, the laptop 302 sits on top of the heat dissipation device 100. The elastic holders 102 are strapped across the top of the laptop 302 and secured to the base 112. The heat sinks 106 are placed at strategic locations below the laptop 302 such that it come into direct contact with the hot spot regions 320 (FIG. 3D). The heat sinks 106 is positioned such that it does not block the ventilation holes 322 (FIG. 3D) of the laptop 302.

[0059] The lower part of the heat sinks 106 are inserted into a plurality of square-blind holes 304 on the plate 110. The holes 304 and the lower part of the heat sinks 106 may come in different shapes like square, rectangle, circle, oval, triangle and etc. The heat sinks 106 are placed throughout the underside of the laptop 302 so that the weight of the laptop 302 is balanced out. The heat sinks 106 and the plate 110 are made of heat conductive material such as copper or aluminum. It is to be appreciated that the heat sinks 106 and the plate 110 may be made of other conductive material to meet the specific design requirements.

[0060] FIG. 3C shows the final assembled illustration of the heat dissipating device 100 with the laptop 302 in operation. Heat is generated mainly on the underside of the laptop 302 around the hot spot regions 320 (FIG 3D). The heat from the hot spot regions 320, being in direct contact with the heat sinks 106, will be quickly transferred to the heat sinks 106 through conduction. The heat sinks 106 are inserted in the holes 304 (FIG. 3A) of the plate 110, this configuration allows the heat from the heat sinks 106 to be transferred to the plate 110 through conduction. Heat transfer by conduction is the fastest form compared to convection and radiation. We can expect the heat sinks 106 and the plate 110 to get heated up within a short period of time. Heat from the heat sinks 106 and the plate 110 will be dissipated to the surrounding environmental air by convection. The heat dissipation device 100 quickly redistribute the heat from the hot spot regions 320 to a very large surface area on the heat sinks 106 and the plate 110. With a greatly expanded surface area of heat dissipation, the heat accumulation in the laptop 302 is expelled.

[0061] Turning now to FIG. 4, the heat sinks 106 are shown in greater detail. The heat sinks 106 comprise of a contact surface 402, a plurality of fins 404, an elongated-heat-conductive support 406 and a hole 408. The contact surface 402 is positioned on the underside of the laptop 302 (FIG. 3C) such that it is in direct contact with the hot spot regions 320 (FIG. 3D). Heat is transferred from the hot spot regions 320 to the contact surface 402 and the heat sinks 106 through conduction. Heat transferred to the heat sink 106 is redistributed to the fins 404. The purpose of the fins 404 are to increase the heat dissipation surface area so as to increase the rate of heat dissipation to the environmental air by convection. The support 406 is inserted into the hole 304 (FIG. 3A) of the plate 110. The support 406 is in direct contact with the plate 110. This is to provide a means to transfer heat from the heat sinks 106 to the plate 110 by

conduction. The spring 108 is inserted into the hole 408 to provide an upward force pushing the heat sink 106 against the underside of the laptop 302. This will ensure close contact and good conduction process between the contact surface 402 and the hot spot regions 320.

[0062] Referring now to FIG. 5, the heat sink extenders 114 are shown in greater detail. The purpose of the heat sink extenders 114 are to increase the heat dissipation surface area of the heat sink 106 and improve heat dissipation efficiency. A plurality of extender fins 504 are positioned beside the fins 404 of the heat sink 106. The extender fins 504 interlock and contact with the fins 404 and provide a heat conduction channel between the heat sink 106 and the heat sink extender 114. A male extender holder 506 and a female extender holder 508 are used to secure the heat sink extender 114 to the heat sink 106. A clip 512 is inserted into a clip hole 510 so that the male extender holder 506 and the female extender holder 508 are locked in place.

[0063] In FIG. 6, a detail illustration of the stabilizers 104 are shown. The purpose of the stabilizers 104 are to prevent the laptop 302 (FIG. 3C) from being knocked off or slipped off by accident. The stabilizers 104 are placed below the laptop 302 in direct contact with the underside of the laptop 302. The stabilizers 104 are placed at location away from the hot spot regions 320 (FIG. 3D) and the ventilation holes 322. The stabilizer 104 is comprises of an anti-slip surface 602, an elongated-heat-conductive support 604 and a hole 606. The surface 602 can be made of material such as rubber or plastic foam, so that when in contact with the underside of the laptop 302, it provides increased friction and adds to anti-slip protection. The support 604 is inserted into the hole 304 (FIG. 3A) of the plate 110. The spring 108 is inserted into the hole 606 of the stabilizer 104. The spring 108 provides an upward force pushing the surface 602 against the underside of

the laptop 302. This will ensure enough frictional force and provide an anti-slip protection.

[0064] Turning now to FIG. 7A and 7B, the operation of the elastic holder 102 is shown in greater detail. The elastic holder 102 is comprises of an elastic band 702 and a plurality of hooks 704. The elastic band 702 is made of re-stretchable material that is strap across the laptop 302. The elastic band 702 terminate with the hook 704 on both end. The hook 704 clip onto a loop 706 on both side of the base 112 to ensure that the laptop 302 is secured properly.

[0065] Referring to FIG. 8A and 8B. FIG. 8B shows a cross sectional view of the heat dissipation device 100 used with the laptop 302 indicated by the section line 8B-8B in FIG. 8A. During the operation of the laptop 302, heat is generated on the underside of the laptop 302. Heat is transferred from the underside of the laptop 302 through the contact surface 402 to the heat sink 106 by conduction. The support 406 is inserted into the hole 304 of the plate 110. A pressure-release hole 804 is located at the bottom of the hole 304. The hole 804 serve to relief the air pressure build up in the hole 304 when the support 406 is inserted. Heat is transferred from the heat sink 106 through the support 406 and a sliding surface 802 to the plate 110. Heat that is transferred from the laptop 302 to the heat sinks 106 and the plate 110 is dissipated to the environmental air through convection.

[0066] In FIG. 8B, the underside of the laptop 302 has a non level surface. The thickness of the left portion is smaller than the right portion. To compensate for this difference in elevation, the springs 108 on the left portion push the heat sink upward against the underside of the laptop 302. This will ensure close contact between the

laptop 302 and the heat sinks 106. The plate 110 sits on top of the heat-insulating base 112 and a hollow air channel 806 is established. Air inside the channel 806 gets heated up and escaped through a heat-release hole 708. User can place the laptop 302 together with the heat dissipation device 100 on his lap. The base 112 will shield the user's lap from the heat generated..

[0067] Referring to FIG. 9, a method of improving the efficiency of the heat dissipation device 100 is shown. A thermal grease container 904 containing a thermal grease 906 (also called thermal gel, thermal compound, thermal paste, heat paste, heat sink paste, thermal interface material, or heat sink compound) is applied and spread on all side of the support 406 of the heat sink 106. When the support 406 is inserted into the hole 304, it comes into contact with the surface 802 of the plate 110. The thermal grease 906 is sandwiched between the support 406 and the surface 802 and help to increase the heat transfer efficiency between the contact surfaces.

[0068] FIG. 21 and 22 show another embodiment of a heat dissipation device 2100 used with a tablet computer 2102. The heat dissipation device 2100 consists of a plurality of heat sinks 2104, a plurality of resilient means or springs 2110, a heat-conductive plate 2106 and a casing 2108. The heat sinks 2104 are placed at the underside of the tablet computer 2102 where hot spot regions are formed. Heat is transferred to the heat sinks 2104 by conduction. Heat in the heat sinks 2104 is further transferred to the plate 2106 by conduction. Heat is dissipated to the environmental air through convection from the plate 2106. FIG. 23 and 24 show the tablet computer 2102 fully assembled with the heat dissipation device 2100.

[0069] Turning now to FIG. 25, the heat sinks 2104 are placed at strategic location to

maximize heat transfer from the tablet computer 2102. In FIG. 26, the heat sinks 2104 are placed at the underside of the tablet computer 2102 around the hot spot regions. The heat sink 2104 comprises of a plurality of side walls 2602, a plurality of fins 2604 and a hole 2606. The fins 2604 serve to increase the surface area of the heat sink 2104 to increase the heat dissipation rate by convection. The hole 2606 allows the spring 2110 to be inserted creating an upward force pushing the heat sink 2104 against the underside of the tablet computer 2102.

[0070] FIG. 27 shows the plate 2106 in greater detail. The plate 2106 comprises of a plurality of sliding surfaces 2702, a plurality of pressure-release holes 2704 and a plurality of square-blind holes 2708. The holes 2708 allow the heat sinks 2104 to be inserted. The surfaces 2702 contact with the heat sinks 2104 so that heat can be transferred from the heat sinks 2104 to the plate 2106. The holes 2704 allow the air pressure to be released when the heat sink 2104 is inserted.

[0071] FIG. 28A shows an another view of the heat dissipation device 2100 assembled with the tablet computer 2102. FIG. 28B shows the cross sectional view indicated by the section line 28B-28B in FIG. 28A.

[0072] Referring to FIG. 29, the tablet computer 2102 is assembled with the casing 2108. The tablet computer 2102 is locked in place by a protrusion lock 2902.

[0073] FIG. 41 and 42 show another embodiment of a heat dissipation device 4100 used with a game console 4102 (Example Playstation 4).

[0074] Referring to FIG. 43, a cross sectional view is shown indicated by the section

line 43-43 in FIG. 42. The heat dissipation device 4100 comprises of a plurality of heat sinks 4202, a plurality of springs 4310 and a heat-conductive plate 4104. The heat sinks 4202 are placed at the underside of the console 4102 around hot spot regions of the console 4102. Heat is generated by the console 4102 and transferred to the heat sinks 4202 by conduction. The heat sink 4202 is inserted into a square-blind hole 4312 of the plate 4104. Heat is transferred from the heat sinks 4202 to the plate 4104 through conduction. The spring 4310 is inserted into a hole 4308 to push the heat sink 4202 upward for situation where the underside of the console 4102 is non level. A pressure-release hole 4304 is located on the heat sink 4202 to relief the air pressure built up when the heat sink 4202 is inserted into the hole 4312.

[0075] FIG. 44 shows the detail of the heat sink 4202 (FIG. 42). The heat sink 4202 is another embodiment of the heat sink 106 shown in FIG. 4. It comprises of a contact surface 4402, a plurality of fins 4404, the hole 4308 and the pressure-release hole 4304. The main difference of the heat sink 4202 is the addition of the hole 4304.

[0076] Turning to FIG. 51, another embodiment of a heat sink 5102 and a resilient means 5108 are shown. The heat sink 5102 has a pressure-release slot 5104 that serve to relief air pressure built up when the heat sink 5102 is inserted into the hole 304 (FIG. 8B). The resilient means 5108 is inserted into a hole 5106 and provide an upward force on the heat sink 5102. The resilient means 5108 comprises of a plurality of base 5110, a plurality of flexible-U-shaped bends 5114 and a plurality of vertical legs 5112. When a load is placed between the opposite side of the bases 5110, the bends 5114 compress vertically and create a vertical resilient movement similar to the spring 108 in FIG. 8B.

[0077] FIG. 52 shows another embodiment of a heat sink 5208 and a resilient means

5202. The resilient means 5202 comprises of a plurality of flexible legs 5204 and a base 5206. The legs 5204 bend downward when it is push against the heat sink 5208, providing an upward force similar to the spring 108 in FIG. 8B.

[0078] FIG. 53 and 54 show another embodiment of a heat sink 5302 and a heat sink extender 5304 similar to the heat sink 106 and the heat sink extender 114 in FIG. 1A. The heat sink 5302 comprises of a plurality of fins 5306, a plurality of attachment slots 5308, a heat-conductive support 5310 and a hole 5318. The heat sink extender 5304 comprises of an attachment 5312, a plurality of attachment slots 5314 and a plurality of rectangle-through holes 5316. To connect the heat sink 5302 to the heat sink extender 5304, the attachment 5312 is slotted into the attachment slot 5308. The fins 5306 and the rectangle through hole 5316 increase the surface area to improve heat dissipation by convection.

[0079] Referring to FIG. 55, a heat sink clamp 5502 is shown. Its purpose is to eliminate the need for the spring 108 (FIG. 1A) that cater to laptop with non level underside. The heat sink clamp 5502 comprises of a plurality of legs 5508, a square-through hole 5510, a screw-threaded hole 5506 and a screw 5504. The hole 5510 is aligned with one of the hole 304 and the legs 5508 are inserted into the holes 304. The support 406 is inserted into the hole 5510 and the screw 5504 is inserted into the screw-threaded hole 5506. The heat sink 106 will slide upward or downward to a pre-determine position and the screw 5504 is tightened until the heat sink 106 hold in place.

[0080] FIG. 56 shows a cross section view of another embodiment of a heat dissipating device 5600 with a modification of a heat-conductive plate 5606 and a heat sink 5602. The heat-conductive plate 5606 comprises of a plurality of square-through hole 5604.

The heat sink 5602 comprises of a elongated-heat-conductive support 5608. The support 5608 is inserted into the hole 5604 and rest on the bottom of the heat-insulating base 112.

[0081] FIG. 57A to 57D show another embodiment of a heat dissipating device 5700. The heat dissipating device 5700 comprises of a plurality of heat sinks 5702, a plurality of K-shaped resilient means 5704, a heat-conductive plate 5706 and the heat-insulating base 112. The heat sinks 5702 are positioned at the underside of the laptop 302 near its hot spot regions 320 (FIG. 3D). The resilient means 5704 is placed below the heat sink 5702 and inserted into a rectangle-blind hole 5710 of the plate 5706. A bend-able frame 5708 will provide an upward force pushing the heat sink 5702 against the underside of the laptop 302.

[0082] Referring now to FIG. 58A and 58G. In FIG. 58A and 58B, the heat dissipating device 100 is used with a computer server 5802. In this embodiment, the heat dissipating device 100 is used to dissipate heat from both the underside and topside of the computer server 5802. FIG. 58C shows the computer server 5802 being housed inside a server rack 5804. In FIG. 58D to FIG. 58F, a plate extender 5806 is inserted between two units of the heat-conductive plate 110. The plate extender 5806 is fastened to the server rack 5804 by passing a screw 5808 through a slot 5812 and screwed into a screw-threaded hole 5810. The plate extender 5806 conducts heat away from the heat-conductive plate 110 and transferred the heat to the server rack 5804. The server rack 5804 and plate extender 5806 are made from heat conductive material. This will dramatically increased the surface area of heat dissipation to environmental air by convection. FIG. 58G shows a typically server data center where the computer server 5802 and the server rack 5804 are stationed in a server room 5814. The server

room 5814 is cooled down by a sets of air conditioner vents 5816 to prevent the servers from overheating. Heat generated by the computer server 5802 is transferred to the heat sink 106, the heat-conductive plate 110, the plate extender 5806 and the server rack 5804. To further increase the heat dissipation rate, the server rack 5804 sit and contact with a floor 5818 that is cooled by the air conditioner vents 5816.

[0083] In FIG. 58H to 58K, another embodiment of a heat dissipation device 5830 used with the computer server 5802 is shown. The heat dissipation device 5830 comprises of a plurality of heat sinks 5824, the plurality of springs 108 and a heat-conductive plate 5822. The heat dissipation device 5830 is sandwiched between two computer servers 5802 that is mounted on a server rack 5820. The heat-conductive plate 5822 is fastened to the server rack 5820 by passing the screw 5808 through a slot 5826 and tightened into a screw-threaded hole 5828.

[0084] FIG. 59A to 59C show another embodiment of a heat dissipating device 5900 that comprises of the plurality of heat sinks 5702, a plurality of heat-conductive sheets 5902, a heat-conductive plate 5904 and the heat-insulating base 112. In FIG. 59C, the heat-conductive sheets 5902 are used to elevate the heat sinks 5702 to cater to the non level underside of the laptop 302.

[0085] Turning to FIG. 60A and 60B, another embodiment of a heat dissipating device 6000 is shown. The heat dissipating device 6000 comprises of a plurality of heat sinks 6002, the plurality of springs 108, the heat-conductive plate 110 and the heat-insulating base 112. The heat sink 6002 comprises of an elongated-heat-conductive first support 6004 and an elongated-heat-conductive second support 6006. The presence of the first support 6004 and the second support 6006 will increase the efficiency of heat transfer

by conduction from the heat sink 6002 to the heat-conductive plate 110.

[0086] FIG. 61 is another embodiment of a heat dissipating device 6100 that comprises of the plurality of heat sinks 106, the plurality of springs 108, a heat-conductive first plate 6102, a heat-conductive second plate 6104 and a heat-insulating base 6106. The first plate 6102 and second plate 6104 are rested on the base 6106. There will be an air gap between the first plate 6102 and second plate 6104. The presence of the air gap will increase the cooling efficiency of the first plate 6102 and second plate 6104.

[0087] Referring to FIG. 62A and 62B, another embodiment of a heat dissipating device 6200 is shown. The heat dissipating device 6200 comprises of a plurality of heat sinks 6202, the plurality of springs 108, a heat-conductive plate 6204 and the heat-insulating base 112. The heat sink 6202 is inserted into a protrusion 6208 on the plate 6204. A slot 6206 on the heat sink 6202 serves to prevent pressure built up and provide additional surface area for heat dissipation by convection.

[0088] FIG. 63 shows another embodiment of a heat sink 6302. The heat sink 6302 comprises of a contact surface 6312, a plurality of fins 6306, a male swivel 6308, a female swivel 6304 and a heat-conductive support 6310. The male swivel 6308 is inserted into the female swivel 6304 and is able to swing forward and backward. This forward and backward movement allow the contact surface 6312 to accommodate laptop whose underside is not regular.

[0089] Turning to FIG. 64A to 64E, a plurality of clamp holders 6402 are shown. The clamp holders 6402 are a replacement to the elastic holders 102 shown in FIG. 1A. Its purpose is to ensure that the laptop 302 is secured to the heat-conductive plate 110. In

FIG. 64A and 64B, the clamp holders 6402 are implemented on all sides of the laptop 302. From FIG. 64C and 64D, the clamp holder 6402 is comprises of a holder stand 6404, a holder mount 6406 and a plurality of clamps 6408. In FIG. 64E, the holder stand 6404 is comprises of a screw-threaded hole 6426, a sliding slot 6418 and a screw-threaded hole 6420. The holder stand 6404 is inserted into the hole 304 of plate 110. A stand screw 6414 slides through the hole 804 and is secured onto the screw-threaded hole 6426. The holder mount 6406 is comprises of a sliding bar 6416, a hole 6424, a plurality of screw-threaded holes 6422 and a sliding slot 6428. To secure the holder mount 6406 to the holder stand 6404, the sliding bar 6416 is inserted into the sliding slot 6418. A mount screw 6412 is passed through the hole 6424 and secured onto the screw-threaded hole 6420. The clamps 6408 are slided into the hole 6428 and hold in place by securing a sets of clamp screws 6410 into the screw-threaded holes 6422.

[0090] Referring to FIG. 65A to 65F, another embodiment of a heat dissipating device 6504 is used with a fridge 6502. In FIG. 65A and 65B, the heat dissipating device 6504 is placed at the back of the fridge 6502. This is the location where heat are generated to cool the interior of the fridge 6502. In FIG. 65C, the heat dissipating device 6504 comprises of a heat sink 6508, a plurality of magnets 6506, a plurality of heat-conductive beams 6510 and a plurality of heat-conductive plates 6512. In FIG. 65D, the magnet 6506 is inserted into a square-blind hole 6514 of the heat sink 6508. A magnetic buffer 6524 (FIG. 65E) serves to hold the heat sink 6508 in place. The magnetic attraction of the magnet 6506 will hold the heat sink 6508 securely to the back of the fridge 6502. The beam 6510 is inserted into the hole 6514 to allow heat transfer from the heat sink 6508 to the plate 6512 by conduction. The beam 6510 comprises of a pressure-release hole 6520 and a pressure-release hole 6522. The hole 6520 and the hole 6522 serve to release pressure built up when the beam 6510 is inserted into the

hole 6514. Additional sets of the magnet 6506 is inserted into a square-through hole 6516 to hold the plate 6512 to the heat sink 6508 by magnetic force. A magnetic buffer 6518 (FIG. 65F) in the center of the hole 6516 will help to hold the heat-conductive plate 6512 in place.

[0091] From the description above, a number of advantages of the heat dissipating devices become evident:

[0092] (a) The heat dissipating device rely on the concept of conduction and convection. There is no electrical or electronic parts and require no electricity.

[0093] (b) The simplicity of design and manufacture results in relatively lower manufacturing costs.

[0094] (c) There is no electrical or electronic parts, therefore there is lesser possibility of failure than the prior art that use electrical fans.

[0095] (d) As it is designed to cool an electronic device from below or above, the shape of the heat dissipation device 100 does not obstruct any communication ports usually located on the side of the electronic device (Example, laptop). It is generic in use, requiring no alteration by the user so the operation is simple.

[0096] (e) It provides comfortable prolonged use on a user's lap.

[0097] (f) The heat dissipating device can be placed below or above the electrical or electronic device (Example, computer server). This will mean an increase in the cooling efficiency.

[0098] (g) The location of the heat sinks is determined by the user. It can be adjusted according to user's preferences and requirements to obtain maximum result.

[0099] It is of course to be understood that the embodiments described herein is merely illustrative of the principles of the invention. A wide variety of modifications thereto may be effected by persons skilled in the art without departing from the spirit and scope of the invention as set forth in the following claims.

CLAIMS

What is claimed is:

1. A heat-dissipating device for cooling of heat generated by an electrical or electronic device comprising:

a. a plurality of heat sinks being thermally coupled to the hotspot regions of said electronic device and transfer heat away from said electronic device,

b. a singular or plurality of heat-conductive plates, and

c. means of thermally coupled said heat sinks to said heat-conductive plates, whereby the free passage of air flowing across said heat sinks and said heat-conductive plates provide cooling for said electrical or electronic device.

2. The heat-dissipating device of Claim 1 wherein said heat sinks are selected from the group comprising of copper or aluminum or other heat conductive material.

3. The heat-dissipating device of Claim 1 wherein said heat sinks contain a singular or plurality of elongated-heat-conductive supports, wherein said elongated-heat-conductive supports are selected from the group comprising of copper or aluminum or other heat conductive material.

4. The heat-dissipating device of Claim 1 wherein said heat sinks contain a singular or plurality of pressure-release slots or pressure-release through holes.

5. The heat-dissipating device of Claim 1 wherein said heat sinks contain a plurality of fins.

6. The heat-dissipating device of Claim 1 wherein said heat-conductive plates contain a plurality of holes, wherein said plurality of holes are square or circle or rectangle or any shape, wherein said plurality of holes are through holes or blind holes.

7. The heat-dissipating device of Claim 1 wherein said heat-conductive plates contain a plurality of protrusions, wherein said plurality of protrusions are square or circle or rectangle or any shape;

8. The heat-dissipating device of Claim 1, further including a plurality of resilient means or springs.

9. The heat-dissipating device of Claim 1, further including a plurality of heat-conductive sheets, wherein said heat-conductive sheets are sandwiched between said heat sink and said heat-conductive plate.

10. The heat-dissipating device of Claim 1, further including a plurality of elastic holders, wherein said elastic holders comprises of an elastic string, a first hook at one end of said elastic string and a second hook at the other end of said elastic string.

11. The heat-dissipating device of Claim 1, further including a heat-insulating base, wherein said heat-insulating base comprises of a plurality of loops.

12. The heat-dissipating device of Claim 1, further including a plurality of heat sink extenders, wherein said heat sink extenders are selected from the group comprising of copper or aluminum or other heat conductive material.

13. The heat-dissipating device of Claim 1, further including a plurality of stabilizers.

14. A method for dissipating of heat generated by an electrical or electronic device comprising the steps of:

a. coupling a plurality of heat sinks to a plurality of hotspot regions of said electronic device thermally, thereby transferring heat away from said electronic device,

b. providing a singular or plurality of heat-conductive plates, and

c. coupling said heat sinks to said heat-conductive plates thermally,

whereby the free passage of air flowing across said heat sinks and said heat-conductive plates provide cooling for said electrical or electronic device.

15. The method of Claim 14, further include securing said electronic device to said heat-conductive plates.

16. The method of Claim 14, further include providing a means of pushing said heat sinks against the hotspot regions of said electronic device to ensure close contact.

17. The method of Claim 14, further include releasing pressure built up when

said heat sinks is inserted into said heat-conductive plates.

18. The method of Claim 14, further include insulating said heat-conductive plates to prevent heat from spreading.

19. The method of Claim 14, further include extending surface area of said heat sinks and said heat-conductive plates.

20. The method of Claim 14, further include stabilizing said electronic device to prevent slipping.