FORM 2

THE PATENTS ACT, 1970

(39 of 1970)

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The Patent Rules, 2003

COMPLETE SPECIFICATION

(See sections 10 & rule 13)

1. TITLE OF THE INVENTION

A HEAT SINK FOR CENTRAL PROCESSING UNIT (CPU) WITH DUAL SIDE HEAT TRANSFER

2. APPLICANT (S)

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3. PREAMBLE TO THE DESCRIPTION

COMPLETE SPECIFICATION

The following specification particularly describes the invention and the manner in which it is to be performed.

FIELD OF INVENTION:

[001] The present invention relates to the field of heat sink. The present invention in particular relates to a hollow structured radial fin heat sink for central processing unit (CPU).

DESCRIPTION OF THE RELATED ART:

[002] In recent years, the amount of heat generated by the CPU and elements inside an electronic device has increased, and at the same time, the housing has been required to be compact and thin, and along with this, a compact heat sink having high heat dissipation efficiency has been required. As a heat sink having high heat dissipation efficiency and being able to be thinned, for example, as in Patent Documents 1 and 2 (Patent Document 1: Japanese Patent Application Laid-Open No. 2007-234957 and Patent Document 2: Japanese Patent Application Laid-Open No. 2006-279004), a heat sink with a fan having improved heat dissipation efficiency while suppressing the thickness by providing heat dissipation fins around the centrifugal fan has been proposed. Specifically, a plurality of plate-shaped fins are arranged around the centrifugal fan at intervals above and below, and air is passed through the gap to dissipate heat.

[003] However, the plate-shaped fins need to have a predetermined thickness from the viewpoint of strength and heat conduction, and the number of sheets that can be arranged vertically is limited. Therefore, in order to improve heat dissipation efficiency, each plate-shaped fin should be wide and large. There is a need to. Therefore, even if the thickness can be reduced, the occupied area in the lateral direction becomes large, and the size and weight of the housing cannot be avoided. Further, in order to obtain heat dissipation

efficiency, it is important to bring each heat dissipation fin as close as possible to the outer surface where the discharge port of the centrifugal fan is located. Is required, which causes high cost.

[004] Further, for the quiet rotation of the centrifugal fan, it is important that the flow velocity of the air passing between the heat radiating fins is uniform around the centrifugal fan, in addition to the high heat dissipation efficiency that functions at low rotation. That is, by equalizing the flow velocity, the heat dissipation effect can be maintained even if the average flow velocity is small, and the fact that the average flow velocity can be reduced also reduces the noise of the fan. If the heat radiation fins have an annular shape in a plan view as in Patent Document 2, the heat radiation fins can be made uniform. On the other hand, if the shape is limited to the annular heat radiation fin, the narrow space in the housing of the electronic device cannot be efficiently used, and the degree of freedom in housing design is reduced.

[005] Reference may be made to the following:

[006] IN Publication No. 201921002702 relates to a method for perforated heat fins for better heat transfer in electrical appliances. A heat sink is used for cooling electronic appliances. Heat sink includes a base plate, a plurality of hollow and perforated fins arranged on said base plate, wherein external diameter of said hollow and perforated fins ranges from 4mm to 16 mm; wherein external diameter of hollow and perforated fins ranges from 2mm to 8 mm; wherein horizontal spacing between said hollow and perforated fins ranges from 5mm to 20 mm; wherein vertical spacing between said hollow and perforated fins ranges from 5mm to 20 mm; and wherein height of said hollow and perforated fins is 30 mm.

[007] IN Publication No. 201921002786 relates to a method for perforated heat fins for better heat transfer in electrical appliances. A heat sink is used for cooling electronic appliances. Heat sink includes a base plate, a plurality of hollow and perforated fins arranged on said base plate, wherein external diameter of said hollow and perforated fins ranges from 4mm to 16 mm; wherein external diameter of hollow and perforated fins ranges from 2mm to 8 mm; wherein horizontal spacing between said hollow and perforated fins ranges from 5mm to 20 mm; wherein vertical spacing between said hollow and perforated fins ranges from 5mm to 20 mm; and wherein height of said hollow and perforated fins is 30 mm.

[008] IN Publication No. 202137015775 relates to a heat sink with a fan with which it is possible to: achieve an overall decrease in thickness and size; provide high heat-dissipating efficiency while maintaining quietness; realize low-cost implementation; prevent a decrease in heat-dissipating efficiency and the generation of noise without the overall shape thereof in plan view being particularly limited to a circular shape, thereby making it possible to adopt a shape in accordance with the space in an electronic apparatus housing and to maintain the freedom of housing design. This heat sink with a fan is provided with: a metal heat-receiving substrate; a centrifugal fan disposed on an upper surface side of the heat-receiving substrate; metal plate-shaped walls which are vertically disposed on the upper surface of the heat-receiving substrate at positions around and opposing an outer peripheral portion of the centrifugal fan having air-outlets, and in which a plurality of through-holes are formed in board surfaces opposing the centrifugal fan; and a lid member which is fixed onto an upper end of the plate-shaped wall and closes a space s1 inside the plate-shaped walls.

[009] Publication No. AU2021101491 relates to innovative central processing cooling system. The objective of the present invention is to solve the problems in the prior art related to adequacies in technologies of cooling system. In the present invention a Peltier technology has been used where it will deliver the cool to the CPU, two numbers of heat sink are used in the present invention where one is normal and another is hollow, the normal will deliver the cool and hollow will have made cool the Peltier another warm side.

[010] Publication No. CN2529305 relates to a CPU radiator that is suitable for radiators with the pedestal inserted, welded or glued on the blade of the radiator. The utility model is characterized in that: the radiator pedestal where opposite with the CPU chip is provided with a through hollow part that can contain high-thermal conductivity material (such as copper column), the air inside the hollow part is discharged when the high-thermal conductivity material is placed into the hollow part so as to conduct the heat produced by the CPU chip with the high-thermal conductivity material to the pedestal of the radiator and the radiator blades.

[011] Publication No. CN2529306 relates to a CPU heat sink device that is suitable heat sink with solid or hollow central column and the radiator blades radiate out in all the directions. The bottom of the radiator is provided with a fixed copper piece that contacts the running chip of the CPU which rapidly spread and conduct the heat produce by the CPU running chip to the outer edge of the radiator, that is to conduct the heat upward to the upper edge of the blade by the central column so as to even the temperature of the whole radiator for the convenience of bringing away the heat by the cool air blown by the fan. Besides, the copper can increase the radiator area to achieve optimum radiation effect.

[012] Publication No. GB2383682 relates to a rotary cooler for a CPU comprises an outer ring heat spreader formed of a cylindrical ring and a seat. Heat radiating fins radially gather together from the outer ring to the center. A fan may be placed at one end of the inner face of the annular wall. The annular wall may be made of solid material or may be hollow and contain material of good conductance or cooling liquid. Heat spreading pipes may also be connected to the both ends of the cooler.

[013] Publication No. CN2566025 relates to a radiating device for a computer CPU, which with a radiating element which is made of a porosity medium, a fan fixedly arranged on the radiating element and a base attached to the CPU, wherein, the radiating element forms a hollow cylinder shape and is provided with a plurality of pores, a mounting hole is arranged at the bottom of the radiating element, the center on the base is provided with a heat conductor which is made of a heat conduction metal material, the heat conductor is connected with the base through a plurality of support chips, and the radiating element is fixedly connected to the base. The heat conductor is arranged in the mounting hole, the fan is fixed to the upper side of the hollow part of the radiating element through a fixing bracket, and high temperature which is created by the operation of the CPU can be transmitted to the radiating element through the heat conductor. The gas is leaded in through the fan, and the heat source can be directly emitted through the pores of the radiating element. Therefore, the high radiating efficiency is achieved, and the temperature of the CPU can sustain a normal working temperature.

[014] Publication No. DE202004014777 relates to a heat sink with a plurality of cooling fins. A heat sink is created. The heat sink has

a hollow chassis with a contact surface on the bottom for attachment to an electronic component and a heat-dissipating surface on the top. A plurality of cooling fins arranged in a circle extend from an inner side wall of the hollow chassis toward the center of the hollow chassis, with gaps between the cooling fins gradually narrowing from the inner side wall of the hollow chassis toward the center of the hollow chassis. At least one heat pipe is positioned between the contact surface and the heat dissipating surface. At least one fan is mounted on one side of the hollow chassis to move air to increase the amount of air that flows through the wider gaps between the cooling fins to increase the rate of heat dissipation.

[015] Publication No. GB2388711 relates to a CPU cooling apparatus for a personal computer comprises a thermal pipe with a metal weave passing through a hollow base portion of a set of fins and through a plurality of overlapping heat sinks covered by the casing of a fan. The hollow base portion of the set of fins is covered by a sheet of metal and a fastener for fastening the set of fins to a CPU socket. Each heat sink has an opening corresponding to each thermal pipe. The fan casing has at least one screw hole for attachment of the fan to a housing of the personal computer. The sheet of metal may be of copper. The thermal pipe may be curved. The heat sinks may be of aluminum. The fan may be arranged to blow air from the interior of the housing to the exterior of the housing.

[016] Publication No. US2005047105 relates to a heat dissipation computer and method. A heat dissipation apparatus comprises a heat sink that is adapted to receive a processor mounted thereto, the heat sink comprising an internal chamber that is adapted to receive a fluid flow that removes heat from the heat sink. A method

for dissipating heat generated by a processor comprises forcing fluid through an internal chamber formed within a heat sink to which the processor is mounted, forcing the fluid from the internal chamber of the heat sink through at least one hollow prong that extends from the heat sink and that is in fluid communication with the internal chamber of the heat sink, and forcing fluid over exterior surfaces of the at least one hollow prong.

[017] Publication No. US2002046826 relates to a CPU cooling structure includes a heat sink and an axial flow fan adapted to dissipate heat from the CPU of the motherboard in a computer, the heat sink having a hollow center shaft filled up with a heat transfer fluid and a plurality of radiation fins equiangularly radially arranged around the periphery of the center shaft and curved in direction corresponding or reversed to the direction of rotation of the fan blade and hub assembly of the axial flow fan.

[018] Publication No. US2005036289 relates to a heat dissipation device includes a mounting plate for mounting the heat dissipation device to a circuit board on which a CPU and a plurality of capacitors are mounted, a heat sink, a core, and a fan mounted on the heat sink. The heat sink locates above the mounting plate and includes a hollow cylinder and a plurality of curved fins extending outwardly from the cylinder. The core includes a base for contacting the CPU and a post extending from the base through the mounting plate to be received in the cylinder. The mounting plate is spaced from the circuit board to allow the capacitors to locate between the mounting plate and the circuit board. The mounting plate defines a plurality of openings for providing access for cooled air from the fan to the CPU and the capacitors.

[019] The efficiency of the cooling system for the CPU of a computer is essential in the case of high-speed computing systems. Hence there required a heat sink for CPU which has high heat transfer efficiency.

[020] In order to overcome above listed prior art, the present invention aims to provide a hollow structured radial fin heat sink for central processing unit (CPU) having high heat transfer rate.

OBJECTS OF THE INVENTION:

[021] The principal object of the present invention is to provide a hollow structured radial fin heat sink for central processing unit (CPU).

[022] Another object of the present invention is to provide a hollow structured radial fin heat sink with dual side heat transfer (HT) for central processing unit (CPU).

[023] Yet another object of the present invention is to provide a hollow structured radial fin heat sink which has enhanced heat transfer (HT) rate.

SUMMARY OF THE INVENTION:

[024] The present invention relates to a hollow structured radial fin heat sink with dual side heat transfer (HT) when placed on the central processing unit (CPU), enhancing the HT rate. The hallow heat sink will have dual side heat transfer enhancing the cooling rate apart from high heat absorption rate by the heat sink due to less mass. The tapered fins have hollow space internally and are connected to a common chamber at the bottom. Apart from the convective HT with the cooling fan fixed on the HS, the cold air from

the vortex tube at 25 degrees enters the hollow HS through the two tubes at the bottom, which then passes across the fins.

BREIF DESCRIPTION OF THE INVENTION

[025] It is to be noted, however, that the appended drawings illustrate only typical embodiments of this invention and are therefore not to be considered for limiting of its scope, for the invention may admit to other equally effective embodiments.

[026] Figure 1 and 2 (a-f) shows hollow structured radial fin heat sink with dual side heat transfer (HT) according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION:

[027] The present invention provides a hollow structured radial fin heat sink with dual side heat transfer (HT) when placed on the central processing unit (CPU), enhancing the HT rate. hallow heat sink will have dual side heat transfer enhancing the cooling rate apart from high heat absorption rate by the heat sink due to less mass. The tapered fins have hollow space internally and are connected to a common chamber at the bottom (Fig 2a- 2f). Apart from the convective HT with the cooling fan fixed on the HS, the cold air from the vortex tube at 25 degrees enters the hollow HS through the two tubes at the bottom, which then passes across the fins.

[028] The centrifugal compressor [2] produces compressed air that is used to supply compressed input air to the vortex tube [3]. This vortex tube [3] takes compressed air from the centrifugal compressor as an input and splits it into two streams, one hot air stream [1] the other cold air stream [7]. The vortex tube's cold air stream [7] is used to feed the hollow-structured radial fin heat sink [5]. These hollow

fins allow the cold air to pass through them, which regulates temperatures at optimal levels 41°C-43°C. The fan [4] placed on top of the heat sink created forced convection [8], which further enhances heat transfer rates. Aluminum is the material used to make the hollow-structured radial fin heatsink. The heat sink consisting of a hollow flat bottom rectangular base chamber. This based chamber is provided with a cold air input pipe on one side with 8 mm diameter. On the other side of the base chamber an output pipe is provided with same diameter. The walls of this base chamber are 1 mm thick. On one side of this rectangular base chamber hallow plate fins with tapered width are provided and they get connected at the center. The thickness of these plate fins increases radially outward from 1mm to 4mm and these hallow fins open into the base chamber.

[029] Initially, air from the atmosphere, which is at the ambient temperature of around 30°C & at atmospheric pressure, is passed through the centrifugal compressor, the air pressure increases on passing through the compressor. Then the air flows all the way through the vortex tube where the air gets splitted into two steams one is hot, and the other is cold according to the cold fraction. The hot stream produced from the vortex tube is rejected to the atmosphere, and the cold stream is directed towards the two inlets of the heat sink (HS). The cold air generated via this process is further used in this simulation as input cold air. The temperature of the output cold air depends entirely upon the inlet pressure and temperature of the compressed air; the flow rate of the cold air depends on the cold fraction (Fig 1).

[030] A cold air chamber is created within the heat sink at the bottom of it through which cold air from the vertex tube is circulated.

Since the temperature of the air coming out of the cooling chamber is almost equal to the room temperature, it is not necessary to use an external cooling fan above the heat sink for the external cooling. The Air coming from the internal cooling chamber can be used to circulate on the external surface of the heat sink by providing a simple airduct.

[031] Thus, it is easy to regulate the temperature of the input cold by regulating the vortex tube and the input compressed air. Compressed air can be used anytime, anywhere by storing. Since atmospheric air is used as an internal working fluid through the hollow spaces, the leaking of air will not cause any damage to both the heat sink & CPU. If other liquids and gases are used as cooling media, leakage may cause damage to the CPU.

[032] The hollow structured radial fin heat sink is made up of aluminum alloy, manufacturing and raw material costs are significantly lower and manufacturing is easy.

[033] Assuming that there is no fluctuation of inlet temperature or pressure throughout the process. The vortex tube can consistently sustain the temperature within ±1°C. The more the cold fraction, the greater the percentage of cold air we get, which means more the mass flow rate from the cold end & lesser the temperature drop of cold air.

[034] In the present invention entire heat sink is a hallow construction. With this hollowness in the base plate and the radial plate fins, the heat transfer rate will be high for the heat sink, which maintain CPU temperatures at optimal levels. As the fin has hollow tapered passage inside, its internal gap varies from 1mm to 4mm. This diverging internal channel will give cooling effect due to

throttling effect. As the fin's are hollow, the surface area gets increased, leading to increase of heat transfer due to dual-sided cooling. The internal forced convection is caused by cold air passing through the fin will complement the heat transfer done by the external fan causing external forced convective heat transfer. The vortex tube and the centrifugal compressor are used together to generate cold air, which is then used for cooling the CPU. Initially the cold air flows into the base chamber and then the air coming out of the hallow fins will be used to circulate on the externals surface with a cooling fan on the top of the fins as seen in the normal CPU cooling systems. This hollow-structured radial fin heatsinks and thus creates dual flow impact enhancing the cooling effect to maintain the optimum CPU temperature.

[035] Numerous modifications and adaptations of the system of the present invention will be apparent to those skilled in the art, and thus it is intended by the appended claims to cover all such modifications and adaptations which fall within the true spirit and scope of this invention.

Dated **20th** day of **September, 2022**

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WE CLAIM:

1. A hollow structured radial fin heat sink with dual side heat transfer (HT) placed on the central processing unit (CPU) to enhance the heat transfer rate comprises-

- compressor [2] produces compressed air that is used to supply compressed input air to the vortex tube [3];
- vortex tube [3] takes compressed air from the centrifugal compressor as an input and splits it into two streams, one hot air stream [1] the other cold air stream [7] used to feed the hollow-structured radial fin heat sink [5] which allows the cold air to pass through them, which regulates temperatures at optimal levels 41°C-43°C. The fan [4] placed on top of the heat sink created forced convection [8], which further enhances heat transfer rates;
- tapered heat sink (5) characterized in that hollow tapered passage inside, its internal gap varies from 1mm to 4mm and hollow space internally and are connected to a common chamber at the bottom wherein apart from the convective heat transfer with the cooling fan fixed on the heat sink, the cold air from the vortex tube at 25 degrees enters the hollow heat sink through the two tubes at the bottom, which then passes across the fins and a cold air chamber is created within the heat sink at the bottom of it through which cold air from the vertex tube is circulated and an external cooling fan above the heat sink for the external cooling and the air coming from the internal cooling chamber can be used to circulate on the external surface of the heat sink by providing a simple airduct.

2. The hollow structured radial fin heat sink with dual side heat transfer. as claimed in claim 1, wherein the temperature of the output cold air depends upon the inlet pressure and temperature of the compressed air and the flow rate of the cold air depends on the cold fraction.
3. The hollow structured radial fin heat sink with dual side heat transfer, as claimed in claim 1, wherein the hollow base plate and the radial plate fins, maintains high the heat transfer rate, which maintain CPU temperatures at optimal levels.
4. The hollow structured radial fin heat sink with dual side heat transfer. as claimed in claim 1, wherein the diverging internal channel provides cooling effect due to throttling effect and as the fin's are hollow, the surface area gets increased, which increases of heat transfer due to dual-sided cooling and the internal forced convection is caused by cold air passing through the complements the heat transfer done by the external fan causing external forced convective heat transfer, the vortex tube and the centrifugal compressor used together to generate cold air, which is then used for cooling the CPU and initially the cold air flows into the base chamber and then the air coming out of the hallow fins is used to circulate on the externals surface with a cooling fan on the top of the fins.
5. The hollow structured radial fin heat sink with dual side heat transfer. as claimed in claim 1, wherein the hollow-structured radial fin heatsinks and thus creates dual flow impact enhancing the cooling effect to maintain the optimum CPU temperature.

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ABSTRACT

A HEAT SINK FOR CENTRAL PROCESSING UNIT (CPU) WITH DUAL SIDE HEAT TRANSFER

The present invention relates to a hollow structured radial fin heat sink with dual side heat transfer (HT) when placed on the central processing unit (CPU), enhancing the HT rate. The hallow heat sink will have dual side heat transfer enhancing the cooling rate apart from high heat absorption rate by the heat sink due to less mass. The tapered fins have hollow space internally and are connected to a common chamber at the bottom.

Figure 2a- 2f

Dated **20th** day of **September, 2022**

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